Posttraumatic Stress Disorder, Anger and Hostility, and Physical Health Status

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Abstract: Accumulating evidence suggests that posttraumatic stress disorder (PTSD) is linked to both objective and subjective indices of poorer health. Less is known about processes that may explain this association. This study examined anger/hostility as a possible mediator and moderator of PTSD and health status among a sample of 134 medical patients. Participants completed a structured interview of PTSD and questionnaires assessing health perceptions and anger and data on physician-diagnosed illnesses were gathered from computerized databases. Trait anger and anger-in partially explained the association between PTSD and poorer general health perceptions. There was a significant association between anger-in and the presence of a circulatory disorder only in patients with PTSD.

Key Words: Posttraumatic stress disorder, physical health status, anger, veterans.

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Accumulating evidence suggests that posttraumatic stress disorder (PTSD) plays a causal role in poorer physical health (Schnurr and Jankowski, 1999). Several studies indicate that among veterans, PTSD is associated with poorer physical health using objective (*e.g.*, Beckham et al., 1998) and subjective health assessments (*e.g.*, Schnurr et al., 2000).

Schnurr and Jankowski (1999) propose that PTSD affects health through biological and psychological correlates that independently and jointly, through behavioral factors, cause poorer health. Hostility is noted as a possible explanatory variable through which PTSD affects physical health (see also Beckham et al., 2002a). Hostility and anger are associated with PTSD (Beckham et al., 2002a). Moreover, chronic anger/hostility has been shown to have adverse consequences for physical health (Miller et al., 1996).

In an evaluation of PTSD and health status among male and female patients in VA medical clinics (Ouimette et al., 2004), we found that after controlling for health risk behaviors and comorbid psychopathology, patients with PTSD were more likely to have physician-diagnosed circulatory and musculoskeletal conditions than those without PTSD. Moreover, patients with PTSD had poorer health-related quality of life, with the strongest evidence for a link between PTSD and more self-reported physical activity limitations and poorer general health. Using these patients, this study extends our earlier work by examining anger/hostility as a possible mediator, moderator, or both of the relationship between PTSD and poorer health. Consistent with the model outlined, we expected that anger/hostility would mediate the association between PTSD and poorer objective (*i.e.*, the presence of a circulatory and musculoskeletal condition) and perceived physical health (*i.e.*, limitations on physical functioning, general health). Moreover, we expected that the association between PTSD and poorer physical health would be moderated by anger/hostility such that patients with PTSD would show a stronger connection between anger/hostility and poorer health than patients without PTSD.

METHODS

Participants and Procedures

Participants ($N = 134$) from general medical and women's health clinics at the Department of Veterans Affairs Medical Center in Palo Alto and Menlo Park completed an interview and questionnaire assessing physical and mental health concerns. Potential participants were identified through those who volunteered to complete the PC-PTSD screen (Prins et al., 2004) in the waiting rooms of clinics. All screened and eligible participants were invited into the study. Exclusion criteria included cognitive impairment, participant living too far away and not able to travel to the VA, not being fluent in English, invalid phone number, and participation in another research project precluding participation in the current study. Of eligible participants ($N = 237$), 57% completed the interview. Master's-level and doctoral-level psychologists interviewed participants. Participants gave written informed consent to participate and allow access to their medical records and were paid for the study. The Stanford University Panel on Medical Human Subjects approved this project.

On average, patients were 51.72 years old (SD = 14.98) and had some college or a college degree (68%; $N = 91$). A total of 61% ($N = 82$) were female, 36% ($N = 48$) were ethnic minorities, 44% ($N = 59$) were married, and 59% ($N = 79$) were employed. Thirty-three patients (25%) met criteria for PTSD based on a structured clinical interview. Participants ($N = 134$) did not differ from nonparticipants ($N = 103$) on the PC-PTSD screen total score.

Measures

Posttraumatic Stress Disorder

DSM-IV (American Psychiatric Association, 1994) PTSD was assessed using the Clinician-Administered PTSD Scale (Blake et al., 1995), which has excellent reliability and validity (see Weathers et al., 2001, for a review). Value of κ for the presence or absence of a PTSD diagnosis was .85 (based on $N = 108$ pairs).

