A cross-lagged analysis of the relationship between symptoms of PTSD and retrospective reports of exposure

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Abstract

exposure at Time 2. However, this finding was modest and was not specific to the recall of traumatic events.

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The diagnosis of PTSD is contingent upon the recall of traumatic events. In fact, individuals exposed to an indexed traumatic event are often asked to reconstruct the details of the event years, even decades, after the event occurred. Regardless of the time elapsed between occurrence and recall, retrospective self-report measures of exposure to potentially traumatic events are frequently used as objective assessments of exposure by stress and trauma researchers. Studies on the psychometric properties of certain exposure measures speak to the consistencies of reporting. For example, Keane et al. (1989) in their paper on the psychometric properties of the Combat Exposure Scale (CES) reported the test–retest reliability of the measure at a 1-week interval to be .97. Krinsley, Gallagher, Weathers, Kutter, and Kaloupek (2003) noted $\kappa$ values ranging from .50 to .91 in their study of the test–retest reliability of the Evaluation of Lifetime Stressors Protocol (ELS). Goodman, Corcoran, Turner, Yuan, and Green (1998) reported on the psychometric properties of the Stressful Life Events Screening Questionnaire (SLESQ) and found a median $\kappa$ of .73 over a 2-week interval.

There are also few studies that have directly examined the consistency of reports of exposure between two separate time periods. Each of these studies has documented inconsistencies in reports of exposure over time. Schwarz, Kowalski, and McNally (1993) studied 12 school personnel at 6 and 18 months after a school shooting. In addition to the change in reports of exposure, they found that the increases in reports of exposure to details of the traumatic event were positively associated with symptoms of PTSD. Southwick, Morgan, Nicolaou, and Charney (1997) reported similar results in their study of 62 veterans of Desert Storm who were assessed a month after they returned to the U.S. and 2 years later. In contrast, Niles et al. (1999) in their study of 38 male Vietnam veterans and Bramsen, Dirkzwager, van Esch, and van der Ploeg (2001) in their study of 137 Dutch peacekeepers did not find a significant correlation between in changes in reports of exposure from Time 1 and Time 2 and symptoms of PTSD. Further complicating our knowledge of the subject matter, in Wyshak’s (1994) study of 30 Southeast Asian refugees she found a negative association between severity of symptoms and changes in endorsement of past experiences such that participants who reported lower levels of distress were more likely to have been more inconsistent in their reporting of traumatic experiences than those endorsing greater levels of distress.

A couple of large-scale studies have explored the relationship between accounts of exposure to traumatic events and reports of PTSD as well. For
example, Roemer, Litz, Orsillo, Ehlich, and Friedman (1998) assessed 460 peacekeepers deployed to Somalia within the first year after they returned from Somalia and a year to 2 years postdeployment. Roemer et al. documented a significant increase in the reports of warzone related stressors at Time 2. They also noted that the severity of symptoms of PTSD, especially symptoms of intrusive recollections, at Time 2 accounted for a significant amount of the variance in the change in reports of exposure. King et al. (2000) conducted a cross-lagged analysis on the reports of exposure and symptoms of PTSD from 2942 Gulf War veterans, who were assessed 5 days after they returned to the United States and between 18 and 24 months later. They reported that the changes in reports of exposure were modestly associated with PTSD symptoms severity, but that the reports of exposure were best predicted by earlier reports of exposure and not by PTSD symptomatology.

There are two consistent findings in this literature. First of all, in each study discrepancies were found in reports of exposure and, in each study, some participants noted an increase in exposure, while others reported a decrease. Yet, the inconsistencies and the scarcity of studies comparing stability of recall for traumatic and nontraumatic events overshadow the consistencies. Specifically, Wyshak (1994) documented greater consistencies in reporting in individuals who reported greater distress (e.g., Wyshak, 1994), while Schwarz et al. (1993) and Southwick et al. (1997) found greater increases in endorsement of stressors to be associated with greater distress. Further, related studies have noted that memory deficits or inconsistencies exhibited by distressed trauma populations may not be specific to traumatic material or events (Gray & Lombardo, 2001; McNally, Metzger, Lasko, Clancy, & Pitman, 1998). Thus, the literature is limited currently by the inconsistencies in the findings, our inability to determine the directionality of the relationship between reports of exposure and psychological distress (see King et al., 2000 for the exception), and the common assumption that inconsistencies in recall for traumatic events are unique to, or more frequent in, memories for traumatic events.

