ATTACHMENT, SOCIAL SUPPORT, AND SOMATIZATION

AFTER A NATURAL DISASTER

by

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ABSTRACT

Following large-scale disasters, there is a well-documented increase in medically unexplained symptoms in survivors. This increase in somatization appears to be related to an individual's attachment style, social support, and degree of exposure to the disaster. However, few studies are able to longitudinally analyze such relationships because disasters are difficult to predict and sufficient data are rarely available from immediately before the disaster to allow researchers to assess the effects of pre-trauma psychological variables on reactions to the trauma. The present study investigates the effects of the April 27, 2011 tornado of Tuscaloosa, Alabama, using data collected from screening measures administered to University of Alabama Psychology subject pool participants 2 weeks to 8 months prior to the tornado, as well as follow-up measures collected approximately 6 to 8 months after the tornado. Multiple regression analyses and structural equation modeling were conducted to assess the effects of attachment style, social support, and degree of exposure to the disaster on changes in somatization following the tornado. Two analyses were conducted, one using pre-tornado attachment and one using post-tornado attachment. In both of these analyses, high disaster exposure and low social support significantly predicted increased somatization. Post-tornado insecure anxious attachment predicted increased somatization, and this effect was most pronounced in participants with high levels of storm exposures. However, these effects were not found for pre-tornado insecure anxious attachment. For both the pre-and post-tornado attachment models, all simple and moderated effects of attachment on increasing somatization were mediated by poor social support. While these results

confirm the importance of disaster exposure and social support in predicting symptom change, the inconsistency between the prospective and cross-sectional findings related to attachment cast doubt on a straightforward view that insecure attachment is a risk factor for somatization.

LIST OF ABBREVIATIONS AND SYMBOLS

a	Cronbach's index of internal consistency
M	Mean: the sum of a set of measurements divided by the number of measurements in the set
SD	Standard deviation: a measure of variation from the mean value within a set
p	Probability associated with the occurrence under the null hypothesis of a value as extreme as or more extreme than the observed value
r	Pearson product-moment correlation
t	Computed value of *t* test
<	Less than
=	Equal to
Att.	Attachment
Anx.	Anxious
Av.	Avoidant
SS	Social support
DE	Disaster exposure
Int.	Interaction term

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Introduction

Somatization, the occurrence of physical symptoms without medically identifiable causes (North, 2002), has been estimated to occur with a prevalence of 20% to 30% in primary care in the general population, although estimates as high as 60% have been made (Swanson, Hamilton, & Feldman, 2010). Somatization is most often operationalized as medically unexplained symptoms, and the two terms are often used interchangeably. Medically unexplained symptoms (MUS) are a key part of the Somatoform Disorder diagnoses in the *DSM-IV-TR*, including Somatization Disorder, Undifferentiated Somatoform Disorder, Conversion Disorder, Pain Disorder, Hypochondriasis, and Somatoform Disorder Not Otherwise Specified (4th ed., text rev.; DSM–IV–TR; American Psychiatric Association, 2000). Although these disorders have varying criteria for diagnosis, all share MUS as a core criterion. Increases in MUS have been observed following exposure to traumatic events, such as large-scale disasters (van den Berg, Grievink, Yzermans, & Lebret, 2005). Degree of exposure to the disaster appears to be related to changes in somatization (van den Berg et al., 2005), and this relationship may be moderated by risk factors, such as insecure attachment style (Mikulincer, Florian, & Weller, 1993) and protective factors, such as perceived social support (Lowe, Chan, & Rhodes, 2010).

The purpose of the present study is to analyze changes in reported MUS following the April 27, 2011 tornado in Tuscaloosa, AL. Potential risk and protective factors, including degree of storm exposure, social support, and attachment style, were analyzed in relation to these changes in MUS. Additionally, future waves of data collection will allow for the longitudinal study of individuals' responses to the disaster.

Disaster Exposure

Many studies have found an increase in psychological and physical problems following a wide variety of traumatic events. Medically unexplained symptoms have been found to be more common in disaster survivors than in individuals in the general population (van den Berg et al., 2005). Dirkzwager, Kerssens, and Yzermans (2006) found that stress reactions, somatic complaints, and psychological problems occurred significantly more in survivors of an explosion at a fireworks depot in Enschede, Netherlands, compared to control participants who were unaffected by the disaster. These increases persisted for up to two years after the disaster. A separate study on the same fireworks disaster similarly found higher rates of psychological and somatic problems in adult survivors who used mental health services in the year after the disaster (den Ouden, Dirkzwager, & Yzermans, 2005). Additionally, in another study on the same disaster, Soeteman et al. (2006) found that survivors without pre-disaster mental health problems significantly increased their utilization of general medical services following the disaster (Soeteman et al., 2006).

Elklit and Christiansen (2009) argue that unexplained medical complaints in trauma survivors may be similar, or related to, posttraumatic stress disorder (PTSD). A literature review by van den Berg et al. (2005) found female gender, high exposure to, and substantive physical damage from, a disaster, and symptoms of PTSD to consistently act as risk factors for medically unexplained symptoms. Victims of the Enschede disaster were found to be particularly at risk for PTSD and other psychological problems when they were forced to relocate due to serious damage to their homes, indicating that those who were most affected by the disaster were also at the greatest risk for increased psychological problems and somatization following it (Dirkzwager et al., 2006). Similarly, a study on a separate fireworks factory disaster in Kolding, Denmark found that survivors experienced significantly increased rates of diagnosable cases of PTSD, probable cases of PTSD, and general level of distress following the disaster (Elklit, 2007). These increases in PTSD and somatization following a large-scale disaster suggest stressful events as a risk factor for PTSD and somatization. It should be noted that the universal health care systems and the accessibility of national medical record databases in Denmark and the Netherlands allowed for particularly comprehensive recruitment in, and monitoring for, these disaster studies.

In a review of 57 studies on natural and man-made disasters, van den Berg et al. (2005) found that medically unexplained symptoms occurred significantly more often in disaster survivors than in controls immediately and in the years after the disaster. This finding was consistent across different types of disasters. A study on the Kolding fireworks disaster found negative affect and feelings of incompetence, which are often associated with exposure to trauma, to significantly predict somatization (Elklit & Christiansen, 2009). A longitudinal study on the Enschede fireworks disaster found that survivors frequently presented to general practitioners with medically unexplained symptoms (van den Berg et al., 2009) suggesting substantial health care costs due to the disaster. The average number of medically unexplained symptoms was significantly higher in the first and second years following the disaster compared to the year before the disaster, although this increase was not clinically significant (van den Berg et al., 2009). Additionally, comorbid psychological problems and low socioeconomic status were found to be risk factors for medically unexplained symptoms, with comorbid psychological problems appearing to act most consistently as risk factors for medically unexplained symptoms among survivors (van den Berg et al., 2009). Although these studies all seem to indicate an increase in somatization in survivors of traumatic events, such as natural disasters, the nature of this relationship is still unclear, as are risk and protective factors related to reporting MUS.

Attachment Style

While the increase in medically unexplained symptoms following traumatic events is relatively well-established, there is less evidence related to the causal mechanisms that account for this relationship. However, there is evidence that variation in individuals' development of somatization may be predicted by attachment style. The four-category model of attachment style first proposed by Bartholomew and Horowitz (1991) describes attachment style as being composed of stable approaches to interpersonal interactions that are shaped by one's childhood relationships with caregivers. This model proposes a *secure* attachment style, characterized by comfort in depending on others, and three insecure attachment styles (Bartholomew & Horowitz, 1991). These insecure attachment styles are *dismissing attachment*, characterized by a desire to remain self-sufficient and independent of others, *preoccupied attachment*, characterized by an expectation that others will not always provide support and attempts to elicit support from others, and *fearful attachment*, characterized by fear of rejection and behaviors alternating between approach and avoidance (Waldinger, Schulz, Barsky, & Ahern, 2006).

