

What Predicts Psychological Resilience After Disaster? The Role of Demographics, Resources, and Life Stress

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A growing body of evidence suggests that most adults exposed to potentially traumatic events are resilient. However, research on the factors that may promote or deter adult resilience has been limited. This study examined patterns of association between resilience and various sociocontextual factors. The authors used data from a random-digit-dial phone survey ($N = 2,752$) conducted in the New York City area after the September 11, 2001, terrorist attack. Resilience was defined as having 1 or 0 posttraumatic stress disorder symptoms and as being associated with low levels of depression and substance use. Multivariate analyses indicated that the prevalence of resilience was uniquely predicted by participant gender, age, race/ethnicity, education, level of trauma exposure, income change, social support, frequency of chronic disease, and recent and past life stressors. Implications for future research and intervention are discussed.

Keywords: resilience, trauma, resources, social support, ethnicity

Try as we might, we cannot prevent bad things from happening. During the course of a normal life span, almost everyone is confronted with the painful reality that loved ones die. Most adults are also exposed to at least one potentially traumatic event (PTE; e.g., physical or sexual assault or a life-threatening accident; Kessler, Sonnega, Bromet, Hughes, & Nelson, 1995). Fortunately, despite the frequency with which these events occur, only a relatively small subset of people typically experience severe enough loss or trauma reactions to meet the criteria for posttraumatic stress disorder (PTSD; American Psychiatric Association, 2000). Although exposure to PTEs often results in transient trauma symptoms (e.g., difficulty sleeping or intrusive memories of the event), most people appear to fully recover from any adverse effects of such symptoms within a relatively short period of time (Shalev, 2002), and many people appear to successfully navigate PTEs with little or no disruption in their normal ability to function (Bonanno, 2004).

Adult Resilience in the Face of Potential Trauma

Extending the pioneering work of developmental psychologists on resilience in children (e.g., Garmezy, 1971; Rutter, 1979), Bonanno (2004) defined adult *resilience* as

the ability of adults in otherwise normal circumstances who are exposed to an isolated and potentially highly disruptive event such as the death of a close relation or a violent or life-threatening situation to maintain relatively stable, healthy levels of psychological and physical functioning . . . as well as the capacity for generative experiences and positive emotions. (pp. 20–21)

This definition contrasts resilience with a more traditional *recovery* pathway characterized by readily observable elevations in psychological symptoms that endure for at least several months before gradually returning to baseline, pretrauma levels. A key point is that although resilient individuals may experience some short-term dysregulation and variability in their emotional and physical well-being, their reactions to a marker PTE tend to be relatively brief and usually do not impede their ability to function to a significant degree. Thus, resilient individuals among an exposed population report little or no psychological symptoms and evidence the ability to continue fulfilling personal and social responsibilities and to embrace new tasks and experiences.

Initial evidence for widespread adult resilience in the face of an isolated but potentially devastating stressor event came from studies of bereavement (Bonanno, Wortman, et al., 2002; Bonanno, Moskowitz, Papa, & Folkman, 2005) and, more recently, direct exposure to the September 11, 2001, terrorist attack on the World Trade Center in New York City (Bonanno, Rennicke, & Dekel, 2005). Bonanno, Galea, Bucciarelli, and Vlahov (2006) examined

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the prevalence of resilient outcomes in New York City and the contiguous geographic area during the first 6 months following the attack using data from a large probability sample ($N = 2,752$). The sample closely matched the most recent New York census data (Galea, Ahern, et al., 2002; Galea, Resnick, et al., 2002; Galea et al., 2003), and the measurement of PTSD symptoms was highly reliable at 1, 4, and 6 months post-September 11 (Resnick, Galea, Kilpatrick, & Vlahov, 2004). The large-scale nature of the study meant, however, that the type of multifaceted definition of resilience specified by Bonanno (2004) would not be possible. For this reason, these researchers adopted the relatively conservative approach used in studies of the absence of depression (e.g., Judd, Akiskal, & Paulus, 1997) and defined a *resilient outcome* as either one or zero PTSD symptoms during the first 6 months after the attack. Despite this conservative definition, the proportion with resilient outcomes was at or above 50% across most exposure groups. Even among the groups with the most pernicious levels of exposure and highest probable PTSD, the proportion that was resilient never dropped below one third of the sample.

Risk and Protective Factors

Although these findings support the idea that adult resilience to trauma is common, the nature of the phenomenon is still relatively poorly understood (Bonanno, 2005). For example, conceptually, it seems clear that there should be multiple protective factors that promote resilience to adversity in both children (Werner, 1995) and adults (Bonanno, 2004). To date, however, most of the research on predictors of adult resilience has focused on person-centered variables, such as the tendency toward hardiness (Barone, 1999) or self-enhancement (e.g., Bonanno, Rennicke, & Dekel, 2005; Bonanno, Field, Kovacevic, & Kaltman, 2002).

The aim of the current study was to address this deficit by examining other factors that may inform resilience to PTEs, including demographics, social and material resources, and additional life stressors (Brewin, Andrews, & Valentine, 2000; Hobfoll, 1989, 2002) using the same large probability sample examined in the Bonanno et al. (2006) study. Because there are so few data on the predictors of a resilient outcome among adults exposed to PTEs, we did not advance hypotheses about the prominence of specific predictor variables. Rather, we considered a range of factors that seemed likely correlates of resilience and then sought to identify the unique predictors through multivariate modeling.

Demographic Variables

Studies of risk factors for PTSD have consistently implicated female gender; minority ethnicity; lack of education; and, to a lesser extent, younger age (for meta-analytic data on these variables, see Brewin et al., 2000). It seems plausible that the inverse of at least some of these factors (i.e., male gender, Caucasian ethnicity, level of education, older age) would predict increased likelihood of resilient outcomes (Bonanno, 2004). However, we also expected to observe unique associations between demographic factors and a resilient outcome.

