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Trauma-Related Sleep Disturbance and Self-Reported Physical Health Symptoms in Treatment-Seeking Female Rape Victims

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Abstract

The purpose of the study was to assess the relationship between trauma-related sleep disturbance and physical health symptoms in treatment-seeking female rape victims. A total of 167 participants were assessed for PTSD symptoms, depression, sleep disturbance, and frequency of self-reported health symptoms. Results demonstrated that trauma-related sleep disturbance predicted unique variance in physical health symptoms after other PTSD and depression symptoms were controlled. The findings suggest that trauma-related sleep disturbance is one potential factor contributing to physical health symptoms in rape victims with PTSD.

Violence against women yields a variety of deleterious effects, both direct and indirect, on objective and subjective indices of physical health (Resnick et al., 1997). In addition to psychological reactions to trauma such as posttraumatic stress disorder (PTSD) and depression, women who have experienced criminal victimization report a variety of physical symptoms that range across bodily systems, including cardiovascular, gynecological, respiratory, musculoskeletal, and dermatological systems (Kimerling and Calhoun, 1994; Koss et al., 1991).

Several studies have demonstrated that PTSD is a mediating factor in the relationship between trauma exposure and reports of elevated health symptoms in women (Kimerling et al., 2000; Wolfe et al., 1994). Researchers have proposed multiple biological mechanisms to explain the impact of PTSD on health (Friedman and Schnurr, 1995). Among these proposed mechanisms is the chronic autonomic hyperarousal (Koss and Heslet, 1992; McFarlane et al., 1994) and sleep disturbance associated with PTSD (Friedman and Schnurr, 1995). The hypothesized link between autonomic arousal and physical health was bolstered by the recent finding that the hyperarousal symptom cluster of PTSD was the strongest of the PTSD symptom subclusters in predicting both total health symptoms and global health perception in a sample of women veterans (Kimerling et al., 2000).

Given the observed relationships between PTSD, particularly hyperarousal symptoms, and health outcomes, and the potential impact of biological alterations associated with a PTSD diagnosis, we hypothesized that sleep disturbance associated with psychological reactions to trauma may be an important predictor of health symptoms. Sleep disturbance has been associated with a variety of negative health outcomes, including immune system alterations, cardiovascular incidents, and general health symptoms (Kales et al., 1984; Newman et al., 1997). Further, in a study investigating the aftermath of Hurricane Andrew, self-reported sleep disturbance mediated between PTSD symptoms and an index of immune functioning (NKCC levels; Ironson et al., 1997).

Recent research suggests that, in addition to PTSD symptoms, depressive symptoms are important in the prediction of self-reported health symptoms after trauma (Clum et al., 2000; Wolfe et al., 1999). A diagnosis of depression independent of trauma exposure has been linked to poorer reported health and immune system alterations (Miller et al., 1999; Schulberg et al., 1987). As with PTSD, there are likely to be multiple pathways by which depression impacts health status. Sleep disturbance, a symptom of depression, has also been examined as a mediating variable in the relationship between depressive symptoms and health. Specifically, sleep disturbance, as objectively measured by EEG, mediated the relationship between bereavement associated intrusions and avoidance symptoms in depressed individuals and natural killer cell (NKC) number, a measure of immune functioning (Hall et al., 1998). This study included individuals with a diagnosis of major depression who were exhibiting PTSD-like symptoms, suggesting that a salient test of the importance of trauma-related sleep disturbance in the prediction of health symptoms should include an examination of depressive symptoms in addition to PTSD symptoms.

Given these interrelationships, an important step in elucidating the role of trauma-related sleep disturbance in the prediction of self-reported physical health symptoms would be to examine sleep as a unique predictor of health symptoms above and beyond PTSD and depressive symptoms. Hierarchical regression was utilized to examine the predictive role of PTSD symptoms, depressive symptoms, and trauma-related sleep disturbance in the prediction of self-reported health symptoms in a sample of female rape victims. We hypothesized that trauma-related sleep disturbance would be associated with health symptoms in this population after controlling for PTSD and depressive symptoms.

