POST-TRAUMATIC SYMPTOMATOLOGY
IN THE LUBY'S SHOOTING

THESIS

Presented to the Graduate Council of the
University of North Texas in partial
Fulfillment of the Requirements

For the Degree of

MASTER OF SCIENCE

By

Pam Adams, B.S.
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The role of exposure to a human-made disaster and the subsequent development of post-traumatic stress reactions were examined. Subjects included 49 males and 30 females who were variously exposed to the Luby's shooting incident in Killeen, Texas in October of 1991. Post-traumatic stress symptomatology was measured by the SCL-90R. Exposure was operationalized by using a scenario-rating scheme with independent raters estimating each subject's level of exposure. A regression and commonality analysis revealed that exposure is an important predictor in post-traumatic symptomatology. Premorbid functioning and gender were also found to play important roles, with females expressing higher levels of symptomatology.
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INTRODUCTION TO THE STUDY

A wide variety of literature has been published in the last 25 years concerning disasters (Berren, Beigel, & Ghertner, 1980). Articles have focused on the extent of the destruction (Berren et al., 1980), assessment of the emotional repercussions of the disaster (P.R. Adams & G.R. Adams, 1984; Baum, Gatchel, & Schaeffer, 1983; Edwards, 1976; Hocking, 1970; Wilkinson, 1983), and analyses of the intervention services that strive to minimize the devastating effects of the disasters (Heffron, 1977; Innes & Slack, 1990; Sank, 1979). The types of disasters described in this growing body of research include natural disasters, such as floods and tornados (Steinglass & Gerrity, 1990); technological accidents, such as the Three Mile Island incident (Baum et al., 1983); and human-made events, such as mass murders (Hough, Vega, Valle, & Kolody, 1990; North, Smith, McCool, & Shea, 1989; Pynoos et al., 1987).

Relatively little of this research has concentrated on the mental health of these disaster-affected communities as a consequence of the exposure to the catastrophes. The present paper consists of a review of the existing literature and the results of a study which examined psychological symptoms within a group of people who were
variously affected by the Luby's shooting incident in Killeen, Texas on October 16, 1991.

Psychological Effects of Disasters

The psychological effects of disasters are numerous. These include symptoms of depression, anxiety, and somatization (Rubonis & Bickman, 1991). Given the characteristic combination of these symptoms, Post-Traumatic Stress Disorder (PTSD) is the most frequently diagnosed condition among trauma-exposed persons (Hough, Vega, Valle, & Kolody, 1990; Steinglass & Gerrity, 1990; True, Goldberg, & Eisen, 1988). PTSD is defined in the Diagnostic and Statistical Manual of Mental Disorders (DSM-III-R, American Psychiatric Association, 1987) in terms of five key criteria. They are summarized as follows:

1. Experience of an event that is outside the range of usual human experience and that would be extremely distressing to almost anyone;

2. Persistent reexperiencing of the traumatic event through either recollections, dreams, flashbacks, or symbolizations of the event;

3. Persistent avoidance of stimuli associated with the trauma or numbing of general responsiveness;

4. Persistent symptoms of increased arousal; and

5. Duration of the disturbance (symptoms in 2, 3, and 4) of at least one month.
While PTSD is prevalent in many communities after the occurrence of a disaster (Steinglass & Gerrity, 1990), many of those people who are exposed do not reach the level of symptomatology required for a clinical diagnosis (North, Smith, McCool, & Shea, 1989). In this regard, the DSM-III-R is not as sensitive to these lesser, sub-clinical levels of symptom expression. Thus, many studies use symptom checklists (such as the SCL-90R; Deragotis, 1977) as a means of measuring the overall level of stress symptomatology (e.g., Green, Grace, J.D. Lindy, Titchener, & J.G. Lindy, 1983).

Whereas the initial responses to these different types of disasters may be similar, it has been suggested by several researchers that human-made disasters, such as mass murders and technological accidents, create different psychological reactions than those of natural disasters (Baum, Fleming, & Davidson, 1983; Frederick, 1980). Post-traumatic stress reactions are typical of both classifications of disasters. However, human-induced catastrophes have been shown (1) to affect people who were not directly victimized by the incident; and (2) to produce longer-term consequences than natural disasters (Baum, Fleming, & Davidson, 1983; Frederick, 1980). In a study on the Beverly Hills Supper Club Fire, Green et al. (1983) found that direct survivors of the incident were still experiencing pathological symptoms at one year post-fire,
while the symptoms for the rescue workers and bereaved family members had decreased. Baum, Gatchel, and Schaeffer (1983) found similar results in an investigation of the Three Mile Island incident. Residents of the Three Mile Island area exhibited significant symptoms of stress when measured almost one and one-half years after the accident—this compared to people living near an undamaged nuclear plant (Baum, Gatchel, & Schaeffer, 1983).

In addition to the role of proximity (as in the studies reviewed above), the intensity of the disaster has also been suggested to affect the degree of psychological impairment (North, Smith, McCool, & Shea, 1989; Shore, Tatum, & Vollmer, 1986). Studies of Vietnam veterans have played a major role in the development of this perspective. True, Goldberg and Eisen (1988) found that the level of combat exposure was significantly associated with all symptoms of PTSD, with greater symptomatology attributable to higher levels of combat exposure. Buydens-Branchey, Noumair, and Branchey (1990) also described similar results. In their study, Vietnam veterans who had been wounded, encountered mines or booby traps, or were engaged in a firefight displayed more persistent PTSD symptoms than veterans who were involved in less intense combat. Other factors, such as age, race, and education, have also been suggested to affect the probability of stress symptoms (Goodwin, Davis, & Rubins, 1975; True, Goldberg, & Eisen, 1988). However, in
many of the Vietnam studies, the variable that seems to account for most of the variance in the PTSD symptoms is combat exposure (Buydens-Branchey, Noumair, & Branchey, 1990; Solkoff, Gray, & Keill, 1986).