Resources

Another candidate set of variables that may potentially foster resilience pertains to social and material resources. Numerous

theorists have delineated a crucial role for such resources in the ways adults cope with stress (e.g., Holahan & Moos, 1991; Lazarus & Folkman, 1984; Murrell & Norris, 1983). There is also considerable research linking resources or change in resources with adjustment following PTEs (Freedy, Shaw, Jarrel, & Master, 1992; Ironson et al., 1997; Kaniasty & Norris, 1993). However, the potential salutary role of social and material resources has not yet been examined in research that has explicitly identified resilient outcomes following PTEs.

Our conceptualization of resources in the present study was guided by Hobfoll's (1989, 2002) conservation of resources (COR) theory. Central to this theory is the concept of resource change (i.e., resource loss or gain) and its role in the generation or amelioration of stress. However, because resilience is apparent relatively early, in the first few months after exposure (Bonanno, 2004), the overall presence or absence of resources is also a crucial issue. Accordingly, in the current study we included both measures of the presence of various resources and, when applicable, measures of resource loss. We examined four types of resources based on groupings suggested by COR theory and by the Conservation of Resources Evaluation (COR-E) measure (Hobfoll & Lilly, 1993): *material resources*, such as income and income loss; *energy resources*, such as the availability of health insurance and loss of health insurance; *interpersonal resources*, such as the availability of social support or affinity groups; and *work resources*, such as employment or loss of employment.

Additional Life Stress

A third set of variables we considered were those pertaining to additional life stressors. The role of cumulative adversity on stress is well documented (Turner, Wheaton, & Lloyd, 1995). There is solid empirical evidence linking the risk for PTSD with increased life stress both prior to and following the marker traumatic event (Brewin et al., 2000). There is not yet evidence, however, regarding the possible role of life stress in adult resilience following PTEs. It seems plausible that the relative absence of life stress should be associated with a greater prevalence of resilient outcomes whereas the converse would be associated with a decreased prevalence of resilience.

The Current Study

The current study examined each of the aforementioned categories as predictors of psychological resilience using a large probability sample ($N = 2,752$) of residents from New York City and the contiguous geographic area obtained approximately 6 months after the September 11 terrorist attack. Although the large-scale nature of the study precluded a multimodal assessment of adjustment, we nonetheless attempted to provide further validation of the resilience category. The virtual absence of PTSD symptoms among these participants suggests that they had, in fact, coped well with the disaster. However, it is worth considering the possibility that the potential distress of trauma may have been manifested in other domains of adjustment (Bonanno, Rennicke, & Dekel, 2005; Luthar, Doernberger, & Zigler, 1993). To explore this possibility, we examined another form of psychopathology, depression, as well as participants' self-reports of substance use (alcohol, cigarettes, and marijuana). If participants with one or zero PTSD

symptoms are, in fact, genuinely resilient, then they should evidence markedly less depression and less substance use relative to participants who had experienced mild-moderate trauma or PTSD.

The primary analyses of the study examined associations between levels of the predictor variables (demographics, depression and substance abuse, material resources, and life stress) and outcome. First, we sought support for the idea that resilience is more than the simple absence of PTSD by simultaneously examining predictors of resilience and mild-moderate trauma in relation to PTSD using a polychotomous multivariate logistic regression. Next, we focused more specifically on the unique predictors of the resilient outcome when compared with all other groups using a hierarchical multivariate logistic regression.

Method

Participants

Data for this study came from a random-digit-dial household survey conducted approximately 6 months after September 11, 2001. The sampling frame included all adults in New York City and contiguous geographic areas in New York State, New Jersey, and Lower Fairfield County in Connecticut. Participants were interviewed in English, Spanish, Mandarin, and Cantonese, using translated and back-translated questionnaires and a computer-assisted telephone interview system. The overall cooperation rate was 56%, and the overall response rate (based on the sum of the number of completed and partial interviews divided by the sum of all numbers that were either eligible as residential telephone numbers or of unknown eligibility) was 34%. The demographic breakdown of the final sample ($N = 2,752$) adequately represented the broader New York population, as evidenced by comparison with the most recent census data (see Bonanno et al., 2006). Of particular importance, the sample included a diverse spectrum of potential trauma experience both during (e.g., in the World Trade Center at the time) and in the aftermath of the attack (e.g., loss of possessions; see Bonanno et al., 2006). Sampling weights were developed and applied to our data to correct potential selection bias related to the number of household telephones, persons in the household, and oversampling. Further discussions of the methods and results from the first of these surveys can be found elsewhere (Galea, Ahern, et al., 2002; Galea, Resnick, et al., 2002).

Measures

Sociodemographics, exposure, and life stress. During the phone interview, respondents were asked questions using a structured questionnaire. Questions about sociodemographic characteristics included information about age, gender, race/ethnicity, educational attainment, income, marital status, household size, caretaker status, number and ages of children, and geographic location of residence. Questions about potential trauma exposure on September 11 included proximity to the World Trade Center complex during the attacks, viewing the attack in person, possible physical injury, involvement in rescue efforts, or loss of a friend or relative. The interview also included questions about previous PTE exposure (e.g., natural disaster, serious accident), exposure to recent stressors (e.g., death of a spouse or close family member), and exposure to ongoing traumas and stressors.

Substance use. Following Vlahov et al. (2004), for each of three substances, cigarettes, alcohol, and marijuana, participants were first asked if they had ever used the substance (e.g., "Have you ever smoked cigarettes?"). Participants who endorsed any lifetime substance use were then asked about the number of cigarettes smoked, number of drinks consumed, and number of times marijuana was smoked in the months following September 11, 2001. For the analyses, we examined use of each of these substances as well as use of any substance.

Depression. We used an adapted version of the module for major depressive disorder from the nonpatient version of the Structured Clinical Interview for the *DSM* (Spitzer, Williams, & Gibbon, 1987). This instrument has been used in several other population studies (e.g., Kilpatrick et al., 1998). Cronbach's alpha for the eight symptoms used in this scale was .79 (Boscarino, Galea, Ahern, Resnick, & Vlahov, 2002). We previously compared the results for depression in the past 30 days with those obtained using the Brief Symptom Inventory—18 (BSI-18; Zabora et al., 2001) and showed the BSI-18 depression subscale had a sensitivity of 73% and a specificity of 87% in detecting depression as classified by our depression instrument (Boscarino et al., 2004).