The following study is an examination of the relationships between reports of exposure, other stressors associated with peacekeeping, and psychological distress at Time 1 and Time 2 using a cross-lagged analysis. This study is the first that we know of to include a measure of potentially traumatic events as well as nontraumatic events within the same assessment period in order to determine whether there was a differential relationship between reports of exposure to potentially traumatic events and psychological distress versus reports of experiences of highly stressful, but nontraumatic events and symptoms of PTSD. This analysis will attempt to address the directionality of reports of warzone exposure, nontraumatic stressors, and psychological distress. Further, this analysis will attempt to disentangle the controversy over whether inconsistencies in recall are unique to memories of traumatic events. Specifically, if the results demonstrate a strong impact of distress on the recall of memories for exposure to traumatic, but not traumatic events, then the
evidence will suggest that human memory for traumatic events is particularly fallible or subject to the influence of psychological distress. If, however, the impact of distress on the recall of traumatic and nontraumatic events is relatively equivalent, then the data will support the conclusion that memory of traumatic and nontraumatic events may be similarly impacted by outside factors, such as psychological distress.

1. Method

1.1. Study design and participants

The data for this study were collected as part of a longitudinal examination of veterans of the Somalia peacekeeping mission (Litz, Orsillo, Freidman, Ehlich, & Batres, 1997). There were 3461 participants who completed an initial questionnaire approximately 15 weeks after their return to the U.S. Approximately 57% (N = 1987) of the initial sample agreed to be recontacted, of which 1237 provided a phone number at which they could be contacted. A total of 523 veterans (42%) were successfully contacted by phone and 522 agreed to the interview.

The mean age of the participants was 26.80 years (S.D. = 6.22 years). The majority of the participants were Caucasian (70%), male (89%), enlisted personnel (87%), and married (57%). This group of peacekeepers reported achieving an average of 12.91 years (S.D. = 1.51 years) of education. At the time of the assessment, the peacekeepers had served an average of 6.26 years (S.D. = 5.53 years) in the armed forces and the mission in Somalia was the first mission for the majority of the study group (80%). Data on the complete population of U.S. military personnel who served in Somalia and the demographic characteristics of those veterans who participated in this study are comparable and similar to the initial sample (Litz, Orsillo, et al., 1997) in age, gender, and education level. In addition, this sample is comparable to the larger Time 1 sample in warzone exposure and posttraumatic symptom severity. However, there were a smaller proportion of non-Caucasian participants in this sample than in the initial sample (29% vs. 37%). It is important to note that in contrast to related findings for Vietnam veterans, the reports of level of exposure in the present sample were similar among veterans of different racial backgrounds.

1.2. Measures

1.2.1. Warzone Exposure Scale

This seven-item scale was developed specifically to assess exposure to mission specific combat stressors (Litz, Orsillo, et al., 1997); it is similar to the Combat Exposure Scale (Keane et al., 1989). The respondent used a 5-point Likert scale to indicate the frequency with which he or she had experienced specific mission-related events. Items included questions such as “Did you go on
patrols,’” “Was your unit fired on,” and “Did you see Somalis dying?” The internal consistency of this scale was .75.

1.2.2. Other Stressors Associated with Peacekeeping Scale (Litz, King, King, Orsillo, & Friedman, 1997)

This 15-item measure assessed stressful events and circumstances that occurred during the peacekeeping mission to Somalia that might have created a sense of personal discomfort or distress, but that did not constitute an imminent threat to life. (see Litz, King, et al., for further details). The respondent used a 5-point Likert scale to indicate the impact of the event, ranging from 1 (not at all, no impact) to 5 (extremely negative impact). Examples of items included, “being in Somalia over the holidays,” “lack of personal space,” and “danger of contracting physical disease.” The internal consistency of the scale was .85.

1.2.3. Posttraumatic stress

The PTSD Checklist (PCL; Blanchard, Jones-Alexander, Buckley, & Forneris, 1996; Weathers, Litz, Herman, Huska, & Keane, 1993) and the Mississippi Scale for PTSD (Keane, Caddell, & Taylor, 1988) were administered to assess the reexperiencing, avoidance and numbing, and hyperarousal symptoms of PTSD. The PCL is a 17-item test that evaluates the severity of each of the 17 PTSD symptoms outlined in the DSM-IV using a 5-point Likert scale. Where appropriate, the items were worded to make reference to the specific deployment experiences of the peacekeepers (e.g., “Suddenly acting or feeling as if your Somalia experiences were happening again”). Using the Structured Clinical Interview for DSM-III R as the criterion, Weathers et al. documented the sensitivity and specificity of this scale to be .82 and .83, respectively. The Mississippi Scale is a 35-item test that evaluated the frequency of PTSD symptoms and associated features on a 5-point Likert scale. It was adapted to capture pertinent experiences in Somalia (e.g., “I wonder why I am still alive when others died in Somalia.”). Based on DSM-III criteria for PTSD, Keane et al. reported the sensitivity and specificity of the instrument to be .93 and .89, respectively. An index of symptom PTSD severity was calculated by standardizing the scores on the PCL and the Mississippi Scale and averaging them.