Buydens-Branchey et al. (1990) have stated that their results regarding "combat exposure" are not applicable to other stressors such as those presented by human-made disasters. However, a growing area of research is focusing on the relation between exposure-level to human-made disasters and trauma-related symptoms. Pynoos et al. (1987) explored PTSD reactions of children one month after a sniper attack at their elementary school. They found significant differences between children according to exposure level (out of vicinity, absent, at home, in neighborhood, on way home, in school, or on playground). Other variables (sex, ethnicity, age, etc.) were not predictive. In a one-year follow-up study of the sniper incident, Nader, Pynoos, Fairbanks, and Frederick (1988) discovered that the level of exposure to the attack was also the primary predictor of ongoing PTSD symptomatology.

Findings similar to the sniper study have been reported in adults as well. A study by North, Smith, McCool, and Shea (1989) focused on a mass murder in Russellville, Arkansas in four local business establishments. They found that employees who were eyewitnesses reported higher rates of subjective upset and symptoms of PTSD than did those
employees who did not directly witness the shootings. Four to six weeks after the event, all of the employees who had not viewed the murders reported full recovery from any symptoms, compared with only one-fourth of the eyewitnesses fully recovering.

Thus, there might seem to be conclusive evidence that the level of exposure to a disaster is related to PTSD symptomatology. However, some of these studies have drawn criticism targeted at the exposure variable itself. Many of the combat scales used in the Vietnam research were created by correlating categories of exposure with frequency of symptomatology (Buydens-Branchey, Noumair, & Branchey, 1990; Casella & Motta, 1990; Foy, Sipprelle, Rueger, & Carroll, 1984; & True, Goldberg, & Eisen, 1988). For example, a soldier who killed enemy civilians is judged to have received more combat exposure than a soldier who only killed enemy military personnel. This is not because of some combat differences in the proximity to the trauma or intensity of the experience; rather this is simply because the former scenario (having killed civilians) is more often found in the histories of the symptomatic subjects. Thus, the higher the correlation between symptoms and exposure "type", the greater the presumed "level" of exposure.

This methodology is problematic for two reasons. First, the resulting order of exposure levels could conceivably be counterintuitive as well as
countertheoretical. For instance, suppose that, for some sampling reason, desk clerks far from the front exhibited more symptoms than foot-soldiers involved in multiple firefights. This method would lead to the conclusion that "sitting at a desk in Vietnam" constitutes a "higher level of combat exposure" than "being shot in a firefight." The second problem is even more confounding. Scales created in this manner have been used in further studies relating these so-called "combat exposure levels" to the presence and severity of PTSD. Positive findings are not interpretable because, put in its simplest terms, the independent and dependent variables are confounded.

Ideally, exposure should be conceptualized as a function of proximity and intensity (Exp. = f (Prox, Int)) with intensity including the factors of duration and magnitude. An example of physical exposure might be helpful. For example, suppose a nuclear accident were to occur in a broadly populated area. Exposure could be measured in the following manner: proximity = miles from site of accident, intensity = minutes of exposure, and actual exposure = rem (percentage of radiation received). With the direct ability to measure each component of the equation, we can derive the function. Thereafter, we can predict exposure of others based upon proximity and intensity only.

Since it is seemingly impossible to construct such a direct method for measuring the psychological exposure to
disasters, many researchers have attempted to estimate exposure (EXP') by substituting a symptomatology correlation into the equation, EXP' = f (Sx r (prox, int)). The resulting estimates of "exposure" are thus confounded with symptoms. Stated another way, such scales might simply be measuring PTSD in a crude fashion (i.e., via correlated circumstances) rather than actually estimating exposure (Watson, Juba, & Anderson, 1989).

To add to the problems with the exposure literature, little validational research has been conducted on many of the scales, and some scales have never been examined for empirical validity by anyone other than the original authors (Watson, Juba, & Anderson, 1989).

Much of the research on exposure to natural and human-made disasters has been conducted in a similar manner to the Vietnam studies. Thus, operationalizations of exposure have seldom been empirically validated (Green, Grace, & Lindy, 1983; North, Smith, McCool, & Shea, 1989). Subjects are usually placed in groups according to their role in the disaster (e.g., direct victim, witness, family member, etc.). Such categorization assumes that people in the same group were equally exposed to the situation and that differences in group membership were psychologically meaningful (Green, Grace, J.D. Lindy, Titchener, & J.G. Lindy; North, Smith, McCool, & Shea, 1989; Wilkinson, 1983).
One, perhaps preferable, alternative to the above estimation of exposure would involve making symptomatology in the equation \( \text{EXP} = f(S\times r \text{ (prox, int)}) \) a constant, thus nullifying the correlation within the exposure function. In other words, \( \text{EXP} = f(S\times-r \text{ (prox, int)}) \). This might be approximated by using some scenario-rating scheme, wherein the symptoms are made overtly constant. Also, ratings can be performed by several persons in order to reduce biases and to increase the validity of the estimates.