Several studies present evidence that insecure attachment may act as a risk factor for somatization. Waldinger et al. (2006) found that attachment styles mediate associations between childhood trauma and somatization in adulthood. Childhood trauma is a stressful event similar to large-scale disasters, in that both cause high amounts of stress and are often unpredictable. This study found associations between the three insecure attachment styles and somatization, noting that women with fearful and preoccupied attachment styles had experienced significantly more childhood trauma, whereas women with secure attachment styles had experienced significantly less childhood trauma (Waldinger et al., 2006). Men with fearful attachment were also found to have experienced significantly more childhood trauma (Waldinger et al., 2006). Similarly, Wayment and Vierthaler (2002) found that, after the death of a loved one, another type of highly stressful and traumatic event, individuals with avoidant attachment style were more likely to experience somatization.

In a study on psychological distress in Israeli students two weeks after the Gulf War, Mikulincer et al. (1993) investigated three attachment styles developed by Ainsworth, Blehar, Waters, and Wall (1978): *secure*, *anxious-avoidant*, and *anxious-ambivalent*, which are comparable to the attachment styles of Bartholomew and Horowitz. This study found that individuals with anxious-ambivalent and anxious-avoidant attachment styles reported significantly higher somatization than those with secure attachment styles (Mikulincer et al., 1993). Participants residing in the area most affected by missile attacks also reported more somatization. Additionally, the study found that this relationship between disaster exposure and subsequent somatization was strongest in individuals with insecure attachment styles, suggesting an interaction. Together, these findings suggest that insecure attachment style and exposure to traumatic events each increase the risk for somatization. Stressful situations appear to increase an individual's risk for somatization, particularly in individuals with insecure attachment, who may already be more likely to develop or report MUS. As suggested by Mikulincer et al. (1993), this interaction between attachment style and being exposed to traumatic events appears to be important for understanding the development of somatization in individuals exposed to disasters, and disaster exposure appears likely to moderate the effects of attachment style on medically unexplained symptoms.

Social Support

Social support, which consists of connections to others, access to resources available from individuals and groups, and validation from one's interpersonal network (Bates & Toro, 1999), may be related to general functioning and coping in times of extreme stress. Social support consists of emotional, psychological, and material support from others and may affect an individual's psychological functioning following traumatic life events. In a study of college students, Moreira et al. (2002) found that lack of social support was a significant predictor of psychological distress. However, the effect of social support was partially accounted for by attachment style, indicating that social support, too, is somehow related to attachment style. Social support may also protect against psychological distress following natural disasters. In a study on psychological distress among survivors of Hurricane Katrina, Lowe, et al. (2010) found that higher perceived social support following the hurricane predicted lower post-disaster psychological distress.

There is also evidence that social support is related to somatization. In a sample of individuals diagnosed with irritable bowel syndrome (IBS), a functional somatic illness, the presence of social support was correlated with lower IBS symptom severity and less severe pain (Lackner et al., 2010). O'Connor and Elklit (2008) found that insecure attachment, and fearful attachment in particular, were significantly associated with low social support and high somatization in Danish college students. In a study on grief reactions following the death of a companion animal, King and Werner (2011) found that insecure attachment was positively correlated with grief, depressed affect, anxious affect, and somatic complaints, while the presence of social support was negatively correlated with these variables. These studies point to a relationship between social support, attachment style, and psychological outcomes, including somatization. Specifically, insecure attachment appears to be related to more MUS and lower social support. Following exposure to traumatic event or events, such as a natural disaster, individuals with insecure attachment styles, who typically experience less social support, appear to be particularly at risk for developing MUS. In this way, social support appears likely to mediate the effects of disaster exposure and attachment style on medically unexplained symptoms.

Limitations of the Existing Literature

The existing literature on risk and protective factors for the development of somatization has a number of limitations. Perhaps the greatest of these limitations is the general lack of longitudinal studies and data from prospective measures. Longitudinal designs in disaster studies are rare, as it is uncommon to have participant data on relevant psychological measures collected prior to the disaster. While MUS appear to be increased in survivors of traumatic events, the rarity of longitudinal studies on trauma and somatization makes it difficult to verify that these increases actually take place following the traumatic event. Furthermore, although many studies analyze the relationship between somatization and one of the variables discussed above (i.e., disaster exposure, attachment style, or social support), all of these variables have not been measured in a single study, to the best of the researcher's knowledge. Additionally, trauma definitions often vary wildly between studies. In many disaster studies, for example, exposure to the disaster is often treated as a dichotomous categorical variable, with no regard for differing levels of exposure, which renders it impossible to observe differences in somatization along a continuous gradient of exposure to a disaster. Prospective studies often look at multiple types of traumatic events and often lump participants experiencing any one traumatic event into a general traumatized group, and these are rarely verified independently of subjects' self-reports.

These limitations make it difficult to identify how risk and protective factors affect the development of somatization following traumatic events.

The Present Study

The purpose of the present study is to capitalize on a rare sequence of events. On April 27th, 2011, a large and exceptionally destructive EF-4 tornado passed through Tuscaloosa, AL (National Weather Service, 2011), differentially affecting the approximately 900 participants in this study. The University of Alabama suspended its operations following the tornado, canceling final exams and postponing commencement. Participants had completed a variety of screening measures as part of the University of Alabama psychology subject pool between 8 months and 2 weeks before the tornado. Following the tornado, funding from the National Science Foundation allowed for these screening measures to be re-administered along with several additional measures. This chain of events created the possibility for a rare longitudinal study of psychological adjustment in disaster survivors using truly prospective measures.

The present study used a longitudinal correlational design to determine if rates of somatization and reporting of medically unexplained symptoms increased in students of the University of Alabama in the first 6 to 8 months following the tornado. The present study first attempted to replicate the findings of the existing literature with prospectively measured variables, and subsequently tested different models explaining the underlying relationships between these variables. Regression and structural equation modeling were used to determine if differences in social support, attachment style, and disaster exposure can account for changes in somatization. Beyond attempting to replicate each of the individual associations between increased somatization and greater storm exposure, lower social support, and insecure attachment style from earlier studies, multiple regression analyses and structural equation modeling were used to uniquely determine the interaction between all of these variables. Several unique measures of disaster exposure were used to investigate the relationship between storm exposure and changes in somatization, with insecure attachment and low social support acting as risk factors.

The longitudinal design of this study provides evidence for causal mechanisms explaining the relationship between trauma and somatization and suggests avenues for future research. The design of this study provides unique insights on how changes in somatization are related to degree of exposure to the disaster, which has only rarely been assessed in the existing literature. Through multiple regression and structural equation modeling, this study also makes much-needed contributions to the literature by investigating the interplay between attachment style, social support, and somatization in highly stressful situations. Based on the literature, current theories,/ and similar studies, I hypothesized:

1) Anxious attachment will be associated with greater post-disaster increases in somatization
2) The effect of insecure attachment on increased somatization will be more apparent in participants who were more exposed to the tornado, compared to individuals who were less exposed to the disaster
3) Insecure attachment and the predicted interaction effect with exposure to the tornado will operate through lower social support to result in greater somatization

Based on these hypotheses, I propose a mediated moderation model (see Figure 1).