Two additional items were taken from the Brief Symptom Inventory (BSI; Derogatis, 1993) to assess suicidality as it is often thought of as a feature related to PTSD (i.e., “thoughts of death and dying” and “thoughts of ending your life”). They were incorporated into one of the five PTSD indicators in the modeling phase of the analysis outlined below.

1.3. Procedure

The initial cohort of participants was made available to the research team by their commanding officers. Participation in the project was not mandatory.
Participants completed the initial psychosocial survey in group sessions, under standardized conditions, in large auditoriums or smaller classrooms. The questionnaire took approximately 45 min to complete. The follow-up interviews took approximately 30–45 min. Well-trained lay interviewers from a national survey research organization conducted these interviews.

1.4. Data analysis

We calculated the means, medians, standard deviations, and intercorrelations for the Warzone Exposure Scale, the Other Stressors Associated with Peacekeeping Scale, and the composite PTSD measure. In order to quantify the magnitude of change exhibited between the two time points, a series of Cohen’s $d$ statistics were computed. Similar to Southwick et al. (1997) and King et al. (2000), we then tallied the changes in reporting (i.e., the number of increases and decreases) for each item on the exposure and stressor measures. Lastly, we collapsed all of the positive endorsements (i.e., all of those responses that indicated that a peacekeeper had had such an experience) into one category (i.e., yes, I experienced that event) so that we could count the number of participants who stated that they experienced an event at the first time point and denied it at the second time point and vice a versa. We were then able to compute the total number of changes of yes to no shifts, no to yes shifts, and total number of changes of either type.

We used a structural equation modeling approach to re-analyze the data presented in Roemer et al. (1998) in order to conduct a cross-lagged panel analysis (Ecob, 1987; Farrell, 1994; Williams & Podsakoff, 1989) that included reports of exposure to traumatic events and nontraumatic events. We used six latent variables: reports of stressor exposure, other stressors associated with peacekeeping, and PTSD symptom severity at two separate time points. The exposure variable was represented as a single causal indicator (Bollen & Lennox, 1991; Loehlin, 1992) in which exposure to events was specified to “cause” the experience of stress or score on the warzone exposure measure. At both Time 1 and Time 2 the sum total of the number of items endorsed was the indicator of reported stressor exposure.

The other stressors associated with peacekeeping latent variable (Time 1 and Time 2) had three effect indicators, which were formed by randomly assigning items into three equal clusters and computing the average score for each indicator (Bernstein & Teng, 1989). These clusters were formed in order to increase the stability of the indicators of the latent constructs.

Similarly, for both time points, each of the PTSD symptom severity latent variables had five effect indicators, which were created by grouping the items from the Mississippi Scale, the PCL, the two items from the BSI and computing average item scores. The five clusters were reexperiencing, active avoidance, emotional numbing, hyperarousal, and suicidality. These item clusters were previously defined (Litz, King, et al., 1997).
The model fit was evaluated using four separate indices: the root mean square error of approximation (RMSEA, Steiger, 1990), the standardized root mean square residual (SRMR, Hu & Bentler, 1998); the Tucker–Lewis Fit Index (TLI, Bentler & Bonett, 1980; Tucker & Lewis, 1973), and the Comparative Fit Index (CFI, Bentler, 1990). RMSEA and SRMR values less than 0.05 are usually considered to indicate a good model-data fit (Browne & Cudeck, 1993; Hu & Bentler, 1998, respectively) as are TLI and CFI values greater than 0.90.

We began by specifying and testing the measurement model based on the latent variables and their indicators as outlined above. Prior combat exposure served as a covariate to control for the impact of prior service on psychological distress. For each of the latent variables, individual parcels were specified to load on a single factor. Covariances among residuals for the observed indicators were constrained to 0. Initially, equality constraints were imposed for corresponding factor loadings at Time 1 and Time 2, which produced a good model fit. We also evaluated the fit of the model when the factor loadings were allowed to vary freely. The $\chi^2$ difference test between the two models was nonsignificant indicating that the factors loading were equivalent across the two occasions.

