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The Psychological Impact From Hurricane Katrina: Effects of Displacement and Trauma Exposure on University Students

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Abstract

The following study examined the reactions of university students to Hurricane Katrina. A group of 68 New Orleans area students who were displaced from their home universities as a result of the hurricane were matched on race, gender, and age to a sample of 68 students who had been enrolled at Louisiana State University (LSU) prior to the hurricane. All students were enrolled at LSU at the time they participated in an online survey, conducted 3 months following the hurricane. The survey included symptom measures of depression, anxiety, stress, posttraumatic stress disorder (PTSD), and other variables. Results indicated displaced students experienced more trauma exposure and greater subsequent distress, more symptoms of PTSD, and more symptoms of depression. Moreover, traumatic exposure and distress from the traumatic exposure were found to fully mediate depressive symptoms and posttraumatic symptoms in the displaced students.

Hurricane Katrina (Louisiana landfall on August 29, 2005) was one of the largest natural disasters experienced in the United States. With over 1,800 lives lost, Katrina was the third deadliest hurricane since 1900. Total estimates for damages and costs hover at \$125 billion (Graumann et al., 2005). As a whole, the effects of the storm were far-reaching with the city of New Orleans closing down for several months and continuing in recovery efforts to this day. As a further post-hurricane insult, the severity and damage from the storm's aftermath caused massive numbers of individuals to evacuate the area. Included in these numbers were students evacuated from local colleges and universities (e.g., Loyola, Tulane, University of New Orleans, Xavier) just weeks into their fall semester. As other, less-affected, colleges in the nearby areas opened their doors, some students were able to resume college life at a new university relatively quickly. The present study was conducted to examine the effects of such displacement (i.e., moving and changing universities) and trauma exposure on students. Further, this study sought to examine symptoms of psychopathology and explore potential mediators in this displaced sample of students.

Past research on natural disasters has broadly demonstrated a consistent link between the experience of such events and psychopathology (cf. Davis, Tarcza, & Munson, 2009; Galea et al., 2007; Green & Solomon, 1995; Horowitz, Stinson, & Field, 1991; Kessler et al., 2008; Kessler, Galea, Jones, & Parker, 2006; Norris et al., 2002; Rubonis & Bickman, 1991;

Weems et al., 2007). Studies specifically focused on the impact of hurricanes have revealed similar increased post-event difficulties, particularly posttraumatic stress and internalizing symptoms such as depression and anxiety (David, Mellman, Mendoza, & Kulick-Bell, 1996; Galea et al., 2007; Ironson et al., 1997; Kessler et al., 2008; Kessler et al., 2006; Pickens, Field, Prodromidis, & Pelaez-Nogueras, 1995; Weems et al., 2007). For example, following Hurricane Andrew, approximately half of a community sample studied by David and colleagues (1996) were found to exhibit a new psychological disorder. Particularly large percentages of participants were found to meet diagnostic criteria for PTSD (36%), depression (30%), or one or more of the anxiety disorders (11% generalized anxiety, 10% panic disorder, 8% agoraphobia). Long-lasting effects following disaster have also been found. Rates of distress have been found to remain high 16 months following tornados and floods and 6 months after hurricanes in the United States (i.e., PTSD, 20–30%; depression, 35–45%; Norris, Perilla, Riad, Kaniasty, & Lavizzo, 1999). Moreover, Kessler and colleagues (1995) reported that approximately one-third of individuals exposed to a disaster continued to evidence symptoms of PTSD, even 12 years later. More recently, those exposed to Hurricane Katrina have been found to have higher rates of severe mental illness and suicidality (cf. Galea et al., 2007; Kessler et al., 2008; Kessler et al., 2006; Weems et al., 2007) with hurricane-related stressors (particularly physical illness and adversity) predicting psychiatric disorders and impaired quality of life (Galea et al., 2007).

