Exploring the Myths of Coping with a National Trauma: A Longitudinal Study of Responses to the September 11th Terrorist Attacks

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SUMMARY. A longitudinal investigation of psychological responses to the September 11, 2001 terrorist attacks was conducted on a U.S. national probability sample. Using an anonymous Web-based survey methodology, data were collected among over 1,900 adults at 2 weeks and 12 months post-9/11 to consider whether direct and proximal exposure were

necessary preconditions for high levels of acute and posttraumatic stress symptoms, and whether greater exposure/proximity led to greater traumatic stress symptoms. Results suggest that the requirement of direct and proximal exposure to the attacks and the expectation of a dose-response relationship between exposure and traumatic stress response are myths. *[Article copies available for a fee from The Haworth Document Delivery Service: 1-800-HAWORTH. E-mail address: <docdelivery@haworthpress.com> Website: <http://www.HaworthPress.com>* © *2004 by The Haworth Press, Inc. All rights reserved.]*

On September 11th, 2001, the worst terrorist attack against the U.S. in modern history was perpetrated on its soil. Americans have had limited opportunities to study the psychological effects of domestic terrorism, but a useful starting point for understanding these phenomena is an examination of the literature on the psychological impact of traumatic life events in general. Many traumas are random, unpredictable and uncontrollable (Silver & Wortman, 1980). When such events are community disasters, the experience is shared by many. But in several ways, terrorism is unique. To the aforementioned characteristics one must add a faceless enemy with political undertones whose specific goal is to create ongoing anxiety in the populace.

A great deal has been written about how individuals will respond to traumatic life events and disasters (Norris, Byrne, & Diaz, 2001). In fact, theory and clinical lore paint a rather clear and consistent picture of responses to trauma–one that shapes societal expectations about responses to tragedy. However, many of these assumptions appear to be myths; these expectations concerning responses to trauma have not fared well when scrutinized against data addressing their validity (see Silver & Wortman, 1980; Wortman & Silver, 1989, 2001). One myth is that psychological responses to traumatic events are predictable; that is, that there are universal reactions to traumatic events. A second myth is that psychological response to traumatic events will follow a pattern, or orderly sequence of stages. A third myth is that psychological response to trauma requires direct, proximal exposure to the stressor, and that traumatic stress response is proportional to the degree of exposure, amount of loss, or proximity to the trauma (i.e., as "objective" loss increases, so will its impact). This third and final set of expectations is addressed directly in this article.

There are many possible psychological and behavioral consequences of traumatic events, including generalized distress, intrusive ruminations, physical symptoms, increased health care utilization, disruptions in functioning, decreased subjective well-being, meaning-making, construal of personal benefits, and positive community effects. One of the most widely researched domains is the extent to which trauma results in a psychopathological stress response, such as Acute Stress Disorder (ASD) or Posttraumatic Stress Disorder (PTSD). Such outcomes have been the focus of many research agendas and interventions, and have been the dominant concern following direct exposure to a trauma (Yehuda, 2002).

According to the *Diagnostic and Statistical Manual of Mental Disorders* (DSM-IV; American Psychiatric Association [APA], 1994), neither ASD nor PTSD can be diagnosed without establishing sufficient (i.e., direct and/or proximal) exposure to a qualifying event. We sought to examine the limits of this expectation in our ongoing investigation of emotional, cognitive, and social responses to the terrorist attacks of September 11, 2001. We suspected that indirect and/or "low dose" exposure to this event could be very traumatic, and that we might see its psychological impact far beyond the directly affected communities. We sought to examine acute and posttraumatic stress responses among individuals who could not meet the clinical precondition of exposure, but might nonetheless share its symptomatology. Relatively few studies have examined the national and indirect impact of disasters before September 11th (e.g., the Oklahoma City attack: Pfefferbaum et al., 2000; the Kennedy assassination: Smith, Rasinski, & Toce, 2001; the Space Shuttle Challenger explosion: Terr et al., 1999).

While several other research teams conducted early national studies of the impact of the September 11th terrorist attacks (see Schlenger et al., 2002; Schuster et al., 2001; Smith et al., 2001), our prospective longitudinal study is one of the first attempts to recruit a national probability sample of individuals shortly after a major traumatic event and systematically follow them over time, and the only one to continue to do so since 9/11. Using an anonymous Web-based survey methodology, we have collected stress and coping data from a sample approximately 9-14 days after the attacks and at several intervals since then. Mental health and health care utilization data collected prior to 9/11 are available on most of these individuals. Thus, our study addresses many methodological limitations of prior research on community disasters (see Norris et al., 2001; North & Pfefferbaum, 2002). Its overall aims have been to: (a) investigate the psychological and social processes that help explain individual differences in response to a national traumatic event; (b) identify early predictors of long-term adjustment to both the attacks and subsequent events that may occur; and (c) investigate prospectively the psy-

chological and social processes that help explain variability in responses to highly stressful life events more generally.