PTSD symptoms. Symptoms of PTSD since September 11 were assessed using National Women's Study (NWS) PTSD module. The NWS PTSD module was validated in a field trial and has a sensitivity of 99% and specificity of 79% when compared against PTSD from the Structured Clinical Interview for *DSM-III-R* (Kilpatrick et al., 1998), and it has evidenced good construct validity in previous research (Kilpatrick, Acierno, Resnick, Saunders, & Best, 1997; Kilpatrick et al., 1998). Both the 6-month cumulative PTSD estimates and the raw PTSD symptom totals were found to be highly reliable with PTSD estimates obtained from similar samples at 1 and 4 months post-September 11 (Resnick, Galea, Kilpatrick, & Vlahov, 2004).

Outcome categories. The operational definitions for resilience, mild/moderate trauma, and probable PTSD were identical to those used in the Bonanno et al. (2006) study. These definitions were based on the observation that even ostensibly healthy individuals sometimes exhibit low levels of psychiatric symptoms. For example, depression researchers have typically set the criterion for the absence of depression as one or zero symptoms (Judd et al., 1997). This same criterion has been used to determine resilience during bereavement (Zisook, Paulus, Shuchter, & Judd, 1997). Although data on the prevalence of PTSD symptoms in the absence of exposure are relatively limited, one previous study reported that in the absence of a current PTE, the normal range for PTSD symptoms (based on the sample mean and standard deviation) was two or fewer symptoms (Bonanno, Moskowitz, Papa, & Folkman, 2005). Extending this literature, Bonanno et al. (2006) set a conservative definition for resilience as one or zero PTSD symptoms at any point in the first 6 months after the September 11 attack. Mild-moderate trauma was defined as two or more PTSD symptoms in the absence of the PTSD diagnosis at any point in the first 6 months. Finally, probable PTSD was defined using the standard *Diagnostic and Statistical Manual of Mental Disorders* criteria applied to the first 6 months after the attack.

Resources. We measured four categories of resources based on items from the COR-E (Hobfoll & Lilly, 1993) modified for application to the events of September 11. Material resources included income and income change. Energy resources included

the availability of a regular physician, retaining or losing health insurance, and quality of personal health (presence-absence of chronic disease). Interpersonal resources included a global social support variable created using three modified questions from the Medical Outcomes Study Social Support Survey (Sherbourne & Stewart, 1991). Responses to these questions were summed and divided into thirds to create a low, medium, or high social support score. An additional interpersonal resource variable pertained to involvement in groups or affiliative organizations, such as church-religious groups, veterans groups, sports or exercise groups, or literary-art discussion groups. Work resources was measured in terms of retaining or losing employment as a result of the September 11 attack.

Results

Statistical Methods

In a preliminary set of analyses designed to further explore the validity of the resilience category, we used two-tailed chi-square tests to detect associations between binary variables representing the presence-absence of depression and several types of substance use and the three outcome categories (resilience, mild-moderate trauma, probable PTSD). Next we examined patterns of association between the predictor variables and different outcome comparisons using a multivariate polychotomous logistic regression. Probable PTSD was the referent category in this analysis. Finally, we conducted a hierarchical multiple logistic regression to determine the unique predictors of resilience when compared with all other outcome groups. Demographic variables were entered on the first step of this analysis, followed by depression and substance abuse, resources, and current and past life stressors on subsequent steps. In these analyses, different levels of a predictor (e.g., racial-ethnic categories, different levels of income) were dummy coded. Odds ratios (ORs) and 95% confidence intervals (CIs) were calculated to describe how well each level of a variable predicted outcome in comparison with the reference level of the variable (e.g., Asians compared with Whites), with all other variables in the model statistically controlled. In each of these analyses, we used SAS-callable SUDAAN 9.0.1 (Research Triangle Institute, 2004) to correct standard errors and statistical tests for weighting.

Resilience, Substance Abuse, and Depression

Binary (yes/no) scores for depression and substance use for the resilient, mild-moderate trauma, and probable PTSD outcome categories are presented in Table 1. The overall pattern of findings conformed to predictions of a healthier profile among resilient individuals. Dramatic and significant group differences were evidenced for depression. A sizable proportion (37.7%) of the participants with probable PTSD exhibited elevated depression. The proportion of participants with depression was also high, although to a lesser extent (21.7%), among the mild-moderate trauma group. However, for resilient individuals, depression was almost nonexistent (1.3%) and well below the national average for depression (e.g., 4.9%; Blazer, Kessler, McGonagle, & Swartz, 1994).

There were no significant group differences in overall substance use or in use of alcohol. However, group differences were signif-

icant for cigarette use and marijuana use—again, with resilient participants evidencing the smallest proportion using these substances. Cigarette smokers were equally prevalent in the probable PTSD group (27.3%) and mild-moderate trauma group (28.8%) but considerably less prevalent in the resilient group (19.9%). Marijuana use was also similarly prevalent in the probable PTSD group (8.5%) and mild-moderate trauma group (7.1%) and, again, was considerably less prevalent in the resilient group (3.8%). Together, these findings support the idea that the resilient group experienced a genuinely healthy course of adjustment.

Polychotomous Multivariate Analysis

A preliminary series of bivariate regressions indicated that all but three variables evidenced significant predictive associations with the resilience category. The three exceptions were involvement in groups or affiliative organizations, whether or not participants had a regular physician, and whether or not they used alcohol. Excluding these three variables, we next examined all remaining variables simultaneously in a multivariate polychotomous logistic regression with probable PTSD as the referent group.

The ORs and 95% CIs for each level of each variable (see Table 2) indicated that although some variables evidenced consistent predictive relations across outcome comparisons, there were also a number of asymmetrical patterns of association. Specifically, the distinction between resilience and probable PTSD and between mild-moderate trauma and probable PTSD were each predicted by age, depression, marijuana use, income level, having been directly affected by September 11, and number of recent stressors. There were some asymmetries, however, within levels of these variables. For example, people were more likely to be resilient than to have PTSD if they earned over \$100,000 but less likely to be resilient if they were 45 to 54 years of age. By contrast, income and age showed more varied prediction in distinguishing mild-moderate trauma from PTSD. More important, four variables distinguished resilience from PTSD (gender, income decline, traumatic events prior to September 11, and traumatic events post-September 11) but did not predict the distinction between mild-moderate trauma and PTSD.