A number of variables have been suggested to influence the association between traumatic events and adverse psychological outcomes. Severity of the disaster has a significant impact: the more extreme the disaster and its effects, the greater psychological distress reported by victims (Toukmanian, Jadaa, & Lawless, 2000). Moreover, greater exposure levels (Bodvarsdottir & Elklit, 2004; Epstein, Fullerton, & Ursano, 1998; Norris & Uhl, 1993; Pickens et al., 1995; Sattler et al., 2002), destruction of property (McFarlane & Papay, 1992; Pickens et al., 1995), resource loss (Benight, Ironson, Klebe, et al., 1999; Freedy, Shaw, Jarrell, & Masters, 1992; Ironson et al., 1997; Kaiser, Sattler, Bellack, & Dersin, 1996; Sattler et al., 2002, 2006), and undesirable/stressful post-disaster events (e.g., Galea et al., 2007; Garrison et al., 1995; Koopman, Classen, & Spiegel, 1994; Sattler et al., 2002) have all been reported to affect psychopathology and serve as potential risk factors for increased difficulties post-disaster. Conversely, greater social support (e.g., Brewin, Andrews, & Valentine, 2000; Norris, Baker, Murphy, & Kaniasty, 2005; Norris & Kaniasty, 1996; Norris, Murphy, Kaniasty, Perilla, & Ortis, 2001) and more effective coping behaviors (e.g., Bandura, 1986; Benight, Ironson, & Durham, 1999; Benight, Ironson, Klebe, et al., 1999; Benight et al., 1997; Spurrell & McFarlane, 1993) appear to serve a protective role following traumatic events. Nonetheless, the influence of factors such as these appears to be complex, interactive, and somewhat imprecise.

Aside from consistent gender differences (i.e., greater distress in females), mixed findings are apparent in the limited research on individual characteristics (e.g., education level, age) that may influence post-disaster distress levels. For example, college students may represent a unique group, as a disaster is more likely to be experienced away from the student's home and family. College campuses also often embrace a community spirit which may provide beneficial social support networks for students. In addition, college students may be at an advantage as individuals with lower education levels have been found to evidence higher symptoms of distress (Caldera, Palma, Penayo, & Kullgren., 2001; Epstein et al., 1998), as well as less social support (Norris et al., 2005) and post-disaster assistance (Kaniasty & Norris, 1995). Alternatively, if students are required to leave the university (e.g., it closes, to see family), then a disruption in their social support network may occur. Kaiser and colleagues (1996) noted that college students may be at increased risk for developing psychological symptoms following a disaster due to the high demands (i.e., academic and social) of the environment and lack of familiar home settings and supports. Otherwise,

remarkably little is currently known about college students' reactions to experiencing natural disasters. In fact, only a handful of studies specifically focusing on college students' responses following a major hurricane were identified in the literature. These studies typically conform with those of adults, in general, demonstrating increased stress, anxiety, and depression following exposure to such a traumatic event (Caldera et al., 2001; Kaiser et al., 1996; Pickens et al., 1995; Sattler et al., 2002). For example, approximately 35% of students reported clinically significant (above the cutoff score) depressive symptoms following Hurricane Andrew (Pickens et al., 1995).

In summary, previous studies have identified several key components in the aftermath of natural disasters. Within-event (e.g., exposure) and post-event (e.g., coping, stressors, social support) factors have been purported to influence the potential psychosocial outcomes of those affected by disaster. Continued research efforts in this area are important as approximately 17% to 22% of the U.S. population will experience at least one natural disaster in their lifetime (Briere & Elliot, 2000; Kessler et al., 1995). Thus, the purposes of the current study were to examine the effects of displacement and trauma on college students following a major natural disaster. Specifically, this study examined displaced and nondisplaced undergraduate and graduate students in an effort to determine the impact of Hurricane Katrina on those students most affected. In addition, given the reported effects of stressors and exposure (e.g., Galea et al., 2007), trauma exposure and distress from exposure were examined as potential mediators of the potential association between displacement and psychopathology (depression and PTSD).

