

Anxiety, Depressed Mood, Self-Esteem, and Traumatic Stress Symptoms among Distant Witnesses of the 9/11 Terrorist Attacks: Transitory Responses and Psychological Resilience

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Posttraumatic stress related to the September 11, 2001 terrorist attacks and general psychological distress were examined in six cohorts of college students (N=5,412) enrolled at an American public university between Spring 2000 and Fall 2002 some 2,500 miles from New York. Consistent with data from Schuster et al.'s (2001) national survey, which used a very low threshold criterion, our findings revealed that 44% of women and 32% of men experienced at least one symptom of posttraumatic stress 6-17 days after the attacks. In contrast to these results, depression levels showed only small differences, and self-esteem and trait anxiety showed no changes. Findings indicate that 9/11-related stress responses among distant witnesses were very mild, transitory and focused in scope, suggesting resilience with respect to broader psychological and psychopathological reactions. Findings are discussed with respect to the role of physical and psychological proximity on the reactions to traumatic events in the general population.

Keywords: trauma, terrorist attacks, stress, depression, resilience, epidemiology

El estrés post-traumático relacionado con los atentados terroristas del 11 de septiembre de 2001, así como el malestar psicológico general se examinaron en seis cohortes de estudiantes universitarios (N=5.412) matriculados entre la primavera de 2000 y el otoño de 2002 en una universidad pública norteamericana distante 2.500 millas aproximadamente de Nueva York. De modo consistente con los datos del estudio a nivel nacional de Schuster et al. (2001), donde se empleó un criterio de corte muy bajo, nuestros resultados fueron que el 44% de las mujeres y el 32% de los hombres experimentaron al menos un síntoma de estrés post-traumático entre 6-17 días después de los atentados. En contraste con estos resultados, los niveles de depresión mostraron únicamente pequeñas diferencias y en la auto-estima y la ansiedad de rasgo no se encontró cambio alguno. Nuestros hallazgos indican que, entre testigos distantes, las respuestas de estrés relacionadas con el 11/9 fueron muy débiles, transitorias y de alcance limitado, lo que sugiere resiliencia en lo referido a las reacciones psicológicas y psicopatológicas. Estos hallazgos se discuten en relación con los efectos de la proximidad física y psicológica sobre las reacciones a hechos traumáticos en la población general.

Palabras clave: trauma, atentados terroristas, estrés, depresión, resiliencia, epidemiología

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When the first airplane struck the World Trade Center (WTC) in New York at 08:46 a.m. Eastern Time (05:46 a.m. Pacific Time) on Tuesday, September 11, 2002, some 2,500 miles to the west of Lower Manhattan, residents of San Diego, CA, were waking up, preparing children for school, and getting ready for work. By the time, classes started at 8 a.m. Pacific Time in schools and universities, many students, faculty, and staff were still unaware of the events in New York. The news, however, spread quickly over the course of the day via word-of-mouth, TV, radio, the internet, telephone, and e-mail to family and friends around the nation and the world. It was through electronic and print media that the majority of San Diego and West Coast residents learned of and experienced the terrorist attacks on the WTC, the Pentagon, and its implications.

There have been few occasions in the study of traumatic events where researchers have responded so rapidly as with the study of the effects of the September 11, 2001 attacks on American soil. The earliest studies on the immediate effects of the attacks were conducted within 2-3 days after the incident (Murphy, Wismar, & Freeman, 2003; Schuster et al., 2001), followed by a second wave of studies 1-2 months later (Blanchard et al., 2004; Galea et al., 2002a; Schlenger et al., 2002; Silver, Holman, McIntosh, & Gil-Rivas, 2002). These studies have made important contributions to our understanding of the short-term responses in the populations most directly affected by the disaster in the New York City metropolitan area and Washington, D.C. (Galea et al., 2002a; Schlenger et al., 2002). In addition, these early studies also added to the literature on stress responses in populations residing in geographically distant areas of the U.S. whose exposure to the events were mainly indirect, through the intensive media coverage provided by TV, radio, and newspapers (Blanchard et al., 2004; Murphy et al., 2003; Schlenger et al., 2002; Whalen, Henker, King, Jamner, & Levine, 2004). Since then, similar studies have been conducted after terrorist attacks in Madrid, 2004 (Miguel-Tobal et al., 2006; Barbero-Val & Linley, 2006; Vázquez, Pérez-Sales, & Matt, 2006; Vázquez, Hervás, & Pérez-Sales, in press) or London, 2005 (Rubin, Brewin, Greenberg, Simpson, & Wessely, 2005).

The importance of the physical proximity of a witness to a traumatic event has long been recognized as an important moderator of its impact on posttraumatic stress. North, Smith, and Spielnagel (1994) have shown that the likelihood of developing Post Traumatic Stress Disorder (PTSD) after a mass shooting or a plane crash increased with the proximity to the event. Sprang (1999) found that 45% of the survivors directly exposed to the Oklahoma City bombing received DSM-III-R diagnoses of anxiety, depression, and alcohol within six months after the bombing, and 34% of these survivors reported PTSD. In contrast, almost no clinical reactions were observed among adults living 900 miles from the bombing site.

Psychological reactions following 9/11 showed a similar proximity gradient. Schuster et al. (2001) found that within two days of the attacks, 61% of the respondents living within 100 miles of the WTC had a 'substantial stress' reaction (see footnotes 2 and 3), in contrast to 48% of those living 100 to 1,000 miles, and 36% of persons residing more than 1,000 miles from the WTC (see footnote 1). Similarly, Schlenger et al. (2002) found that 1-2 months after 9/11 probable diagnosis of PTSD was much more common in the New York City metropolitan area (11.2%) than in Washington, D.C. (2.7%), and areas not directly affected by the attacks (i.e., 3.5% in other major metropolitan areas; 4.0% in the rest of country). This suggests that, even though rates of probable PTSD were elevated in the New York City, the rates in the rest of the country were within the range observed before 9/11 in the US general population (Kessler, Sonnega, Bromet, Hughes, & Nelson, 1995). Similarly, Blanchard et al. (2004) have shown that probable PTSD, as measured by the Posttraumatic Stress Disorder Checklist-Civilian, affected 11.3% of their sample of undergraduates from the University of New York at Albany, whereas the same disorder affected 7.4% of students in Augusta (Georgia), and a mere 3.4% in Fargo (North Dakota).

