Alternative Representations of War Zone Stressors: Relationships to Posttraumatic Stress Disorder in Male and Female Vietnam Veterans

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Four conceptualizations of war zone stressor experiences were defined: traditional combat, atrocities—abusive violence, perceived threat, and malevolent environment. Items from the National Vietnam Veterans Readjustment Study (NVVRS) were reviewed for content, and stressor indexes were created. Using retrospective self-report data from the NVVRS, intercorrelations among stressor scores and between these scores and measures of posttraumatic stress disorder (PTSD) were computed for all veterans and for men and women separately. Structural equation modeling procedures followed. Results indicated that the four stressor indexes were internally consistent, reasonably distinct from one another, and influenced PTSD differentially. Men scored significantly higher than women on all 4 indexes. Whereas the pattern of relationships among the variables was comparable across genders, there was evidence that one path coefficient in the model differed for men and women.

An integral component of the diagnosis of posttraumatic stress disorder (PTSD) is exposure to a universally accepted traumatic event, Criterion A in the currently operative revised third edition of the Diagnostic and Statistical Manual of Mental Disorders (DSM-III-R; American Psychiatric Association, 1987). Kilpatrick, Resnick, and Freedy (1992) and Kilpatrick and Resnick (1993) appropriately characterized Criterion A as playing the "key gatekeeping function" (p. 1 and p. 244, respectively) for a PTSD diagnosis; that is, its presence is a prerequisite to consideration of the remaining diagnostic criteria: symptoms of reexperiencing (Criterion B), avoidance and numbing (Criterion C), and hyperarousal (Criterion D) that have persisted for at least a month (Criterion E).

However, there is ongoing debate as to how the stressor criterion in PTSD should be defined and operationalized. One aspect of this debate is whether the stressor can and should be considered a truly objective event or conceptualized in terms of the subjective meaning of that event. In one of the earliest analyses of this issue, Brestau and Davis (1987) challenged the discriminant validity of PTSD on the basis of the thesis that the defining characteristic of Criterion A as an extraordinary stressor fails to distinguish persons with PTSD from persons with other stress reactions. They observed that extreme stressors do not always produce long-term dysfunction. Moreover, they contended that such stressors are not qualitatively unique in producing a particular response (PTSD), but rather function as high-magnitude forms of more ordinary stressful life events. Their conclusion was that the likelihood of a psychopathological response and the particular nature of that response lies with subjective meaning grounded in preexisting personality traits. A similar position was proposed by Lazarus, DeLongis, Folkman, and Gruen (1985), who argued that there is no pure stressor independent variable that can be isolated from personal appraisal, and that the entire process of experiencing and responding to a stressor involves cyclical, multifactorial person–environment relationships.

Green (1990), on the other hand, sought to segregate the objective stressor event from the person's perception of that event and suggested that advancements in our understanding of stress reactions necessitate such a distinction. She then offered a typology of objective, generic stressor dimensions to aid the clinician in linking specific stressors to particular outcomes, which, in turn, could inform treatment efforts. Along the same lines, Green proposed that the identification of different stressor categories or dimensions may generate "more precise research" (p. 1635) on how environmental events interact with other factors (including subjective perceptions) to produce stress reactions.

A second aspect of the Criterion A debate concerns the characterization of the stressor event with regard to magnitude: beyond "usual human experience" and "markedly distressing" (italics added), as DSM-III-R prescribes (American Psychiatric Association, 1987, p. 250). There is some interest in whether more usual, less intense events can produce PTSD symptoms. J. R. T. Davidson and Foa (1991), for example, remarked that certain fairly common negative life events—they cited loss of a job and marital separation—may cause a PTSD-like response. They also pointed out that what is usual or typical for one individual may be quite unusual, and presumably far more distressing, for another individual. Sutker, Uddo-Crane, and Allain (1991) similarly noted that some evidence suggests that repeated, less intense events may produce a cumulative effect equal to the impact of a single high-intensity traumatic event, and that what one might characterize as "daily hassles" may, in some cases, produce significantly greater dysfunction than that resulting from more intense events.
We note here that the draft criteria for the fourth edition of the *Diagnostic and Statistical Manual of Mental Disorders (DSM-IV; American Psychiatric Association, 1993)* introduce a subjective component into Criterion A: a response of "intense fear, helplessness, or horror" (p. K-8). No official recognition is given, however, to the possible role of low-level stressors in the etiology of PTSD. In anticipation of the release of the new criteria, March (1993) provided a timely summary of the objectivity–subjectivity and event magnitude issues and discussed the advantages and disadvantages of a broader conceptualization of Criterion A. He concluded there was a current lack of research evidence to resolve these issues, implying that additional empirical work is required. Accordingly, the present study sought to address aspects of objectivity–subjectivity and event magnitude for one class of stressor events, war zone experiences, using retrospective self-report data from a national sample of male and female Vietnam veterans.

**War Zone Stressors: Alternative Representations**

In large part, the stressor construct in past military veteran research has been conceptualized in terms of reports of observable behaviors related to traditional combat events: firing a weapon, being fired on, seeing persons wounded or killed, and the like. Because the experiences and mental health outcomes of veterans of the Vietnam War essentially motivated the contemporary study of traumatic stress, combat exposure has been a prototypical Criterion A stressor for PTSD. The Vietnam veteran literature contains numerous studies that document a significant relationship between this representation of Criterion A and measures of PTSD and other adjustment variables (e.g., Carroll, Rueger, Foy, & Donahoe, 1985; Foy, Resnick, Sipprelle, & Carroll, 1987; Foy, Sipprelle, Rueger, & Carroll, 1984; Resnick, Foy, Donahoe, & Miller, 1989).