The Present Study

It seems quite reasonable to predict a relationship between exposure to a disastrous event, such as a mass murder, and the displayed level of stress symptomatology. Although several researchers have explored this issue in children, there is an apparent lack of information in this area with regard to adults. Problems also exist in many studies with the measures of exposure being created based on their relationship to symptoms. The present study clarified these matters by improving upon the existing measures of disaster exposure and then examining the relationship between exposure to the Luby’s shooting and the severity of stress symptomatology for a group of adults who were involved in the incident. With the relatively limited data on human-made disasters involving adults, this study should (1) increase our knowledge of a little-studied subject area,
as well as (2) enhance our ability to quantify exposure levels.

Hypothesis

It was hypothesized that the level of exposure to the Luby's shooting would be a predictor of overall level of stress symptomatology, with those participants having higher levels of exposure to the shooting expressing more PTSD-related symptoms. This outcome was predicted even after exposure was quantified independent from symptoms and after gender and pre-trauma symptomatology were statistically controlled.

METHOD

Subjects

Subjects consisted of 49 male and 30 female volunteers who were affected by the Luby's shooting on October 16, 1991 in Killeen, Texas. The group included 27 patrons and employees of Luby's, 37 emergency personnel, 6 media personnel, and 9 people of the local community. A majority of the emergency workers were male. Due to the limitations of such field research, eliminating a possible gender bias was impossible without drastically reducing the total subject pool.

Procedure

The presence and overall level of symptomatology for all subjects was assessed one month after the incident by the SCL-90R (Derogatis, 1977) via the positive symptom
Subjects were asked to respond first for the past month (i.e., since the shooting incident) and then again for the month prior to the shooting.

In order to avoid the inherent problems of previous research which has confounded the measures of exposure and symptomatology, the present study employed the following method of operationalizing exposure. The actual scenario of involvement for each subject was extracted based on interview data. Two researchers (the author and one assistant) completed this task independently. Upon consolidation of the scenarios (see Appendix A), 20 different independent raters (graduate students), not including the two persons extracting the scenarios, estimated each subject’s level of exposure based on a scale from 0% to 100% with increments of 10. Raters were provided with a "set" to help them divorce the idea of symptomatology from their ratings of exposure. This was accomplished by first explaining that exposure is a combination of proximity and intensity. The rater was then informed that all subjects expressed the same level of symptomatology. By using this mildly deceptive technique, symptoms were made a constant (to the extent possible). Thus, the estimate of exposure was not directly confounded with symptoms. Raters were debriefed upon completion of their participation.
Instruments

The SCL-90R (Derogatis, 1977) is a self-report symptom checklist. It consists of a series of 90 symptoms or behaviors (such as having trouble falling asleep, crying easily, etc.). The subject’s task is to rate how troubled he or she has been by that symptom during the past week on a 5-point scale of distress from not at all (0) to extremely (4) (Green, Grace, J.D. Lindy, Titchener, & J.G. Lindy, 1983). The positive symptom total (PST) for each subject was used for the analysis of the data. The PST consists of the number of symptoms endorsed as present (i.e., greater than 0) by each subject. This summary variable communicates the breadth of the individual’s distress while not being overly sensitive to response styles.

Other studies have supported the usefulness of the SCL-90R as a measure of global distress (Brophy, Norvell, & Kiluk, 1988; Cyr, McKenna-Foley, & Peacock, 1985). The PST of the SCL-90R has also been used as a global indicator of symptomatic response to stress (Baum, Gatchel, & Schaeffer, 1983). Deragotis (1977) reports a test-retest reliability coefficient between .78 and .90 for the SCL-90R, as well as an internal consistency coefficient between .77 and .90. Validity for the symptom constructs of this measure has been demonstrated (Deragotis & Cleary, 1977), and evidence has been found for the convergent validity of the original SCL-90 using the MMPI clinical scales for comparison (Deragotis,
Rickels & Rock, 1976). Similar results for convergent validity were found for the SCL-90R by Brophy, Norvell, and Kiluk (1988).

RESULTS

Descriptive statistics for the predictor variables are shown in Table 1. To test the hypothesis that those persons having higher levels of exposure to the Luby's shooting would express more symptomatology than others with lower levels of exposure, a regression and commonality analysis was conducted. The dependent variable was the SCL-90R PST, and the predictor variables were exposure, premorbid functioning, and gender. This analysis allowed for the identification of the proportion of variance with regards to symptomatology that may be attributed uniquely to exposure, premorbid functioning, and gender, as well as proportions of variance that may be attributed to various combinations of the independent variables. Premorbid functioning was measured by the PST of the SCL-90R administered with instructions to rate for the month prior to the shooting incident.

As predicted, the commonality analysis revealed that the exposure variable accounted for a significant proportion of the variance in the dependent variable, $R^2 = .0607, p < .05$. Also, when premorbid functioning and gender are statistically controlled, the relation remains significant ($R^2 = .0327, p < .05$). However, the other two predictor
Table 1
Descriptive Statistics of Independent and Dependent Variables