Method

Participants

Participants were drawn from the University of Alabama undergraduate Psychology subject pool. A subset (N = 900) of these students were given a variety of screening measures 2 weeks to 8 months prior to the tornado. There are approximately 699 participants from the screening who provided usable data. Although participants' identities are kept confidential, participants were assigned a unique code number in order to match participants' responses across measures. The participants are an average of 19 years old and 63% are female. These participants were recruited to participate in the Silver Lining project conducted by Dr. James Hamilton of the University of Alabama. Approximately 6 months after the tornado, all students who completed the screening measures were invited via email to participate in the Silver Lining Study and were offered $40 compensation. Of the 699 possible participants, 440 elected to participate in the study, and 398 of these 440 participants provided useable data. The measures relevant to the present study administered during the initial and subsequent waves of data collection can be found in Table 1.

Measures

Attachment style was assessed by the Experiences in Close Relationships-Revised questionnaire (ECR-R) (Fraley, Waller, & Brennan, 2000), which has been found to be a highly reliable and valid measure of attachment style, providing a very stable indicator of attachment and explaining up to 85% of shared variance in attachment-related emotions in interactions withromantic and non-romantic others (Sibley, Fischer, & Liu, 2005). The ECR-R is a 36 item self-report questionnaire that is rated on a 7-point scale, where 1 = strongly disagree and 7 = strongly agree (Fraley et al., 2000). The ECR-R is composed of two subscales, the attachment-related avoidance scale and the attachment-related anxiety scale (Fraley et al., 2000). These scales were used to operationalize insecure attachment for data analysis. The ECR-R has been found to explain 30% to 40% of the inter-individual variation in social interactions via diary ratings of emotions related to attachment style experienced during interactions with a romantic partner, but explains only 5% to 15% of emotions related to attachment style experienced in interactions with non-romantic others, such as family and friends (Sibley et al., 2005). This discriminatory ability provides evidence for the validity of the ECR-R.

One measure of somatization in the present study is the Physical Health Questionnaire (PHQ-15) (Spitzer, Williams & Kroenke), which has been found to be valid and moderately reliable for assessing risk for somatoform disorders among primary care patients, indicating its utility in detecting somatization and symptoms likely to be medically unexplainable (van Ravesteijn et al., 2009). The PHQ-15 was constructed using *DSM-IV-TR* criteria for somatization disorder (4th ed., text rev.; DSM–IV–TR; American Psychiatric Association, 2000), making it particularly useful for identifying symptoms that are likely to lack a medical explanation. The PHQ-15 is a 15 item self-report questionnaire assessing for somatic symptoms found in somatization disorder and is rated on a 0 to 2 scale, with 0 meaning not bothered at all, 1 meaning bothered a little, and 2 meaning bothered a lot (Spitzer et al.). There are no subscales for the PHQ-15, and the overall score is an assessment of the severity of symptoms associated with somatization and somatoform disorders (Spitzer et al.). This score was used to determine a change in somatization following the tornado. Kroenke, Spitzer, and Williams (2002) found the internal reliability of the PHQ-15 to be adequate, with a Cronbach's α of .80. Additionally, Körber, Frieser, Steinbrecher, and Hiller (2011) found that the correlation between the PHQ-15 and medically explained symptoms was .63 in a sample of 308 German primary care patients, indicating that the PHQ-15 is a valid measure for detecting somatization and somatoform disorders.

The Screening for Somatoform Symptoms (SOMS) (Rief, Hiller, & Heuser, 1997) is another useful measure for determining somatization, as it specifically asks about medically unexplained symptoms. The SOMS is a 68 item self-report questionnaire assessing for symptoms associated with somatization and somatoform disorders, as well as the onset, duration, severity, and lack of a medical explanation for these symptoms (Rief et al., 1997). The SOMS has two subscales, a symptom count and a severity index, which were used in analyses to determine change in somatization following the tornado (Rief et al., 1997). The SOMS has been demonstrated to be a reliable and valid measure for determining treatment effects in patients with somatoform disorders, indicating that it is able to detect multiples levels of, and changes in, somatization, as expressed by numerous somatic complaints (Rief & Hiller, 2003). The SOMS is also able to discriminate between criteria for somatoform disorders, somatization disorder, and other disorders (Rief & Hiller, 2003).

The Interpersonal Support Evaluation List (ISEL) (Cohen, Mermelstein, Kamarck, & Hoberman, 1985) is a 40-item self-report measure of social support. The ISEL has four subscales, three of which were used for the present study. These three subscales measure the perceived availability of material aid, emotional support, and positive comparison of oneself to others (Cohen et al., 1985). The ISEL was found to be acceptably reliable in measuring social support in a sample of homeless and poor people, with r of .81 (Bates & Toro, 1999). In a sample of Greek college students, the ISEL was found to have excellent internal consistency, with Cronbach's α of .897, and acceptable test-retest reliability, ICC = .686 (Delistamati et al., 2006).

The Storm Experience Questionnaire (SEQ) is a measure developed specifically for this study. The SEQ includes subjective ratings of exposure to the tornado, in the form of ratings of the terror experienced before, during, and after the disaster, as well as more objective questions about exposure to the tornado. Knowledge of previous disaster studies and of this tornado was used to create 128 questions corresponding to different aspects of exposure to the storm. These additional questions capture individuals' social and physical experiences of the storm. Social questions determine whom the respondent was with before, during, and after the disaster, as well as questions asking how many friends and family members of the respondent were injured or killed in the disaster. Physical questions inquire about personal injury and damage to the dwellings and material possessions of the respondents. Global positioning data were collected to determine participants' locations when they first learned of the tornado and when the tornado was closest to them. Additional GPS data were collected to determine the location of participants' homes at the time of the tornado, the location of their place of employment, and where they slept the night of the tornado.

The SEQ's questions about physical exposure to the tornado comprise four subscales, each corresponding to different physical experiences during the storm. These four subscales include: a Personal Physical Exposure sum, with questions corresponding to an individual's physical experience of the storm (e.g., watching live video coverage of the storm, physically seeing or hearing the storm, experiencing increased wind speed, etc.); a Personal Harm sum, with questions corresponding to injury (or lack thereof) sustained by the respondent during the storm; an Exposure to Death/Injury sum, with questions corresponding to the respondent's experiences with injured, dead, or trapped victims of the storm; and a Property sum, with questions corresponding to damage to the respondent's personal property or disruptions in their utility services. These subscales are combined to create a sum for Overall Exposure, and questions for each of these subscales are weighted by the authors based on their severity, such that a higher SEQ score indicates more severe disaster exposure. The comprehensive scoring system for the SEQ was developed using discussions with research collaborators, specific knowledge of the Tuscaloosa tornado, and the existing literature on large-scale natural disasters. For example, some questions use the highest score for a given group of items, whereas other questions use a cumulative score, to best capture an individual's exposure to the disaster. For more information on the scoring of the SEQ, please see Appendix A.

Procedure

Participants were given a battery of screening measures prior to the tornado, including the ECR-R, PHQ-15, and SOMS. Approximately 6 to 8 months after the tornado, all students who completed the screening measures were invited via email to participate in the Silver Lining Study and were offered $40 compensation. Those who elected to participate were directed to a website where they were administered all measures completed prior to the tornado and additional measures, including the ISEL and SEQ. These follow-up measures took approximately one hour to complete.

Data Analysis

Power Analysis

Given the number of participants in the study, even a relatively small effect size should have been detected. With $\alpha = .05$ and $\beta = .80$, effects with an r^2 increase of .028 could be detected with the 398 participants and 3 predictors in this study, as determined by G*Power, a general power analysis program (Faul, Erdfelder, Lang, & Buchner, 2007). Tests of moderation and indirect effects were conducted with traditional and inferential significance testing, and relevant testing of indirect effects were recalculated using bootstrap methods.