Perhaps the most forceful evidence for the significance of physical proximity in moderating the psychological consequences of 9/11 attacks comes from a study by Galea et al. (2002b). They found that the prevalence of PTSD was approximately twice as high among residents of Manhattan (7.5%) than the 12-month prevalence rates found in the general population (U.S. Surgeon General, 1999). However, the prevalence of PTSD was almost three times higher among residents of Manhattan living very close to the WTC (i.e., south of Canal Street) than those living between north of Canal Street and 110th Street. Overall, 20% of those living south of Canal Street met diagnostic criteria for PTSD.

Finally, our general expectation was that there would not be a high rate of stress-related reactions. In fact, a general pattern of resilience has been observed not only in distant witnesses of this type of terrorist attacks but also in people living in the same area of the attacks (Vázquez et al., 2006) and even in people who suffer repeated terrorist incidents (Sharlin, Moin, & Yahav, 2006). This pattern of findings support the idea that, although stress-related symptoms can be significant in the first hours after the attack, they are usually transitory ones (Vázquez, Pérez-Sales, & Hervás, 2008). Bonanno and his team studied the prevalence of resilience (defined as having either no PTSD symptoms or one symptom) among a probability sample (n = 2,752) of New York residents during the 6 months following the 9/11 terrorist attacks. Surprisingly, resilience was observed in 65.1% of the sample even though many participants had a high exposure to the event. Some recent studies have also reported that, beyond an absence of significant symptoms after terrorist attacks, it can often be observed positive

consequences in individuals and communities after these attacks (Jones, Woolven, Durodie, & Wessely, 2006; Vázquez et al., in press).

Yet, we do not deny the negative, long-lasting impact that these traumatic situations may eventually have on some direct victims. In a recent metaanalysis, DiMaggio and Galea (2006) have shown that in the year following terrorist incidents, the prevalence of PTSD in directly affected populations varies between 12% and 16% but, even so, the general pattern in survivors is of resilience rather than psychopathology (Bonnano, 2004).

The present study investigates stress reactions specifically related to 9/11 and general psychological and psychopathological responses following 9/11 in a population who witnessed the terrorist attacks 2,500 miles West of the attacked sites. This physically distant perspective may have attenuated posttraumatic stress. This physical distance, however, may have been considerably reduced by the symbolism of the attacked sites and the intensive and extensive media coverage following the attacks (Ahern et al., 2002). Although there was no immediate measure of audience ratings after the attack, it is estimated that more than 80 million US citizens watched evening news on 9/11 on any of the three major TV channels (ABC, NBC, CBS), four times more than the average daily audience (Downie & Kaiser, 2002). Furthermore, residents of prominent U.S. cities, persons living near sites of national interest, professional groups in charge of public safety, and personnel defending national interests felt a psychological proximity to the 9/11 victims and were particularly vulnerable to further terrorist attacks following 9/11. For instance, San Diego has a significant military presence with approximately 95,000 uniformed military personnel assigned to Navy and Marine Corps bases, some 80,000 family members living in San Diego County, and some 260,000 veterans. For these families, the terrorist attacks may have been particularly self-relevant, increasing their vulnerability to distress responses.

The present study adds a unique perspective on the existing research on the psychological adjustment to the 9/11 events because of the accidental circumstances that made it possible. First, this study relies on data from semi-annual assessments of young college students from Spring 2000 through Fall 2002. The three pre-9/11 cohorts provide a baseline against which responses to 9/11 attacks can be compared. Moreover, the semi-annual assessments make it possible to examine and control for seasonal trends in psychological distress. Second, by coincidence the data collection in September 2001 occurred during a two-week period following 9/11. The timing of the data collection provides a snapshot of the psychological distress experienced shortly after the attacks. Third, because the study was designed as a general screening effort long before the 9/11 terrorist attacks, no references to the 9/11 attacks were made in the instructions given to students for completing the instruments. That is, different from the majority of the

published studies on the psychological effects of 9/11, our September 2001 data collection did not frame questions in the context of the terrorist attacks, allowing respondents to express their thoughts and feelings based on the priorities of their personal lives. Fourth, while most of the existing studies on the psychological reactions to the 9/11 attacks focus on posttraumatic distress in response to 9/11, this study includes a variety of other widely used and well-validated psychological instruments that are related to trauma responses. Thus, besides the Posttraumatic Stress Disorder Checklist-Civilian (PCL-C), it includes the Beck Depression Inventory (BDI), the Spielberger Trait Anxiety Inventory (STAI), and the Rosenberg Self-Esteem Questionnaire (RSEQ). The availability of these instruments makes it possible to assess not only posttraumatic stress but more general psychological and psychopathological responses. In summary, the 9/11 attacks and its aftermath can be viewed as a "natural experiment" (Shadish, Cook, & Campbell, 2002) in which the pre-9/11 and post-9/11 cohorts provide a natural contrast of a comparison and an intervention condition.

In summary, this study used a cohort design to examine whether the 9/11 attacks affected psychological well-being beyond symptoms specifically related to traumatic event and to explore the persistence of 9/11-related post-traumatic stress symptoms among distant observers.