Method

PARTICIPANTS

Participants for this study were 68 undergraduate and graduate students from New Orleans area universities (48.5% from University of New Orleans, 16.2% from Loyola, 13.2% from Tulane, 13.2% from Xavier, and 8.8% from other New Orleans area universities and colleges) displaced by Hurricane Katrina and 68 matched, but non-displaced students from Louisiana State University (LSU). All participants ($N = 136$) were enrolled at LSU during the Fall 2005 semester: displaced New Orleans area students were allowed to register and temporarily transition to LSU because of disruptions from the hurricane. A total of 2,387 undergraduate students displaced from their colleges and universities by Hurricane Katrina registered at LSU that fall semester, of which only 227 returned for the spring semester (registrar's office, personal communication, May 20, 2009), and were potentially available for study purposes. Displaced, relocated participants were selected from a larger online study pool of students and were carefully matched to nondisplaced students. All displaced participants were matched on race and gender; however, given the available matches only 87% were matched exactly on age, with an additional 9% matched within 1 year and 4% to the closest age match beyond a year. Ties for matches were chosen at random. The majority of displaced students had their primary residences within 10 miles of Metairie / New Orleans, Louisiana (83.8%), and most were fled from their homes at the time of the hurricane (85.3% not at home, 7.4% remained in New Orleans for the hurricane, 7.3% went home from New Orleans area colleges and universities to their family homes across the state—most further inland but one went 90 miles closer to the coast). When asked how close displaced students were to the hurricane's effects (i.e., very close, moderately close, somewhat close, or at a safe distance), 66.2% indicated they were "very close," 13.2% indicated they were "moderately close," 7.4% indicated they were "somewhat close," and 13.2% responded they were "at a safe distance." The combined 136 participant sample was matched for gender (67.6% female) and race (58.8% Caucasian, 41.2% African-American), and had a mean age of 20.8 years ($SD = 3.9$ years; see Table 1 for additional demographic

information). The groups were also comparable in marital status: 94.1% single, 1.5% engaged, 2.9% married, and 1.5% divorced.

MEASURES

Demographic and Clinical Screener Questionnaire—A questionnaire was developed by the investigators which assessed typical demographic information/variables (e.g., name, age, race, sex, SES) as well as 46 additional questions designed to provide a broad overview of functioning, coping, and living situations following Hurricane Katrina.

Depression, Anxiety, and Stress Scales (DASS; Lovibond & Lovibond, 1995a)

—The DASS is a widely used self-report measure composed of 42 items examining depression, anxiety, and stress. Participants rated to what degree items applied to them over the past week from 0 (*did not apply to me at all*) to 3 (*applied to me very much, or most of the time*). The three 14-item scales are formed by summing responses to relevant items. The DASS has been used in both clinical and nonclinical samples and has been found to have excellent internal consistencies (α s = .947, .897, and .933 for the Depression, Anxiety, and Stress scales respectively; Crawford & Henry, 2003) and adequate validity: DASS scales correlate significantly with related Beck Anxiety Inventory and Beck Depression Inventory scores (Lovibond & Lovibond, 1995b). The possible range of raw scores for each of the scales is 0 to 42.

Impact of Events Scale – Revised (IES-R; Weiss & Marmar, 1997)—The IES-R is an expansion of the original Impact of Events Scale (Horowitz, Wilner, & Alvarez, 1979) to a form more consistent with Posttraumatic Stress Disorder criteria (PTSD; American Psychiatric Association, *Diagnostic and Statistical Manual of Mental Disorders*, 4th ed., 1994; *DSM-IV*). The resulting measure provides an overall score and three subscale scores (i.e., Avoidance, Intrusion, and Hyperarousal) with possible mean scores ranging from 0 to 4. Respondents rate their distress to items from 0 (*not at all*) to 4 (*extremely*) during the past 7 days. The IES-R has recently been found to have high internal consistency (alphas ranging from .87 to .94 for the various subscales) and to be highly correlated with another measure of PTSD (Creamer, Bell, & Failla, 2003).

Traumatic Exposure Severity Scale (TESS; Elal & Slade, 2005)—The TESS was utilized to quantify the amount of traumatic exposure and the degree of subsequent distress from that exposure. Respondents were asked to indicate “yes” (scored a 1) or “no” (scored a 0) if they had experienced any of the 24 events listed in the instrument (e.g., items included “Were you physically injured in the hurricane?” “Was your home damaged in the hurricane?” “Were any members of your family or loved ones physically injured in the hurricane?”) and, if so, to rate their resulting distress from 1 (*not at all*) to 5 (*extremely*). By summing responses, total Occurrence (range 0–24) and Distress (range 0–120) scale scores, as well as five subscale scores were determined. The Concern for Others and Resource Loss subscales each contain 6 items and have identical occurrence (0–6) and distress (0–30) ranges. The Damage to Home subscale has 3 items, and occurrence and distress ranges of 0–3 and 0–15, respectively. The Personal Harm subscale has 5 items, with an occurrence range of 0–5 and a distress range of 0–25. Finally, the Exposure to the Grotesque subscale contains 4 items and possible occurrence and distress scores ranging from 0–4 and 0–20, respectively. Reliability coefficients for the Occurrence and Distress total scales have been found to be .78 and .84, respectively, and comparisons to other relevant measures of anxiety and trauma have resulted in significant but moderate correlations (Elal & Slade, 2005).