Health Status

We obtained information from the Department of Veterans Affairs Outpatient Clinic File on physician-identified medical diagnoses during the year after the index visit. Diagnoses were grouped using the ICD-9 (World Health Organization, 1988). This included any infectious, neoplasm, endocrine, blood, nervous system, circulatory, respiratory, gastrointestinal, genitourinary, dermatological, and musculoskeletal diagnoses. A summary variable of total number of types of diagnoses was created (range, 0 to 11). In addition, we focused specifically on the presence or absence of the two diagnoses that were more prevalent among the patients with PTSD: circulatory and musculoskeletal (Ouimette et al., 2004).

Two RAND-36 health survey 1.0 (Ware and Sherbourne, 1992) scales measured perceived health: physical functioning (10 items reflecting the extent to which health limits physical activities; alpha = .92) and general health (four items tapping current health, future health, and resistance to illness; alpha = .89). Scores ranged from 0 to 100; higher scores indicated better functioning.

Anger/Hostility

Components of anger/hostility were measured with two scales from the Spielberger State-Trait Anger Expression Inventory-2 (Spielberger, 1999). Ten items tapped trait anger, which assesses the frequent experience of angry feelings and hostility. People who score high on this measure often feel like others treat them unfairly and are more hostile. This scale taps into the experiential or emotional aspects of hostility (Miller et al., 1996). Anger expression-in is an eight-item scale that also assesses the frequent experience of angry feelings. However, people who score high on anger-in tend to suppress these feelings rather than express them. Anger-in has items that represent behavioral aspects of anger such as pouting and withdrawing from others and cognitive aspects of hostility such as unexpressed hostile cognitions. Alphas for trait anger and anger-in were .87 and .78, respectively.

Health Risk Behaviors

Items from the Behavioral Risk Factor Surveillance System (Thompson et al., 1999) tapped body mass index and smoking status (current, former, never). Items assessing frequency and quantity of alcohol consumed on heaviest drinking days were culled from the Health and Daily Living Form (Moos et al., 1990)

Data Analysis

Hierarchical logistic and linear regressions examined the relationship between PTSD and anger/hostility (the predictors) and the health status variables (the criteria). To examine anger/hostility as a mediator of PTSD and health status, the approach of Mackinnon and Dwyer (1993) was used. Covariates were entered on the first step; these included demographic and behavioral risk factors. Patients with PTSD were significantly younger, were more likely to be current smokers, and had higher body mass indexes (Ouimette et al., 2004), so these variables and alcohol consumption on maximum drinking days were used as covariates. One additional covariate, total number of physician diagnosed medical conditions, was included for analyses predicting physical functioning and general health.

After controlling for covariates, we compared the regression coefficient relating PTSD to health status before and after the anger measure was added to the model. To the extent that anger/hostility mediates the effect of PTSD on health status, the association between PTSD and the health status will be weakened after anger is added to the model. The difference between the regression coefficient relating PTSD to outcome before and after adding the mediator is referred to as the *mediated effect*, and each estimated mediated effect was tested for statistical significance.

To examine anger/hostility as a moderator of PTSD and health status, interactions between PTSD and the anger/hostility were examined in association with health status. Using hierarchical logistic/linear regression, PTSD, the moderating variable, and the zero-centered product term for these two variables were entered as predictors of health status.

RESULTS

Patients with PTSD scored higher on trait anger (mean = 21.58; SD = 7.32; $t(131) = 5.47$; $p < .001$) and anger-in (mean = 20.64; SD = 4.75; $t(131) = 5.59$; $p < .001$) than patients without PTSD (trait anger: mean = 15.41; SD = 4.95; anger-in: mean = 15.18; SD = 4.78).

Mediator Analyses

Trait anger and anger-in were examined as mediators of the association between PTSD and health status. After controlling for covariates, PTSD diagnosis was associated with the presence of a circulatory and musculoskeletal condition and poorer physical functioning and health perceptions.

After controlling for covariates, anger-in was associated with the presence of a circulatory condition (χ^2 [1, N = 134] = 3.97; $p < .05$). Trait anger was not associated with circulatory conditions, and neither anger/hostility scale was associated with the presence of a musculoskeletal condition. After controlling for covariates, higher trait anger was significantly associated with poorer physical functioning ($\beta = -.26$; $t = 2.99$; $p < .01$) and general health ($\beta = -.349$; $t = 4.21$; $p < .001$). Anger-in was associated with poorer physical functioning ($\beta = -.22$; $t = 2.55$; $p < .05$) and general health ($\beta = -.27$; $t = 3.46$; $p < .01$). Thus, greater anger-in was examined as a potential mediator of PTSD and circulatory conditions, and trait anger and anger-in were examined

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as potential mediators of the two health-related quality of life scales (Table 1).