Multivariate Analysis Predicting Resilience

To identify the unique predictors of resilience when compared with all other participants, we examined the same variables used in the preceding analysis in a hierarchical multivariate logistic regression. ORs and 95% CIs for each level of each variable for each model in the analysis are presented in Table 3.

Demographic variables. With demographic variables entered together on the first step of the analysis, significant effects were observed for gender, age, and race/ethnicity. These variables also remained significant when other variables were added to the models. In addition, education, which was not initially significant (Model 1), entered as a significant predictor of resilience when resources (Model 3) and life stressors (Model 4) were added. In the final model, women were less than half as likely (OR = 0.43) to be resilient as men; people 65 years of age or older were more than 3 times more likely (OR = 3.11) to be resilient as were people between 18 and 24 years of age; Asians were close to 3 times as likely (OR = 2.78) to be resilient as Whites; and, somewhat

Table 1

Resilience, Mild–Moderate Trauma, and Probable Posttraumatic Stress Disorder (PTSD) in Relation to Depression and Substance Use 6 Months After the September 11 Disaster

Variable	Total		Resilience 1 or 0 PTSD symptoms		Mild–moderate trauma ≥ 2 PTSD symptoms		Probable PTSD related to WTCD		<i>p</i> ^a
	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%	
Depression									
No	2,400	90.6	1,617	98.7	667	78.3	116	62.3	< .001
Yes	300	9.4	24	1.3	178	21.7	98	37.7	
Substance use									
Any drug									
No	1,149	44.1	730	43.6	333	61.4	86	39.6	<i>ns</i>
Yes	1,603	55.9	942	56.4	530	38.6	131	60.4	
Cigarettes									
No	2,093	75.7	1,328	80.1	610	71.2	155	72.7	< .001
Yes	634	24.3	329	19.9	247	28.8	58	27.3	
Alcohol									
No	1,369	54.3	835	51.0	422	49.5	112	52.8	<i>ns</i>
Yes	1,332	45.8	801	49.0	430	50.5	101	47.2	
Marijuana									
No	2,569	95.0	1,590	96.2	786	91.9	193	91.5	< .001
Yes	150	5.0	63	3.8	69	7.1	18	8.5	

Note. WTCD = World Trade Center disaster.

^a Significance of difference across groups based on chi-square analyses.

surprisingly, people with a college degree were less likely to be resilient ($OR = 0.51$) compared with those who had not completed high school.

Depression and substance use. These variables were entered primarily as control variables and, not surprisingly, depression and marijuana use predicted less resilience in each step of the models in which they were included.

Resources. In terms of material resources, income was a significant predictor of resilience in the polychotomous analysis but did not predict resilience in the multivariate model. However, loss of income remained an important predictor in the final model. Compared with participants with no income loss, those who experienced income decline as a result of the September 11 attack were less than half as likely ($OR = 0.44$) to be resilient. Among energy resources, loss of health insurance did not predict resilience, but number of physician-confirmed chronic diseases remained statistically meaningful in the final model. Compared with participants with no chronic diseases, resilience was about two thirds as likely ($OR = 0.71$) among participants with one or two chronic diseases, and only one third as likely ($OR = 0.32$) among participants with three or more chronic diseases. For interpersonal resources, although social support was only marginally associated with resilience when compared with PTSD in the polychotomous analysis, social support was a significant predictor of resilience when contrasted with all other outcomes. Compared with participants with high levels of social support, participants with medium support were about 30% less likely ($OR = 0.71$) to be resilient. The same was true for participants with low support, although in this case the OR was just outside the 95% confidence interval. The work resource variable of loss of employment was not a significant predictor of resilience.

Additional trauma exposure and life stress. As in the polychotomous analysis, each of the life stress and trauma exposure

variables was a significant predictor of resilience. With all other variables controlled, being directly affected by the September 11 attack reduced the odds of a resilient outcome by over 40% ($OR = 0.58$). Using participants with no recent life stressors as the reference group, we found that resilience was 71% as likely among participants with an additional recent life stressor, and only about half as likely ($OR = 0.53$) among participants with two or more recent life stressors. Compared with participants with no prior traumatic experiences, resilience was equally prevalent if there was one prior trauma ($OR = 0.96$), but close to half as likely ($OR = 0.58$) if there were two or three prior traumas, and less than half as likely ($OR = 0.42$) if there were four or more prior traumas. Compared with participants with no subsequent traumas after September 11, resilience was only about one third as likely ($OR = 0.36$) among participants who did experience subsequent traumas.

Discussion

The primary goal of the current study was to explore how the prevalence of resilience in the aftermath of disaster might vary in relation to various sociocontextual factors, such as demographics, the availability of social and material resources or the loss of resources, and past and current life stressors. As a preliminary step, we first sought to provide convergent support for our operational definition of resilience. In a prior study using the same data, Bonanno et al. (2006) defined resilience as one or zero PTSD symptoms during the first 6 months after the attack. In the current study, we demonstrated that people meeting this criterion had a markedly lower incidence of depression than people with mild–moderate trauma and probable PTSD. Resilient participants' depression levels were, in fact, lower than the national average for nonclinical samples. Resilient participants were also significantly less likely to smoke cigarettes or use marijuana compared with the

Table 2
Polychotomous Multivariate Regression Predicting Outcome, With Probable PTSD as Referent Category