PROCEDURE

Participants were recruited through multiple means, including an online experiment registration system, mass emails, classroom announcements, posters/flyers, and media advertisements. The questionnaire materials were made available via an online data collection system that students could log in and out of at their convenience and thereby complete the survey at their leisure, hopefully minimizing fatigue. Online data collection methodologies have grown in popularity and have been specifically suggested as viable alternatives to traditional assessment methodologies or telephone interviews following natural disasters (Schlenger & Silver, 2006). Data were collected beginning 3 months after Hurricane Katrina for a period of approximately 4 weeks. In accordance with ethical standards, students completed an informed consent online prior to participating in the survey and following the survey were provided relevant treatment contact information in case they desired services. This research, including the online consenting process, was approved by the university's Internal Review Board.

STATISTICAL ANALYSES

Following preliminary analyses to check for differences due to age, gender, and race, and descriptive analyses examining clinical cutoffs, a series of five multivariate analyses of variance (MANOVAs) were conducted using Wilks' Lambda to examine the differences between displaced and nondisplaced students. A Bonferroni correction was applied to the alpha level of these omnibus tests (i.e., alpha was set to $p = .01$). These MANOVAs corresponded to examinations of the DASS scale scores (i.e., Depression, Anxiety, Stress), the IES-R scale scores (i.e., Avoidance, Intrusion, Hyperarousal), the TESS Occurrence and Distress scale scores, the five TESS Occurrence subscale scores (i.e., Concern for Others, Resource Loss, Damage to Home, Personal Harm, Exposure to the Grotesque), and the five TESS Distress subscale scores (i.e., Concern for Others, Resource Loss, Damage to Home, Personal Harm, Exposure to the Grotesque). Subsequent univariate analyses were conducted and interpreted as appropriate. A single analysis of variance (ANOVA) was also conducted on the IES-R total score. Effect sizes (Cohen's d) with confidence intervals (95%) were calculated for the univariate comparisons. Finally, in order to extend the findings from previous studies and investigate the associations between displacement, trauma exposure, and symptoms of psychopathology, trauma Occurrence and Distress scores from the TESS were examined as potential mediators of PTSD (i.e., IES-R total score) and other psychopathological (i.e., DASS scales) symptoms according to procedures described by Baron and Kenny (1986), Holmbeck (1997), and others (MacKinnon, Lockwood, Hoffman, West, & Sheets, 2002; Shrout & Bolger, 2002). Historically, mediation has been conducted based on the procedures outlined by Baron and Kenny (1986). With such an approach, a series of regression analyses are conducted examining the effect of the independent variable on the dependent variable (i.e., path c), the effect of the independent variable on a proposed mediator (path a), the effect of the mediator on the dependent variable (path b), and finally the effect of the independent variable on the dependent variable while controlling for the mediator (path c'). Mediation is indicated when the initial analyses are significant and the final step results in the effect of the independent variable being reduced to zero (i.e., full mediation) or significantly reduced (i.e., partial mediation). In addition, tests to measure the indirect effect or significance of the mediation have been recommended to determine if the indirect effect is significantly different from zero (i.e., Sobel test) or does not contain zero in a 95% confidence interval based on repeated, random resamplings of the data (i.e., bootstrapping) (for reviews see MacKinnon et al., 2002, and Shrout & Bolger, 2002). Further, per MacKinnon, Fairchild, and Fritz (2007), "if the c' coefficient is statistically significant and there is significant mediation, then there is evidence for partial mediation" as opposed to full mediation (p. 602). Results were analyzed using SPSS version 17 and

mediation analyses (including Sobel tests and bootstrapping) were conducted using the SPSS syntax appended to Preacher and Hayes (2004) to examine the indirect effects.

Results

DEMOGRAPHIC CHARACTERISTICS

Preliminary analyses revealed no significant associations between outcome variables and race, gender, or age (see Table 1; note – given previous gender differences in the literature, interactions with gender were also explored however all p 's were $>.22$). Additionally, no significant differences were observed between groups for income, marital status, or academic year at the university (i.e., freshman, sophomore, junior, senior, and graduate student or other student status). Further examination of Table 1 indicated a modest student income ($M = \$10,023$), a predominantly single life-style, and a near equivalent distribution of students across year classifications.