Exposure to atrocities or exceptionally abusive violence is a second stressor conceptualization that has received attention in the veteran literature. Using data from the *Legacies of Vietnam* study (Egendorf, Kudushin, Lauper, Rothbart, & Sloan, 1981), Laufer, Gallops, and Frey-Wouters (1984) created an index of abusive violence from responses to questions about such incidents as the torture of prisoners, severe mistreatment of civilians, use of cruel weaponry or chemicals, and mutilation of bodies. Scores on this index were only moderately related to scores on a traditional combat experience measure and were significantly related to postwar psychological states of veterans. Much the same results were reported by Breslau and Davis (1987) with a sample of veteran psychiatric patients. Gallows, Foy, Donahoe, and Goldfarb (1988) found a relationship between PTSD and several traumatic violence variables, and Green and her associates (Green, Grace, Lindy, & Glaser, 1990; Green, Grace, Lindy, Glaser, & Leonard, 1990; Green, Lindy, Grace, & Glaser, 1989) endorsed the importance of a variable formulated in terms of exposure to grotesque death and mutilation. Thus, war-related experiences of even higher magnitude than "normal" combat appear salient to the etiology of PTSD.

With regard to subjectivity, Hendin and Haas (1984) used a case study approach to investigate the adaptation of 10 nondistressed heavy-combat Vietnam veterans and introduced the idea that postcombat stress disorders are not so much a function of the objective experiences in the war zone, but rather how those experiences were individually perceived and internalized. This theme was echoed in Baum, O'Keefe, and Davidson's (1990) model of acute and chronic stress, where duration of perceived threat was considered as important as the objective characteristics of the stressor situation; L. M. Davidson and Baum (1993) made specific application of this model to Vietnam veterans. Furthermore, Solomon, Mikulincer, and Hobbell (1987) provided quite compelling empirical support for the importance of subjective interpretations of war-related traumatic or stressful events.

A final type of war zone experience deals with discomforts and deprivations in day-to-day life that most veterans, both combatants and noncombatants, experience (Kaylor, King, & King, 1987). These relatively low-magnitude stressors—at least when compared to combat or atrocity situations—might include lack of desirable food, poor living arrangements, annoying climate, unpredictable and extended work schedules, and the like. They are the typical "daily hassles," irritations, and pressures within a harsh or malevolent war zone. Although there is a dearth of empirical research on this type of war zone experience, assessments of such personal discomforts and deprivations were included in the hallmark National Vietnam Veterans Readjustment Study (Kulka et al., 1990a, 1990b), with the resulting data merged with other stressor scores to form that study's global stress index.

A first purpose of the present study was to use these four representations of war zone stressors to examine the Criterion A objectivity–subjectivity and event magnitude issues in terms of relationships to PTSD. Reports of exposure to traditional combat events and reports of exposure to atrocities or episodes of extraordinarily abusive violence were intended to denote potentially verifiable (the more "objective") aspects of the war zone experience, with a concern for high magnitude versus very high magnitude, respectively. Personal judgments of threat or harm in the face of war zone incidents and circumstances were included to assess a more subjective conceptualization of the stressor. Finally, exposure to the harsh or malevolent environment of daily life exemplified stressors of lower magnitude, and, as will be explained in the Method section, involved largely subjective appraisals.

**Women and War Zone Stress**

Wolfe (1993) recently pointed to a general lack of empirical studies of female military veterans. Indeed, whereas serious research on male veterans of the Vietnam War is about to enter its third decade, it was not until the mid-1980s that a few researchers (e.g., Paul, 1985; Schnaier, 1986; Stretch, Vail, & Malone, 1985) began to examine the unique war zone stressors that were encountered by women in Vietnam and the adjustment problems and stress-related symptoms they experienced on return. Women Vietnam veterans, mostly registered nurses, generally did not engage in what would be called traditional combat activities, nor were they typically in a position to witness or participate in the commission of atrocious or extremely violent acts. On the other hand, perceived threat (fear for one's safety and well-being in a guerrilla war in which there were no clearly established lines of battle) and harsh day-to-day living (like their male counterparts, many female noncombatants contended with personal discomforts and deprivations accom-
panying a Vietnam tour) are possibly quite salient in understanding the etiology of PTSD and other conditions for women. Wolfe, Brown, Furey, and Levin (1993) assessed war-related stressors specific to the experiences of female veterans and civilians who served in Vietnam and suggested the potential for differential relationships between war zone experiences and outcomes for men and women.

Therefore, a second purpose of the present study was to give special attention to the effect of war zone stressors on women who served in Vietnam. We analyzed data separately for male and female veterans and made gender-based comparisons.

Method

Sample

The data for this study were taken from those generated in the National Vietnam Veterans Readjustment Study (NVVRS; Kulka et al., 1990a, 1990b). A national probability sample of 1,632 Vietnam veterans participated in the NVVRS, 1,200 (74%) men and 432 (26%) women. These individuals had served in the theater of war operations, Vietnam or its surrounding regions, sometime between August 5, 1964, and May 7, 1975. African American and Hispanic men, women, and veterans with service-connected disabilities were oversampled. The overall response rate was 83%, and all veterans were individually questioned in their homes for approximately 5 hr on an array of premilitary, military, and postmilitary variables.

The current study was the first in a series of inquiries into the etiology of PTSD using the NVVRS data and was intended to address one aspect of the causal framework, the role of war zone stressors. The larger, ongoing project (of which this study is a part) aims to specify and evaluate a full theoretical model for the etiology of PTSD. Therefore, only a portion of the sample was used for the present study of the war zone stressors in the model, allowing for other portions of the sample to be available for the examination of premilitary and postmilitary factors, and especially for cross-validation of a fully integrated model. Consequently, a 25% subsample (n = 408) was randomly selected from the 1,632 Vietnam theater veterans. The sample was stratified by gender, yielding 300 men and 108 women.