<table>
<thead>
<tr>
<th></th>
<th>Mean</th>
<th>Standard Deviation</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Males</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Exposure</td>
<td>6.284</td>
<td>1.534</td>
<td>2.350-09.000</td>
</tr>
<tr>
<td>Pre-SCL</td>
<td>12.959</td>
<td>12.819</td>
<td>0.000-55.000</td>
</tr>
<tr>
<td>Post-SCL</td>
<td>25.714</td>
<td>18.256</td>
<td>0.000-73.000</td>
</tr>
<tr>
<td><strong>Females</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Exposure</td>
<td>6.547</td>
<td>2.315</td>
<td>3.000-09.500</td>
</tr>
<tr>
<td>Pre-SCL</td>
<td>23.600</td>
<td>18.704</td>
<td>0.000-73.000</td>
</tr>
<tr>
<td>Post-SCL</td>
<td>48.933</td>
<td>19.276</td>
<td>8.000-84.000</td>
</tr>
<tr>
<td><strong>Entire Sample</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Exposure</td>
<td>6.384</td>
<td>1.859</td>
<td>2.350-09.500</td>
</tr>
<tr>
<td>Pre-SCL</td>
<td>17.000</td>
<td>16.069</td>
<td>0.000-73.000</td>
</tr>
<tr>
<td>Post-SCL</td>
<td>34.532</td>
<td>21.723</td>
<td>0.000-84.000</td>
</tr>
</tbody>
</table>

variables accounted for a substantially larger proportion of that variance with premorbid functioning at $R^2 = .2787$, $p < .0001$ and gender (with females showing more symptoms) at $R^2 = .2726$, $p < .0001$ (see Table 2). In addition, all three predictor variables were significantly correlated with levels of symptomatology (see Table 3).
Table 2

Regression Relations with SCL-90R Positive Symptom Total

Post-Incident: Commonality Analysis--Entire Sample

<table>
<thead>
<tr>
<th>Relationship</th>
<th>Shared (R^2)</th>
<th>Unique (R^2)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Zero-Order</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Exposure</td>
<td></td>
<td>.0607*</td>
</tr>
<tr>
<td>PreSCL</td>
<td></td>
<td>.2787*</td>
</tr>
<tr>
<td>Gender</td>
<td></td>
<td>.2726*</td>
</tr>
<tr>
<td><strong>First-Order</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Exposure (PreSCL)</td>
<td>.3169a</td>
<td>.0382*</td>
</tr>
<tr>
<td>Exposure (Gender)</td>
<td>.3170b</td>
<td>.0444*</td>
</tr>
<tr>
<td>PreSCL (Exposure)</td>
<td>.3169a</td>
<td>.2562**</td>
</tr>
<tr>
<td>PreSCL (Gender)</td>
<td>.4165c</td>
<td>.1440**</td>
</tr>
<tr>
<td>Gender (Exposure)</td>
<td>.3170b</td>
<td>.2563**</td>
</tr>
<tr>
<td>Gender (PreSCL)</td>
<td>.4165c</td>
<td>.1379**</td>
</tr>
<tr>
<td><strong>Second-Order</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>EXP(PreSCL,Gender)</td>
<td>.4493d</td>
<td>.0327*</td>
</tr>
<tr>
<td>PreSCL(EXP,Gender) &quot;d</td>
<td>1.323**</td>
<td></td>
</tr>
<tr>
<td>Gender (EXP,PreScl) &quot;d</td>
<td>1.324**</td>
<td></td>
</tr>
</tbody>
</table>

a mathematically identical
b mathematically identical
c mathematically identical
d mathematically identical
* Significance of predictor entered last is p < .05
**Significance of predictor entered last is p < .0001
Upon finding that gender accounted for a significant proportion of the variance, further analyses were conducted. With regards to positive symptom totals, females (Mean = 48.93) reported a significantly greater number of symptoms than the males (M = 25.71), t(77) = 5.37, p < .001. Another commonality analysis was then conducted using only the exposure and premorbid functioning predictor variables, in order to look at their effects upon male and female subgroups separately. These two variables remained as significant predictors for the male subgroup only, with exposure at $R^2 = .0992$, p < .05 and premorbid functioning at $R^2 = .4127$, p < .0001 (see Table 4).

Table 3

**Intercorrelation of Predictor Variables**

<table>
<thead>
<tr>
<th></th>
<th>PostSCL</th>
<th>Exposure</th>
<th>PreSCL</th>
<th>Gender</th>
</tr>
</thead>
<tbody>
<tr>
<td>PostSCL</td>
<td>1.000</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Exposure</td>
<td>.246*</td>
<td>1.000</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PreSCL</td>
<td>.528**</td>
<td>.098</td>
<td>1.000</td>
<td></td>
</tr>
<tr>
<td>Gender</td>
<td>.522**</td>
<td>.069</td>
<td>.323**</td>
<td>1.000</td>
</tr>
</tbody>
</table>

*Significance of coefficient is p < .05

**Significance of coefficient is p < .01
Table 4

Regression Relations with SCL-90R Positive Symptom Total
Post-Incident: Commonality Analysis--Males

<table>
<thead>
<tr>
<th>Relationship</th>
<th>Shared ($R^2$)</th>
<th>Unique ($R^2$)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Zero-Order</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Exposure</td>
<td>.0992*</td>
<td></td>
</tr>
<tr>
<td>PreSCL</td>
<td>.4127**</td>
<td></td>
</tr>
<tr>
<td><strong>First-Order</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Exposure (PreSCL)</td>
<td>.4752</td>
<td>.0626*</td>
</tr>
<tr>
<td>PreSCL (Exposure)</td>
<td>.4752</td>
<td>.3760**</td>
</tr>
</tbody>
</table>