Method

Participants

Participants were six consecutive cohorts of college students enrolled in introductory psychology courses during the Fall and Spring semesters 2000, 2001, and 2002. Altogether, 7,605 students were enrolled in these courses. Of those, 5,412 (71%) were 18 years or older, participated in testing for course credit, and provided sufficient data for analysis.

Approximately 71% of study participants were female, and average age was 19.5 years. Slightly over half of the participants (53%) identified themselves as Caucasian, white, European-American, and Nonhispanic; 16% as Latino, Hispanic, Mexican-American, Chicano, or from Spanish origin; 16% as Asian-American, Filipino-American, South-East Asian, or Pacific Islander; 4% as African-American; and less than 1% as Native American or Alaskan Native. Table 1 presents gender, age, and ethnic distributions of the six cohorts.

Procedures

Data collection. Questionnaires for the semi-annual mass screening of students enrolled in introductory psychology classes are typically distributed during the second week and collected during the third week of each Spring and Fall semester. That is, testing typically takes place mid February and mid September of the Spring and Fall semesters, respectively.

Table 1
Demographic characteristics of research participants

	Spring 00	Fall 00	Spring 01	Fall 01	Spring 02	Fall 02
Enrolled students (N)	1,234	1,433	1,103	1,528	966	1,341
Participating students ≥ 18 years						
N	784	1,039	725	1,139	710	1,009
Percentage of enrolled	64%	73%	66%	75%	74%	75%
Female (%)	69	72	67	73	69	72
Age (years)						
Mean	19.9	19.2	20.1	19.1	20.0	19.2
SD	2.0	1.8	2.4	1.9	1.9	1.8
Ethnicity (%)						
African-American – Nonhispanic	4.0	3.8	3.8	3.8	3.5	4.1
Native American or Alaskan Native	.8	.3	.4	.3	1.6	.5
Caucasian – Nonhispanic	53.0	59.0	51.9	53.3	48.9	51.2
Asian, South-East Asian	13.6 ¹	6.8	7.1	7.7	7.8	7.8
Pacific Islander	3.7 ¹	.6	.6	.7	1.6	.2
Filipino American	—	8.1	7.2	8.7	8.7	7.2
Latino, Hispanic, Spanish Origin	6.6	5.2	7.2	6.0	5.9	5.9
Mexican-American, Chicano	12.0	11.2	9.0	8.6	9.7	9.7
Mixed, parents from 2 or more groups	—	—	3.8	8.6	9.0	10.5
Other	6.4	4.9	4.5	2.4	3.2	2.8

Note. ¹Includes Filipino American.

September 11, 2001 fell on the Tuesday of the week in which the screening questionnaires were to be distributed. Distribution was stopped on that Tuesday and resumed the following Monday (9/17). Completed questionnaires were collected during the week of 9/24. That is, during the Fall 2001 semester data collection occurred between 9/17 and 9/28, that is, 6 to 17 days after the terrorist attacks.

Measures. Altogether more than 20 different psychological measures were administered between Spring 2000 and Fall 2002, ranging from Beck Depression Inventory to a Weight Concerns Scale. This study took advantage of the subset of these questionnaires with established validity and reliability that specifically assessed psychological distress, and were administered before, during, and after September 2001, and remained unchanged over multiple administrations¹. In addition to these existing instruments, the authors added questionnaires in Spring 2002 and Fall 2002 that specifically dealt with media exposure and post-traumatic stress responses in the context of 9/11.

Socio-demographic characteristics included age, gender, and ethnicity race. Table 1 describes the socio-demographic characteristics for each cohort of students.

The Beck Depression Inventory (BDI; Beck, 1987) is a 21-item questionnaire where subjects rate the extent to which they experience cognitive, affective, and somatic symptoms of depression. The BDI has been extensively used in clinical

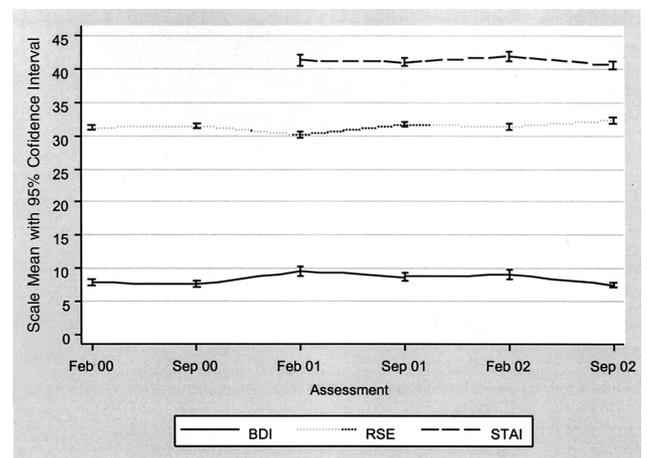


Figure 1. Means and 95% confidence intervals for Beck Depression Inventory, Rosenberg Self-Esteem Questionnaire, and Spielberg Trait Anxiety Inventory from February 2000 to September 2002.

¹ Although the screening database included other measures (e.g., weight concerns, cultural identity, etc.) we decided not to include those in our analyses because there was no sound theoretical rationale to expect a significant association to trauma-related responses.

and non-clinical populations (Beck, Steer, & Garbin, 1988b). There is much support for its reliability and validity as a measure of dysphoria in non-clinical and clinical populations (Kendall et al., 1987). Consistent with the existing literature on its psychometric properties, internal consistency estimates for the BDI in the present study ranged from $\alpha=.89$ (Fall 2000) to $\alpha=.93$ (Spring 2001). The BDI was administered every semester from Spring 2000 to Fall 2002.