OVERVIEW OF METHODS

In collaboration with Knowledge Networks (KN), a survey research organization that maintains a nationally representative, Web-enabled research panel of potential respondents, we have administered Web-based surveys at several points in time since 9/11 to a national sample of U.S. residents (see Silver, Holman, McIntosh, Poulin & Gil-Rivas, 2002; Silver, Holman, McIntosh, Gil-Rivas & Poulin, in press, for a fuller description of the methods, sampling strategy, participation rates, etc.). The KN panel is developed using traditional probability methods for creating national survey samples and is recruited using stratified random-digit-dial (RDD) telephone sampling. RDD provides a known non-zero probability of selection for every U.S. household having a telephone, and the distribution of the KN panel closely tracks the distribution of census counts for the U.S. population on age, race, Hispanic ethnicity, geographical region, employment status, income, and education. KN provides households in the panel with free Web access and an Internet appliance, which uses a telephone line to connect to the Internet and uses the television as a monitor. In return, panel members participate in brief Internet surveys three to four times a month. The panel does not respond significantly differently over time to surveys than more "naïve" survey respondents (Dennis, 2001, 2003). Surveys are confidential, self-administered and accessible any time of day for a designated period, and participants can complete a survey only once.

Pre-9/11 mental health was assessed on our sample with a health survey completed by most KN panel members between September, 2000 and September, 2001. Sixty percent of our sample completed these measures before December 31, 2000. Respondents reported whether they had ever suffered from an Anxiety Disorder (Obsessive Compulsive Disorder, Generalized Anxiety Disorder) or Depression, and whether they received such a diagnosis from a medical doctor.

DATA COLLECTION IN THE YEAR FOLLOWING 9/11/01

Knowledge Networks administered an initial survey between September 20 and October 4, 2001 to identify acute stress symptoms experienced in the immediate aftermath of 9/11. The survey included a modified version of the Stanford Acute Stress Reaction Questionnaire (SASRQ; Cardena, Koopman,

Classen, Waelde, & Spiegel, 2000), a measure often used to assess ASD (APA, 1994). Items on the SASRQ were modified to read at a 6.5 grade Kincaid reading level, and respondents reported whether they "experienced" or "did not experience" acute stress symptoms *specific* to the 9/11 attacks. A random sample of 3,496 adult KN panel members was invited to participate in the survey, and 2729 completed it (a 78% participation rate). Over 75% of respondents who completed this survey did so within the first few days (9-14 days post-attacks); the remainder completed it the following week.

At approximately one year post-9/11 (between September 20 and October 24, 2002), another survey was fielded to the Wave 1 sample. Because the SASRQ is specifically tailored to assess ASD symptoms within a month following event exposure, the PTSD Checklist (PCL; Weathers, Litz, Herman, Huska, & Keane, 1993) was used to assess posttraumatic stress symptoms one year after the attacks. The PCL is a well-validated 17-item self-report measure of intrusion, avoidance, and arousal symptoms with excellent reliability. Respondents indicated how distressed or bothered they were by symptoms related to the 9/11 attacks over the prior 7 days using a scale ranging from 1 (not at all) to 5 (extremely).

We were successful in obtaining a representative sample of the US population at both waves of data collection with respect to key demographic characteristics. Most differences were within sampling error, although middle-income households tend to be overrepresented in our sample (see Silver et al., 2002; in press). Overall, 75% ($N = 2,033$) of all eligible adults completed the one-year anniversary data collection (see Silver et al., in press). Individuals who completed the anniversary survey were not significantly different from the non-respondents on pre-9/11 mental and physical health indices, gender, marital status, race/ethnicity, education, or their immediate reactions to the 9/11 attacks. Attrition analyses indicated that people who dropped out of the study were significantly younger ($M = 41$ yrs) than those who completed it ($M = 49$; $t (2,727) = 11.27$, $p < .001$).

OVERVIEW OF ANALYTIC STRATEGY

The following statistical analyses were conducted with STATA version 7.0, a program designed to handle weighted analyses of complex longitudinal survey data and provide the necessary adjustments of standard errors for these analyses. Data were weighted to adjust for differences in the probabilities of selection and non-response both within and between households. In addition, the post-stratification weights are calculated by deriving weighted sample distributions along various combinations of age, gender, race/ethnicity, region,

metropolitan status, and education. Similar distributions are calculated using the most recent U.S. Census Bureau's CPS data and the KN panel data. Cell-by-cell adjustments over the various univariate and bivariate distributions are calculated to make the weighted sample cells match those of the U.S. Census and the KN panel. This process is repeated iteratively until there is convergence between the weighted sample and benchmark distributions.