Next, we tested the structural model and evaluated the cross-lagged relationships between exposure to traumatic events, the other stressors associated with peacekeeping, and PTSD symptom severity. In each analysis, prior combat exposure served as a covariate to control for the impact of prior service on psychological distress. All correlation and bivariate analyses were conducted using the SPSS Statistical Software Package (version 11.0) (SPSS Inc., 2001). The cross-lagged analysis was conducted using the Mplus Software Package (version 2.0) (Muthen & Muthen, 1998); we used a maximum likelihood estimation procedure.

2. Results

2.1. Characteristics of the study sample

The prevalence rate for PTSD in this study group at Time 1 was 8.2% and at Time 2 was 10.2%. The criterion for defining a PTSD case was determined in a previous study of Somali peacekeepers; the established cut-off is based on a utility analysis conducted to optimize the specificity and sensitivity of the measures (Litz, Orsillo, et al., 1997).

Table 1 presents the descriptive statistics, including means and standard deviations, and the intercorrelations between the Time 1 and Time 2 measures. As depicted in the table, reported stressor exposure and symptoms of PTSD as assessed by the Mississippi Scale for PTSD increased slightly over time (Cohen’s $d = .42$ and .11, respectively). In contrast, there was negligible change in symptoms of PTSD as assessed by the PCL ($d = .02$) and there was a decrease in reports of the other stressors associated with peacekeeping ($d = -1.47$).
addition, as would be expected, the correlations across time between the same measures and between measures of the same construct were the highest. Further, the correlations within the same time period across different measures and the correlations across time between different measures were similar in magnitude.

Tables 2–4 summarize the types of reporting alterations across time on the exposure measure. Specifically, Table 2 presents the percentage of people endorsing an increase, decrease, or no change on each item of the stressor scale and Table 3 presents the percentage of people indicating an increase, decrease, or no change on each of the other stressors of peacekeeping items. Table 4 documents the percentage of peacekeepers reporting no to an item on the stressor measure at both times, yes at both times, yes at Time 1 and no at Time 2, and no at Time 1 and yes at Time 2.

2.2. Cross-lagged panel analysis

In the most saturated structural model, the factor loading of the five indicators of PTSD were constrained to be equivalent over occasions and the residuals for the PTSD indicators were allowed to covary from Time 1 to Time 2. The model allowed all structural parameters to be freely estimated. The initial structural model produced $\chi^2(132, N = 522) = 298.36, P < .001$. The RMSEA and SRMR were less than 0.05. According to Browne and Cudeck (1993) and Hu and Bentler (1998), RMSEA and SRMR values of less than 0.05 are indicative of a good model-data fit. The Comparative Fit Index (Bentler, 1990) was 0.97, and the Tucker–Lewis Fit Index (Bentler & Bonett, 1980; Tucker & Lewis, 1973) was 0.96. Convention has dictated that values of such indices exceeding 0.90 reflect reasonable model-data fit. More recently, Hu and Bentler (1998) have stated that values above 0.95 are preferred.

Next, the specification of the model was altered so that the cross-lagged paths were fixed at zero, which yielded $\chi^2(138, N = 522) = 317.24, P < .001$. The fit of this model was significantly worse than that of the unconstrained model, $\Delta \chi^2(6, N = 522) = 19.28, P < .01$. Furthermore, when the cross-lagged paths were

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### Table 1

<table>
<thead>
<tr>
<th>Measure</th>
<th>N</th>
<th>M</th>
<th>S.D.</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
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</thead>
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<tr>
<td>WZES (Time 1)</td>
<td>522</td>
<td>14.42</td>
<td>3.84</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>WZES (Time 2)</td>
<td>522</td>
<td>16.21</td>
<td>4.60</td>
<td>.48*</td>
<td>.12*</td>
<td>.10</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>PK Stressors (Time 1)</td>
<td>522</td>
<td>2.47</td>
<td>0.71</td>
<td>.12*</td>
<td>.15</td>
<td>.50*</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PK Stressors (Time 2)</td>
<td>522</td>
<td>1.48</td>
<td>0.64</td>
<td>.12*</td>
<td>.15</td>
<td>.50*</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PCL (Time 1)</td>
<td>521</td>
<td>29.28</td>
<td>12.70</td>
<td>.27*</td>
<td>.24*</td>
<td>.25*</td>
<td>.28*</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PCL (Time 2)</td>
<td>522</td>
<td>29.57</td>
<td>12.26</td>
<td>.22*</td>
<td>.25*</td>
<td>.19*</td>
<td>.37*</td>
<td>.64*</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mississippi (Time 1)</td>
<td>522</td>
<td>65.83</td>
<td>16.15</td>
<td>.23*</td>
<td>.21*</td>
<td>.22*</td>
<td>.22*</td>
<td>.81*</td>
<td>.62*</td>
<td></td>
</tr>
<tr>
<td>Mississippi (Time 2)</td>
<td>522</td>
<td>67.81</td>
<td>18.53</td>
<td>.19*</td>
<td>.25*</td>
<td>.18*</td>
<td>.18*</td>
<td>.61*</td>
<td>.85*</td>
<td>.66*</td>
</tr>
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</table>