Mechanisms and Conceptual Models

From the available literature on risk and resilience factors related to somatization, disaster exposure appears to emerge as a major risk factor for increased somatization, with those most heavily exposed appearing to be most at risk for somatization and other poor adjustment following the disaster (van den Berg et al., 2005). Additionally, attachment appears to contribute to this moderated relationship, such that those who are both highly exposed and insecurely attached experience the greatest somatization following the disaster (Mikulincer et al., 1993). However, attachment might affect this relationship in one of two ways; first, by acting through social support (O'Connor & Elklit, 2008), which appears to function as a buffer to negative psychological outcomes following traumatic events (Moreira et al., 2002). Alternatively, attachment might act indirectly on somatization by affecting *reports* of somatic symptoms or exposure to traumatic events.

Based on the available evidence, I have proposed a moderated mediator model (see Figure 1), such that the interaction between high disaster exposure and insecure attachment style will predict low social support. Furthermore, I hypothesized that low social support and the interaction between insecure attachment style and high disaster exposure would predict increased somatization. In this way, the proposed model is similar to a stress-diathesis model, in that insecure attachment acts as a general vulnerability for developing somatization that is triggered or exacerbated by stressful life events, such as traumatic events and low social support. Conceptually, insecure attachment may affect medically unexplained symptoms by reducing an individual's access to social support, leading to more negative effects from trauma; in this way, low social support would mediate the effects of insecure attachment and disaster exposure.

Main Analysis

Data were analyzed using linear multiple regression and structural equation modeling to determine relationships between attachment style, social support, disaster exposure and the resulting change in somatization from pre-tornado to post-tornado levels. First, individual zero-order correlations between high disaster exposure, low social support, insecure attachment, and increased somatization were investigated. Next, the extent to which changes in somatization (determined by using pre-tornado somatization as a covariate) are accounted for by disaster exposure, social support, and attachment style was assessed.

Moderation and mediation relationships were analyzed using the techniques discussed by Preacher, Rucker, and Hayes (2007) and Baron and Kenny (1986). First, moderation was assessed by determining if attachment style better explains the relationship between disaster exposure and somatization than by analyzing changes in somatization in light of disaster exposure alone or attachment style alone. When somatization is regressed on disaster exposure, attachment style, and the interaction between disaster exposure and attachment style, disaster exposure would be confirmed as a moderator if the relationship between somatization and the interaction between attachment style and disaster exposure remains significant when disaster exposure and attachment style are each individually controlled (Baron & Kenny, 1986). For the purpose of discriminant validity, the effects of both anxious and avoidant attachment on somatization were investigated. Avoidant attachment, which is typically considered to be characterized by self-sufficiency and independence from others, would be expected to have less of an effect on somatization, particularly when functioning through social support, whereas anxious attachment, which is typically considered to be characterized by behaviors alternating between approach and avoidance, would be expected to have both main effects on somatization and indirect effects through social support. Next, mediation was assessed by determining if social support helps explain the relationship between attachment and somatization at high levels of exposure. For social support to function as a mediator, attachment style and social support would each significantly correlated with somatization, and when these individual relationships with somatization are controlled, the previously significant relationship between attachment style and somatization would no longer be significant or would be greatly decreased in significance (Baron & Kenny, 1986). Finally, indirect effects were evaluated using bootstrapped standard errors from a full structural equation model using latent regression.

In all models tested, somatization was predicted using pre-tornado somatization as a covariate, so all effects reflect effects on changes in somatization. As suggested by the literature, the SOMS appears to have been a better assessment of somatization than the PHQ. Although the SOMS and the PHQ appear to have functioned in a similar manner, the effects were more clear when the SOMS was used, and, unless otherwise noted, the results reported after this point refer to models using the SOMS. Two different analyses were conducted, one using pre-tornado anxious attachment (the prospective analysis) and one using post-tornado anxious attachment (the cross-sectional analysis). The prospective analysis represents the hypothesized model using longitudinal data, whereas the cross-sectional analysis, which uses measures that were all collected at the same time following the tornado, is a replication of cross-sectional studies that have examined these relationships. Since most studies on somatization and natural disasters are cross-sectional, these analyses can be compared to investigate possible differences between longitudinal and cross-sectional studies on somatization. Structural equation modeling utilizing latent regression was used to test the fit of these two hypothesized models. Both of these analyses used the overall exposure measure of disaster exposure as a moderator.

Results

Preliminary Analyses and Descriptive Results

Storm Exposure. There was a great deal of variation across individuals in the nature and extent of their exposure to the storm and its consequences. Although a few individuals were severely affected, a significant minority was moderately affected, and most of the participants in this study were at least somewhat affected. For example, only 2% of participants touched a dead person, 6.3% saw, in-person, a dead person, 3.3% were forced to leave their damaged house or apartment, and 1.8% experienced major loss of, or damage to, their personal possessions. Approximately, 20-25% experienced moderate exposure: 29.6% experienced flying debris when the storm was closest, 19.5% were within a half-mile of the storm at its closest point, and 14.6% reported some degree of damage to their lodging. Notably, the vast majority (93%) of participants at least reported taking cover from the storm. and 89.4% experienced disruption to their utility services, such as running water, electrical power, telephone service, and television/internet connection. Thus, the sample reflects a wide range of varied storm experiences.

The SEQ's questions related to physical exposure were divided into categories based on their temporal relation to the storm, creating six conceptual categories: (a) tracking or experience of the storm thirty minutes before it hit, (b) tracking or experience of the storm at its closest point to the participant, (c) personal harm from the storm, (d) contact with injured or dead persons after the storm, (e) utility damage, and (f) property damage. Visual inspection of the distribution and frequency of item responses revealed few differences between participants' experiences 30 minutes before the tornado hit and their experiences when it was at its closest point to the participant, so these categories were collapsed. Frequencies of item responses were used to guide the creation of sums of exposure questions, and the conceptual groupings were collapsed into four subscales: Personal Physical Exposure, Personal Harm, Exposure to Death/Injury, and Property Damage. An Overall Exposure sum, which represents general physical exposure to the tornado, was also computed from the sum of these subscales. Additional information on the scoring of the SEQ can be found in Appendix A.

We conducted several descriptive analyses to understand the nature and extent of the participants' exposure to the storm. On the SEQ, participants had a mean Overall Exposure sum of 15.03, with a standard deviation of 6.06. The minimum possible score on the SEQ is 0, and the maximum possible score is 43.

Descriptive analyses were also conducted on the subscales that together comprise the Overall Exposure sum. On the Exposure to Death/Injury subscale, participants had a mean score of 1.72, with a standard deviation of 1.876. The minimum possible score on the Exposure to Death/Injury subscale is 0, and the maximum possible score is 7. On the Personal Harm subscale, participants had a mean score of .05, with a standard deviation of .306. The minimum possible score on the Personal Harm subscale is 0, and the maximum possible score is 7. On the Personal Physical Exposure subscale, the mean score was 6.27, with a standard deviation of 3.014. The minimum possible score on the Personal Physical Exposure subscale is 0, and the maximum possible score is 12. On the Property Damage subscale, the mean score was 7, with a standard deviation of 3.376. The minimum possible score on the Property Damage subscale is 0, and the maximum possible score is 17. For example narratives of exposure for individuals at approximately the mean level of exposure, as well as approximately one standard deviation above and below the mean, for each of the SEQ subscales, please see Tables 4, 5, 6, and 7.