Variable	Resilient vs. PTSD OR (95% CI)	Mild-moderate trauma vs. PTSD OR (95% CI)	Variable	Resilient vs. PTSD OR (95% CI)	Mild-moderate trauma vs. PTSD OR (95% CI)
Gender			Income decline		
Male	—	—	No	—	—
Female	0.44 (0.25–0.77)	1.03 (0.60–1.76)	Yes	0.29 (0.16–0.53)	0.63 (0.35–1.1)
Age			Lost employment		
18–24	—	—	No	—	—
25–34	0.59 (0.20–1.70)	0.54 (0.20–1.44)	Yes	0.95 (0.34–2.68)	1.45 (0.56–3.73)
35–44	0.55 (0.19–1.58)	0.34 (0.13–0.90)	Social support		
45–54	0.21 (0.07–0.63)	0.18 (0.07–0.49)	High	—	—
55–64	0.67 (0.19–2.31)	0.32 (0.10–1.03)	Medium	0.52 (0.26–1.04)	0.70 (0.36–1.37)
65+	0.85 (0.19–3.77)	0.24 (0.05–1.05)	Low	0.52 (0.25–1.03)	0.68 (0.34–1.37)
Race/ethnicity			Lost health insurance		
White	—	—	Yes	—	—
Asian	1.73 (0.47–6.41)	0.58 (0.15–2.20)	No	0.72 (0.19–2.80)	0.39 (0.12–1.27)
African American	0.65 (0.31–1.38)	0.54 (0.26–1.12)	Chronic diseases		
Hispanic	0.47 (0.21–1.03)	0.63 (0.30–1.34)	0	—	—
Other	0.52 (0.16–1.69)	1.28 (0.45–3.70)	1–2	0.82 (0.45–1.51)	1.21 (0.68–2.16)
Education			3 or more	0.46 (0.12–1.68)	1.53 (0.46–5.08)
<HS graduate	—	—	Directly affected by 9/11		
HS/GED	1.18 (0.37–3.72)	1.54 (0.52–4.61)	No	—	—
Some college	1.02 (0.28–3.65)	1.48 (0.44–4.95)	Yes	0.22 (0.12–0.41)	0.32 (0.17–0.60)
College degree	0.51 (0.16–1.59)	1.05 (0.36–3.09)	Recent life stressor		
Graduate degree	0.33 (0.09–1.17)	0.56 (0.17–1.91)	0	—	—
Depression			1	0.38 (0.20–0.71)	0.48 (0.26–0.90)
No	—	—	2 or more	0.48 (0.22–1.03)	0.90 (0.43–1.87)
Yes	0.02 (0.01–0.05)	0.40 (0.22–0.72)	Prior trauma		
Cigarette use			0	—	—
No	—	—	1	1.15 (0.46–2.90)	1.21 (0.48–3.05)
Yes	1.05 (0.56–1.99)	1.19 (0.65–2.19)	2–3	0.44 (0.18–1.12)	0.73 (0.29–1.86)
Marijuana use			4 or more	0.21 (0.08–0.53)	0.44 (0.17–1.10)
No	—	—	Trauma since 9/11		
Yes	0.18 (0.07–0.44)	0.44 (0.20–0.97)	No	—	—
Income			Yes	0.35 (0.17–0.70)	0.96 (0.52–1.77)
<\$20,000	—	—			
\$20,000–\$29,999	1.89 (0.64–5.53)	2.14 (0.76–5.98)			
\$30,000–\$39,999	1.55 (0.56–4.26)	1.40 (0.56–3.54)			
\$40,000–\$49,999	2.23 (0.51–9.85)	1.96 (0.48–8.05)			
\$50,000–\$74,999	2.67 (0.95–7.51)	2.85 (1.07–7.55)			
\$75,000–\$99,999	2.28 (0.81–6.39)	2.60 (0.98–6.93)			
\$100,000+	7.18 (2.11–24.43)	5.55 (1.71–18.02)			

Note. Model fit: Wald $\chi^2 = 9.29$, $N = 2,096$, $df = 74$, $p < .0001$. PTSD = posttraumatic stress disorder. Significant ($p < .05$) odds ratios (ORs) indicated in boldface.

other groups. Although the large-scale nature of this study precluded more in-depth examination of participants' adjustment, these findings nonetheless provide important convergent support for the assumption that the resilient group did experience genuinely healthy adjustment in the months following the attacks.

Having established convergent support for the resilience category, we next sought support for the idea that resilience is more than the simple absence of PTSD (Bonanno, 2004) by examining patterns of association between predictor variables and outcome categories (resilient, mild-moderate trauma, and probable PTSD) using a polychotomous multivariate regression. As anticipated, although a number of variables distinguished both resilience and mild-moderate trauma from PTSD (e.g., age, depression, marijuana use, income level, having been directly affected by September 11, and number of recent stressors), there were also a number of asymmetries within levels of these variables. More important, a

number of variables also distinguished resilience from PTSD but did not distinguish mild-moderate trauma from PTSD (e.g., gender, income decline, traumatic events prior to September 11, and traumatic events post-September 11).

In a final analysis, we sought to identify the unique predictors of a resilient outcome using a hierarchical multivariate analysis that controlled for the covariation among predictors as well as the possible confounding association with exposure and more global types of dysfunction (e.g., depression and substance use). The results of this analysis indicated that the prevalence of resilience was uniquely predicted by participant gender, age, race-ethnicity, and education level; by the absence of depression and substance use; by less income loss, social support, and fewer chronic diseases; and by less direct impact of September 11 and fewer recent life stressors, fewer past prior traumatic events, and not having experienced an additional traumatic event since September 11.

Table 3

Summary of Hierarchical Multivariate Logistic Regression Predicting Resilience Versus All Other Groups