Methods

Participants

The sample was comprised of 167 treatment-seeking female rape victims who did not meet initial exclusionary criteria for the treatment study. Participants were at least 3 months post-crime. The exclusionary criteria included DSM-III-R diagnoses of an organic mental disorder, schizophrenia, mood disorder with psychotic features, and current substance dependence. Participants who had recently begun to take psychoactive medications, were currently in a violent relationship, or were acutely suicidal were also excluded. Of the 167 women who were screened into the study, 149 met diagnostic criteria for PTSD and 17 did not. Complete data were missing for one participant.

The average age of the participants was 32 years (range: 18 to 70 years) with an average of 8.63 years elapsed between the index rape and seeking treatment in the study. The mean years of education was 14.28 (range: 8 to 24). Regarding income, 26 (15.6%) participants made less than \$5,000 per year, 13 (7.8%) made between \$5,000 to 10,000 per year, 29 (17.4%) made between \$10,000 to 20,000 per year, 17 (10.2%) made between \$20,000 to 30,000 per year, 15 (9%) made between \$30,000 to 50,000 per year, and 16 (9.6%) made more than \$50,000 per year. Income data on 51 (30.5%) participants were missing. Regarding marital status, 87 (52.1%) were single, 33 (19.8%) were married, 5 (3%) were separated, 34 (20.4%) were divorced, 6 (3.6%) were living with a partner, and 1 (.6%) was widowed. Marital status data on one (.6%) participant were missing. The racial distribution of participants was 122 (73.1%) Caucasians, 37 (22.2%) African-Americans, and 7 (4.2%) other. Data on one (.6%) were missing.

Measures

PTSD Symptom Scale (PSS; Foa et al., 1993)—The PSS consists of 17 self-report items that correspond to the symptoms of the DSM-IV (American Psychiatric Association, 1994)

diagnostic criteria for PTSD. Each symptom is rated for frequency on a 4-point scale, which can be summed to derive a total score (total range 0 to 51). The three PTSD symptom subclusters of intrusion, avoidance, and hyperarousal symptoms were used in the analyses. Reliability and validity of the PSS are good (Foa et al., 1993). For the current study, $\alpha = .84$.

Beck Depression Inventory (BDI; Beck et al., 1961)—The BDI is a 21-item, self-report inventory that evaluates cognitive and vegetative symptoms of depression (total range 0 to 63). Reliability has been reported as good (Beck et al., 1988). For this study, $\alpha = .86$.

Pennebaker Inventory of Limbic Languidness (PILL) (Pennebaker, 1982)—The PILL is 54-item, 5-point scale assessing the frequency of occurrence of common physical symptoms and sensations. There are two methods of scoring: summing and binary. With the summing technique, items 1 to 54 are added, and this method was utilized in this study. The internal consistency is high (.91 for summing and .88 for binary). Test-retest reliability was found to be .83 for summing and .79 for binary. High PILL scorers are aware of more symptoms across a number of settings relative to low PILL scorers. PILL scores are positively correlated with self-reported physician visits within the past year ($r = .22$, $N = 505$), number of days that the person's activities were restricted in the last year ($r = .19$, $N = 505$), and aspirin use within the last month ($r = .30$, $N = 231$). The PILL correlates moderately with the Hopkins Symptom Checklist ($r = .48$, $N = 213$), the Autonomic Perception Questionnaire ($r = .50$, $N = 75$), and the Cornell Medical Index composite score ($r = .57$, $N = 100$). To ensure that we were not predicting sleep disturbance as a physical symptom, one item assessing insomnia was dropped from the total PILL score.

Procedure and Statistical Analyses

The participants who gave informed consent were given self-report measures to assess for demographic information, PTSD symptoms, depression symptoms, and frequency of occurrence of physical health symptoms. Because the focus of the analyses was to determine the unique contribution of PTSD-related sleep difficulties after controlling for PTSD and depression symptoms, the sleep items contained on the PSS and the BDI were removed from the scoring of these measures. The nightmare and insomnia items from the PSS were summed (range: 0 to 6) to create a continuous variable that served as an index of PTSD-related sleep difficulties. Correlations were computed to determine the relationship of sleep difficulties with demographic variables, PTSD, and depression measures. Finally, a hierarchical multiple regression was conducted to determine whether sleep difficulties predicted unique variance in health symptoms after controlling for symptoms of PTSD and depression.