Attachment. Confirmatory factor analyses were conducted on the Wave 1 and Wave 2 ECR-R data to determine if the latent variable structure of the ECR-R for our sample replicated that of published studies. To maximize model fit in these analyses, several indicator residuals were correlated with those of other indicators for the same type of insecure attachment. These decisions were based on Mplus' modification indices for each confirmatory factor analysis. For Wave 1, the chi-square test of model fit was significant, chi-square value = 1786.85(571), $p < .01$, indicating poor fit. However, other measures of model fit suggest acceptable fit. There was a comparative fit index (CFI) of .93, and the root mean square error of approximation (RMSEA) was .07. These results suggest that the factor structure for the ECR-R is an acceptable fit for the data collected from this sample during Wave 1. For Wave 2, the chi-square test of model fit was significant, chi-square value = 1933.08(540), $p < .01$, indicating poor fit. However, other measures of model fit suggest acceptable fit. There was a CFI of .94, and the RMSEA was .08. These results suggest that the factor structure for the ECR-R is an acceptable to mediocre fit for the data collected from this sample during Wave 2. Standardized factor actor loadings for Wave 1 anxious and avoidant attachment can be found in Tables 9 and 10, respectively. Standardized factor loadings for Wave 2 anxious and avoidant attachment can be found in Tables 11 and 12, respectively. Next, latent variables were created for structural equation modeling. Three indicator variables were created for each of the ECR-R subscales by summing the first six, second six, and final six items in each 18-item subscale. This resulted in three six-item indicators for each of the ECR-R's subscales (anxious and avoidant attachment). These indicators were used in the latent variable models described below.

On the ECR-R anxious attachment subscale, participants had a mean score of 61.45 and a standard deviation of 20.83 in Wave 1, and a mean score of 59.69 and a standard deviation of 22.49 in Wave 2. The minimum possible score on the ECR-R's anxious attachment subscale is 0, and the maximum possible score is 126. The mean scores for this sample are consistent with the ECR-R developer's normative data for 20 year old test-takers, which lists a mean anxious attachment subscale score of 64 (Fraley, 2012). The test-retest reliability between administrations of the ECR-R anxious attachment subscale was .490. A paired-samples t-test revealed no significant difference between ECR-R anxious attachment means for Waves 1 and 2, t (391) = 1.64, p = .102 (two-tailed).

On the ECR-R avoidant attachment subscale, participants had a mean score of 52.66 and a standard deviation of 18.78 in Wave 1, and a mean score of 51.68 and a standard deviation of 20.23 in Wave 2. The minimum possible score on the ECR-R's avoidant attachment subscale is 0, and the maximum possible score is 126. The mean score for this sample is consistent with the ECR-R developer's normative data for 20 year old test-takers, which lists a mean avoidant attachment subscale score of 51.84 (Fraley, 2012). The test-retest reliability between administrations of the ECR-R avoidant attachment subscale was .563, and a paired-samples t-test revealed no significant difference between ECR-R avoidant attachment means for Waves 1 and 2, t (391) = .94, p = .346 (two-tailed).

Social Support. A confirmatory factor analysis was conducted on the ISEL item-level data to determine if the latent variable structure of the ISEL for our sample replicated that of published studies. The chi-square test of model fit was significant, chi-square value = 881.14(402), $p < .01$, indicating poor fit. However, other measures of model fit suggest acceptable fit. This analysis found a CFI of .949 and an RMSEA was .06. These results suggest that the factor structure for the ISEL is an acceptable to mediocre fit for the data collected from this sample. Standardized factor loadings for appraisal-based, tangible, and belonging-based social support can be found in Tables 13, 14, and 15, respectively. Next, latent variables were created for structural equation modeling. Three indicator variables were created from first three, second three, and final four items in each of the ISEL's 10-item subscales. This resulted in two three-item indicators and one four-item indicator for each of the ISEL's three subscales (appraisal-based social support, tangible social support, and belonging-based social support). These indicators were used in the latent variable models described below.

On the ISEL, participants had a mean score of 73.76 and a standard deviation of 12.80. This mean represents the sum of tangible, appraisal-based, and belonging-based social support. The minimum possible score for the sum of these items is 0, while the maximum possible score for the sum of these items is 90. The mean overall ISEL score obtained for this sample is consistent with the reported mean ISEL score (for the three subscales included in this study) of 77.45 in a study of parental alcoholism in 80 college students with a mean age of 18.97 years (Wright & Heppner, 1993). Participants had a mean appraisal subscale score of 24.92, with a standard deviation of 5.10, a mean belonging subscale score of 24.05, with a standard deviation of 4.96 and a mean tangible subscale score of 24.79, with a standard deviation of 4.53. The minimum possible score for each subscale is 0, and the maximum possible score for each subscale is 30. Because the ISEL was completed by participants only once, during Wave 2, test-retest reliability and changes in social support between waves could not be computed.

Somatization. On the PHQ, participants had a mean score of 4.51 and a standard deviation of 3.22 in Wave 1, and a mean score of 6.67 and a standard deviation of 4.43 in Wave 2. The minimum possible score on the PHQ is 0, while the maximum possible score is 28 for males and 30 for females. A paired-samples t-test revealed a significant difference between PHQ means for Waves 1 and 2, t (389) = -10.20, $p < .001$ (two-tailed). The mean PHQ scores obtained for this sample are consistent with a mean score of 4.0 found in a 53-person control group, with a mean age of 23 years, in a study on symptom and illness words and health anxiety in college students (Witthoft, Rist, & Bailer, 2008). The test-retest reliability between administrations of the PHQ in Waves 1 and 2 was .422.

On the SOMS, participants had a mean score of 5.38 and a standard deviation of 6.85 in Wave 1, and a mean score of 9.87 and a standard deviation of 10.79 in Wave 2. The minimum possible score on the SOMS is 0, and the maximum possible score is 192 for men and 208 for women. Although college student norms are not readily available for the SOMS, the mean scores obtained for this sample are consistent with those obtained for other samples: a mean SOMS score of 14.6 was obtained from 295 outpatients, with a mean of 50.6 years, in a study on illness attributions (Rief, Nanke, Emmerich, Bender, & Zech, 2004), and a mean SOMS score of 3.35 was obtained from 2050 participants, who were a representative sample of the general population of Germany in terms of age and other demographic data, in a study on somatization and hypochondriacal features (Winfried, Hessel, & Braehler, 2001). The test-retest reliability between administrations of the SOMS in Waves 1 and 2 was .394, and a paired-samples t-test revealed a significant difference between SOMS means for Waves 1 and 2, t (388) = -8.57, $p <$ .001 (two-tailed).

Intercorrelations between the two measures of somatization were also investigated. As described above, the test-retest reliability was .422 for the PHQ and .394 for the SOMS. There was a significant correlation between Wave 1 PHQ and SOMS scores, r = .522, $p < .001$, and between Wave 2 PHQ and SOMS scores, r = .666, $p < .001$. There was also a significant correlation between Wave 1 PHQ scores and Wave 2 SOMS scores, r = .419, $p < .001$, and between Wave 1 SOMS scores and Wave 2 PHQ scores, r = .359, $p < .001$. The magnitude of these correlations likely reflects the differences in instructions for these measures. Since the SOMS specifically instructs participants to report only *medically unexplained* symptoms, whereas the PHQ merely instructs participants to report physical symptoms, the SOMS is likely to be a more strict measure of somatization and medically unexplained symptoms. For this reason, and since both measures appear to have functioned in a similar manner, with the effects being more clear when the SOMS was used, the results reported after this point refer to models using the SOMS as a measure of somatization.