Variable	Model 1		Model 2		Model 3		Model 4	
	OR	95% CI						
Gender								
Male	—	—	—	—	—	—	—	—
Female	0.60	0.48–0.75	0.58	0.46–0.74	0.54	0.40–0.71	0.43	0.32–0.59
Age								
18–24	—	—	—	—	—	—	—	—
25–34	0.87	0.58–1.30	0.78	0.49–1.25	1.01	0.59–1.72	1.02	0.59–1.79
35–44	1.33	0.89–2.00	1.09	0.68–1.73	1.47	0.85–2.56	1.47	0.81–2.64
45–54	0.99	0.65–1.49	0.74	0.46–1.20	0.97	0.56–1.68	0.98	0.55–1.76
55–64	1.47	0.92–2.35	1.01	0.60–1.69	2.02	1.09–3.75	1.87	0.97–3.57
65+	2.60	1.60–4.21	1.73	1.00–2.49	3.95	1.98–7.88	3.11	1.53–6.31
Race/ethnicity								
White	—	—	—	—	—	—	—	—
Asian	2.35	1.28–4.33	2.39	1.13–5.06	3.21	1.41–7.31	2.78	1.24–6.22
African American	0.99	0.73–1.34	0.85	0.61–1.18	1.04	0.72–1.50	1.12	0.77–1.65
Hispanic	0.77	0.56–1.06	0.62	0.43–0.87	0.77	0.51–1.17	0.71	0.46–1.09
Other	0.53	0.31–0.90	0.38	0.21–0.68	0.35	0.18–0.70	0.40	0.19–0.87
Education								
<high school graduate	—	—	—	—	—	—	—	—
High school-GED	1.31	0.84–2.04	1.26	0.77–2.06	0.76	0.40–1.47	0.84	0.44–1.59
Some college	1.18	0.75–1.87	1.12	0.68–1.86	0.62	0.32–1.23	0.75	0.39–1.45
College degree	1.29	0.82–2.03	1.04	0.63–1.72	0.48	0.24–0.94	0.51	0.27–0.98
Graduate degree	1.55	0.95–2.55	1.26	0.73–2.17	0.53	0.26–1.09	0.58	0.29–1.17
Depression								
No	—	—	—	—	—	—	—	—
Yes	—	—	0.04	0.02–0.08	0.04	0.02–0.09	0.05	0.02–0.11
Cigarette use								
No	—	—	—	—	—	—	—	—
Yes	—	—	0.79	0.59–1.05	0.84	0.60–1.18	0.91	0.64–1.28
Marijuana use								
No	—	—	—	—	—	—	—	—
Yes	—	—	0.33	0.19–0.60	0.37	0.20–0.68	0.37	0.20–0.69
Income								
<\$20,000	—	—	—	—	—	—	—	—
\$20,000–\$29,999	—	—	—	—	1.08	0.61–1.91	0.97	0.55–1.73
\$30,000–\$39,999	—	—	—	—	1.08	0.63–1.85	1.14	0.64–2.00
\$40,000–\$49,999	—	—	—	—	1.30	0.67–2.51	1.25	0.63–2.47
\$50,000–\$74,999	—	—	—	—	1.08	0.63–1.88	1.07	0.60–1.91
\$75,000–\$99,999	—	—	—	—	0.93	0.53–1.62	0.99	0.55–1.78
\$100,000+	—	—	—	—	1.46	0.86–2.50	1.55	0.87–2.76
Income decline								
No	—	—	—	—	—	—	—	—
Yes	—	—	—	—	0.40	0.29–0.56	0.44	0.31–0.62
Lost employment								
No	—	—	—	—	—	—	—	—
Yes	—	—	—	—	0.65	0.31–1.33	0.69	0.33–1.44
Social support								
High	—	—	—	—	—	—	—	—
Medium	—	—	—	—	0.68	0.48–0.97	0.71	0.51–1.00
Low	—	—	—	—	0.68	0.49–0.95	0.71	0.49–1.03
Lost health insurance								
Yes	—	—	—	—	—	—	—	—
No	—	—	—	—	1.26	0.50–3.17	1.60	0.56–4.56
Chronic diseases								
0	—	—	—	—	—	—	—	—
1–2	—	—	—	—	0.62	0.45–0.85	0.70	0.50–0.98
3 or more	—	—	—	—	0.24	0.14–0.43	0.32	0.18–0.56
Directly affected by September 11								
No	—	—	—	—	—	—	—	—
Yes	—	—	—	—	—	—	0.58	0.42–0.80
Recent life stressor								
0	—	—	—	—	—	—	—	—
1	—	—	—	—	—	—	0.71	0.51–1.00
2 or more	—	—	—	—	—	—	0.53	0.34–0.81

(Table Continues)

Table 3 (continued)

Variable	Model 1		Model 2		Model 3		Model 4	
	OR	95% CI	OR	95% CI	OR	95% CI	OR	95% CI
Prior traumatic events								
0	—	—	—	—	—	—	—	—
1	—	—	—	—	0.96	0.65–1.43	—	—
2–3	—	—	—	—	0.58	0.40–0.85	—	—
4 or more	—	—	—	—	0.42	0.26–0.68	—	—
Trauma since September 11								
No	—	—	—	—	—	—	—	—
Yes	—	—	—	—	0.36	0.22–0.56	—	—

Note. Model 1, Wald $\chi^2 = 13.89$, $N = 2,661$, $df = 14$, $p < .0001$; Model 2, Wald $\chi^2 = 19.71$, $N = 2,567$, $df = 17$, $p < .0001$; Model 3, Wald $\chi^2 = 10.11$, $N = 2,096$, $df = 30$, $p < .0001$; Model 4, Wald $\chi^2 = 9.69$, $N = 2,096$, $df = 37$, $p < .0001$. Significant ($p < .05$) odds ratios (ORs) are indicated in boldface. CI = confidence interval.

Before moving onto the broader implications of these findings, we consider each of the multivariate predictors in more detail and also the limitations of the study.

Of the demographic variables, gender emerged as a robust predictor of resilience. Gender has shown a complex relationship to adjustment among at-risk children, with the direction of prediction often depending on the type of symptom measured (e.g., Fergusson & Horwood, 2003), but a more straightforward association with PTSD in adults (Brewin et al., 2000). Although the current study does not offer insights into the reason why female gender was associated with a reduced likelihood of resilience, clearly this should be an important research topic for future studies. To this end, in a subsequent study, we plan to examine more closely whether different factors might interact with gender in predicting resilience.

Ethnic minority status is often reported as a risk factor for the development of PTSD (e.g., Breslau, Peterson, Poisson, Schultz, & Lucia, 2004). Hispanics have been reported to evidence the greatest risk for PTSD (e.g., Kulkarni et al., 1990; Perilla, Norris, & Lavizzo, 2002), whereas the findings are somewhat more equivocal for African Americans (Mainous, Smith, Acierno, & Geesey, 2005; Perilla et al., 2002). However, studies reporting racial-ethnic differences in PTSD have often failed to account for the confounding influence of other risk factors, such as low socioeconomic status (McGruder-Johnson, Davidson, Gleaves, Stock, & Finch 2000). Indeed, in a recent study of responses to the September 11 attack, bivariate racial-ethnic differences in PTSD were rendered nonsignificant when socioeconomic factors were statistically controlled (e.g., Adams & Boscarino, 2005). This was also true in the current study. Univariate analyses of the sample used in this study indicated a lower prevalence of resilience among Hispanics (Bonanno et al., 2006). However, when the covariance among the predictors was controlled in the current study, the difference between Whites and Hispanics was nonexistent.