The Rosenberg Self-Esteem Questionnaire (RSEQ; Rosenberg, 1965) is a 10-item questionnaire that measures global feelings of self-worth. The RSEQ has been widely used in nonclinical populations, and there is a large body of research on its reliability and validity (Blascovich & Tomaka, 1991). Consistent with this research, internal consistency estimates for the RSEQ in the present study ranged from .70 (Fall 2000) to .88 (Fall 2001). The RSEQ was administered every semester from Spring 2000 to Fall 2002.

The Spielberger Trait Anxiety Inventory (STAI; Knight, Waal-Manning, & Spears., 1983; Spielberger, Gorsuch, Lushene, Vagg, & Jacobs, 1983) is a 20-item questionnaire, in which participants rate the extent to which they experience stable symptoms of anxiety. The STAI has been widely used in clinical and nonclinical populations, and is known to correlate positively with the BDI and negatively with the RSEQ (Beck, Epstein, Brown, & Steer, 1988a). Internal consistency estimates in the present study ranged from .90 (Spring 2002) to .91 (Spring 2001). The STAI was administered from Spring 2001 through Fall 2002.

The Posttraumatic Stress Disorder Checklist-Civilian (PCL-C; Weathers et al., 1993) is a 17-item self-report measure of posttraumatic stress reactions, covering symptoms associated with the DSM-IV diagnostic criteria for posttraumatic stress disorder. Respondents indicate, on a scale anchored from 1 (*not at all*) to 5 (*extremely*), the degree to which they have been affected by particular symptoms stemming from potentially traumatic life experiences occurring over the past month. The PCL-C has extensively been used in research on the effects of terrorism (see Vázquez et al., 2006). We identified probable cases of PTSD based on total scores of 50 and above (possible range of scores 17 – 65) as suggested by Schlenger et al. (2002). Test-retest reliability at 2-3 days has been reported at .96 (Weathers et al., 1993), and the overall diagnostic efficiency has been found to be acceptably high at .90 (Blanchard, Jones-Alexander, Buckley, & Forneris, 1996). Internal consistency estimates in the present study ranged from .91 (Spring 2000, Fall 2001) to .92 (Spring 2001). The PCL-C was administered in Spring 2000, and again in Spring and Fall of 2002.

The 9/11 Questionnaire was adopted from the US National Survey study by Schuster et al. (2001), asking respondents to report their whereabouts on 9/11, media exposure,

experiencing of five PTSD symptoms, and coping behaviours with respect to 9/11. In our study, this questionnaire was administered in Spring 2002 and Fall 2002, and all questions were explicitly framed with respect to the 9/11 terrorist attacks. The five PTSD symptoms, coincidentally extracted from the PCL-C, were: (1) feeling upset, (2) intrusive memories, (3) difficulty concentrating, (4) trouble falling/staying asleep, (5) irritability/angry outbursts². In Spring 2002, these questions were asked with respect to two timeframes, the week following 9/11, and the week preceding the administration of the questionnaire. Thus, 9/11-related PTSD symptoms reported for the weeks following 9/11 are based on retrospective reports made in February 2002. PTSD symptoms related to 9/11 for Spring 2002 and Fall 2002 were reported in February and September 2002, respectively; i.e., 5 and 12 months after the 9/11 attacks.

Statistical Analyses. Data analyses were conducted with SPSS version 11 and STATA version 8. The Type I error rate was set at $\alpha=.05$, and planned comparisons were tested at a Bonferroni-adjusted $\alpha = .05/4 = .0125$. Post-hoc comparisons were tested via the Scheffé method to protect post-hoc pair-wise and complex comparisons at $\alpha=.05$ (Maxwell & Delaney, 2003).

To investigate potential effects of the 9/11 terrorist attacks, we examined a two-factorial between-subjects ANOVA, with time and gender as between-subjects factors, and BDI, RSEQ, SIAS and STAI, as response variables. To test for potential effects of the 9/11 terrorist attacks, the following planned comparison were tested as contrasts of the time factors while allowing for seasonal effects: Contrast 1 (Ψ_1) captures seasonal effects by comparing the average of all February assessments to all September assessments; Ψ_2 compares September 2001 responses to September 2000; Ψ_3 compares September 2001 to September 2002, and Ψ_4 compares the average of all assessment prior to September 11 to responses in September 2001.

Because of the large sample size, statistical power for hypothesis tests was very high even for small effect (e.g., power $> .95$ to detect effects as small as 1% of variance accounted for). Thus, we paid close attention to effect sizes to evaluate the practical importance of statistically significant findings.

Results

Depressed Mood, Anxiety, and Self-Esteem after 9/11

To examine whether psychological wellbeing assessed 2-3 weeks after September 11, 2001 differed from that observed during equivalent time periods in other semesters, two-factorial between-subjects ANOVA were conducted to examine main and interaction effects of time (Feb 00, Sep

² Those five items were selected from the ones reported by 50% or more of the survivors of the bombing attack in Oklahoma City (North, Nixon, Shariat et al., 1999).

00, Feb 01, Sep 01, Feb 02, Sep 02) and gender (male, female) on depressive symptoms (BDI), self-esteem (RSEQ), and trait anxiety (STAI). Table 2 provides means and standard deviations for all these measures for each cohort of men and women.

Beck Depression Inventory. Omnibus tests of the main and interaction effects indicated only significant main effects of time ($F(5, 4775) = 3.2; p = .007$) and gender ($F(5, 4775) = 10.5; p = .001$), accounting for 0.8% and 0.5% of the total variance, respectively.

Post-hoc analyses of the gender main effect revealed that women on average reported higher levels of depression on the BDI than men ($M = 7.4, SD = 8.7$, vs. $M = 8.6, SD = 7.9$), corresponding to a standardized mean difference effect size of $d = .15$. An analysis of the time main effect revealed statistically significant seasonal effects with higher levels of depressive symptom reported in February than September ($\psi_1: F(1,4824)=14.0, p<.001$; 0.9 points or $d=.12$).