Relations Among the Study Variables

Relations Among the Predictor Variables. Simple correlational analyses were conducted to test the intercorrelations among the predictor variables and anxious attachment (see Tables 2 and 3). Wave 1 and Wave 2 anxious attachment were significantly correlated, r = .490, $p < .001$. Neither Wave 1 nor Wave 2 anxious attachment was significantly correlated with any measures of disaster exposure, suggesting that self-reported disaster exposure was not biased by anxious attachment. Social support was significantly correlated with Wave 1 anxious attachment, r = -.193, $p < .001$, and Wave 2 anxious attachment, r = -.402, $p < .001$.

Simple correlational analyses were also conducted to test the intercorrelations among the predictor variables and avoidant attachment (see Tables 2 and 3). Wave 1 and Wave 2 avoidant attachment were significantly correlated, r = .563, $p < .001$. While Wave 1 avoidant attachment was not significantly correlated with disaster exposure, Wave 2 avoidant attachment was significantly correlated with disaster exposure, r = .106, $p < .05$, indicating that avoidant attachment may have affected self-reported disaster exposure. Social support was significantly correlated with Wave 1 avoidant attachment, r = -.211, $p < .001$, and Wave 2 avoidant attachment, r = -.417, $p < .001$.

Relations Among the Predictor and Outcome Variables. Correlational analyses were also conducted to test the intercorrelations among the predictor and outcome variables. In these analyses, SOMS Wave 2 scores were regressed on SOMS Wave 1 scores to create SOMS residual scores, which were used to represent changes in SOMS scores. Participants' Wave 1 SOMS scores were significantly correlated with Wave 2 SOMS scores, r = .394, $p < .001$, Wave 1 anxious attachment, r = .183, $p < .001$, and Wave 2 anxious attachment, r = .164, $p = .001$. In addition to the significant correlation with Wave 1 SOMS scores, Wave 2 SOMS scores were significantly correlated with unstandardized SOMS residual scores, r = -.325, $p < .001$, disaster exposure, r = .226, $p < .001$, social support, r = -.308, $p < .001$, Wave 2 anxious attachment, r = .286, $p < .001$, and Wave 2 avoidant attachment, r = .181, $p < .001$. The correlation between Wave 2 SOMS scores and unstandardized SOMS residual scores is expected, as SOMS residual scores indicate change in Wave 2 SOMS scores unexplained by Wave 1 SOMS scores. In addition to the significant correlation with Wave 2 SOMS scores, unstandardized SOMS residual scores were significantly correlated with disaster exposure, r = .207, $p < .001$, social support, r = .325, $p < .001$, Wave 2 anxious attachment, r = .246, $p < .001$, and Wave 2 avoidant attachment, r = 183, $p < .001$.

Anxious Attachment Regression. To establish that structural equation modeling would be appropriate, and to further investigate the relationship between study variables, a simultaneous linear regression was conducted testing the effects of exposure, pre-tornado anxious attachment, and social support on Wave 2 SOMS scores, controlling for Wave 1 SOMS scores. The overall model was significant, $F(4, 379) = 36.412$, $p < .001$, and accounted for

27.8% of the variance in Wave 2 SOMS scores. Wave 1 SOMS scores significantly predicted Wave 2 SOMS scores, $t(383) = 8.647$, $p < .001$, and explained 15.6% of variance. The total explained variance increased to 27.8% when Overall Exposure, social support, and pre-tornado anxious attachment were added to the model. Overall Exposure, $t(383) = 3.856$, $p < .001$, and social support, $t(383) = -6.684$, $p < .001$, each predicted Wave 2 SOMS scores. Pre-tornado anxious attachment scores had a nonsignificant effect on Wave 2 SOMS scores, but, interestingly, the (nonsignificant) effect was in the opposite direction of my prediction, such that higher anxious attachment predicted lower Wave 2 SOMS scores.

A simultaneous linear regression analysis was also conducted using post-tornado anxious attachment. The overall model was significant, $F(4, 384) = 38.484$, $p < .001$, and accounted for 28.6% of the variance in Wave 2 SOMS scores. Wave 1 SOMS scores again significantly predicted Wave 2 SOMS scores, $t(383) = 8.012$, $p < .001$, and explained 15.6% of variance in Wave 2 SOMS scores. The total explained variance increased to 28.6% when including Overall Exposure, social support, and post-tornado anxious attachment. Overall Exposure, $t(383) = 3.837$, $p < .001$, and social support, $t(383) = -4.911$, $p < .001$, each predicted Wave 2 SOMS scores. Additionally, post-tornado anxious attachment had a significant direct effect on Wave 2 SOMS scores, $t(383) = 2.745$, $p < .05$, and, as indicated by the unstandardized coefficient, this effect is in the predicted direction, such that higher anxious attachment predicted higher Wave 2 SOMS scores.

Avoidant Attachment Regression. A simultaneous linear regression was conducted testing the effects of exposure, pre-tornado avoidant attachment, and social support on Wave 2 SOMS scores, controlling for Wave 1 SOMS scores. The overall model was significant, $F(4, 379) = 35.716$, $p < .001$, and accounted for 27.4% of the variance in Wave 2 SOMS scores.

Wave 1 SOMS scores significantly predicted Wave 2 SOMS scores, $t(383) = 8.470$, $p < .001$, and explained 15.3% of variance. The total explained variance increased to 27.4% when Overall Exposure, social support, and pre-tornado avoidant attachment were added to the model. Overall Exposure, $t(383) = 3.776$, $p < .001$, and social support, $t(383) = -6.528$, $p < .001$, each predicted Wave 2 SOMS scores. Pre-tornado avoidant attachment scores had a nonsignificant effect on Wave 2 SOMS scores, but, unlike pre-tornado anxious attachment, this (nonsignificant) effect was in the expected direction, such that higher avoidant attachment predicts lower Wave 2 SOMS scores.

A simultaneous linear regression analysis was also conducted using post-tornado avoidant attachment. The overall model was significant, $F(4, 384) = 36.145$, $p < .001$, and again accounted for 27.4% of the variance in Wave 2 SOMS scores. Wave 1 SOMS scores again significantly predicted Wave 2 SOMS scores, $t(383) = 8.483$, $p < .001$, and explained 15.6% of variance in Wave 2 SOMS scores. The total explained variance increased to 27.4% when including Overall Exposure, social support, and post-tornado avoidant attachment. Overall Exposure, $t(383) = 3.739$, $p < .001$, and social support, $t(383) = -5.590$, $p < .001$, each predicted Wave 2 SOMS scores. Interestingly, post-tornado avoidant attachment had a nonsignificant effect on Wave 2 SOMS scores.

Tests of the Main Hypotheses

Structural equation modeling of the effects of disaster exposure, attachment, and social support on changes in somatization from wave 1 to wave 2 was conducted using Mplus to test the main hypotheses. I separately examined the effects of pre- and post-tornado attachment, and used both anxious and avoidant attachment scores, resulting in four separate models. Attachment and social support were represented in these models as latent variables, and disaster exposure and somatization were represented as observed variables. Wave 1 SOMS was entered as a covariate in the models such that effects of Wave 2 SOMS represent change from Wave 1 to Wave 2.

Anxious Attachment. In the overall models tested, social support and attachment were represented as latent variables. In the prospective analysis, the chi-square test of model fit was significant, chi-square value = 74.88(36), $p < .01$, indicating poor fit. However, other measures of model fit suggest acceptable fit. The prospective analysis has a CFI of .99, and an RMSEA of .04, both of which indicate a close fit. In the cross-sectional analysis, the chi-square test of model fit was significant, chi-square value = 79.59(46), $p < .01$, indicating poor fit. However, other measures of model fit suggest acceptable fit. The cross-sectional analysis has a CFI of .98, and an RMSEA of .04, both of which indicate a close fit. These results indicate that the latent measures of social support and attachment closely reflect the observed data and relations among the 6 indicators of these measures.