EFFECTS OF DISPLACEMENT ON PSYCHOLOGICAL FUNCTIONING

Means and standard deviations for the two groups (i.e., displaced and nondisplaced) are presented in Table 2, as well as the results of the univariate comparisons and subsequent effect sizes with 95% confidence intervals. Utilizing the cutoffs for the IES-R (cf. Creamer, Bell, & Failla, 2003; clinical cutoff of 1.5 on the total score) and the DASS (cf. Crawford & Henry, 2003; 0 to 78th percentile – normal, 78th to 87th – mild, 87th to 95th – moderate, 95th to 98th – severe, 98th and above – extremely severe), 20.59% of the displaced students met the clinical cutoff on the IES-R (14.71% in the nondisplaced), 29.41% had moderate to extremely severe depression (16.18% nondisplaced), 23.53% had moderate to extremely severe anxiety (23.53% nondisplaced), and 30.88% had moderate to extremely severe stress (20.59% nondisplaced).

The first MANOVA examined the effects of displacement on students using indicators of anxiety, depression, and stress (i.e., DASS). The resulting omnibus effect was significant: Wilks' Λ , $F(3, 132) = 4.99$, $p < 0.01$. Subsequent ANOVAs on the three DASS scales indicated that displaced students, although not differing from nondisplaced students in broad anxiety or stress, reported significantly higher levels of depression (see Table 2). The second MANOVA examined the effects of displacement on PTSD symptomatology through the IES-R subscale scores. This multivariate effect was not significant given the Bonferroni correction (i.e., $p < 0.01$) and, as a result, subsequent univariates were not interpreted: Wilks' Λ , $F(3, 132) = 2.67$, $p = 0.05$. An ANOVA on the IES-R total score was significant, however, with displaced students reporting significantly more symptoms.

TRAUMA EXPOSURE AND DISTRESS BY LOCATION

The third MANOVA examined displaced and nondisplaced students on broad scales of their exposure to and subsequent distress from the hurricane (i.e., TESS scale scores for occurrence and distress). The resulting MANOVA was significant: Wilks' Λ , $F(2, 133) = 28.69$, $p < 0.01$. Examination of the univariate analyses, presented in Table 2, indicated displaced students reported both significantly more traumatic exposure and significantly more distress from that exposure. The fourth MANOVA further differentiated the type of exposure experienced between displaced and nondisplaced students by examining the Occurrence subscales of the TESS. The significant multivariate effect, Wilks' Λ , $F(5, 130) = 23.92$, $p < 0.01$, was followed by univariate tests presented in Table 2. Results indicated displaced students experienced significantly more trauma as measured by the Resource Loss and Damage to Home subscales. The final MANOVA examined subsequent distress associated with trauma exposure (i.e., the TESS Distress subscales); a significant effect was observed—Wilks' Λ , $F(5, 130) = 17.03$, $p < 0.01$. Results indicated displaced

students experienced significantly more distress related to their trauma exposure as measured by the Concern for Others, Resource Loss, and Damage to Home subscales.

In sum, displaced students experienced significantly more traumatic exposure than nondisplaced students, primarily as it related to the loss of tangible possessions, shelter, and finances. Understandably, displaced students also reported more distress overall and from these tangible losses, but also had significantly more concern about the whereabouts and status of loved ones. Of interest is whether the significantly increased exposure and distress contributed to psychopathology as hypothesized. This series of analyses follows.

TRAUMA OCCURRENCE AND DISTRESS AS MEDIATORS OF PSYCHOPATHOLOGY

To examine exposure to traumatic events (i.e., TESS Occurrence) and subsequent distress (i.e., TESS Distress) as potential mediators of the increased levels of depression (i.e., DASS Depression scale) and PTSD (i.e., IES-R total) reported in this study for the displaced students, four mediational analyses were undertaken (see Table 3). For each of these analyses, three analytic approaches were conducted (i.e., Baron and Kenny, Sobel test, and bootstrapping). The results of all mediation tests indicated traumatic exposure and distress fully mediated the associations between displacement and depression and displacement and PTSD. Using the Baron and Kenny steps (presented in the corresponding portions of Table 3), traumatic exposure (i.e., TESS Occurrence) was found to mediate the relationship between displacement and depression (i.e., DASS Depression scale; Table 3), distress from traumatic exposure (i.e., TESS Distress) was found to mediate the relationship between displacement and depression (i.e., DASS Depression scale; Table 3), traumatic exposure (i.e., TESS Occurrence) was found to mediate the relationship between displacement and PTSD symptoms (i.e., IES-R Total; Table 3), and distress from traumatic exposure (i.e., TESS Distress) was found to mediate the relationship between displacement and PTSD symptoms (i.e., IES-R Total; Table 3). The results of all four Sobel tests were significant (p 's all < 0.05) indicating the indirect effects were significantly different from zero, and the results of bootstrapping indicated zero was not contained in any of the four 95% confidence intervals constructed based on 1,000 re-samples for each analysis (see Table 3). As a result, the indirect effect is significantly different from zero in each instance and, when all analyses are considered, evidence for full mediation is supported.