Independent of gender and the seasonal effects, BDI scores in September 2001 were significantly higher than those observed in September 2000 ($\psi_2: F(1,4824)=10.1, p=.001$; 1.2 BDI points or $d=.15$) and September 2002 ($\psi_3: F(1,4824)=8.3, p=.004$; 1.1 BDI points or $d=.13$). However, September 2001 BDI scores did not differ from the average BDIs of the previous three terms ($\psi_4: F(1,4824)=1.6, p=.200$; 0.4 BDI points or $d=.05$).

Trait Anxiety. Omnibus tests of main and interaction effects revealed only significant main effects of gender ($F(1, 3035)=8.6; p = .003$), accounting for 0.3% of the total variance. Post-hoc analyses revealed that women had overall higher trait anxiety scores than men ($M = 41.6, SD = 9.7$ vs. $M = 40.0, SD = 10.0; d = .16$).

Rosenberg Self-Esteem Questionnaire. Analyses revealed a significant main effect of time ($F(5, 4649) = 8.8; p < .001$) and a time-by-gender interaction effect ($F(5,4649)=2.6; p=.021$), accounting for 0.9% and 0.5% of the total variance, respectively.

Table 2

Posttraumatic stress disorder symptoms associated with the 9/11 terrorist attacks reported by the Spring 02 and Fall 02 cohorts

	Men		Women	
	Mean (SD)	SL	Mean (SD)	SL
Following 9/11/01 ^a				
Upset when something reminded you of 9/11	2.61 (1.16)	25.5%	3.03 (1.11)	35.6%
Intrusive memories about 9/11	1.70 (.94)	6.2%	2.17 (1.19)	16.8%
Difficulty concentrating because of 9/11	1.71 (1.01)	8.3%	2.12 (1.14)	15.0%
Trouble falling/staying asleep because of 9/11	1.53 (.95)	6.8%	1.62 (1.00)	6.8%
Irritable or angry outbursts about 9/11	1.59 (.98)	7.3%	1.55 (.93)	6.5%
One or more of the above symptoms		32.3%		43.8%
February 2002 ^b				
Upset when something reminded you of 9/11	1.64 (.88)	5.2%	1.83 (.98)	7.8%
Intrusive memories about 9/11	1.33 (.73)	3.6%	1.40 (.76)	2.6%
Difficulty concentrating because of 9/11	1.34 (.70)	1.6%	1.30 (.67)	2.4%
Trouble falling/staying asleep because of 9/11	1.34 (.76)	2.6%	1.32 (.74)	3.1%
Irritable or angry outbursts about 9/11	1.31 (.75)	1.6%	1.29 (.68)	2.6%
One or more of the above symptoms		8.3%		12.4%
September 2002 ^c				
Upset when something reminded you of 9/11	1.74 (.84)	4.6%	1.97 (.98)	7.8%
Intrusive memories about 9/11	1.38 (.76)	3.7%	1.47 (.78)	3.9%
Difficulty concentrating because of 9/11	1.39 (.79)	3.7%	1.37 (.68)	2.3%
Trouble falling/staying asleep because of 9/11	1.31 (.66)	.9%	1.23 (.61)	1.6%
Irritable or angry outbursts about 9/11	1.40 (.82)	4.6%	1.26 (.68)	2.4%
One or more of the above symptoms		10.3%		12.1%

Note. Response scale: 1 - not at all 2 - a little bit 3 - moderately 4 - quite a bit 5 - extremely

%SL: Substantial Level - percentage of respondents endorsing (4) or (5)

a: Symptoms experienced following 9/11 are based on retrospective reports in February 2002 by the Spring 02 cohort.

b: Symptoms experienced in February 2002 are based on reports in February 2002 by the Spring 02 cohort.

c: Symptoms experienced in September 2002 are based on reports in September 2002 by the Fall 02 cohort.

Further investigation of the time main effect revealed a seasonal effect with September scores being on average higher than February scores (Ψ_1 : $F(1,4669)=15.7$, $p<.001$, $d=.18$). Self-esteem scores in September 2001 did not differ from those in September 2000 (Ψ_2 : $F(1,4669)=0.3$, $p=.555$, $d=.04$), were significantly lower than those in September 2002 (Ψ_3 : $F(1,4669)=8.1$, $p=.004$, $d=.20$), and were significantly higher than the average scores observed during the previous three terms (Ψ_4 : $F(1,4669)=7.2$, $p=.007$, $d=.16$).

Further investigation of the time-by-gender interaction effect revealed an absence of gender differences in self-esteem from February 2000 through September 2001, followed by significant gender difference in February 2002 and September 2002, with men showing higher levels of self-esteem than women in both semesters (February 2002: $F(1, 4649) = 5.5$, $p = .019$, 1.8 RSE points or $d = .33$; September 2002: $F(1, 4649) = 6.1$, $p = .014$, 1.3 RSE points or $d = .24$). This was confirmed by an interaction contrast comparing gender differences from February 2000 to September 2001 to those observed in February 2002 and September 2002 ($F(1, 4669) = 10.7$, $p = .001$).

Traumatic Stress Symptoms After the 9/11 Attacks

Of the 710 students completing the February 2002 assessment, 93% reported to have been in San Diego on September 11, 2001, and 4% reported to have been elsewhere in the Western US. Nine students indicated to have been within 100 miles of the WTC or the Pentagon, four were elsewhere in the US, and 5 outside of the US. The students who were in San Diego on 9/11/01 reported to have watched TV for an average of $M = 5.31$ hours ($SD = 3.89$, $Mdn = 5.5$ h) on the day about the disaster.