*Significance of predictor entered last is $p < .05$

**Significance of predictor entered last is $p < .0001$

The exposure variable for the current study was also compared with a similar study that used the same data set but placed subjects in high, medium, or low exposure groups according to their role in the disaster (Sewell & Jenkins, 1992). Although both exposure variables were highly correlated, $R = .81$, a commonality analysis revealed that the present study's exposure variable accounted for a significantly greater proportion of variance with regards to symptomatology, $R^2 = .0312$ (the Sewell & Jenkins, 1992 variable failed to enter into this regression).
DISCUSSION

This study demonstrates that one's level of exposure to a human-made disaster, such as the Luby's shooting, is indeed a predictor of the resulting level of PTSD symptomatology for that person. Thus, the more exposed a person is to a disastrous event, the greater number of post-traumatic stress symptoms that person is likely to express. The current study quantified exposure in a unique manner (independent from symptoms). The exposure variable proved to be significant in predicting symptomatology, avoiding the potential confounds found in some research, such as correlating measures of exposure with frequency of symptomatology (Buydens-Branchey, Noumair, & Branchey, 1990; Casella & Motta, 1990; Foy, Sipprelle, Rueger, & Carroll, 1984) or arbitrarily placing people in exposure categories according to their role in the disaster (Green, Grace, J.D. Lindy, Titchener, & J.G. Lindy, 1983; North, Smith, McCool, & Shea, 1989). In comparing this scenario and independent rating format to the frequently-used method of exposure categorization (Sewell & Jenkins, 1992), this new method proved to be more sensitive to symptomatology. This finding has implications for future trauma research conducted with regards to how exposure levels are quantified.

In addition, exposure was shown to be a significant predictor of stress symptomatology even after gender and premorbid functioning were statistically controlled.
Contrary to much of the current literature which places primary emphasis on exposure (Buydens-Branchey, Noumair, & Branchey, 1990; Green, Grace, & Glesser, 1985a; Leopold & Dillon, 1963; Pynoos et al., 1987), this study suggests that gender and premorbid functioning played an important role in the prediction of PTSD symptoms. In Steinglass and Gerrity’s study of natural disasters (1990), they also found substantial gender differences in PTSD response rates, with women expressing higher levels. However, because of the quasi-experimental nature of these types of studies, further inquiry into this matter is indicated. In the current study, an overwhelming majority of the females participants were survivors of the shooting incident, as opposed to being emergency personnel or media, and were, indeed more highly exposed to the incident. Thus, the significance of gender may be confounded with qualitative differences in their reasons for exposure (i.e. their roles in the incident). This is consistent with the Sewell and Jenkins (1992) report, in that predictors of diagnosable PTSD were only useful in the subgroup of subjects not in the restaurant during the incident.

Although premorbid functioning and PTSD development have been linked in a few studies (Davidson, Swartz, & Storck, 1985; McFarlane, 1988, Sewell & Jenkins, 1992), the role that premorbid functioning played in this study is somewhat ambiguous. This variable was assessed after the
shooting incident by asking subjects to rate their functioning for the past month. Therefore, it is possible that subjects rated their past month level of functioning as being more severe than it actually was because they were experiencing a number of distressful symptoms at that time. It seems equally likely that subjects currently distressed could have under-reported prior symptoms as a way to put current upset in maximum contrast. Regardless, in this study a person's view of their pre-trauma functioning was an important predictor of their resulting trauma-related symptomatology. While this retrospective symptom report is vulnerable to the confounds mentioned above, there may be reason to attend to the relation between pre- and post-trauma symptom levels. In the study by Sewell and Jenkins (1992), reported traumatic response to a prior stressor was a significant predictor for a post-traumatic reaction following a disaster. Also, in a serendipitous prospective study, Nolen-Hoeksema and Morrow (1991) described similar results. They assessed students levels of depressive symptomatology two weeks before the Bay Area earthquake. They also found that pre-trauma levels of symptomatology was a predictor of students' levels of depression and post-traumatic stress as assessed by measures taken after the earthquake.

This study emphasizes the role of exposure in the development of stress reactions in response to a disaster.
Because this is the first attempt to operationalize exposure in a way that neither confounds it with symptoms, nor relies on subjective experimental categorization, further studies should be conducted in a similar manner in order to determine the validity of these findings. Premorbid functioning, to the extent it can be measured, and gender would be important variables to consider in this research.
APPENDIX A

SCENARIO RATING SCALE
Scenario Rating Scale

Subject #1 is a Chaplain and was driving by Luby’s shortly after the shooting and noticed the ambulances. #1 stopped to see if he/she could be of assistance and counselled people outside of the restaurant. #1 witnessed the injured being removed from the restaurant. #1 had friends who were physically injured in the shooting incident.

Level of Exposure

0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%

How Confident Are You In Your Rating?

1 2 3 4 5
not at all moderately extremely

Subject #2 is a paramedic who was off-duty and at home when hearing the dispatch concerning the shootings. #2 arrived very early at the scene and witnessed police officers firing into the restaurant and a bloody man lying in a ditch. Upon entering the restaurant, #2 assisted with the injured and placed napkins over the faces of the deceased. #2 told an elderly gentleman with a chest wound that he/she would get to him in a minute, and the man later died.

(scale as above throughout)

Subject #3 is a paramedic who was off-duty and having lunch with a friend when hearing about the incident. #3 arrived on the scene after the shootings and assisted with the injured and deceased inside and outside of the restaurant.