Analyses were designed to address the relation between exposure to the 9/11 attacks and patterns of acute stress (at two weeks post-attacks) and posttraumatic stress (at 12 months post-attacks), adjusting for relevant demographics and whether or not respondents had pre-September 11th physician-diagnosed mental health problems (none, anxiety or depression, or both). Exposure to the attacks was assessed both as geographic distance from the World Trade Center (WTC) and as the means by which individuals experienced the attacks. Only respondents who completed both the Wave 1 and one-year anniversary surveys and who had non-missing data on all variables were included in these analyses to minimize missing data, yielding a final sample of 1906.

The weighted percentages of individuals reporting acute and posttraumatic stress symptoms were examined using descriptive analyses of SASRQ and PCL symptoms. Individuals experiencing high levels of acute stress were identified using DSM-IV criteria B (three or more dissociative symptoms), C (one or more reexperiencing/intrusive symptoms), D (one or more avoidance symptoms), and E (one or more arousal/anxiety symptoms) for ASD (APA, 1994). Because we did not assess all DSM-IV criteria (e.g., feelings of fear, horror or helplessness; duration of symptoms), respondents were not assumed to have ASD. In addition to this dichotomous (high versus not-high acute stress) variable, we calculated the total number of acute stress symptoms reported by each individual.

We also calculated a dichotomous index of high vs. not-high posttraumatic stress from the PCL data. Symptoms were considered positive if respondents reported having been at least moderately distressed by them in the prior week (2 on a 0-4 point scale) (Mollica et al., 2001). Individuals experiencing high posttraumatic stress were identified using DSM-IV criteria B (one or more reexperiencing symptoms), C (three or more avoidance symptoms), and D (two or more arousal symptoms) for PTSD (APA, 1994). Because we did not assess all DSM-IV criteria (e.g., degree of functional impairment, duration of symptoms), and because respondents did not meet the basic requirement for direct exposure, they were not assumed to have PTSD. The total number of posttraumatic stress symptoms was also calculated by counting the number of symptoms that respondents reported were at least "moderately" distressing.

STATA's "svylogit" procedure for population-averaged logistic regression was used to estimate odds ratios (OR's) for predictors of dichotomized (high versus not-high) levels of acute and posttraumatic stress following the attacks. STATA's "svypois" procedure for population-averaged Poisson regression was used to estimate incidence rate ratios (IRR's) for predictors of the total number of acute and posttraumatic stress symptoms across all symptom categories (e.g., avoidance and arousal).

The analyses addressing the relation between exposure and stress symptoms all examined predictors from three blocks of variables entered sequentially into the regressions: (a) demographics, (b) pre-September 11th mental health history, and (c) September 11th related exposure and distance from the WTC. Significant predictors from each of these blocks were retained while non-significant variables were removed from analyses to provide the most parsimonious model.

EXPOSURE TO THE ATTACKS AND ACUTE AND POSTTRAUMATIC STRESS SYMPTOMS

Based on responses to several individual questions in the surveys people completed in the 12 months following the September 11th attacks, individuals were categorized as belonging to one of three categories of exposure: *direct exposure*, including being in the WTC or Pentagon, seeing or hearing the attacks in person, or being close to someone in the targeted buildings during the attacks (i.e., meeting criterion A1 for ASD and PTSD) ($n = 57$); *live media exposure*, or watching the attacks unfold live on television ($n = 1225$); and *no live exposure*, or only seeing or learning of the attacks after they had occurred ($n = 624$). Using their residential zip codes, individuals were also categorized by azimuth distance from the WTC, with the assumption that such distance could represent a test of the dose-response relationship (similar to an earthquake, with lessening impact as distance from the "epicenter" increased). (For specific categories employed and number of individuals in each category, see Table 1.) Exposure and distance were both dummy coded, with the reference group for exposure being direct exposure and the reference group for distance being less than 25 miles from the WTC.