Measures

Stressor indexes. Four stressor indexes were developed using a rational approach to instrument construction (Hulin, Drasgow, & Parsons, 1983; Jackson, 1971; Nunnally, 1978). As a first step, the “Vietnam Experience” portion of the NVVRS interview protocol was reviewed, and 113 items with content judged as representing some aspect of trauma or stress in the war zone were extracted and typed on separate cards.

At the same time, rather extensive, formal definitions of the previously discussed four stressors were set forth. Traditional combat events were defined in terms of reports of events or circumstances that would be considered observable stereotypical combat-related experiences. For this stressor category, there was an attempt to exclude any personal interpretations or subjective judgments about the events or circumstances. It also was defined so as to exclude representations of highly deviant war-related experiences. (Sample items ultimately selected for this category: “How often did you fire a weapon?” “How often [if ever] did you see the bodies of dead Americans?”)

Atrocities or episodes of extraordinarily abusive violence were defined in terms of reports of observable events or circumstances that would be considered extreme or highly deviant forms of war-related experiences. This representation included events or circumstances that might be viewed as “going beyond” what most would regard as the “normal” expectations of warfare. Events might be characterized as very grotesque or raise questions of morality. As with traditional combat, this type of war zone stressor was defined so as to reduce personal interpretations or subjective judgments. A distinction between witnessing and participating in atrocities was not possible with this category, because the response options to the interview questions ranged from no involvement through degrees of witnessing to degrees of active participation. (Sample items: “To what extent were you involved in terrorizing, wounding, or killing civilians?” “To what extent were you involved in mutilation of bodies of the enemy or civilians?”)

Subjective or perceived threat was defined in terms of personal judgments or individual assessments of events or circumstances as potentially threatening or harmful. This category reflected idiosyncratic emotional or cognitive appraisals of situations that may or may not accurately represent objective or factual reality. Of particular importance in the definition of this type of stressor was the emphasis on interpretations of and feelings about war zone events or circumstances. (Sample items: “How often [if ever] did you find yourself in a combat situation in which you thought you would never survive?” “In your opinion, how often were you in danger of being killed or wounded in [or around] Vietnam?”)

General milieu of a harsh or malevolent environment was defined in terms of events or circumstances representing repeated or day-to-day irritations and pressures related to life in the Vietnam war zone. The definition referred specifically to “daily hassles” or bothersome and aggravating living conditions that accumulate to the point of possibly causing personal distress and creating a sense of futility, helplessness, or emotional emptiness. Because the items that were eventually placed in this category required the respondent to judge degree of personal comfort or discomfort, this type of war zone stress connoted a subjective appraisal. (Sample items: “How unpleasant did you find this situation in Vietnam? loss of sleep.” “How unpleasant did you find this situation in Vietnam? the insects, disease, and filth.”)

We then recruited two clinical psychologists expert in the research and treatment of PTSD and six psychology graduate students for a sorting task. Each was presented with the randomly shuffled full set of 113 items and the four stressor definitions and asked to sort each item into one of the four content categories (or into a “none” category, if necessary). The results of this sorting task were compiled, and items for which there was substantial agreement in categorization were retained.

Next, the items within each category were reviewed, and some were deleted due to content redundancy. Because of differences in response formats, retained items were all scaled to have a mean of 0 and a standard deviation of 1. Item–total correlations and estimates of internal consistency were then computed for each stressor category. On the basis of these values, a few additional items that detracted from the homogeneity of their set were eliminated; care was taken, however, to maintain coverage of the relevant content domains. Means, standard deviations, item–total correlations, and estimates of coefficient alpha were computed for the four resulting stressor indexes. 1

PTSD measures. Current PTSD was assessed using three measures. The first was Keane, Caddell, and Taylor’s (1988) Mississippi Scale for Combat-Related PTSD. This 35-item instrument uses a 5-point Likert response format and assesses the standard PTSD symptoms as well as the associated features of depression, substance abuse, and suicidal tendencies. The Mississippi Scale has been shown to demonstrate high internal consistency, test–retest reliability (Hyer, Davis, Boudewyns, & Woods, 1991; Keane et al., 1988; Kulka et al., 1990a, 1990b; McFall, Smith, Mackay, & Tarver 1990) and validity in the form of expected relationships with combat exposure (Keane et al.) and other PTSD measures and assessment devices (Kulka et al., 1990a, 1990b; McFall, Smith, Roszell, Tarver, & Malas, 1990).

A second measure of current PTSD was taken from Kulka et al.’s

1 A copy of all items in each of the four stressor indexes may be obtained from Daniel W. King.
jectivity, and that one's current state serves as a context within which reliability, we also computed scale means, standard deviations, and potentially threatening to the validity of the data are recognition-seeking of this type of experience to the NVVRS interviewers. A count of the total number of endorsed symptoms was computed.

Finally, current PTSD was documented using Kulka et al.'s (1990a, 1990b) predicted probability computation. This is a composite proba-

bility statement calculated for each individual on the basis of a logistic regression equation. The equation incorporated nine variables, includ-

ing scores on PTSD assessment devices, adjustment scores, and demo-

graphic characteristics. It should be noted that the score on the Missis-

sippi Scale and the DIS symptom count were included as part of the predictor set in the regression equation. As a probability value, scores on this predicted PTSD measure could range from 0 to 1.