Subject #4 is a fire/rescue officer who was off-duty and at home when hearing the dispatch. #4 went to the station and was told that fifteen to twenty people had been shot. #4 gathered supplies and went to the scene. #4 assisted with the injured and was told to stop working on an injured person because that person was dead and to go on to someone else. #4 stayed on the scene to do body recovery and was there for approximately six and a half hours.
Subject #5 is a paramedic who was off-duty when the general alarm sounded. #5 went to the station and gathered supplies and went to the scene. Triage was already set up when #5 arrived. #5 assisted with the injured and deceased inside and outside of the restaurant. #5 knew their spouse had went out to lunch and looked for their spouse while walking through the restaurant. #5 later went to the Sheraton to treat an elderly person with chest pain.

Subject #6 is a fire/rescue officer who was off-duty and working at another job when their spouse called to tell them about the incident. #6 went to the scene and assisted with the injured and deceased inside and outside of the restaurant. #6 was told to walk by several people because they were already dead.

Subject #7 is a fire/rescue officer who was in class at the time of the shootings and arrived on the scene four hours afterwards. However, #7 witnessed several dead bodies remaining in the restaurant. #7 also later interacted with other emergency personnel who assisted with the injured and deceased at the scene.

Subject #8 is an EMT who was in class at the time of the shooting and did not go to the scene of the incident. #8 later interacted with other emergency personnel who assisted with the injured and deceased at the scene.

Subject #9 is a reporter who was on the way back from lunch when his/her secretary called and informed him/her of the incident. #9 arrived on the scene while the gunman was still shooting. #9 videotaped a man dying from a gunshot wound and witnessed people running from the building. #9 interviewed people and looked inside the restaurant. #9 remained on the scene for approximately forty-five minutes before being told by the authorities to leave. #9 had friends who were physically injured as a result of the shooting incident.

Subject #10 is a R.N. who heard about the incident on the news and called the police to see where he/she could go to help out. #10 went to the Sheraton Hotel, next door to Luby’s, to assist with the injured. #10 knew someone who was driving behind the shooter when he turned into Luby’s.
Subject #11 is an EMT who was off-duty and at home when hearing the dispatch. #11 went to the scene and witnessed a couple of dead bodies at the front and side of building when first arriving at Luby’s. #11 loaded dead victims onto choppers and conducted crowd control in the parking lot for most of the day. #11 saw two friends’ names on the list of the deceased but was not allowed to walk through the restaurant. #11 was told to go home after this but #11 stayed at the scene.

Subject #12 is a paramedic who arrived on the scene after the injured had already received medical treatment. #12 had a friend who was physically injured as a result of the shooting incident.

Subject #14 is a fire/rescue officer who was left in charge of the fire station during the incident. #14’s former teacher was killed in the shooting incident. #14 also later interacted with other emergency personnel who assisted with the injured and deceased at the scene.

Subject #15 is a fire captain who was off-duty and had went to the station to pick up his/her paycheck when hearing of the incident. #15 went to the scene and assisted with the injured and deceased inside and outside of the restaurant. #15 had to decide who was or was not going to make it in order to determine who to treat. #15 worked on one man who died after several minutes. #15 had to leave the scene to respond to a fire run in town.

Subject #16 is an EMT who treated people with minor glass lacerations outside of the building and did not enter the restaurant.

Subject #17 is a fire marshall who was off-duty and with their spouse when overhearing the radio call for help. #17 went to the scene and assisted with the injured and deceased inside and outside of the restaurant. #17 had a friend who was physically injured as a result of the shooting incident.

Subject #18 is a paramedic who assisted with the injured and deceased inside and outside of the restaurant. #18 had to leave some injured people in order to treat others who were worse.
Subject #19 is a paramedic who was off-duty and did not go to the scene. #19 has a friend who was an eyewitness to the shooting incident. #19 later interacted with other emergency personnel who assisted with the injured and deceased at the restaurant.

Subject #20 is an EMT who was off-duty and did not go to the scene of the incident. #20 was at a partner’s house for lunch when hearing of the shooting. #20’s partner had two friends killed in the incident. #20 formerly worked at Luby’s and is friends with the manager. #20 also later interacted with other emergency personnel who assisted with the injured and deceased at the scene.

Subject #22 is a paramedic who was in charge of triage at the shooting incident and had to decide who to treat first. #22 had to leave some of the injured in order to treat others who were worse.

Subject #23 is a fire/rescue officer who assisted with the injured and deceased inside and outside of the restaurant.

Subject #24 is a fire/rescue officer who was off-duty and at home when hearing of the incident. #24 arrived on the scene approximately thirty minutes after the shooting incident. #24 treated the injured with minor cuts and picked up equipment at the scene.

Subject #25 is a firefighter who was off-duty and did not go the scene but later interacted with other emergency personnel who assisted with the injured and deceased. #25 had two friends shot in the incident.

Subject #26 is an EMT who was off-duty and watched reports of the incident on TV. #26 did not go to the scene but later interacted with other emergency personnel who assisted with the injured and deceased. #26 had two friends killed as a result of the shooting incident.

Subject #27 is a paramedic who arrived in the third ambulance on the scene and assisted in triage in treating the injured and deciding who to treat first. #27 had to leave some people in order to get to the worst injured.
Subject #28 is a fire captain who helped carry people out of the restaurant and also placed napkins on the faces of the deceased.

Subject #29 is a fire/rescue officer who assisted with the injured and deceased inside and outside of the restaurant.

Subject #30 is a fire/rescue officer and arrived at the scene very early. #30 went around checking pulses to find live bodies and assisted with the injured. #30 also had to leave some people in order to get to the worst injured.