Discussion

This study examined the effects of Hurricane Katrina on a sample of displaced and nondisplaced students 3 months after their initial Hurricane exposure. Results from the analyses examining the effects of displacement on psychological functioning indicated displaced students reported significantly more symptoms of depression and PTSD than their nondisplaced counterparts, who were matched on a number of participant characteristics. Although these findings are disconcerting, they help to clarify the extant literature. In this study, students at affected universities in New Orleans were displaced, directly exposed to Hurricane Katrina, and then reintegrated into a university setting (LSU, Baton Rouge) approximately 80 miles distance from New Orleans. Recommendations for similar types of routine reestablishment have been the clarion call in the trauma literature (e.g., Sattler et al., 2002). Unfortunately, the present study reveals that even this ideal reestablishment of routine is not protective for this young adult sample given the effects of exposure and subsequent distress, as displaced students still displayed more psychopathological symptoms than their nondisplaced peers.

Not surprisingly, displacement was tied to increased levels of traumatic exposure and subsequent distress from that exposure. These results are consistent with the literature suggesting the severity of traumatic exposure affects subsequent adjustment to trauma.

Similarly, results from the current survey replicated findings suggesting the most prevalent stressors following Katrina were related to housing and property (cf. Galea et al., 2007). Of interest, however, was that mediational relationships fully accounted for the depressive and traumatic symptoms observed. Mediation models indicated that both trauma exposure and the subsequent distress from the traumatic exposure significantly and fully mediated the effects of displacement on indices of psychopathology. These findings point to the powerful effects of merely being exposed to a traumatic event and to the varying outcomes which result from such experiences (e.g., symptoms of PTSD, depression, etc.).

Even so, the mean levels of psychopathology observed, although significantly higher than nondisplaced students, were not in the clinical range. Compared to clinical recommendations on the instruments utilized, displaced students were on average in the mild range for their depressive symptoms (cf. Crawford & Henry, 2003; displaced participants' mean score fell between the 79th and 81st percentiles) and their mean total score on the IES-R failed to meet the recommended clinical cutoff of 1.5 (Creamer et al., 2003; observed mean total for displaced students was 0.9). However, both groups of students reported elevated anxiety and stress, with scores between the 60th and 77th percentiles. In this regard, variance between two so closely exposed groups may have been restricted, preventing significant findings. Overall, however, the findings are more indicative of elevated but nonclinical symptoms in most individuals, though not all (i.e., roughly 20–30% of displaced individuals did meet cutoffs). Additionally, the proximity of both the displaced and nondisplaced participants to the hurricane's landfall in all likelihood also contributed to some of the elevations seen in the nondisplaced group's rates of anxiety and stress, leading to a lack of significant differences between the groups.

The limitations of the current study are important to consider. First, the survey was based entirely on self-report measures. Although the exclusive use of self-report is a limitation, it is not uncommon in the trauma literature and every effort was made to carefully select and utilize questionnaires whose psychometric properties have been examined, previously reported in the literature, and shown to be acceptable as opposed to writing questions and questionnaires whose properties would be unknown. Second, even though the data reported were some of the earliest Hurricane Katrina data collected in the current literature (e.g., Galea et al., 2007; Kessler et al., 2008; Kessler et al., 2006, began data collection approximately 2.5 months later; see Weems et al., 2007, for a report of data with a comparable timeline), the immediate turmoil and transition following the hurricane prevented the collection of data in the current study prior to 3 months after the hurricane. Third, the cross-sectional methodology in the current study does not rule out different competing causal interpretations of the mediation analyses (e.g., depression leading to more distress instead of distress leading to more depression). Fourth, although the LSU comparison group is not an ideal control group for the effects of displacement, it does provide an interesting point of comparison in lieu of an ideal comparison group (i.e., students remaining in New Orleans and attending classes during the immediate aftermath). That is, New Orleans area universities were not open or capable of serving students at the time of this survey. For example, the University of New Orleans reported it was the first university to "reopen" but was still holding some classes in "a tent or other makeshift facility" 5 months later in January 2006 (University of New Orleans, n.d.). Nonetheless, a strength of this study was the brief period of time between Katrina and the data collection. Similarly, the representativeness of the sample should be considered. Given the turmoil following Katrina and the high turnover in enrollment experienced, exact figures are difficult to discern; however, participation rates of displaced students in the current survey varied from 3%, if all 2,387 displaced students were still at LSU at the time of the survey, to 30%, if at the time of the survey the possible sample of displaced students was limited to the 227 students who returned in the spring. Thus, it is difficult to determine how representative