Limitations and Cautions Regarding the Data

The stressor indexes for the current study were based on retrospective self-reports of events and circumstances that occurred approximately 10 to 20 years prior to data collection. Without doubt, there are a number of inherent problems in data of this sort. First and foremost is the possibility of simply poor recall, especially for events or circumstances that were encoded at a time of emotional arousal or stress (Burke, Heuer, & Reisberg, 1992; Loftus & Burns, 1982; Christianson, 1992). In addition, this problem can be compounded by a potential tendency to reconstruct details surrounding the prior events, which, in turn, weakens the distinction between objectivity and subjectivity. In this re-

gard, Metts, Sprecher, and Cupach (1991) pointed out that all retro-

spective self-reports are reconstructions that vary in accuracy and ob-

jectivity, and that one's current state serves as a context within which interpretations of the past are framed. Nisbett and Wilson (1977) com-

mented further that individuals often draw on internal, culturally ap-

propriate implicit causal theories to assign meaning to prior stimuli to account for a current condition.

For PTSD, in particular, present-day symptomatology and accompa-

naying dysfunction may create an attributional bias whereby the veteran appraises war zone stressor events as more intense than what was actu-

ally experienced. In the language of research design (Cook & Campbell, 1979), attributions of this type introduce ambiguity about the direction of causal influence, an inevitable consequence of cross-sectional studies with retrospective data. Other factors that should be considered as po-

tentially threatening to the validity of the data are recognition-seeking or compensation-seeking on the part of the veteran and the need to present oneself in a socially desirable manner (D. W. King & King, 1991). Moreover, this latter issue may be especially relevant to the as-

essment of the atrocities-abusive violence stressor category. Many vet-

erans may have been quite hesitant to offer candid acknowledgements of this type of experience to the NVVRS interviewers.

Analyses

In addition to the previously described analyses required for develop-

ing the stressor indexes and documenting their scale characteristics and reliability, we also computed scale means, standard deviations, and (where appropriate) estimates of coefficient alpha for the PTSD mea-

ures. Then, we intercorrelated the stressor indexes for the sample as a whole and separately for the subsamples of male and female Vietnam veterans. We conducted tests of the significance of the difference be-

tween the correlations for men and the correlations for women, followed by multivariate analysis of variance and univariate t tests to determine the significance of the difference between means of men and women on the four stressor indexes.

Next, to determine the contributions of the four stressors to PTSD, particularly their potential differential influences, we used a structural equation modeling strategy. The model included six indicators of PTSD (four derived from the Mississippi Scale along with the DIS symptom count and the predicted probability of PTSD), and the four stressor in-

dexes. The coefficient alpha values for all four indexes are quite acceptable, suggesting a reasonably high degree of homogeneity across items within each set. Along the same lines, internal consistency was reflected in strong item-total correlations, which averaged .56, .63, .55, and .58 for the measures of traditional combat, atrocities-abusive violence, perceived threat, and malevolent environment, respectively.

Table 1 also provides means, standard deviations, and internal consistency reliability estimates for the four stressor indexes computed on the combined sample of male and female veterans. The items making up each of these measures were submitted to z-score transformations prior to calculating a summative score for each individual. Hence, each item had a mean of 0. Because there were missing data on several items, however, the average of the item sums over persons does not exactly equal (but does approximate) 0 for three of the four in-

dexes. The coefficient alpha values for all four indexes are quite acceptable, suggesting a reasonably high degree of homogeneity across items within each set. Along the same lines, internal consistency was reflected in strong item-total correlations, which averaged .56, .63, .55, and .58 for the measures of traditional combat, atrocities-abusive violence, perceived threat, and malevolent environment, respectively.

Table 1 also provides means, standard deviations, and internal consistency reliability estimates for the measures of PTSD. The average scores are quite consistent with what would be expected from the community sample of veterans that participated in the NVVRS. The mean Mississippi Scale score, for example, is well below recommended screening cut-points, which have ranged from 89 (Kulka et al., 1990a, 1990b) to 107 (Keane et al., 1988). The mean number of DIS-assessed PTSD symptoms is less than 1. The mean predicted probability of PTSD suggests an estimated 18% prevalence in this sample; the sampling design-weighted estimate resulting from the original study and incorporating all veterans was 15% (Kulka et al., 1990a, 1990b). Regarding reliability, the Mississippi Scale's .94 value for this subsample of veterans is virtually identical to the value computed across all 2,348 theater and era veterans who participated in the NVVRS (Kulka et al., 1990a, 1990b). The reliability of the DIS symptom count is remarkably high, considering that it consisted of 16 dichotomously scored items.
Table 1
Descriptive Statistics and Reliability Estimates for All Measures in the Study

<table>
<thead>
<tr>
<th>Index-measure</th>
<th>No. of items</th>
<th>M</th>
<th>SD</th>
<th>α</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stressor indexes</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Traditional combat</td>
<td>36</td>
<td>0.02</td>
<td>20.04</td>
<td>.94</td>
<td>405</td>
</tr>
<tr>
<td>Atrocities-abusive violence</td>
<td>9</td>
<td>0.00</td>
<td>6.31</td>
<td>.88</td>
<td>402</td>
</tr>
<tr>
<td>Perceived threat</td>
<td>9</td>
<td>0.02</td>
<td>5.68</td>
<td>.83</td>
<td>405</td>
</tr>
<tr>
<td>Malevolent environment</td>
<td>18</td>
<td>0.01</td>
<td>11.62</td>
<td>.91</td>
<td>405</td>
</tr>
<tr>
<td>PTSD measures</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mississippi Scale</td>
<td>35</td>
<td>72.41</td>
<td>21.80</td>
<td>.94</td>
<td>406</td>
</tr>
<tr>
<td>DIS symptom count</td>
<td>16</td>
<td>0.83</td>
<td>2.32</td>
<td>.91</td>
<td>387</td>
</tr>
<tr>
<td>Predicted probability of PTSD</td>
<td></td>
<td>0.18</td>
<td>0.30</td>
<td></td>
<td>396</td>
</tr>
</tbody>
</table>

Note. PTSD = posttraumatic stress disorder; DIS = Diagnostic Interview Schedule.