Table 3 describes the means and standard deviations of the five posttraumatic stress symptoms and the percentage of respondents reporting “substantial levels” of symptoms (i.e., levels 4 and 5 of a five-point scale: being bothered *quite a bit* or *extremely*) as defined by Schuster et al. (2001)³. Approximately 33% of men and 44% of women experienced one or more PTSD symptoms at significant levels. The most prevalent symptom for men and women was feeling upset; 26% of men and 36% of women reported substantial levels of this symptom. This was followed by intrusive memories (6% and 17% for men and women, respectively), difficulty

Table 3

Means and standard deviations for men and women on the Beck Depression Inventory, Rosenberg Self-Esteem Questionnaire, and State Trait Anxiety Inventory during the Spring and Fall Semesters from 2000 to 2002.

Measure	Semesters												
	Spring 00		Fall 00		Spring 01		Fall 01		Spring 02		Fall 02		
	M	F	M	F	M	F	M	F	M	F	M	F	
PCL-C													
M	30.8	33.2							31.3	33.4	30.2	29.7	
SD	11.3	11.7							12.1	12.3	11.8	10.4	
PTSD ¹	6.9%	9.1%							6.1%	11.4%	8.5%	6.3%	
BDI													
M	6.26	8.59	6.84	7.78	9.16	9.72	8.41	8.87	8.06	9.52	6.29	7.93	
SD	7.74	8.28	8.03	6.26	7.85	6.84	7.52	9.16	8.54	8.36	6.76	7.21	
RSEQ													
M	31.25	31.18	31.67	31.45	29.94	30.25	31.90	31.61	32.62	30.82	33.27	32.02	
SD	5.02	4.68	4.73	4.88	6.16	5.54	5.78	5.80	5.48	5.95	5.47	5.79	
STAI													
M					39.63	42.19	40.57	41.27	39.90	42.87	40.46	40.62	
SD					9.36	10.32	10.02	9.85	9.34	9.68	10.16	10.06	

Note. PTSD: Probable posttraumatic stress disorder based on a score ≥ 50 on the PCL-C.

³ We adopted this criterion of ‘substantial’ stress reaction just to compare our results to those of Schuster et al. (2001). According to the authors’ definition, anyone of the interviewed subject might be suffering from that condition, provided that he/she states that he suffers from *at least 1* of the 5 items of this brief questionnaire, with a seriousness of 4 (*quite a bit*) or 5 (*extremely*) in a 1 to 5 scale. Therefore, anyone interviewed feeling *quite a bit* upset when something *reminded him/her of the attacks that took place on September 11*, would be deemed to be a person with “substantial stress”. Yet, we have strongly criticized this type of simplistic approach as it may unnecessarily pathologize what may be viewed as normal reactions to a stressful situation (Pérez-Sales & Vázquez, 2007; Vázquez, 2005; Vázquez, Pérez-Sales, & Matt, 2006; see also Wesseley, 2004).

concentrating (8% and 15%), irritability and angry outbursts (7% and 7%), and trouble falling and staying asleep (7% and 7%).

Two-factorial MANOVAs were conducted to investigate potential gender effects on five posttraumatic stress symptoms among students who were in San Diego on 9/11/01. The multivariate tests revealed statistically significant main effects of symptoms (Wilks' Lambda = .737, $F(4, 626) = 55.8, p < .001$) and a significant symptom-by-gender interaction effect (Wilks' Lambda = .984, $F(4, 569) = 2.6, p < .038$).

Further investigations of the symptom-by-gender interaction effect revealed that women reported significantly higher levels than men of feeling upset when something reminded them of the events ($F(1, 649) = 18.8, p < .001; d = .37$), intrusive memories ($F(1, 649) = 23.5, p < .001; d = .42$), and difficulties concentrating ($F(1, 649) = 18.0, p < .001; d = .36$). No gender differences were found for sleep-related problems ($F(1, 649) = 1.31, p = .252; d = .10$), and irritability or angry outbursts ($F(1, 649) = .3, p = .601; d = .04$).

Traumatic Stress Symptoms Five Months After the 9/11 Attacks

Table 3 presents the means, standard deviations, and percentages of respondents at substantial levels of the 9/11 related posttraumatic stress symptoms experienced in February 2002. Approximately 8% of men and 12% of women experienced one or more PTSD symptoms at substantial levels. The most prevalent symptom for men and women continued to be feeling upset when reminded of 9/11; 5% of men and 8% of women reported substantial levels of this symptom. This was followed by intrusive memories (4% and 3% for men and women, respectively), trouble falling and staying asleep (3% and 3%). Least prevalent were irritability and angry outbursts (2% and 3%) and difficulty concentrating (2% and 2%).

To investigate whether the 9/11-related PTSD symptoms had changed from September 2001 to February 2002 in this single cohort, repeated measures ANOVA were conducted, in which time and symptoms were within-subjects factors and gender was a between-subjects factor. Statistically significant main effects of time (Wilks' Lambda = .661, $F(1, 649) = 332.2, p < .001, \eta^2 = .33$) and symptoms (Wilks' Lambda = .978, $F(1, 649) = 14.9, p < .001, \eta^2 = .26$), and a significant time-by-symptoms interaction effect were found (Wilks' Lambda = .664, $F(4, 646) = .716, p < .001, \eta^2 = .14$). In addition, the gender main effect, time-by-gender, symptom-by-gender, and time-by-symptom-by-gender interactions were statistically significant, each accounting for very less than 1.5 % of variance.

Compared to the retrospective recall of reactions after 9/11, feeling upset was lower in February 2002 by approximately one standard deviation unit (i.e., $d = .94$ for men and $d = 1.14$ and women). Intrusive memories had

decreased by $d = .44$ and $d = .78$, respectively. Difficulties concentrating decreased by $d = .43$ and $d = .88$. For trouble falling/staying asleep, means declined by $d = .21$ and $d = .44$, and irritability or outbursts means declined by $d = .33$ and $d = .22$. For the first three measures, the means for women declined significantly more than those for men ($F(1, 649) = 6.6, p = .010; F(1, 649) = 20.7, p < .001; F(1, 649) = 23.8, p < .001$). In fact, during the week prior to completing the questionnaire in 2/02, men and women did not differ on any of the five symptoms ($F(1, 649) = .5, p = .487$).