* $P < .05.$  
  ** $P < .01.$
Table 2
Distribution of response patterns for warzone stressor items

<table>
<thead>
<tr>
<th>Stressor Item</th>
<th>Percentage endorsing greater exposure at Time 2</th>
<th>Percentage endorsing decreased exposure at Time 2</th>
<th>Percentage reporting no change in response</th>
</tr>
</thead>
<tbody>
<tr>
<td>Times w/sick and hungry people</td>
<td>17.9</td>
<td>43.0</td>
<td>39.1</td>
</tr>
<tr>
<td>Times on patrol/dangerous duties</td>
<td>11.0</td>
<td>41.8</td>
<td>47.2</td>
</tr>
<tr>
<td>Times needed to police Somalis</td>
<td>16.2</td>
<td>45.1</td>
<td>38.5</td>
</tr>
<tr>
<td>Times unit was fired upon</td>
<td>20.1</td>
<td>38.5</td>
<td>41.4</td>
</tr>
<tr>
<td>Times rocks thrown at unit</td>
<td>20.5</td>
<td>40.7</td>
<td>38.9</td>
</tr>
<tr>
<td>Times saw Somalis dying</td>
<td>11.0</td>
<td>53.7</td>
<td>35.3</td>
</tr>
<tr>
<td>Times experienced hostile reactions</td>
<td>26.9</td>
<td>39.3</td>
<td>33.8</td>
</tr>
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</table>
Table 3
Distribution of response patterns for other stressors of peacekeeping items

<table>
<thead>
<tr>
<th>Stressor Description</th>
<th>Percentage endorsing increased negative impact at Time 2</th>
<th>Percentage endorsing decreased negative impact at Time 2</th>
<th>Percentage reporting no change in response</th>
</tr>
</thead>
<tbody>
<tr>
<td>Being separated from family and friends</td>
<td>8.2</td>
<td>69.5</td>
<td>22.2</td>
</tr>
<tr>
<td>Being in Somalia over holidays</td>
<td>17.1</td>
<td>57.5</td>
<td>25.5</td>
</tr>
<tr>
<td>Having problems with mail and phone service</td>
<td>6.1</td>
<td>78.1</td>
<td>15.7</td>
</tr>
<tr>
<td>Uncertainty about length of deployment</td>
<td>8.7</td>
<td>77.6</td>
<td>13.8</td>
</tr>
<tr>
<td>Lacking privacy or personal space</td>
<td>8.6</td>
<td>73.9</td>
<td>17.5</td>
</tr>
<tr>
<td>Seeing physical devastation in Somalia</td>
<td>16.3</td>
<td>52.9</td>
<td>30.9</td>
</tr>
<tr>
<td>“Sanitizing” a town or area, only to have armed Somalis return</td>
<td>13.8</td>
<td>62.2</td>
<td>24.1</td>
</tr>
<tr>
<td>Having to endure the climate</td>
<td>10.8</td>
<td>63.8</td>
<td>25.5</td>
</tr>
<tr>
<td>Having things stolen by Somalis</td>
<td>11.0</td>
<td>69.0</td>
<td>19.9</td>
</tr>
<tr>
<td>Feeling unappreciated by the Somalis</td>
<td>9.8</td>
<td>70.5</td>
<td>19.6</td>
</tr>
<tr>
<td>Being in danger of contracting disease</td>
<td>8.7</td>
<td>71.3</td>
<td>20.0</td>
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<tr>
<td>Looting of food supplies</td>
<td>15.9</td>
<td>61.3</td>
<td>22.7</td>
</tr>
<tr>
<td>Being aware of cultural differences between you and the Somalis</td>
<td>11.4</td>
<td>57.3</td>
<td>31.5</td>
</tr>
<tr>
<td>Having to exercise restraint while patrolling dangerous areas</td>
<td>14.1</td>
<td>67.1</td>
<td>18.8</td>
</tr>
<tr>
<td>Dealing with changing rules as to the discretionary use of force</td>
<td>9.0</td>
<td>72.3</td>
<td>18.7</td>
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<tr>
<td>Times w/sick and hungry people</td>
<td>Percentage responding no at both times</td>
<td>Percentage responding yes at both times</td>
<td>Percentage yes at Time 1, no at Time 2</td>
</tr>
<tr>
<td>--------------------------------</td>
<td>---------------------------------------</td>
<td>----------------------------------------</td>
<td>----------------------------------------</td>
</tr>
<tr>
<td>Times on patrol/dangerous duties</td>
<td>11.8</td>
<td>59.3</td>
<td>7.6</td>
</tr>
<tr>
<td>Times needed to police Somalis</td>
<td>2.1</td>
<td>92.5</td>
<td>2.1</td>
</tr>
<tr>
<td>Times unit was fired upon</td>
<td>9.2</td>
<td>72.8</td>
<td>3.7</td>
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<tr>
<td>Times unit was fired upon</td>
<td>2.1</td>
<td>86.9</td>
<td>2.1</td>
</tr>
<tr>
<td>Times rocks thrown at unit</td>
<td>1.7</td>
<td>93.1</td>
<td>1.9</td>
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<tr>
<td>Times rocks thrown at unit</td>
<td>10.2</td>
<td>64.1</td>
<td>3.3</td>
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<tr>
<td>Times experienced hostile reactions</td>
<td>3.5</td>
<td>78.9</td>
<td>6.0</td>
</tr>
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constrained to be equivalent, \( \chi^2(135, N = 522) = 311.83, P < .001 \), this produced a significantly worse fit to the data, \( \Delta \chi^2(3, N = 522) = 13.66, P < .01 \) as well. Therefore, the model of best fit was the initial model.