* Means of Stressor indexes were computed on standardized item scores. Thus, each item had a mean of 0 and a standard deviation of 1. Because of missing data, when summative scores across items were computed for all respondents, the expected scale mean of exactly 0 did not obtain for the traditional combat, perceived threat, and malevolent environment indexes.

b Predicted probability of PTSD measure did not consist of a collection of items; classical test theory estimate of internal consistency was not appropriate.

Stressor Indexes: Intercorrelations and Male–Female Comparisons

The intercorrelations among the four stressor indexes are presented in Table 2. For the total sample, the six correlation coefficients ranged from .44 (atrocities–abusive violence with malevolent environment) to .79 (traditional combat with perceived threat). Despite the potential for monomethod bias—all items were administered within the same segment of the interview, with the large majority requiring an oral response—the relationships among the variables suggest a fair amount of discriminant validity. For men separately, the sizes of the coefficients (.43 to .82) and the pattern of correlations were quite comparable to those for the whole group, not an unexpected observation considering that men comprised 74% of the total sample. For female veterans, coefficients were lower (.30 to .72), and their pattern of relationships differed somewhat from that of their male veteran counterparts. In fact, of the six correlations among stressor indexes, three (traditional combat with atrocities–abusive violence, traditional combat with perceived threat, and atrocities–abusive violence with perceived threat) were significantly different for men and women (z values of 2.98, 2.19, and 2.22, respectively, all ps < .05).

The multivariate analysis of variance test of the difference for men and women on the four stressor indexes produced a significant Wilks’s lambda value of .87, with an exact F(3, 396) = 15.13, p < .001. As shown in Table 3, the univariate t statistics demonstrated that male veterans reported significantly higher levels of war zone stress than female veterans across all four indexes. Gender accounted for a significant 11% of the variance in scores on the traditional combat index, 6% of the variance in scores on atrocities–abusive violence, and 2% of the variance in scores on both perceived threat and malevolent environment.

Structural Equation Modeling

As noted previously, we designed the structural equation modeling phase of this study to assess the simultaneous and differential contributions of the several stressor variables to PTSD within an integrated model. Figure 1 displays the initial model that was proposed. It contained both measurement and structural components. Regarding the measurement component, the endogenous latent variable of PTSD had six manifest indicators. Two of these were the DIS symptom count and the predicted probability of PTSD. The other four were average item scores for “mini-scales” (Bernstein & Teng, 1989, p. 475) or content-based “parcels” (MacCallum, Roznowski, & Necowitz, 1992, p. 494) formed by clustering the 35 items in the Mississippi Scale. These PTSD parcels or item clusters repre-
Table 3
Differences Between Male Participants' and Female Participants' Means on Stressor Indexes

<table>
<thead>
<tr>
<th>Variable</th>
<th>Men (N = 297)</th>
<th>Women (N = 108)</th>
<th>t</th>
<th>p &lt;</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>M</td>
<td>SD</td>
<td>M</td>
<td>SD</td>
</tr>
<tr>
<td>Traditional combat</td>
<td>0.13</td>
<td>21.35</td>
<td>-0.28</td>
<td>9.61</td>
</tr>
<tr>
<td>Atrocities–abusive violence</td>
<td>0.10</td>
<td>6.83</td>
<td>-0.29</td>
<td>3.51</td>
</tr>
<tr>
<td>Perceived threat</td>
<td>0.08</td>
<td>5.81</td>
<td>-0.14</td>
<td>5.08</td>
</tr>
<tr>
<td>Malevolent environment</td>
<td>0.07</td>
<td>11.95</td>
<td>-0.16</td>
<td>10.06</td>
</tr>
</tbody>
</table>

* Because of significant differences between within-group variances for men and women, these t values were computed using separate group variance estimates rather than pooled estimates.

Perceived threat was likewise considered an endogenous latent variable in the measurement component and had three manifest indicators, simply the average scores on each of three item parcels, formed by randomly grouping the nine items into triplets. The third latent variable in the model's measurement component was exposure to a malevolent environment. This was an exogenous variable considered to be manifest in responses to six indicators, average scores on randomly grouped triplets formed from the 18 items comprising the malevolent environment index.

The creation of miniscales or parcels was advantageous for several related reasons. First, single items within a scale such as those in the present study are generally considered rather unstable (Bagozzi & Heatherton, 1994; Bernstein & Teng, 1989). As Marsh (1994) noted, the formation of parcels (as averages or sums of subsets of items) yields indicators of latent constructs that are more stable than single items and can result in a higher cases-to-variables or cases-to-parameter-estimates ratio. In ad-

Figure 1. Initial most saturated model displaying relationships among war zone stressors and posttraumatic stress disorder (PTSD). Miss = Mississippi Scale; DIS = Diagnostic Interview Schedule; pred = predicted probability of PTSD.
dition, the specification of latent variables with multiple indicators (as opposed to merely using the total or average item score on a full scale) yields perfectly reliable latent variables within the structural model (Joreskog & Sorbom, 1979, 1993a). Because a reasonable number of manifest indicators are necessary to achieve an acceptable measurement model (Marsh & Bailey, 1991), the formation of parcel scores as averages of item clusters within defined scales seemed a suitable means of meeting this requirement for the data in this study.