Subject #31 is a fire/rescue officer who assisted with the injured and deceased inside and outside of the restaurant. #31’s sixth grade school teacher was physically injured in the incident and #31 saw her at the scene. #31’s partner had a neighbor who was killed in the shooting.

Subject #32 is the Deputy Chief for the fire dept. who went to the scene to oversee the other EMT’s. #32 assisted with the injured and deceased inside and outside of the restaurant.

Subject #33 is an EMT who was on his way back to the station when hearing the call. #33 arrived on the scene while shots were still being fired. #33 did not enter the restaurant and treated the injured outside. #33 helped transport the injured to the hospital and restocked equipment. #33 also assisted with the injured at the Sheraton next door to Luby’s.

Subject #34 is an EMT who arrived at the scene and saw four or five dead bodies before finding a live one. #34 assisted with the injured at the scene of the incident and helped in transporting the injured. #34 also assisted at the Sheraton, next door to Luby’s, in setting up debriefing rooms. #34 knew a lady that was killed as a result of the shooting incident.

Subject #35 is a fire/rescue officer who was off-duty at the time of the incident but responded to the call. #35 assisted with the injured and deceased inside and outside of the restaurant.
Subject #36 is a fire/rescue officer who was off-duty at the time of the incident but responded to the call. #36 assisted with the injured and deceased inside and outside of the restaurant.

Subject #37 is a firefighter who arrived late at the scene of the incident. #37 was posted at the front door of the restaurant to fend off the media and remained there approximately four to five hours and never entered the restaurant. #37 knew four of the victims, with one being a distant family member on their spouse’s side of the family.

Subject #38 is an emergency medical aide who was at lunch when hearing the call. #38 went to the scene and assisted with the injured and deceased inside and outside of the restaurant. #38 had several acquaintances that were eyewitnesses to the shooting.

Subject #39 is an EMT who assisted with the injured and deceased inside and outside of the restaurant. #39 had several friends who were physically injured as a result of the shooting incident.

Subject #40 is a firefighter who assisted with the injured on the second triage team. #40 had to go through and check all bodies before beginning treatment. #40 had a family acquaintance that was physically injured as a result of the shooting incident.

Subject #41 is a paramedic who assisted with the injured and deceased inside and outside of the restaurant.

Subject #42 is an EMT who was off-duty when hearing about the incident on the scanner. #42 went to the scene and assisted with a group of injured and then transported them to the hospital. When #42 returned to the scene, the restaurant had been sealed off. #42 knew two people who were killed as a result of the shooting incident and also knew one person who was an eyewitness to the incident.
Subject #43 is an employee of Luby's and an eyewitness to the shooting. #43 heard the glass breaking and then gunshots. #43 climbed under a table while the shooting was going on and then there was silence. #43 did not see the gunman shoot anyone. Beside #43 a man broke through the glass, and #43 saw the gunman headed that way, no more than ten feet away, and he was reloading his gun. #43 then ran through the glass with the gunman firing that way and missing. #43 cut his/her hand when running through the glass. #43 ran across the street and climbed into an open car and locked the doors. #43 later learned that he/she were the last employee to leave the scene safely. #43 knew two women customers who were killed as a result of the shooting incident.

Subject #45 was an eyewitness to the shooting incident. #45 had a friend/coworker pulled from him/her and shot and killed by the gunman. #45 was treated for shock after the incident.

Subject #46 is a United Way official who heard about the incident from spouse and responded by assisting at the Sheraton, next door to Luby's. #46 had friends that were physically injured as a result of the shooting incident. The United Way assisted in the recovery and relief operation.

Subject #47 was an eyewitness to the shooting incident. #47 heard the glass breaking and then saw the gunman begin shooting. #47 ducked and started crawling to the back of the restaurant. #47 received medical treatment for injuries as a result of the shooting incident.

Subject #48 was an eyewitness to the shooting incident. #48 had several coworkers who were killed as a result of the incident.

Subject #49 was an eyewitness to the shooting incident. #49's friend/supervisor was shot and killed as a result of the incident.

Subject #51 is a reporter who responded to the shooting incident after hearing of it on the police scanner. #51 was thirty minutes out of town when hearing the news.
Subject #52 was a photographer who responded to shooting incident after hearing of it on the police scanner. #52 was thirty minutes out of town when hearing the news.

Subject #53 was the first reporter on the scene and arrived before the gunman was dead.

Subject #54 is a photographer/reporter who responded to the incident. #54 was at lunch with spouse at the time of the shooting but had almost went to Luby's for lunch. #54 had a coworker who was injured as a result of sitting at the table the truck landed on when the gunman drove into the restaurant. #54 saw his/her injured coworker, who was bleeding, at the scene.

Subject #55 was an eyewitness to the shooting incident and saw the man in front of him/her being shot. #55 received medical treatment due to a physical injury as a result of the incident. #55 also had friends that sustained physical injuries as a result of the incident.

Subject #56 was a survivor of the shooting incident who was sitting at the back of the restaurant and did not see the shootings occur.

Subject #57 was an eyewitness to the shooting incident. #57 heard the truck and then heard gunshots and saw the gunman headed his/her way. #57 escaped the restaurant and continued to hear gunshots. #57 received medical treatment as a result of a physical injury and also suffered damage and/or loss of property as a result of the incident. #57 also had friends who received physical injuries as a result of the incident.