The standardized parameter estimates for the significant paths and their associated critical ratios for this model are depicted in Fig. 1. As the figure illustrates, the same occasion association is strongest between the exposure to warzone and other stressors associated with peacekeeping scales and symptoms of PTSD. These associations are strongest at Time 1. The figure also reveals that reports of exposure and other stressors associated with peacekeeping experiences are vulnerable to shifts in reporting over time. Although the changes in endorsement are slight, our findings are consistent with previous findings suggesting a tendency to augment reports of traumatic and nontraumatic events that is in some measure due to symptoms of psychological distress.

3. Discussion

Despite the fact that potentially traumatic events are generally regarded as highly objective, salient events, previous researchers have documented that reports of exposure to such events can be somewhat variable over longer intervals (Roemer et al., 1998; Southwick et al., 1997). Unfortunately, the relationship between posttraumatic distress and inconsistencies in reports of traumatic
exposure remains unclear, due to the rather disparate findings in this area. A great deal of this confusion is owing to the cross-sectional methodologies that are typically employed. Such designs do not provide information about the directionality of associations between symptoms of PTSD and inconsistencies in reports of traumatic exposure. Fortunately, cross-lagged designs, such as the one employed in this investigation help to clarify the magnitude and direction of such relationships.

To the best of our knowledge, only one previous study in this area has utilized this design (King et al., 2000). In part, the present study was conducted as an attempt to replicate the results of that investigation given the many inconsistencies in this area. We also sought to extend the results of King et al.’s investigation by evaluating the specificity of relationship between symptoms of PTSD and changes in reported trauma exposure. That is, by including a measure of stressful but nontraumatic life events, it was possible to evaluate the extent to which associations between PTSD and event reporting inconsistencies are unique to traumatic events.