The last two manifest variables, exposure to traditional combat and exposure to atrocities-abusive violence, were both specified in the measurement component as causes rather than effects of their respective latent constructs. According to Loehlin (1992) and MacCallum and Browne (1993), there are certain instances in which the conventional treatment of latent variables as causes of observed variables is contrary to the rationale underlying the model. In this case, it seemed more logical that exposure to combat or atrocities would cause the experience of trauma or stress rather than the reverse. MacCallum and Browne pointed out possible problems that can arise when incorporating such causal indicators in a model, including identification problems and redundancy of the constructs caused by the observed variables. In the present model, however, each single manifest indicator causes a separate exogenous latent construct or "composite variable" (MacCallum & Browne, 1993, p. 534), a situation less likely to be of concern.

As shown in Figure 1, all three exogenous variables (traditional combat, atrocities-abusive violence, and malevolent environment) were allowed to covary, as designated by the three curved two-headed arrows. In addition, the initial structural component proposed direct causal paths from each of these three exogenous variables to each of the two endogenous variables (perceived threat and PTSD). Moreover, a path from perceived threat to PTSD was specified. Indirect paths from the three exogenous variables to PTSD by way of influence on the perceived threat endogenous variable were thus a part of the model. This more saturated model presumed, therefore, that all stressor representations had a direct impact on PTSD; furthermore, it presumed that exposure to combat, to atrocities-abusive violence, and to the daily discomforts and deprivations of the war zone influenced the occurrence of PTSD by virtue of creating a judgment or appraisal of impending threat or harm. No covariances among the residual elements of the model were postulated.

The multisample modeling procedure was based on systematic chi-square difference testing of hierarchically nested models (Anderson & Gerbing, 1988), proceeding from more saturated to less saturated. The first step was to postulate a saturated model corresponding to Figure 1 simultaneously for both men and women. The pattern and structure of relationships seemed to be relatively consistent across genders, the next task was to assess whether the values of the parameters representing factor loadings were the same for men and women. To this end, first, a measurement model with equivalent or invariant factors across groups was fit to the data, $\chi^2(234, N = 397) = 409.03, p < .001$. The difference in fit between this more constrained model and the previous more saturated model was nonsignificant, $\chi^2(12, N = 397) = 12.77, p = .386$. The interpretation, therefore, is invariant measurement of variables across male and female veterans (Reise, Widaman, & Pugh, 1993).

At this stage, evaluation of the significance of the individual structural coefficients suggested a respecification and simplification of the model portrayed in Figure 1. In particular, results indicated negligible contributions of the paths from traditional combat to PTSD for both men ($t = -0.26$) and women ($t = 1.08$) and from atrocities-abusive violence to perceived threat for both men ($t = -1.66$) and women ($t = -0.26$). The revised model, with two deleted paths, is depicted in Figure 2, where traditional combat now only indirectly influences PTSD through its impact on perceived threat and atrocities-abusive violence only directly influences PTSD, with no indirect path through perceived threat. This model was fit to the data, $\chi^2(238, N = 397) = 413.11, p < .001$, and the difference in fit between this model and the measurement invariance model was nonsignificant, $\chi^2(4, N = 397) = 4.08, p = .395$. The two models, therefore, appear functionally equivalent; deleting the two paths did not significantly alter the fit. Consequently, for both male and female veterans, the more parsimonious model shown in Figure 2 must be deemed a better representation of the relationships between war zone stressors and PTSD.

A chi-square difference test likewise was used to examine whether the strength of relationships between war zone stressors and PTSD differed as a function of gender. A model constraining the five structural coefficients among latent variables for men to be equivalent to the corresponding structural coefficients for women was fit to the data, $\chi^2(243, N = 397) = 427.64, p < .001$. The chi-square difference test between this model and the previous model yielded a significant result, $\chi^2(5, N = 397) = 14.53, p < .001$. Thus, one or more of the path coefficients representing relationships among the latent variables in Figure 2 appeared to be nonequivalent across genders.

To explore the source of gender differences in structural path coefficients, the modification indexes for the rejected equivalent-paths model were examined. The modification index for the traditional combat-to-perceived threat path for women, in comparison to the sizes of all other modification indexes for the structural component, was quite high. Because modification indexes are estimates of the drop in a chi-square statistic should a constrained parameter be freed, this observation suggested that the particular equality constraint for this path might likely be the primary source of misfit: The effect of traditional combat on perceived threat is not the same for men as for women. Accordingly, a less constrained model in which this path was allowed to be estimated separately for men and women was fit to the data, $\chi^2(242, N = 397) = 416.82, p < .001$. Relaxing the constraint, therefore, led to a significant decrease in the chi-square statistic, $\chi^2(1, N = 397) = 10.82, p < .01$, from that
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produced by the model in which all structural coefficients were constrained to be equivalent. Furthermore, the model allowing the combat-to-perceived threat path to vary for men and women did not differ significantly from the more saturated model in which all structural coefficients were allowed to vary across genders, $\chi^2(4, N = 397) = 3.71, p = .45$. Thus, the simplest representation of gender differences in the model is one in which the combat-to-perceived threat path differs for male and female veterans, and all others are equivalent.

In the end, the model that was judged as most parsimonious generated the structural path coefficients displayed in Figure 3. These coefficients are scaled such that all variables are in a pooled, common standard-score metric that takes into consideration the differential dispersion of the variables within each group. All paths are relatively substantial. In the male subsample, the structural component produced squared multiple correlations for the equations in which the latent endogenous variables were regressed on their respective causal factors of .85 for perceived threat and .52 for PTSD. In the female subsample, the corresponding values were .63 and .43, respectively. Regarding the observed variables, the squared multiple correlations involving the six manifest indicators of PTSD ranged from .39 to .85 for men and from .27 to .78 for women. Similar squared multiple correlations for the three perceived threat indicators ranged from .64 to .78 for men and from .51 to .76 for women; for malevolent environment's six manifest indicators, these coefficients ranged from .63 to .74 for men and from .38 to .70 for women.