Results

The mean PTSD score on the PSS for the entire sample was 25.91 ($SD = 8.01$), indicating moderate PTSD symptoms. The mean depression score on the BDI was 21.41 ($SD = 8.96$), indicating moderate to severe depression. The mean score of PTSD-related sleep difficulties was 3.07 ($SD = 1.53$) indicating, on average, moderate problems with nightmares and insomnia. The mean score on the PILL was 127.15 ($SD = 33.37$). The most frequently endorsed physical symptoms can be viewed in Table 1.

In the first series of analyses, zero order correlations were computed between the variables (Table 2). The correlational analyses showed a significant relationship of frequency of self-reported physical health symptoms with depression scores and all three PTSD subclusters of intrusion, avoidance, and hyperarousal symptoms. In addition, the physical health symptom variable (PILL) was significantly related to PTSD-related sleep disturbance. Demographic variables were not related to self-reported physical symptoms; therefore, they were not

included in the regression analysis. Table 3 shows the results of the hierarchical multiple regression analysis. In step 1, the three PTSD symptom clusters accounted for 19% of the variance in self-reported health symptoms. When depressive symptoms were entered, this variable accounted for an additional 9% of the unique variance in health symptoms. After controlling for the three PTSD symptom clusters and depressive symptoms, PTSD-related sleep disturbance predicted an additional 2% of the variance. In the final step, increased reports of physical health symptoms were associated with the hyperarousal symptoms of PTSD, depressive symptoms, and trauma-related sleep disturbance (multiple $R = .532$, $R^2 = .284$, $F [5, 161] = 12.74$, $p < .0001$).

Discussion

This is one of the first studies to examine trauma-related sleep disturbance as a predictor of self-reported physical symptoms in a trauma population. It is also unique in that both PTSD and depressive symptoms were controlled, allowing for a more rigorous test of the hypothesis. Our results suggest that trauma-related sleep disturbance accounted for a small, but significant, portion of the variance in self-reported physical symptoms above and beyond that accounted for by PTSD and depressive symptoms.

The most frequently reported physical symptoms in this sample are consistent with reported physical symptoms in other studies of sexual assault victims (Clum et al., 2000; Kimerling and Calhoun, 1994), reflecting a variety of bodily systems, including respiratory, gastrointestinal, gynecological, dermatological, and musculoskeletal systems. Sleep disturbance has been linked to alterations in immune function independent of traumatic exposure. Trauma-related sleep disturbance has also been shown to be a mediator of the relationship between PTSD symptoms and immune system markers in natural disaster survivors (Ironson et al., 1997). Further, these immune measures were correlated with self-reported health symptoms (Ironson et al., 1997). Although we did not test mediation or have objective measures such as immunity, our results lend support to the findings of Ironson and colleagues and extend this research to a rape sample. It is possible that some of the elevations in physical symptoms seen in our sample (*e.g.*, respiratory) may be the result of immune changes resulting from trauma-related sleep disturbance. Other potential pathways to increased self-reported health symptoms include mediating variables such as reduced physical activity or other negative health behaviors associated with PTSD or depression. Alternatively, negative health behaviors may be a consequence of fatigue associated with sleep disturbance. Future studies should endeavor to clarify the role of health behaviors when trauma-related symptoms and health are examined.

The results of the regression analysis also support an important role for PTSD and depressive symptoms in the prediction of self-reported health symptoms. Specifically, the hyperarousal symptoms of PTSD were strong predictors of physical symptoms. These results are consistent with a previous examination of PTSD symptom clusters in relation to health indices (Kimerling et al., 2000). Notably, even after removing sleep disturbance from the hyperarousal cluster, it remained the strongest predictor of the PTSD clusters. This suggests the possibility that, in addition to sleep disturbance, other factors associated with chronic autonomic arousal may be important mechanisms in the relationship between trauma and self-reported health outcomes. As Friedman and Schnurr (1995) postulated, cardiovascular reactivity, autonomic reactivity, adrenergic dysregulation, and hypothalamic-pituitary-adrenal (HPA) axis alterations, among other changes associated with PTSD, may affect physical health. Our results suggest that depressive symptoms are also important in the prediction of self-reported health symptoms in a rape sample. Recent evidence points to depressive symptoms as an important component of the documented changes in health status identified in trauma populations. Depression should continue to be included in investigations of trauma and health outcomes.