Direct Effects and Moderation. In the prospective analysis, anxious attachment was found to be significantly associated with somatization in the prospective analysis. This relationship was in the opposite direction of this study's prediction and the pattern found in previous research, such that pre-tornado anxious attachment was associated with decreased somatization, beta = -.103, $p < .05$. The second hypothesis of this study predicted that the effect of anxious attachment on increased somatization would be more apparent in participants who were more exposed to the tornado. As in the simultaneous linear regression analysis, disaster exposure significantly predicted increased somatization, beta = .165, $p < .05$; however, the moderation effect of disaster exposure was nonsignificant. Finally, similar to the simultaneous linear regression analysis, lower social support was found to significantly predict increased somatization, beta = -.311, $p < .05$.

In the cross-sectional analysis, post-tornado anxious attachment significantly predicted increased somatization, lending support to the first hypothesis, beta = .132, $p < .05$. As in the simultaneous linear regression analysis, post-tornado anxious attachment predicted somatization in the hypothesized direction. In this model, as in the simultaneous linear regression analysis, disaster exposure was found to significantly predict greater change in somatization, beta = .153, $p < .05$. The second hypothesis was also supported: the interaction between post-tornado anxious attachment and disaster exposure was also found to significantly predict greater change in somatization, beta = .153, $p < .05$. Additional testing of the effects of this interaction term found that the relation between attachment and increased somatization was strongest among those with higher levels of disaster exposure. Finally, as in the simultaneous linear regression analysis, lower social support was found to significantly predict greater somatization, beta = -.227, $p < .05$.

Mediation. The third hypothesis of this study predicted that anxious attachment and the interaction between anxious attachment and disaster exposure would result in greater somatization through decreased perceived social support. The mediating role of social support in the direct effects described above was tested using inference testing and repeated using bootstrapping methods. For all effects described as significant, the confidence intervals for the effects did not include zero.

In the prospective analysis, as discussed in the previous section, lower social support was found to significantly predict increased somatization, beta = -.311, $p < .05$. Pre-tornado anxious attachment, beta = -.199, $p < .05$, and the interaction between pre-tornado anxious attachment and disaster exposure, beta = -.132, $p < .05$, had significant direct effects on social support. The significant effects of the predictor variables on social support, and of social support on somatization, suggest that anxious attachment style is strongly predictive of lower social support, and lower social support is strongly predictive of greater somatization. Further testing of the effects of this interaction term on social support found that individuals with an anxious attachment style reported less social support when they were more exposed to the tornado. In the prospective analysis, a significant indirect path was found from pre-tornado anxious attachment to change in somatization, through social support, beta = .062, $p < .05$. The overall amount of variance in Wave 2 SOMS scores explained by the prospective analysis is 28.7%, which is a 14% increase from the 14.7% of variance in Wave 2 SOMS scores explained by Wave 1 SOMS scores alone. For a summary of the prospective analysis, see Figure 2.

In the cross-sectional analysis involving anxious attachment, lower social support was found to significantly predict greater somatization, beta = -.227, p < .05. In this analysis, post-tornado anxious attachment, beta = -.441, $p < .05$, and the interaction between post-tornado anxious attachment and disaster exposure, beta = -.114, $p < .05$, had significant direct effects on social support. Additional testing of the effects of this interaction term on social support found that individuals with an anxious attachment style reported less social support when they were more exposed to the tornado. A significant indirect path was found from post-tornado anxious attachment to change in somatization, through social support, beta = .10, $p < .05$. The overall amount of variance in Wave 2 SOMS scores explained by the cross-sectional analysis is 28.9%, which is a 16.7% increase from the 12.2% of variance in Wave 2 SOMS scores explained by Wave 1 SOMS scores alone. For a summary of the cross-sectional analysis, see Figure 3. For a summary of standardized estimates of direct effects for each model, see Table 8.

Avoidant Attachment. For discriminant validity, avoidant attachment was substituted for anxious attachment. Just as with anxious attachment, two different analyses were conducted, one using pre-tornado avoidant attachment and one using post-tornado avoidant attachment. In the overall model tested, social support and avoidant attachment were represented as latent variables. Structural equation modeling was used to test the fit of these two hypothesized models. Both of these analyses used the sum of overall exposure measure of disaster exposure as a moderator. In the prospective analysis, the chi-square test of model fit was significant, chi-square value = 94.25(46), $p < .01$, indicating poor fit. However, other measures of model fit suggest acceptable fit. The prospective analysis has a CFI of .98, and an RMSEA of .05, both of which indicate a close fit. In the cross-sectional analysis, the chi-square test of model fit was significant, chi-square value = 152.80(46), $p < .01$, indicating poor fit. However, other measures of model fit suggest acceptable fit. The cross-sectional analysis has a CFI of .96, and an RMSEA of .08, both of which indicate an acceptable fit. These results indicate that the latent measures of social support and avoidant attachment acceptably reflect the observed relations among the 6 indicators of these measures.

Direct Effects and Moderation. In the prospective analysis, there was a nonsignificant relationship between avoidant attachment and somatization. The second hypothesis of this study predicted that the effect of insecure attachment on increased somatization would be more apparent in participants who were more exposed to the tornado. Although disaster exposure significantly predicted increased somatization, beta = .169, $p < .05$, the moderation effect of disaster exposure and avoidant attachment was nonsignificant. Finally, lower social support was found to significantly predict increased change in somatization, beta = -.315, $p < .05$.

In the cross-sectional avoidant analysis, there was a nonsignificant relationship between avoidant attachment and somatization. In this model, the second hypothesis was also supported: disaster exposure, beta = .166, $p < .05$, was found to significantly predict greater change in somatization. There was a nonsignificant effect of the interaction between avoidant attachment and disaster exposure on change in somatization. Finally, lower social support was found to significantly predict greater somatization, beta = -.290, $p < .05$.

Mediation. The third hypothesis of this study predicted that insecure attachment and the interaction between insecure attachment and disaster exposure would result in greater somatization through decreased perceived social support. Indirect effects were tested via traditional inferential significance testing, and repeated using bootstrapping methods. For all effects described as significant, the confidence intervals for the effects did not include zero.

In the prospective analysis, as discussed in the previous section, social support was found to significantly predict increased somatization, beta = -.315, $p < .05$. Pre-tornado avoidant attachment also had a significant direct effect on social support, beta = -.229, $p < .05$. In the prospective analysis, a significant indirect path was found from pre-tornado avoidant attachment to change in somatization, through social support, beta = .072, $p < .05$. The overall amount of variance in Wave 2 SOMS scores explained by the prospective avoidant analysis is 27.1%, which is a 13.1% increase from the 14% of variance in Wave 2 SOMS scores explained by Wave 1 SOMS scores alone.

In the cross-sectional avoidant analysis, lower social support was found to significantly predict greater somatization, beta = -.290, $p < .05$. In this analysis, post-tornado avoidant attachment, beta = -.414, $p < .05$, and the interaction between post-tornado avoidant attachment and disaster exposure, beta = -.100, $p < .05$, had significant direct effects on social support.

Additional testing of the effects of this interaction term on social support found that individuals with an avoidant attachment style reported less social support when they were more exposed to the tornado. A significant indirect path was found from post-tornado avoidant attachment to change in somatization, through social support, beta = .12, $p < .05$. The overall amount of variance in Wave 2 SOMS scores explained by the cross-sectional analysis is 26.9%, which is a 13.1% increase from the 13.8% of variance in Wave 2 SOMS scores explained by Wave 1 SOMS scores alone.