For the full model, the LISREL goodness-of-fit index was .80; the normed fit index (Bentler & Bonett, 1980) was .98; the comparative fit index (Bentler, 1990) was .99; the incremental fit index (Bollen, 1989) was .99; the parsimony normed fit index (James et al., 1982) was .88; and the root-mean-square error of approximation (Steiger, 1990) was .043. Relative to the base model's overall fit indexes, the LISREL goodness-of-fit index and the normed fit index dropped slightly, but the indexes representing parsimony improved.

Table 4 presents the total, direct, and indirect effects of the latent stressor variables on the latent PTSD variable for both men and women. Overall, the Table 4 and Figure 3 findings give strong evidence that the four stressors do impact PTSD and that their impact is manifest in different ways. A particularly striking result is that the index with the largest total effect on PTSD was that reflecting exposure to the harsh or malevolent war zone environment. Its effect was both direct and indirect, through the intervening variable of perceived threat. The results also suggest that exposure to traditional combat experiences does not directly influence PTSD, but rather makes its impact indirectly through perceived threat.

It is also quite interesting that the variable defined in terms of exposure to atrocities-abusive violence had only a direct effect on PTSD, with no indirect impact through perceived threat. In retrospect, the negligible and nonsignificant effect of atrocities-abusive violence on perceived threat may partially be attributed to the manner in which the former variable was operationalized. Although the differentiation of witnessing atro-

Figure 2. Revised model displaying relationships among war zone stressors and posttraumatic stress disorder (PTSD). Miss = Mississippi Scale; DIS = Diagnostic Interview Schedule; pred = predicted probability of PTSD.
Cious acts as opposed to participating in them is somewhat clouded by the response options to many of these items, the items still impart an implicit suggestion of active behavior on the part of the respondent. To endorse these items and score high on the index may suggest admitting to being a perpetrator or the creator of threat. This is in contrast to the wording of most of the items in the traditional combat category, for which responding in the keyed direction suggests a sense of being the victim of war zone events, a circumstance that might reasonably lead to perceptions of threat.

Conclusions

In summary, the present study provided some support for four representations of war zone stressors: exposure to traditional combat events, exposure to atrocities or episodes of extraordinarily abusive violence, subjective or perceived threat, and general milieu of harsh or malevolent environment. Using retrospective self-report data from a national sample of male and female Vietnam veterans, indexes created to measure these representations were internally consistent and sufficiently distinct from one another to argue for a fair amount of discriminant validity.

As one would expect, male veterans scored significantly higher on all four stressor indexes than their female veteran counterparts. Differences in means were particularly pronounced for the traditional combat and atrocities–abusive violence indexes, two measures with content more likely descriptive of the male veteran experience. Whereas the measurement component of the model was invariant across genders, evidence for a fully invariant structural model was not convincing. The pattern of relationships was generally similar for men and women, but one path, from traditional combat to perceived threat, differed across genders.

Rather noteworthy differential influences of the stressor indexes on PTSD were evident. Considering the total effects of each stressor variable on PTSD, malevolent environment appeared to be the most potent factor for men and women. For men, traditional combat had the least impact; for women, atrocities–abusive violence had the least impact. The traditional combat variable was found not to have a direct effect on PTSD; rather, its influence was indirect through perceived threat. Conversely, the atrocities–abusive violence stressor had only a direct and not an indirect influence.

Table 4

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Note. All effects are computed from the LISREL 8 common metric completely standardized solution. PTSD = posttraumatic stress disorder.
What potential implications do these findings have for our understanding of the stressors that might contribute to PTSD? First, the study affirms Green’s (1990) observation that multiple representations of observable or verifiable stressor experiences are worthy of consideration. In the present study, reports of exposure to traditional combat and atrocities—abusive violence did not appear to make their impact on PTSD in the same way. Perhaps, to some degree, this reflects Green’s passive versus active categorization of stressors: in this case, a distinction between the veteran as more of a victim of stressful events, as suggested by the content of the traditional combat items, versus the veteran as more of an “agent of his or her own stressor experience” (Green, 1990, p. 1638), as suggested by the content and response options for the atrocities—abusive violence items. This differential mode of impact might motivate two different approaches to clarify further the etiology of PTSD. Specifically, the indirect effect of traditional combat through perceived threat (but no direct effect) seems to require study of other factors that covary with or cause one to process imparing events as being more or less personally threatening. On the other hand, the direct (but not indirect through event appraisal) effect of atrocities—abusive violence primarily for male veterans may suggest investigation into other factors that covary with or cause one to be involved in atrocious acts. Furthermore, it is very likely that guilt and shame, which were not a part of the present study, mediate the relationship between atrocities—abusive violence and PTSD. In other words, the data here are limited in that they do not contain all appropriate subjective components that are likely to qualify relationships between variables, in particular, between atrocities—abusive violence and PTSD.

Second, on the basis of the findings, it seems reasonable to recommend that both objective and subjective aspects of stressful events be assessed. This recommendation is consistent with the emerging DSM-IV guidelines (American Psychiatric Association, 1993). In this study, perceived threat, conceptualized and operationalized as a subjective personal appraisal, had a total effect for male veterans that was greater than either traditional combat or atrocities—abusive violence, both considered more observable, verifiable representations of war zone stressful events. For women, the total effect for perceived threat exceeded that for atrocities. As noted above, traditional combat only manifested an influence when its causal linkage to PTSD was mediated by the subjective assessment of impending harm.