Post Traumatic Stress Symptoms Twelve Months after the 9/11 Attacks

Table 3 also presents descriptive statistics for 9/11 related PTSD symptoms experienced around the one-year anniversary by the Fall 2002 cohort of students. The most prevalent symptom for men and women continued to be feeling upset when reminded of 9/11; 5% of men and 8% of women reported substantial levels of this symptom. This was followed by intrusive memories (4% and 4% for men and women, respectively), difficulties concentrating (4% and 2%), and angry outbursts (5% and 2%). Least prevalent were sleep-related problems (1% and 2%). Approximately 10% of men and 12% of women experienced one or more PTSD symptoms at a substantial level.

Probable Posttraumatic Stress Disorders in the Spring 2000, Spring 2002, and Fall 2002 Cohorts

Table 3 reports percentages of respondents with probable PTSD. Based on PCL-C total scores ≥ 50 (Schlenger et al., 2002), 6.1% of men and 11.4% of women showed probable PTSD in Spring 2002 (9.8% total sample). This compares to 6.9% of men and 9.1% women with probable PTSD in February 2000 (8.4% total sample), and 8.5% of men and 6.3% of women in September 2002 (6.9% total sample).

Discussion

Posttraumatic Stress Responses

Consistent with research in the general adult U.S. population outside of New York City and Washington, DC (Schlenger et al., 2002; Schuster et al., 2001; Silver et al., 2002), participants who witnessed the 9/11 attacks through the media in San Diego experienced similar patterns and levels of acute posttraumatic stress symptoms. Also consistent with previous research on the 9/11 attacks and with epidemiological data from the general population (Brewin, Andrews, & Valentine, 2000; Kessler, Sonnega, Bromet, Hughes, & Nelson, 1995), female students showed stronger trauma-related responses than men during the weeks following 9/11.

Five and twelve months after the terrorist attacks, few students reported traumatic symptoms associated with 9/11. These findings are consistent with other longitudinal research that showed acute traumatic stress symptoms in the general population throughout the U.S. rapidly declining following 9/11 (Blanchard et al., 2004; Galea et al., 2003; Schlenger et al., 2002; Silver et al., 2002, 2005),

The transitory nature of traumatic stress responses found in the majority of the general population suggests that acute posttraumatic symptoms should not be mistaken for indicators of PTSD (see Vázquez, 2005; Vázquez et al., 2006). As McNally, Bryant, and Ehlers (2003), and Southwick and Charney (2004) have argued, these initial responses may be part of the natural recovery, improving without the assistance of professional help in the presence of supportive environments. At the same time, these initial responses should not be ignored. In some cases, PTSD can have a chronic course and symptoms may persist for decades after the traumatic incident (Morgan, Scourfield, Williams, Jasper, & Lewis, 2003). Assessing initial stress reactions is important because the type of symptoms (e.g., a high presence of dissociative symptoms), the overall intensity of the initial reactions, the appraisal of one's stress reactions, and one's social support resources may predict the development and prognosis of PTSD (Brewin, 2003; Bryant & Harvey, 2000). The reason why relatively few distant witnesses of the 9/11 attacks suffered from persistent PTSD symptoms five months after the attacks suggest that the natural recovery using the existing support resources in personal and community networks were sufficient to successfully cope with the tragedy (Shalev, 2004; Silver et al., 2002).

Psychological Distress Responses

In contrast to acute posttraumatic stress responses, general psychological distress has changed very little in response to 9/11. The best case for a general psychological distress response (independent of seasonal trends) can be made for depressed mood. Independent of gender and seasonal effects, BDI scores in the Fall 2001 cohort were significantly higher than those in the Fall 2000 and Fall 2002 cohorts. The standardized mean differences comparing Fall 2001 to Fall 2000 and Fall 2002 scores were rather small with .15 and .13, respectively (i.e., 1.2 and 1.1 BDI points). For reference purposes, these effect sizes correspond approximately to the size of the seasonal effect ($d = .12$) and the gender main effect ($d = .15$). It is important to note that these effects were not moderated by gender differences.

With respect to self-esteem, an impact of 9/11 is more uncertain. Self-esteem in September 2001 was significantly lower than in September 2002 and equivalent to September 2000. Moreover, men had significantly higher levels of self-esteem than women in Spring 2002 and Fall 2002, whereas they did not differ in earlier cohorts.

Consistent with the expectation that traits are stable dispositions largely unaffected by seasonal variations and historical events (see a discussion in Roberts, Walton, & Viechtbauer, 2006), mean levels of trait anxiety remained unchanged across the four cohorts. Women reported consistently higher levels than men ($d = .16$).

Resilience among Distant Witnesses

While the participants in the present study lived 2,500 miles from the sites of the terrorist attacks, the media coverage of the 9/11 attacks brought the physically distant events close to home. This and other studies showed that a large proportion of distant witnesses responded with immediate symptoms of acute stress (Muñoz, Crespo, Pérez-Santos, & Vázquez, 2004; Rubin et al., 2005; Vázquez et al., 2006; Miguel-Tobal et al., 2006). However, upon closer examination, the pattern and level of acute posttraumatic symptoms show resilience and limited severity of distress responses even during the week following 9/11 (Vázquez, 2005). Out of the five PTSD symptoms derived from the PCL-C, the average symptom levels among men was above *a little bit* (level 2 of a five-point rating scale) but below *moderately* (level 3) on only one item (i.e., *feeling upset when something reminded you of 9/11*). For women, three symptoms yielded average symptom levels above *a little* and one above *moderately* (i.e., level 3). Within 5 months, neither men nor women showed average symptom levels above *a little bit*. Similarly, in Blanchard et al.'s study (2004) the overall means for the PCL-C were 1.68 (1.61 and 1.76 for men and women, respectively) in Albany, 1.54 (1.39 vs. 1.60) in Augusta, and 1.39 (1.32 vs. 1.43) in Fargo. Similar low figures were found by Murphy et al. (2003) in their sample of African-American college students at Louisiana (NO): three days after September 11, the average mean in the PCL-C scale was 1.75 and only eleven students (5% of the sample) obtained a higher score of 50 or above (i.e., the standard cut-offs score to estimate PTSD in this measure). From this perspective, the relative small changes in depressed mood and the lack changes in self-esteem are not surprising anymore.