Consistent with previous research, changes in reported trauma exposure were not uncommon. One-third to one-half of participants’ responses on War-Zone Exposure Scale (WZES) items were inconsistent across time (Table 2). It should be noted, however, that many of the inconsistencies evident in Table 2 are owing to differing estimates of the frequency of each event rather than occurrence of the event. When responses are dichotomized to reflect occurrence versus nonoccurrence, responses are much more consistent. Specifically, in terms of occurrence versus nonoccurrence of specific events, consistent responding rates ranged from 71 to 97% with a mean of 84%. In contrast, the average percentage of participants responding consistently on each item is only 39% on the WZES when the standard for consistency is the exact same frequency ratings at both time points (Table 2). Although consistency is much better when viewed in terms of occurrence versus nonoccurrence, potentially traumatic events such as those comprising the WZES are presumably the sort of events that people would not forget regardless of whether they were asked a few weeks after returning to the United States, or 18 months later. That is, the fact that an average of 16% of respondents on each item reported that a potentially traumatic event had occurred to them during one assessment period while denying its occurrence during the other assessment period may be surprising to some readers. However, this rate of inconsistent responding actually compares favorably with other investigations of memory consistency for traumatic events (e.g., Southwick et al., 1997). Moreover, the items that pertain to threat of serious personal injury or harm such as going on dangerous patrols, being fired upon, or having rocks thrown at one’s unit, were associated with the most consistent rates of responding. For these items, only 6% of respondents, on average, reported that the event had occurred when asked during one assessment and reported that it had not happened to them when asked during another assessment period. Such events arguably represent the most stressful or traumatic experiences tapped by the WZES.
To contextualize these data, comparison of memory consistency for potentially traumatic events relative to unpleasant, nontraumatic events (i.e., comparing Tables 2 and 3) reveals that reporting inconsistencies are not unique to traumatic events. Further, reporting inconsistencies were even more pronounced for nontraumatic events. Designs that obtain reports or information about traumatic events only, to the exclusion of nontraumatic events, often yield unwarranted conclusions about unique properties of traumatic memories or are used as evidence for traumagenic amnesia. In contrast, designs that use similar methods to obtain information about traumatic as well as nontraumatic events have revealed that characteristics of reports of traumatic events are often not trauma-specific (e.g., Gray & Lombardo, 2001). The present findings then are in accord with the observations of others (Shobe & Kihlstrom, 1997) that traumatic memories are not necessarily unique or “special,” and that conclusions to the contrary are often generated from studies that fail to obtain information about nontraumatic events from the same time period. Only studies designed to gather such information are capable of evaluating the extent to which reporting inconsistencies are unique to traumatic events.

Although memories for traumatic events and stressful but nontraumatic events both proved to be fallible, it must be acknowledged that memories for potentially traumatic events increased over time, whereas memories for nontraumatic events decreased (\(d = .42\) and \(-1.47\), respectively). Memory researchers have theorized that our recall is often very “spotty” and that we tend to “fill in the gaps” in order to create a more coherent narrative of our experiences (e.g., Loftus, Coan, & Pickrell, 1996). Several months after combat, potentially life-threatening events may still be fairly salient whereas more mundane, low-level stressors may be less vivid when remembering the mission. Alternatively, a change in life circumstance, such as subsequent exposure to potentially traumatic and/or stressful life events rendering an individual more fearful, might affect recall for a previous event. Regardless, when gaps in memory are “filled in” it would be reasonable to expect that a disproportionate number of these details would be relevant to more salient potentially life-threatening experiences relative to low-level frustrations. These findings do not require separate theories to account for traumatic and nontraumatic memories, however. As a general rule, more salient information is more likely to be recalled and if we then fill in gaps or inconsistencies, these newly constructed details should be relevant to the more salient memories. Regardless, it is clear that memory for traumatic events is not more fallible than memory for nontraumatic events and more importantly, as discussed below, the relationship between PTSD symptom severity and memory inconsistencies is negligible.

Of course, many of the inconsistencies in the reporting of stressful events in this study may have been due not to memory lapses, but rather to intrapersonal differences in interpretation of items during the two assessment periods. For instance, when reporting on seeing Somalis dying, one could infer that this item refers to combat-related deaths only on one occasion, but may include exposure to
severely emaciated Somalis when completing the measure on a separate occasion. Similarly, when asked about dangerous duties or patrols, respondents’ perceptions of the extent to which certain duties were dangerous may have changed over time. As King et al. (2000) noted extensive media coverage of conflicts and their aftermath following a participant’s return may alter his or her previously held perceptions of safety. If so, novel reports of exposure at follow-up may not be instances of memory recovery or construction, but may instead reflect an alternate interpretation of previously remembered events.

Although speculative, novel endorsements of potentially traumatic events during the follow-up assessment period may be indicative of a more open reporting style or continued identification with military standing (enlisted vs. discharged). Given the often-reported sense of pride related to serving one’s country and/or providing humanitarian aid and performing a peacekeeping function, some participants may have been reluctant to acknowledge or to report the full extent of their traumatic or unpleasant experiences on the WZES as well as the measure of nontraumatic stressors associated with peacekeeping. It is often assumed that events that are reported much later, after not being reported initially, are fabricated or constructed. In the absence of independent corroboration, it is impossible to know which report is more accurate. It is also impossible to know whether such novel endorsements reflect memory fallibility or instead reflect item interpretation differences or alterations in response styles and biases.