The available evidence on trauma reactions among Asians is limited primarily to refugee populations with, usually, high levels of prior trauma exposure, and not surprisingly, these groups report high levels of PTSD (Lee, Lei, & Sue, 2001). The Asian participants in the current study did not evidence high levels of PTSD and, in fact, were considerably more likely to be resilient compared with all other participants. In the multivariate analysis, which controlled not only for socioeconomic variables but also for

the potentially confounding influence of prior trauma, Asian participants were close to 3 times as likely to be resilient as White participants.

The age of the participants at the time of a PTE has shown a mixed pattern of findings in previous research. However, when age effects have been reported, they have tended to indicate more extreme reactions in younger people, following both loss (Bonanno & Kaltman, 1999) and potential trauma (Brewin et al., 2000). The findings of the current study were generally consistent with this pattern. Participants over 65 years of age were least likely to have PTSD and more than 3 times as likely to be resilient compared with the youngest (18- to 24-year-old) participants.

Another demographic variable, level of education, has consistently evidenced a small but reliable inverse association with PTSD (Brewin et al., 2000). In a previous study of the same participants (Bonanno et al., 2006), univariate analysis associated higher levels of education with a greater prevalence of resilience. However, in the current study, when other demographic factors, exposure, resources, and life stress were statistically controlled, education was inversely associated with resilience. Specifically, participants with a college education were only about half as likely (OR = 0.51) to be resilient as were participants with less than a high school education. This is the first evidence we know of where, with other factors held constant, education actually appears to impede adaptation to trauma. This effect may prove to be unique to the September 11 attack, or perhaps more broadly to the overwhelming and seemingly incomprehensible nature of large-scale disaster. Clearly, our data cannot adjudicate between these and other possible explanations, and further research is warranted.

Among the resource variables we examined, income change, social support, and the absence of chronic disease emerged as solid predictors of resilience. Absolute level of income is often associated with PTSD symptoms when considered in isolation. However, in multivariate analyses that control for the covariance among sociocontextual variables, income level rarely explains much of the PTSD variance (e.g., McCraren et al., 1995; Middleton, Willner, & Simmons, 2002). This same pattern was evident in the present study for income level in relation to resilience. By contrast, however, the loss of income remained a significant predictor of resilience even with other socioeconomic and demographic variables controlled. People who experienced a significant decline in income in the aftermath of the September 11 attack were in fact

less than half as likely to be resilient as participants who did not experience income loss.

The absence of social support has been consistently associated with PTSD (e.g., Brewin et al., 2000; Davidson, Hughes, Blazer, & George, 1991), whereas the presence of support has been found to foster recovery from trauma over time (Koenen, Stellman, Stellman, & Sommer, 2003). Perceived social support is generally associated with health and well-being. However, it was not obvious from this evidence that social support would evidence an association with resilience. Our findings suggest that it does. Although involvement in affinity groups and organizations was unrelated to resilience, people with lower levels of perceived social support were less likely to be resilient.

Another resource variable, the absence of chronic disease, was strongly associated with resilience. There is some evidence that chronic health problems increase the likelihood of PTSD reactions (Amir & Ramati, 2002). Although in the current study chronic disease did not distinguish PTSD from the other outcome categories, in the multivariate analysis chronic disease was clearly associated with a reduced likelihood of resilience.

The most robust class of variables associated with resilience in the current study pertained to the absence of additional life stressors. There is plentiful evidence linking both current life stress and past traumatic experiences with PTSD (Brewin et al., 2000). In one of the few prospective studies to examine these variables, Ong, Bergeman, and Bisconti (2004) found that chronic stress following the death of a spouse resulted in less differentiation of emotional responding, which in turn implied an association between chronic stress and reduced resilience in the face of loss. However, no research had yet examined whether the absence of current or past life stress might be directly linked with resilience. In the current study, the multivariate analysis indicated significant relations between resilience and each of the life stress variables we examined. Specifically, resilience was more prevalent among people who reported no prior traumatic events, no recent life stressors, and no experience of additional traumatic events since September 11. Complementarily, participants with the most extreme life stress (e.g., several recent life stressors) were only about one third as likely to be resilient.

Limitations

Although the design of the current study made it possible to examine a range of sociocontextual predictors in a large sample exposed to a single disaster event, there were also several methodological limitations that might be addressed in future studies. One obvious limitation was that because of the large-scale nature of the study, the definition of resilience we used in the current study was necessarily restricted. It will be important for future studies to continue to explore how resilience might be defined using a more diverse array of subjective and objective measures, such as clinical interviews, ratings of participant adjustment from close friends or relatives, and other markers of optimal social and occupational functioning (Bonanno, Wortman, et al., 2002; Bonanno, Moskowitz, et al., 2005; Bonanno, Rennicke, & Dekel, 2005).

Another limitation of the current investigation that might be considered in future studies is the relatively proscribed nature of the sociocontextual factors we measured. Although we explored a

wide range of sociocontextual variables, there are still other factors that might potentially inform resilient outcomes after disaster. For example, following research on resilient functioning in at-risk children (Cowen, 1991; Rutter, 1999; Werner, 1995), future studies of resilience after disaster might further explore how resilience relates to different aspects of social adjustment, such as the quality of close relationships or family interactions (Kiser & Black, 2005). It would also be fruitful to examine support variables at the level of community support services and interactions and how these support systems themselves are influenced by disaster (e.g., Kaniasty & Norris, 1993). Similarly, although past and current life stress emerged in this study as an important category of predictors of resilience, as in most studies reporting such effects, measurement of these variables was limited to participant self-report. It will be interesting to examine whether these predictive relationships hold when more objective life stress data, such as biological markers of illness or stress, or medical records, are used. Finally, it should be noted that univariate analyses were used to first determine which predictors to retain for multivariate modeling, which may limit generalizability, and large number of comparisons were examined, which may inflate Type I error.