The limited severity of distress responses has several possible explanations. First, it is consistent with other findings on emotional experiences when confronting stressful experiences. The initial horror and helplessness after the 9/11 attacks were followed by grief, patriotism, and an outpour of instrumental and emotional support at personal, local, national, and international levels. Throughout the U.S., there were many opportunities to express anger, compassion, confusion, and determination, and to make constructive contributions to recovery and healing (Vázquez, Hervás & Pérez-Sales, in press). A poll conducted days after the September terrorist attacks by the National Organization for Research at the University of Chicago found that people in NYC and in other parts of the country felt deeply

interconnected, had a general positive view of the nature of human beings, and also showed a significant increase of feeling pride about the nation (Smith, Rasinski, & Toce, 2001). Similarly, Peterson and Seligman (2003) found that people experienced not only negative emotions but also positive ones which, in turn, may foster resilience. Research on natural disasters has also shown that even under the most adverse circumstances, positive emotions may be highly prominent and help victims to cope with the situation (Vázquez, Cervellón, Pérez-Sales, Vidales, & Gaborit, 2005; Fredrickson, Tugade, Waugh, & Larkin, 2003).

Second, self-reference of events plays an important role in cognitive theories of psychopathology. The effect of the 9/11 attacks on mental health would be expected to be weaker if distant observers perceived them to lack self-relevance. Instead of an attack directed at the personal self, 9/11 may have been perceived as an attack on the collective self (Sedikides & Brewer, 2001). In fact, the strongest effects were found in direct witnesses who were personally affected by the events because they have been themselves harmed or at risk of harm or who may have lost a friend, a job, housing, or transportation (Galea et al., 2002c). From this perspective, self-relevance may be the explanatory mechanism behind the robust relationship between physical proximity and posttraumatic stress responses (Wayment, 2004).

It is now clear that the 9/11 terrorist attacks and their extensive media coverage did not cause a mental health crisis as some had initially feared (Herman, Felton, & Susser, 2002; Stephenson, 2001; McNally & Breslau, 2008). Studies of treated cases have shown that rates of diagnosed PTSD and the use of mental health services due to that disorder in the New York area and the rest of the country showed no substantial increases following 9/11 (Boscarino, Galea, Ahern, & Vlahov, 2002; McCarter & Goldman, 2002; Rosenheck & Fontana, 2003). The present study is consistent with these findings that the 9/11 attacks appear to have had little short-term and no long-term effects on general psychological distress in the general population.

Strengths, Limitations, and Future Research

This study relied on a cohort design with six groups of students enrolled in introductory psychology courses between Spring 2000 and Fall 2002. This design took advantage of the cyclical turnover in this course and the administration of a common set of measures to establish a baseline level against which post 9/11 cohorts can be compared. The large sample size provided sufficient power to detect even small effect. The inclusion of three pre-9/11 and three post-9/11 cohorts and nonequivalent dependent variables made it possible to examine and control for some of the potential threats to internal validity, including history and nonequivalence between groups. Specifically, this design allowed us to control for seasonal patterns in depressed

mood and self-esteem independent of gender differences. Consistent with the definition of a trait, no seasonal patterns or cohort differences were observed for trait-anxiety. Therefore, the observed seasonal pattern in distress and self-esteem may have multiple sources including seasonal patterns in depressed mood, optimism at the beginning of a new academic year, and selection processes that lead to differential enrollment and participation of students in the Fall and Spring semesters. Although the cohort design with multiple pre- and post-9/11 assessments allowed us to statistically control for cyclical nonequivalence, this statistical control must be necessarily imperfect.

Although our findings suggest resilience in the face of posttraumatic stress among young men and women, this study did not examine the role of other potential risk factors and moderating variables. In particular, 9/11 may have had a particularly detrimental impact on people with previous PTSD disorders (Maes, Mylle, Delmeire, & Janca, 2001) and past history of psychiatric disorder (Brewin et al., 2000; Silver et al., 2002).

This and other studies have demonstrated that traumatic events witnessed through the media in and of themselves are insufficient to cause lasting distress responses. Although some authors suggest the idea of a widespread media-induced PTSD (see Marshall, Amsel, and Suh, 2008), the epidemiological data consistently show that not only direct witnesses but also distant witnesses of different traumatic experiences are rarely affected by long lasting stress-related symptoms (Vázquez, 2005; MacNally & Breslau, 2008).

As much as public health professionals must be prepared to deal with significant mental health crises in the aftermath of disasters, such efforts are primarily relevant for persons directly witnessing and immediately affected by a disasters. There is, however, a broader role for preventive mental health strategies targeting all potential victims of terrorist attacks. Better understanding and strengthening public and private support networks human to increase resilience before traumatic events occur (Kessler, Sonnega, Bromet, Hughes, & Nelson, 1995) should be part of a broader public health strategy to prepare for disasters. Further research should also address the study of those factors that promote or deter resilience in people exposed to traumatic events (Bonnano, Galea, Bucchiarelli, & Vlahov, 2007).

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