We must return, however, to the obvious caution that accompanies any commentary on objectivity versus subjectivity in this study (and in most other studies where exposure to prior traumatic or stressful events is of concern). All the data about war zone stressors were retrospective, self-reports of events, circumstances, and perceptions thereof that occurred many years earlier. Among other problems (presented earlier), there is no doubt that some amount of event reappraisal would necessarily cloud the veterans’ accounts of what this study classified as the more objective experiences. Here, as with the work of Solomon et al. (1987), the items that operationalized the more objective traditional combat and atrocities—abusive violence indexes were intended to elicit accounts of observable events, whereas the items that operationalized the more subjective perceived threat and malevolent environment indexes required reflection, deliberation, or evaluation. It is duly recognized, however, that the issue of objectivity—subjectivity remains one of degree.

Third, the results of this study point to the critical need to evaluate further what role is played by lower magnitude events, perhaps occurring over an extended period of time, in the etiology of PTSD. In this regard, the results are partially at variance with the draft DSM-IV (American Psychiatric Association, 1993) Criterion A nosology. Whereas a DSM-based diagnosis of PTSD requires the experiencing of an extraordinary event, the findings of this study suggest that it is nonetheless important to assess perceptions of lower magnitude events, which may be occurring simultaneously with the more potent and traditionally recognized stressors. After all, like the global war zone experience that was the focus of the present study, a number of trauma-inducing environments may persist over time and may include exposure to multiple stressors of varying magnitudes. A home situation in which there is abuse or domestic violence is a good example. It may have its own version of a persistent harsh or malevolent environment, creating day-to-day pressures, discomforts, or deprivations, in addition to likely incidents of severe abuse or violence. It seems well worth knowing the extent to which lower magnitude stressors over some length of time create their own effects or exacerbate a person’s reaction to an extremely traumatic incident. Or it may be the case that exposure to an extreme event or circumstance leads an individual to be overly sensitive or reactant to daily irritations and pressures of lower magnitude.

Fourth, the finding of a common pattern of stressor—PTSD relationships for male and female veterans may be viewed as support for the validity of PTSD. In the ideal, the explanatory power of a construct is bound up in how well its relationships with other antecedents, correlates, and consequences hold up across different groups, settings, and times (Cook & Campbell, 1979). From this perspective, one would desire a common network of relationships between relevant stressor variables and PTSD across men and women. Generally, this was the outcome in this study, with this network accounting for fairly substantial proportions of variance in PTSD (52% for men and 43% for women). On the other hand, the variation found for the one structural coefficient representing the impact of combat experiences is intriguing. Although female veterans reported significantly lower levels of exposure to traditional combat events, the indirect effect of this variable on PTSD appeared markedly stronger for women (.29) than for men (.12). This outcome should encourage additional gender-based investigations of war zone stressors.

Relatedly, the findings of the present study may reinforce the need for continued work on stressor representations that are more exclusively the domain of women. The vast majority of the items used in the NVVRS were understandably directed at “describing” the war zone experiences of male Vietnam veterans, and, indeed, men tended to receive higher item and summative index scores than women. Resnick, Kilpatrick, and Lipsky (1991) have urged researchers to be more precise in their assessment of potential trauma among women (in their case, victims of rape), so as to screen more accurately for Criterion A and subsequently diagnose PTSD. Likewise, the ongoing work of Wolfe et al. (1993) to measure precisely various dimensions of women’s war zone stress may be helpful in articulating causal factors for PTSD unique to the increasing number of women who serve in the armed forces.

Finally, in the present study, PTSD was treated as a single
latent variable with six manifest indicators, four of which were derived from subsets of Mississippi Scale items grouped according to a rational judgment of their content. An interesting extension of this work might be to disaggregate PTSD into its several symptom clusters or subdimensions (e.g., reexperiencing, active avoidance, passive avoidance, arousal) and model these as latent endogenous variables in their own right. This strategy could very likely produce a different pattern of relationships.
L. A. King and King's (in press) measurement model for Mississippi Scale data, with a single second-order PTSD factor and four first-order symptom category factors, may provide a beginning point for such an inquiry.

References
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Appendix

Intercorrelations, Means, and Standard Deviations for All Observed Variables

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<td>0.00</td>
<td>0.06</td>
<td>0.03</td>
<td>0.17</td>
<td>0.13</td>
<td>-0.13</td>
</tr>
<tr>
<td>SD</td>
<td>0.32</td>
<td>3.89</td>
<td>0.74</td>
<td>0.78</td>
<td>0.72</td>
<td>0.57</td>
<td>0.81</td>
<td>0.72</td>
<td>0.69</td>
<td>0.75</td>
<td>0.73</td>
<td>0.78</td>
<td>0.80</td>
<td>0.85</td>
<td>0.77</td>
<td>0.60</td>
</tr>
</tbody>
</table>

|          | M  |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
| Women    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
| M        | 0.10 | -1.38 | 1.81 | 1.94 | 1.80 | 1.48 | -0.39 | -0.29 | 0.25 | -0.06 | 0.08 | -0.16 | -0.04 | -0.36 | -0.38 | -0.28 | -0.53 |
| SD       | 0.22 | 2.35 | 0.55 | 0.58 | 0.58 | 0.51 | 0.67 | 0.55 | 0.80 | 0.67 | 0.70 | 0.70 | 0.77 | 0.56 | 0.61 | 0.27 | 0.57 |

Note. Male participants' correlations are above the diagonal and female participants' correlations are below the diagonal. PTSD = posttraumatic stress disorder; DIS = Diagnostic Interview Schedule; MS = Mississippi Scale; R & SA = reexperiencing and situational avoidance; W & N = withdrawal and numbing; A & LC = arousal and lack of control; G & S = guilt and suicidality.

These variables were highly skewed and were therefore treated as censored below by PRELIS 2 (Joreskog & Sorbom, 1993b) prior to structural equation modeling.

Received October 21, 1993
Revision received June 30, 1994
Accepted July 11, 1994