these findings would be of other hurricane displaced students and especially other students displaced by other types of natural disasters. A final limitation is that the current study does not speak to the longer term effects of Katrina. Even so, the current study is the first to examine mediators of psychopathology resulting from Hurricane Katrina and to examine the impact the hurricane had on displaced college students.

The implications of this study for future research should include a focus on this largely understudied population. In addition, universities should consider specific training for counselors, faculty, and other employees who live and work in areas with a high probability for natural disasters, like the Gulf Coast. Plans should be considered in advance for the possible displacement and housing of students and better avenues for the dissemination of information should be explored. Finally, given the traumatic exposure and subsequent distress in this sample largely focused on the loss of resources, housing damage, and concern for loved ones, these areas should be ones considered for pre- and post-disaster planning, prevention, and intervention at all levels before disasters strike (i.e., by students, families, universities, and governmental agencies alike).

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Table 1

Demographic characteristics of displaced and non-displaced students

Characteristic	Group		
	Displaced	Non-Displaced	Total
Age (<i>M/SD</i>)	21.0 (4.6)	20.6 (3.2)	20.8 (3.9)
Annual Income (<i>M</i>)	\$10,889	\$9,157	\$10,023
Year Classification (%)			
Freshman	30.9	22.1	26.5
Sophomore	16.2	26.5	21.3
Junior	25.0	22.1	23.5
Senior	26.5	27.9	27.2
Graduate/Other Student	1.5	1.5	1.5

Table 2

Psychopathology and trauma exposure of displaced and non-displaced students

Instrument/Scale/Subscale	Group		Results of Univariate Analyses		
	Group		F	p-value	d (95% CI)
	Displaced (m/sd)	Non-Displaced (m/sd)			
	N=68				
DASS – Depression Scale ⁺ (range 0–42)	9.62 (9.69)	6.01 (7.69)	5.77 *	0.02	0.41 sm (0.07, 0.75)
DASS – Anxiety Scale ⁺ (range 0–42)	5.24 (7.99)	5.16 (7.04)	<0.01	0.96	0.01 (–0.33, 0.35)
DASS – Stress Scale ⁺ (range 0–42)	12.28 (11.51)	9.35 (9.33)	2.65	0.11	0.28 sm (–0.06, 0.62)
IES-R – Total Score ^m (range 0–4)	0.90 (0.83)	0.53 (0.69)	7.79 **	<0.01	0.48 sm (0.14, 0.82)
IES-R – Avoidance Scale ^m (range 0–4)	0.95 (0.91)	0.55 (0.75)	7.65 **	<0.01 ⁱⁿⁱ	0.47 sm (0.13, 0.81)
IES-R – Intrusion Scale ^m (range 0–4)	0.94 (0.90)	0.58 (0.78)	6.24 **	0.01 ⁱⁿⁱ	0.43 sm (0.09, 0.77)
IES-R – Hyperarousal Scale ^m (range 0–4)	0.77 (0.88)	0.44 (0.68)	6.24 **	0.01 ⁱⁿⁱ	0.43 sm (0.09, 0.77)
TESS – Occurrence Scale ⁺ (range 0–24)	6.37 (3.30)	2.10 (3.43)	54.58 ***	<0.01	1.27 ^{lg} (0.89, 1.63)
Concern for Others ⁺ (range 0–6)	0.62 (0.83)	0.40 (0.90)	2.21	0.14	0.25 sm (–0.08, 0.59)
Resource Loss ⁺ (range 0–6)	3.68 (1.71)	1.03 (1.30)	102.71 ***	<0.01	1.74 ^{lg} (1.33, 2.12)
Damage to Home ⁺ (range 0–3)	1.72 (1.18)	0.43 (0.95)	49.44 ***	<0.01	1.21 ^{lg} (0.83, 1.56)
Personal Harm ⁺ (range 0–5)	0.12 (0.32)	0.09 (0.51)	0.16	0.69	0.07 (–0.27, 0.40)
Exposure/Grotesque ⁺ (range 0–4)	0.24 (0.60)	0.16 (0.64)	0.48	0.49	0.12 (–0.22, 0.45)
TESS – Distress Scale ⁺ (range 0–120)	21.84 (14.72)	6.22 (9.66)	53.47 ***	<0.01	1.25 ^{lg} (0.88, 1.61)
Concern for Others ⁺ (range 0–30)	2.24 (3.14)	1.09 (2.11)	6.25 **	0.01	0.43 sm (0.09, 0.77)
Resource Loss ⁺ (range 0–30)	12.03 (7.50)	2.99 (4.46)	73.09 ***	<0.01	1.47 ^{lg} (1.08, 1.84)
Damage to Home ⁺ (range 0–15)	6.32 (5.45)	1.44 (3.51)	38.60 ***	<0.01	1.07 ^{lg} (0.70, 1.42)
Personal Harm ⁺ (range 0–25)	0.47 (1.33)	0.24 (1.31)	1.08	0.30	0.18 (–0.16, 0.51)
Exposure/Grotesque ⁺ (range 0–20)	0.78 (2.11)	0.47 (1.97)	0.78	0.38	0.15 (–0.19, 0.49)