ACUTE STRESS SYMPTOMS

High Acute Stress. Individuals who met DSM-IV criteria B, C, D and E for ASD were classified as having "high" levels of acute stress. These individuals

TABLE 1. 9/11-Related Acute Stress (Wave 1; 2 Weeks Post 9/11) and 9/11-Related Posttraumatic Stress (at One Year Anniversary) by Degree of 9/11 Exposure and Proximity (N = 1906)

	Weighted % with High Levels of Acute Stress	Mean No. of Acute Stress Symptoms (Weighted)	Weighted % with High Levels of Posttraumatic Stress	Mean No. of Posttraumatic Stress Symptoms (Weighted)
Degree of 9/11 Exposure				
Directly exposed n = 57	9.3%	6.31	11.2%	3.27
Watched attacks on live television n = 1225	12.8%	5.32	4.7%	1.61*
No live exposure n = 624	10.4%	4.45*	3.4%	1.08**
Distance from WTC				
< 25 miles n = 71	21.0%	6.46	3.8%	2.24
25-100 miles n = 124	12.7%	5.14	5.0%	1.32
100-500 miles n = 428	11.7%*	4.99	4.8%	1.32
500-1000 miles n = 524	9.9%**	4.99*	5.0%	1.61
1000+ miles n = 759	12.6%*	5.03*	3.8%	1.44

*p < 0.05; ** p < 0.01

Note: The reference group for the exposure variables was direct exposure; the reference group for the distance variables was within 25 miles of the World Trade Center (WTC).
The Wave 1 data represent the proportion of participants reporting high levels of 9/11-related acute stress (i.e., DSM-IV Criteria B, C, D, and E for Acute Stress Disorder–3 or more dissociative symptoms, one or more reexperiencing symptoms, one or more avoidance symptom(s), and one or more arousal symptom(s)). The One Year Anniversary data represent the proportion of participants reporting *high levels* of 9/11-related posttraumatic stress (i.e., DSM-IV Criteria B, C, and D for PTSD–one or more reexperiencing symptom(s), three or more avoidance symptoms, and two or more arousal symptoms). All analyses adjust for relevant demographics and pre-September 11th physician diagnosed mental health status.

were present at all levels of exposure and across the nation, with 10.4% of those with no live exposure and 12.6% of those who lived over 1,000 miles from the WTC reporting high levels of acute stress at Wave 1. Distance from the WTC was significantly associated with high acute stress, with those between 100 and 500 (OR = 0.41, 95% CI 0.20-0.87), 500 and 1,000 (OR = 0.31, 95% CI 0.15-0.65), and over 1,000 (OR = 0.42, 95% CI 0.20-0.87) miles away less likely to report high acute stress than those within 25 miles of the WTC. Variables associated with high acute stress beyond exposure or distance included mental health status before September 11th (OR = 1.72, 95% CI 1.32-2.24), female gender (OR = 1.56, 95% CI 1.12-2.19), and age (OR = 0.98, 95% CI 0.97-0.99). Degree of exposure was not associated with high acute stress.

Number of Acute Stress Symptoms. Degree of exposure was associated with the number of acute stress symptoms respondents reported, with individuals who had no direct exposure (IRR = 0.76, 95% CI 0.59-0.98) reporting fewer symptoms than those who had direct exposure. Distances of 500 to 1,000 miles (IRR = 0.77, 95% CI 0.61-0.98), or more than 1,000 miles (IRR = 0.79, 95% CI 0.63-0.99) from the WTC, predicted fewer symptoms than being within 25 miles. Significant non-exposure predictors again included history of pre-September 11th mental health disorders (IRR = 1.31, 95% CI 1.21-1.42), female gender (IRR = 1.38, 95% CI 1.25-1.52), and younger age (IRR = 0.99, 95% CI 0.99-0.99).

Posttraumatic Stress Symptoms

High Posttraumatic Stress. Individuals who met DSM-IV criteria B, C, and D for PTSD were classified as having "high" levels of posttraumatic stress. High acute stress was strongly predictive of high posttraumatic stress (OR = 2.44, 95% CI 1.32-4.49). At one year post-attacks, high posttraumatic stress was reported primarily among those directly exposed to the attacks, with 11.2% of these individuals reporting such levels. Nonetheless, controlling for demographic factors, pre-September 11th mental health history, and high levels of Wave 1 acute stress, high posttraumatic stress was not significantly more likely among the directly exposed subsample than among the other two subsamples (see Table 1).[1] Similar findings were obtained for distance from the WTC, with high posttraumatic stress not differing significantly across distance categories. Variables predicting high posttraumatic stress beyond the effects of high acute stress included bachelor's degree or greater education (OR = 0.33, 95% CI 0.15-0.71), income (OR = 0.89, 95% CI 0.82-0.97), and prior mental health diagnoses (OR = 1.82, 95% CI 1.19-2.80).