The descriptive and bivariate analyses do not speak to the extent to which inconsistencies in stressor exposure are related to psychopathology. In order to examine this issue, we must turn to the results of the cross-lagged analysis and structural model. As Fig. 1 demonstrates, the partial regression coefficient for the cross-lagged effect from initial postdeployment (i.e., Time 1) PTSD symptom severity to Time 2 warzone stressor exposure is .11, and the cross-lagged effect from Time 1 PTSD symptom severity to Time 2 nontraumatic peacekeeping stressor exposure is .14. These relationships indicate that, controlling for stressor reports at Time 1, initial psychopathology is significantly associated with increased estimates of stressor exposure (traumatic and nontraumatic) over time.

The lack of significant pathways between Time 1 stressor exposure variables and Time 2 PTSD symptom severity indicate that initial reports of stressor exposure are not associated with increases in reported PTSD symptoms over time. Despite the fact that memories for traumatic and nontraumatic stressful events were somewhat variable over time, PTSD symptoms were fairly stable over time as evidenced by very similar prevalence rates at Time 1 and Time 2. As depicted in Fig. 1, the only significant predictor of Time 2 distress was Time 1 distress, providing further evidence that variable stressor recall and reporting has a negligible impact on reported symptoms of posttraumatic stress.

Although the associations between Time 1 psychopathology and the Time 2 stressor variables are statistically significant (after controlling for existing symptoms of PTSD), the effect sizes are quite small. Specifically, the increase in reported warzone stressors that can be accounted for by initial posttraumatic
psychopathology is approximately 1.2% of the variance. Similarly, the increase in reported nontraumatic peacekeeping stressors that can be accounted for by Time 1 PTSD symptom severity is approximately 2% of the variance. It is the case then that PTSD symptom severity can influence retrospective reports of stressor exposure. These statistically significant associations are likely owing to the relatively large sample size, however, as the magnitude of these relationships is miniscule. Moreover, the influence of PTSD symptom severity on retrospective reports of life events is not trauma specific, as this effect was slightly more pronounced (although still negligible) for retrospective reports of nontraumatic peacekeeping stressors.

Our findings directly replicate those of King et al. (2000), who also found a very small but statistically significant association between PTSD symptom severity and increased reports of stressor exposure. As these researchers pointed out, such increases could be attributable to “motivated recall,” as individuals seek explanations for their pronounced psychological distress. Alternatively, at Time 1, inhibited reporting of stressful experiences that actually occurred could result from avoidance and numbing symptoms that are a defining feature of PTSD. In such a scenario, newly reported stressors at Time 2 may more accurately reflect stressors that the individual encountered during the mission. Our findings extend those reported by King et al. by demonstrating that the small but statistically significant relationship between PTSD and event recall is not specific to traumatic events.

Regardless, the finding that PTSD symptom severity exerts a negligible impact on altered reporting of stressors over time is an important one. A strong relationship between PTSD symptom severity and stressor reporting fallibility would have dire implications for the diagnosis of PTSD. Because a diagnosis of PTSD requires exposure to an inordinately stressful event (i.e., trauma) and because it is often the case that the sole source of information about such an exposure is the individual being diagnosed, such a relationship would certainly hamper diagnostic efforts and may make it necessary to obtain independent corroboration of traumatic exposure before a diagnosis of PTSD could be established. Although such corroboration is always helpful, the present data do not lend credence to the notion that those with significant symptoms of PTSD are inordinately poor historians. Moreover, posttraumatic distress is no more strongly associated with inconsistencies in reported exposure of traumatic events than it is with inconsistencies in reported exposure of nontraumatic events.

In sum, the descriptive and bivariate data bearing on reporting discrepancies between the two assessment periods (Tables 1–4) are consistent with prior research conducted over similar intervals and do not provide evidence for traumatogenic amnesia or trauma-specific memory deficits. A great deal of the discordance in responding is attributable to differing estimates of the frequency of occurrence rather than whether the events occurred at all. Nevertheless, instances of discordance in the occurrence of potentially traumatic events can hardly be considered rare. Such discordance is likely not fully attributable to faulty memory
processes, however. Differences between the two assessment periods in participants’ response biases, content interpretation and other factors are equally viable explanations for such inconsistencies. The final structural model does confirm that there is a statistically significant association between psychological distress during the immediate postdeployment period and subsequent increases in reported warzone stressor exposure. Similar to the findings of others, however, the magnitude of this association is exceedingly small, disconfirming the notion that the relationship between psychological distress and trauma reporting inconsistencies is clinically or practically meaningful. Finally, the inclusion of a measure of nontraumatic life events in the design and analyses reveals that relationships and reporting inconsistencies observed in the present study are not specific to traumatic events.

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References