Subject #58 was an eyewitness to the shooting incident and saw the gunman standing over people and shooting them. #58 received medical treatment for a physical injury as a result of the incident. #58 also had friends that suffered physical injuries due to the incident.
Subject #59 is a Luby’s employee who was working at the time of the incident. #59 heard the shooting begin, at which time he/she climbed into a refrigerator and remained there for two and a half hours. #59 could hear the shooting while in the refrigerator. #59 received medical treatment for being in the refrigerator.

Subject #60 was an eyewitness to the incident and saw the truck go through the window. #60 had a friend that was killed as a result of the shooting incident. #60 received medical treatment for rug burn and shock after the incident. #60 also suffered loss of personal property (clothes) as a result of the incident.

Subject #61 was an eyewitness to the shooting incident. #61 had friends that suffered physical injuries as a result of the shooting incident.

Subject #64 was a survivor of the incident. When #64 heard and realized it was gunshots, he/she ran out the back door of the restaurant.

Subject #65 is a Luby’s employee who was not at work at the time of the incident. #65’s brother, friends, and coworkers were there during the time of the shooting incident.

Subject #67 was an eyewitness to the incident. #67 saw the truck go through the window and then saw a female being shot in the head, at which time he/she dove to the ground. #67 experienced a physical injury as a result of the incident.

Subject #68 was an eyewitness to the shooting incident. #68 had friends that were physically injured as a result of the incident.

Subject #69 was an eyewitness to the incident and was sitting at the back corner of the restaurant. #69 received medical treatment as a result of physical injuries sustained during the incident. #69 also had friends who were physically injured as a result of the incident.
Subject #70 was an eyewitness to the shooting incident. #70 had friends who were physically injured as a result of the incident.

Subject #71 was an eyewitness to the shooting incident. #71 was located at the back corner of the restaurant and heard the truck go through the window. #71 then heard gunshots and got under the table. #71 did not see anyone getting shot but did see the gunman's hand. #71 hit the window with a chair but it did not break. Another person ran through the glass and #71 followed. #71 had friends who were physically injured as a result of the incident.

Subject #72 is a community member whose spouse usually goes there for lunch but who did not go there that day.

Subject #73 was an eyewitness to the shooting incident. #73 saw the truck go through the window and heard gunshots coming closer. #73 laid on the floor covering his/her spouse. #73 ran out of a broken window with spouse. Once outside #73 saw an employee bleeding from the neck. #73's spouse and friends were physically injured as a result of the incident.

Subject #74 was an eyewitness to the shooting incident. #74 saw the truck go through the window and the truck stopped only three tables away. #74 then heard gunshots and his/her spouse covered them on the floor. #74 could see the gunman shooting. #74 then ran out of a broken window with spouse. #74 received medical treatment for physical injuries sustained in the incident. #74 also had friends that were physically injured in the incident.

Subject #75 is a Luby's employee who was not working at the time of the incident but heard about it while at school. #75 had friends that were physically injured as a result of the shooting incident.

Subject #76 was an eyewitness to the incident and was sitting in the back corner of the restaurant. #76 saw the truck and then heard the gunshots coming closer to him/her. #76 had friends that were physically injured as a result of the incident.
Subject #77 is a Luby's employee and an eyewitness to the shooting incident. #77 was at the cashier's booth and saw the truck come through the window and saw the gunman start shooting. #77 hid in a closet and when coming out was shot at and missed by the gunman.

Subject #78 is a Luby's employee who was at school at the time of the incident but knew people who were involved in the incident.

Subject #79 was an eyewitness to the shooting incident. #79 was in the serving line and saw the truck go through the window and then heard gunshots. #79's spouse threw him/her on the floor and covered him/her up. #79 could not see what was going on but heard gunshots getting closer and then a female was shot next to them in line. #79 heard the gunman say it was worth it and began shooting the same people again. #79 then followed spouse out of the restaurant and was separated from him/her for a little while once outside. #79 was medically treated for physical injuries sustained in the incident.

Subject #80 was an eyewitness to the shooting incident. #80 was in the serving line and saw the truck go through the window and then saw the gunman. #80 laid on the floor and covered spouse. #80 saw the gunman approaching them when the gunman shot the female next to them. #80 ran out of the restaurant with spouse following. #80's spouse was medically treated for physical injuries sustained in the incident.

Subject #81 was an eyewitness to the incident. #81 was in the parking lot and saw the truck go through the window. #81 ran to see if it was an accident when their spouse yelled to get down because of the gunfire, although #81 did not hear the shots. #81 then left the immediate area.

Subject #82 was an eyewitness to the shooting incident. #82 was in the parking lot and saw the truck go through the window. #82 heard the shooting and yelled for their spouse to get down. #82 then left the immediate area. #82 had friends who were physically injured as a result of the incident.
Subject #90 is a community member who was at their spouse’s workplace when hearing of the incident. #90 did not know where spouse had gone to lunch. #90’s spouse’s secretary called to say she had just escaped Luby’s and would be late in getting back to work. #90’s spouse had not been at Luby’s and returned to work shortly afterwards.

Subject #91 is a news director that responded to the incident after hearing of it on the radio. #91 had one close friend and nine acquaintances that were physically injured as a result of the shooting incident.

Subject #92 is a United Way volunteer who heard of the incident on T.V. while shopping in an appliance store. #92 assisted in the recovery and relief operation provided by United Way.

Subject #93 is a community member of Killeen who heard of the incident on the radio. #93 had one close friend, one neighbor, and one acquaintance that were physically injured as a result of the shooting incident.
REFERENCES


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