Anger-in did not significantly mediate the association between PTSD and the presence of a circulatory condition. Neither trait anger nor anger-in mediated the association between PTSD and physical functioning. Trait anger (mediated effect = 6.02; $z = 2.60$; $p < .01$) and anger-in (mediated effect = 4.62; $z = -2.11$; $p < .05$) significantly mediated the association between PTSD and general health.

Moderator Analyses

The interaction effect between PTSD and anger-in predicting the presence of a circulatory disorder was significant (χ^2 [1, $N = 134$] = 5.71; $p < .05$; Table 1). For patients with PTSD, anger-in was significantly associated with the presence of a circulatory disorder (χ^2 [1, $N = 33$] = 5.71; $p < .05$; OR = 1.39; 95% CI = 1.06 to 2.02). For those without PTSD, the association between PTSD and the presence of a circulatory disorder was not significant (χ^2 [1, $N = 100$] = .08, NS). None of the other interaction effects was significant.

DISCUSSION

These data suggest that two distinct aspects of anger/hostility—the experiential and emotional aspects and inwardly held anger/hostility—partially explain the association between PTSD and poorer general health perceptions. Schnurr and Jankowski (1999) discuss the possibility that among patients with PTSD, hostility increases attention to physical symptoms, which amplifies self-reports of symptoms and poorer functional status. Notable is that these associations were independent of the effects of poorer health habits such as smoking.

Another interpretation may lie in the negative social interactions associated with hostility. Patients with PTSD who are angrier may be less able to establish a trusting, effective relationship with primary care providers. Poor communication could lead to poorer quality of care (*e.g.*, not being prescribed appropriate medications) and continuity of care (*e.g.*, fewer follow-up visits), ultimately influencing poorer general health perceptions.

Similar to our findings of a link between anger-in and circulatory disease only among the patients with PTSD, Beckham et al. (2002b) found a relationship between covert hostility and cardiovascular reactivity only among veterans with PTSD. The authors proposed that anger/hostility may be encoded as part of the trauma memory structure, triggering frequent anger episodes in the face of trauma cues. These episodes may alter physiology (*e.g.*, increasing cardiovascular reactivity), leading to the development of disease states. Collectively, these data suggest a possible psychophysiological pathway linking PTSD, hostility, and health.

Several limitations are important to note. These are cross-sectional data, and causality cannot be inferred. Anger/hostility may be a precursor of PTSD symptoms, which may mediate the connection between anger and perceived health. The sample size was small and may have lacked power to detect significant mediated effects and moderator effects. Our assessment of anger/hostility was limited to self-report. In a meta-analysis of research on hostility and health, Miller et al. (1996) found that structured interviews of hostility yield higher and more consistent associations with physical health. In addition, specific components of anger/hostility were more consistently associated with physical health, such as cognitive self-report measures of hostility. Future work on PTSD,

TABLE 1. Summary of regression analyses examining anger/hostility as a mediator/moderator of PTSD and health status[a]

	Circulatory condition			Physical functioning			General health		
	B	(SE)	ΔR^2	B	(SE)	ΔR^2	B	(SE)	ΔR^2
Step									
1. Covariates	—		.33	—		.15	—		.23
2. PTSD	1.23*	(.53)	.05	−19.78**	(5.66)	.08	−18.38***	(5.11)	.07
3. Trait Anger	.04	(.04)	.00	−.78	(.41)	.02	−1.13**	(.36)	.05
Step									
1. Covariates	—		.33	—		.15	—		.23
2. PTSD	1.23*	(.53)	.05	−19.78**	(5.66)	.08	−18.38***	(5.11)	.07
3. Anger-in	.05	(.04)	.00	−.66	(.46)	.01	−.96*	(.41)	.03
4. PTSD by anger-in	.27*	(.12)	.04	—	—	—	—	—	—

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

[a]Hierarchical logistic regression analyses examining circulatory conditions include age, smoking status, alcohol consumption on maximum drinking days, and body mass index as covariates (R^2 based on Nagelkerke pseudo R^2). Hierarchical linear regression analyses examining physical functioning and general health include age, smoking status, alcohol consumption on maximum drinking days, body mass index, and total number of medical conditions as covariates.

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hostility, and health may benefit from using interview assessments of hostility and considering different components of hostility, especially inwardly held hostility, vis-à-vis physical health.

In conclusion, as psychologists join medical care teams, perhaps a focus on improving anger management may enhance the health perceptions and objective health status of patients with PTSD. Anger management could target improved communication/relationships with primary care providers.

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