Number of Posttraumatic Stress Symptoms. The number of acute stress symptoms reported was a significant predictor of posttraumatic stress symptoms reported at the one-year anniversary (IRR = 1.10, 95% CI 1.09-1.13). Degree of exposure to the attacks was also related to the number of posttraumatic stress symptoms reported at the one-year anniversary, beyond the influence of number of Wave 1 acute stress symptoms. Individuals who had no direct exposure (IRR = 0.57, 95% CI 0.38-0.90) or only observed the attacks on live television (IRR = 0.65, 95% CI 0.44-0.95) reported fewer posttraumatic stress symptoms than those individuals who were directly exposed to the attacks. Beyond exposure and acute stress symptoms, African American ethnicity (IRR = 1.77, 95% CI 1.23-2.56) and pre-September 11th mental health diagnoses (IRR = 1.27, 95% CI 1.07-1.50) predicted a greater number of posttraumatic stress symptoms. A bachelor's degree or more education predicted fewer symptoms (IRR = 0.57, 95% CI 0.44-0.74). Distance from the WTC was not a significant predictor of the number of posttraumatic stress symptoms reported at the one-year anniversary.

CONCLUSIONS AND IMPLICATIONS

The unparalleled impact of the September 11th terrorist attacks, combined with the representative nature of our national sample, the pre-September 11th assessment of mental health histories, and the early collection of emotional responses to these events, has provided us with a remarkable opportunity to examine longitudinally how individuals across the U.S. have coped with a major traumatic event. We have found significant psychological reactions across the U.S. after the September 11th attacks; our findings strongly suggest that the effects of these terror attacks were not limited to communities directly affected. Instead, our data show that substantial effects of the events of September 11th rippled throughout the country. Posttraumatic stress symptoms clearly declined over the first year post-9/11. Nonetheless, many individuals who were not directly exposed to the attacks reported symptoms both acutely and over the year afterwards at levels that were comparable to those individuals who experienced the attacks proximally and directly. We acknowledge that by not including clinically significant impairment or dysfunction in our criteria (Criterion F for both ASD and PTSD), we are unlikely to have measured psychopathological symptomatology and may not have identified individuals who warrant psychological intervention. Nonetheless, our data suggest quite clearly that indirect and/or low dose exposure to a community disaster can be very traumatic, and heretofore such levels of exposure have tended to be excluded from discussions of the traumatic impact of such events (cf. Norris, Phifer, & Kaniasty, 1994).

Importantly, the degree of psychological response to the September 11th attacks was not explained simply by degree of exposure or proximity to the trauma. Many individuals who lived hundreds of miles from the attacks or had low levels of exposure (i.e., individuals who watched the attacks live on TV and those who reported no direct exposure at all) reported high levels of symptomatology. In addition, there was great variability in acute and posttraumatic response among individuals who observed the attacks directly or lived within the directly affected community.

These findings suggest that relying on unfounded assumptions about who will be affected by a traumatic event is not useful. It is important that health care providers be sensitive to and aware of the enormous variability in response, both immediately and over time, following a major national trauma. It is also important that these professionals avoid pathologizing "normal" responses to an abnormal event (Silver et al., 2002). Most importantly, health care providers and others must recognize that the impact of terrorist events is likely to go far beyond those directly exposed, and one should not expect a simple dose-response relationship between exposure and psychological impact (see also Kroll, 2003). Instead, one must examine other risk factors that may help explain posttraumatic responses to national disasters, such as preexisting mental conditions, coping strategies employed (Silver et al., 2002), prior traumatic life experiences (Silver et al., in press), or individual difference variables (Bowman, 1997), among others.

Together, the findings from this research challenge some basic assumptions about coping with highly stressful events. Broadly, it is clear that psychological outcomes are multiply determined, and that there are social and psychological factors beyond mere exposure to the event that predict outcomes. Our work also suggests the importance of documenting responses over time (North & Pfefferbaum, 2002). Ultimately, it is our hope that information collected in this effort can illuminate the coping process more generally so as to advance future conceptual work in this area. The absence of an expectation that a traumatic stress response can occur among individuals who were thousands of miles from a traumatic event has hampered investigations of which indirectly exposed individuals might be most affected by national traumas and why.

Ultimately, we hope our national longitudinal research effort can further the understanding of the normal course of responses to terrorism. We also hope that our research can assist public health officials in the identification of individuals in the community who may be at particular risk for the psychological aftereffects of terrorism or other national disasters. Our data can guide educational and intervention efforts with evidence-based information so that they

are better informed, more cost-effective and more sensitive to the needs of the country's residents.

NOTE

1. All analyses were conducted two ways: with exposure and distance entered together, and with these sets of variables entered separately. Statistics reported are with both sets of variables entered together, but no findings were altered substantially when exposure and distance were examined separately.

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