This study has several limitations. One limitation is that health status was only measured with a subjective report of physical symptoms. It has been noted that self-report measures such as the PILL are affected by psychological factors such as negative affectivity (Watson and Pennebaker, 1989), which may function to inflate reports of health symptoms. Self-report of physical symptoms should be bolstered with additional methods of measurement, such as objective indices of health. Future studies should include medical utilization, health behaviors, biological measures (*e.g.*, immune system), morbidity, and mortality in concert with self-reported health symptoms in the assessment of health status. Given these limitations, the PILL has been shown to be associated with additional health indices, such as treatment seeking, activity restriction, and aspirin use (see *Methods*). Also, general physical symptoms and symptoms associated with particular organ systems are facets of health status that have demonstrated relationships to other indices of health, such as medical prognosis, health risk behaviors, and morbidity (Idler and Angel, 1990; Segovia et al., 1989). A similar limitation is that trauma-related sleep disturbance was measured by self-report, and objective documentation of sleep disturbance would be useful. Finally, given the correlational nature of the data, it is impossible to know whether trauma-related sleep disturbance is a cause or an outcome of physical health symptoms. However, the fact that trauma-related sleep disturbance was assessed in this study, rather than global sleep disturbance, supports the hypothesized direction of the relationship. Prospective studies would be useful in delineating the relationship between sleep disturbance and health symptoms. In sum, multiple factors are likely responsible for the increase in physical symptoms observed after rape, and trauma-related sleep disturbance may be one mechanism by which PTSD symptoms impact physical health.

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TABLE 1Most Frequently Reported Physical Symptoms ($N = 167$)

Physical Symptom	Percentage Endorsing Symptom
Headaches	86%
Upset stomach	75%
Back pains	70%
Sensation of pressure in head	66%
Acne or pimples on face	60%
Monthly premenstrual problems, such as severe abdominal bloating, headache, or breast tenderness	60%
Stiff muscles	60%
Indigestion	58%
Running nose	58%
Racing heart	58%
Sore muscles	58%
Nausea	57%
Severe pains or cramps in stomach	57%
Itching or painful eyes	56%
Congested nose	55%
Out of breath	55%

TABLE 2

Zero-Order Correlations among Demographic Variables, PTSD Symptoms, Depression, Sleep Disturbance, and Health Symptoms ($N = 167$)

Variable	1	2	3	4	5	6	7	8	9	10
1. Age	1.00									
2. Education	.10	1.00								
3. Rape duration	.53**	.05	1.00							
4. Income	-.00	.22*	-.02	1.00						
5. PSS intrusion	-.00	-.03	-.06	-.17	1.00					
6. PSS avoidance	-.05	.10	-.15	-.03	.49**	1.00				
7. PSS hyperarousal	-.02	.02	-.04	-.09	.42**	.40**	1.00			
8. BDI total	.02	-.03	-.03	-.16	.31**	.55**	.38**	1.00		
9. PSS sleep	-.06	-.08	-.13	-.07	.61**	.50**	.42**	.39**	1.00	
10. PLL total	-.04	-.01	.12	-.11	.17*	.30**	.37**	.47**	.33**	1.00

* $p < .05$;

** $p < .01$.

TABLE 3
Hierarchical Multiple Regression for Prediction of Frequency of Physical Health Symptoms (*N* = 167)

Predictor	B	SE B	β	Step ΔR^2	Total R^2
Step 1: PTSD Sx					
PSS Intrusion	-.79	1.05	-.06	.17	17%***
PSS Avoidance	1.49	.61	.21*		
PSS Hyperarousal	3.89	1.02	.31***		
Step 2: Depression Sx					
PSS Intrusion	-.74	.99	-.06	.10	27%***
PSS Avoidance	.18	.64	.03		
PSS Hyperarousal	2.93	.98	.23**		
BDI Total	1.43	.31	.39***		
Step 3: Sleep disturbance					
PSS Intrusion	-1.73	1.10	-.14	.02	28%***
PSS Avoidance	-.06	.64	-.01		
PSS Hyperarousal	2.64	.98	.21**		
BDI Total	1.36	.31	.37***		
PSS Sleep	4.00	1.96	.18*		

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