Note. Exposure/Grotesque=Exposure to the Grotesque subscale;

* <0.05,

** <0.01,

<0.001;

dn_i=do not interpret as the overall corrected omnibus multivariate effect was not significant; sm=small effect size, md=medium effect size, lg=large effect size. Effect size descriptors based on recommendations by Cohen (1992; i.e., $d=0.20$, 0.50 , and 0.80 respectively). + =items are summed, m =items are averaged.

Table 3

Mediation Analyses Results

	Baron and Kenny Steps				Sobel Indirect Effect				Bootstrap Indirect Effect			
	Path	Coef.	SE	t	p	Value	SE	95%CI	p	M	SE	95%CI
DIS → DEP TESS-O	c	-3.60	1.50	-2.40	0.02	-2.03	0.99	-3.98, -0.09	0.04	-2.10	1.23	-4.94, -0.19
	a	-4.26	0.58	-7.39	<0.01							
	b	0.48	0.22	2.15	0.03							
	c'	-1.57	1.76	-0.89	0.37							
DIS → DEP TESS-D	Path	Coef.	SE	t	p	Value	SE	95%CI	p	M	SE	95%CI
	c	-3.60	1.50	-2.40	0.02	-3.41	1.02	-5.42, -1.40	<0.01	-3.40	1.26	-6.19, -1.13
	a	-15.62	2.14	-7.31	<0.01							
	b	0.22	0.06	3.77	<0.01							
	c''	-0.2	1.69	-0.12	0.91							
DIS → PTSD TESS-O	Path	Coef.	SE	t	p	Value	SE	95%CI	p	M	SE	95%CI
	c	-0.37	0.13	-2.79	<0.01	-0.28	0.09	-0.46, -0.11	<0.01	-0.33	0.17	-0.66, -0.06
	a	-4.26	0.58	-7.39	<0.01							
	b	0.07	0.02	3.52	<0.01							
	c'	-0.08	0.15	-0.55	0.58							
DIS → PTSD TESS-D	Path	Coef.	SE	t	p	Value	SE	95%CI	p	M	SE	95%CI
	c	-0.43	0.13	-2.79	<0.01	-0.43	0.10	-0.62, -0.24	<0.01	-0.43	0.12	-0.70, -0.20
	a	-15.62	2.14	-7.31	<0.01							
	b	0.03	0.01	5.75	<0.01							
	c'	0.06	0.14	0.44	0.66							

Note. DIS=Displacement Status, DEP=Depression, PTSD=Post-Traumatic Stress Disorder, TESS-O=Traumatic Exposure Severity Scale – Occurrence Subscale, TESS-D=Traumatic Exposure Severity Scale – Distress Subscale, Coef=Coefficient.