Implications

When considered within the bounds of the limitations we have discussed, the findings of the current study provide important new information to help flesh out the emergent portrait of resilience among adults exposed to extreme adversity. That these variables emerged as independent predictors is of particular significance because this means we might consider these factors to exert an additive or cumulative influence on resilience. Developmental theorists have for years argued that resilience to aversive childhood contexts results from a cumulative mix of person-center variables (e.g., disposition, personality) and sociocontextual (e.g., family interaction, community support systems) risk and protective factors (Garmezy, 1991; Rutter, 1999; Werner, 1995). The multivariate analysis in the current study likewise suggests that resilience among adults exposed to an isolated PTE is informed by a cumulative mix of factors. It will be important for future studies to explore how sociocontextual factors might combine with personality variables that appear to promote resilience (Bartone, 1999; Bonanno, Rennicke, & Dekel, 2005; Bonanno, Field, et al., 2002) and whether these or other factors (e.g., gender or age) might interact in more complex predictive relationships (Rutter, 1987).

A compelling implication of the putative cumulative nature of resilience-promoting factors is that there may be myriad ways to conceptualize prophylactic intervention in the aftermath of disaster (Litz, Gray, Bryant, & Adler, 2002; Shalev, 2004). In recent years, ideas about early intervention have been dominated by psychological approaches, such as critical incident stress debriefing (Mitchell, 1983; Mitchell & Everly, 2000). Unfortunately, a growing body of evidence has indicated that the global application of brief psychological interventions, such as debriefing, is ineffective (Rose, Brewin, Andres, & Kirk, 1999) and often even harmful (Bisson, Jenkins, Alexander, & Bannister, 1997; Mayou, Ehlers, & Hobbs, 2000; for a review, see McNally, Bryant, & Ehlers, 2003). Some investigators have argued that early psychological interventions could be improved if they targeted only those people most at risk for the development of chronic PTSD (e.g., Litz et al., 2002).

One obvious category for this type of targeted intervention would be people who show early signs of elevated distress or trauma symptoms. However, several studies have now shown that survivors with the highest initial symptom levels are actually more likely to experience the negative effects of early intervention (Mayou et al., 2000; Sijbrandji, Olff, Reitsma, Carter, & Gersons, 2005).

In response to the sobering limitations of brief psychological interventions, Shalev (2004) argued that "early interventions in communities suffering mass trauma should consist of general support and bolstering of the recovery environment rather than psychological treatment" (p. 174). The findings of the current study are not incompatible with this line of reasoning and suggest that sociocontextual variables are promising candidates for early risk assessment. Some of these factors, including low social support or the struggle with chronic disease, might be identified and addressed relatively soon after the marker event. Other factors, such as marked loss of income or additional life stressors after the PTE, would require a longer postevent period for adequate assessment. Nonetheless, these factors too could be targeted for intervention to help foster healthy adaptation. There is also evidence to suggest that early psychological interventions might yet be effective, provided they are enacted as part of a broader ecological approach that includes the assessment and intervention of sociocontextual factors (Sandler et al., 2003).

It is our hope that the research reported in this article will inspire further study of the broad range of predictor variables that might inform resilient outcomes across different types of PTEs. It is our hope too that in future studies researchers will be able to heed one of the major implications of the current study regarding the vital importance of controlling for the potentially confounding impact of both socioeconomic factors and prior trauma history. Finally, it is our hope that continued research on the range of factors that promote resilience in the face of extreme adversity will help guide further research and theory on potentially new prophylactic interventions that might foster increased resilience in both individuals and communities.

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New Editors Appointed, 2009–2014

The Publications and Communications Board of the American Psychological Association announces the appointment of six new editors for 6-year terms beginning in 2009. As of January 1, 2008, manuscripts should be directed as follows:

- *Journal of Applied Psychology* (<http://www.apa.org/journals/apl>), **Steve W. J. Kozlowski, PhD**, Department of Psychology, Michigan State University, East Lansing, MI 48824.
- *Journal of Educational Psychology* (<http://www.apa.org/journals/edu>), **Arthur C. Graesser, PhD**, Department of Psychology, University of Memphis, 202 Psychology Building, Memphis, TN 38152.
- *Journal of Personality and Social Psychology: Interpersonal Relations and Group Processes* (<http://www.apa.org/journals/psp>), **Jeffry A. Simpson, PhD**, Department of Psychology, University of Minnesota, 75 East River Road, N394 Elliott Hall, Minneapolis, MN 55455.
- *Psychology of Addictive Behaviors* (<http://www.apa.org/journals/adb>), **Stephen A. Maisto, PhD**, Department of Psychology, Syracuse University, Syracuse, NY 13244.
- *Behavioral Neuroscience* (<http://www.apa.org/journals/bne>), **Mark S. Blumberg, PhD**, Department of Psychology, University of Iowa, E11 Seashore Hall, Iowa City, IA 52242.
- *Psychological Bulletin* (<http://www.apa.org/journals/bul>), **Stephen P. Hinshaw, PhD**, Department of Psychology, University of California, Tolman Hall #1650, Berkeley, CA 94720. (Manuscripts will not be directed to Dr. Hinshaw until July 1, 2008, as Harris Cooper will continue as editor until June 30, 2008.)

Electronic manuscript submission: As of January 1, 2008, manuscripts should be submitted electronically via the journal's Manuscript Submission Portal (see the website listed above with each journal title).

Manuscript submission patterns make the precise date of completion of the 2008 volumes uncertain. Current editors, Sheldon Zedeck, PhD, Karen R. Harris, EdD, John F. Dovidio, PhD, Howard J. Shaffer, PhD, and John F. Disterhoft, PhD, will receive and consider manuscripts through December 31, 2007. Harris Cooper, PhD, will continue to receive manuscripts until June 30, 2008. Should 2008 volumes be completed before that date, manuscripts will be redirected to the new editors for consideration in 2009 volumes.