These analyses illustrate the predicted effects of anxious and avoidant attachment on somatization. The analyses of avoidant attachment found that, much like when substituting the PHQ for the SOMS, significant results were often lost when using avoidant attachment rather than anxious attachment. Thus, anxious attachment quickly emerged as a more consistent risk factor for somatization than avoidant attachment.

Discussion

This study offered a unique opportunity to perform longitudinal analyses of change in symptom reporting as a function of prospective attachment in the context of a natural disaster. To reiterate, this study's hypotheses were:

1) Anxious attachment would be associated with greater post-disaster increases in somatization
2) The effect of insecure attachment on increased somatization would be more apparent in participants who were more exposed to the tornado, compared to individuals who were less exposed to the disaster
3) Insecure attachment and the predicted interaction effect with exposure to the tornado would operate through lower social support to result in greater somatization

Consistent with the existing literature, there was an overall increase in medically unexplained symptoms following the tornado, regardless of the degree of exposure. Moreover, those who reported greater exposure to the disaster also reported a greater increase in somatization. Also consistent with the existing literature, those who reported insecure attachment prior to the tornado reported lower social support after the tornado, regardless of their degree of exposure. The core prediction of this study was that anxious attachment would be associated with symptom reporting. Surprisingly, pre-tornado anxious attachment predicted lower somatization, and disaster exposure did not moderate the effects of pre-tornado attachment. In contrast, post-tornado attachment fully supported the hypothesized relationships, and predicted higher somatization after the tornado. These significant relationships were absent or significantly diminished using post-tornado anxious attachment, again indicating that anxious attachment is more relevant for predicting change in somatization. As predicted, social support mediated the relationship between pre- and post-tornado attachment and somatization, as well as the relationship between the post-tornado attachment by disaster exposure interaction term and somatization. However, social support did not mediate the relationship between disaster exposure and somatization.

Whereas post-tornado anxious attachment, as hypothesized, predicted *more* medically unexplained symptoms, pre-tornado anxious attachment actually predicted *fewer* medically unexplained symptoms. In essence, while the cross-sectional analysis of the relationship between attachment, which is considered to be a relatively stable trait, and somatization returned expected results, the prospective analysis of this relationship returned unexpected results. These results may be accounted for by an unidentified factor that changed the relationship between attachment and somatization following the tornado, as evidenced by the increased correlation between somatization and post-tornado attachment as compared to the correlation between somatization and pre-tornado attachment. In the wake of the tornado, the increased correlation between somatization and post-tornado attachment may have been influenced by a common biasing factor that resulted in a slight inflation of the typically reported relationship between insecure attachment and symptom reporting. This common biasing factor appears to have affected somatization more strongly than attachment, as evidenced by the larger increase in the standard deviation of the SOMS after the tornado and the smaller increase in the standard deviation of the ECR-R after the tornado. The general upheaval following the tornado may also have, in some way, made anxious attachment a more important risk factor for the development of medically unexplained symptoms after the disaster. As in a diathesis-stress model, anxious attachment may only be an important risk factor for the development of somatization in the presence of a severe life stressor, such as a natural disaster.

The unexpected relationship between anxious attachment and somatization might also have been affected by a number of other factors. Since the size of the relationship between both pre- and post-tornado anxious attachment, while significant, was very small, these results may be spurious. Alternatively, social support may be acting as a suppressor variable, artificially deflating the relationship between attachment style and somatization. To further examine the unexpected relationship between pre-tornado attachment and somatization, the nature of ECR-R and insecure attachment styles must also be considered. One key to the unexpected findings related to pre-tornado attachment and change in somatization is the instability of the ECR-R in this study. Although attachment is generally considered to be a relatively stable trait, this may be a flawed assumption. Attachment style appears to be relatively stable across a short period of time, such that latent repeated measures of avoidant and anxious attachment styles, as measured by the ECR-R, shared 86% and 86.5% of variance, respectively, across a 6-week time period (Sibley & Liu, 2004). However, attachment may be less stable over longer periods of time. If this is the case, the gap between the collection of pre-tornado attachment and post-tornado somatization measures, which was as short as 6 months and as long as 16 months for some individuals, may have resulted in the observed instability of pre- and post-tornado attachment and their ability to predict somatization. Finally, the instructions for the ECR-R direct participants to respond based on their interactions in emotionally intimate relationships, which may not be a reflection of how an individual interacts in relationships that are non-romantic.

In general, these results support the existing literature on disaster exposure and social support and their relation to somatization. These results are consistent with current theories that view disaster exposure as a risk factor and social support as a protective factor for the development of post-disaster somatization. However, these results cast doubt on current theories and understandings of attachment as a stable trait and the basic relationship between attachment and somatization. More research is needed to clarify the stability of attachment styles, as well as on the relationship between attachment style and somatization. Furthermore, research is needed on factors (such as personality traits) that may further clarify the relationship between attachment style and somatization. These results also underscore the importance of post-disaster interventions targeting individuals with high disaster exposure, who are at the highest risk for developing somatization. Additionally, these results provide further support for role of social support as a protective factor for the development of post-disaster somatization. Disaster interventions should consider attempting to strengthen social support and identify individuals with the lowest social support after a disaster.

Limitations

Although the present study has many unique strengths, the circumstances that created the opportunity to conduct this study occurred through sheer chance, so understandably there are important limitations to this research. As this study is correlational, rather than experimental, cause and effect conclusions can only be drawn with great caution. Because no one in the sample appears to have been truly unaffected, our results do not allow us to capture difference between exposed and unexposed participants. However, given the number of participants in the study and the knowledge that the tornado was likely the most significantly traumatic event in the lives of the participants between screening and participation in the study, I believe that correlations between the predictor variables and changes in somatization will very likely be due to the stress of exposure to the tornado and recovery. Additionally, since the SEQ was developed specifically for this study, there are no data on validity or reliability for this measure. Furthermore, since the scoring for the SEQ was developed intuitively based on severity of exposure, there are some implications for the range of scores possible for this measure. Because of decisions made on scoring the SEQ, there is an unavoidable heterogeneity within ranges of scores. For example, a score of 3 on the personal harm subscale could be obtained in two ways: by endorsing scars from injuries received (scored one) and permanent, partial loss of function (scored two); or by endorsing permanent, total loss of function (scored three) but not endorsing scars from injuries. I have no way of validating the scoring scheme, calibrating the devised weighting system, or understanding the impact of the homogeneity that is inherent in the scoring system. The possibility of a response bias also cannot be ruled out. Since the sample includes only students in introductory psychology, there is a selection bias in this study, but it is unlikely that there are significant differences between individuals in the psychology subject pool and individuals in the general population. Since participants elect to participate in the online study, there is also a self-selection bias in the present study. However, with internet access being readily available, it is unlikely that there is any significant limitation to the study presented by this self-selection. A more serious limitation is presented by the order of data collection in this study. Although attachment style and somatization were measured prior to the tornado, social support, disaster exposure, and somatization were all measured concurrently following the disaster. As such, it cannot be concluded that social support is not affected by post-disaster somatization, which will make it difficult to conclusively assess social support as a mediator. However, this methodological limitation will be remedied by later waves of data collection, which will allow for the analysis of social support as a mediator of individuals' changes in somatization in the future. Finally, all measures used in this study are self-report measures, and shared method variance may have affected the results of these structural equation analyses.

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Figure 1

Conceptual Model of Predicting Somatization Following Disaster Exposure

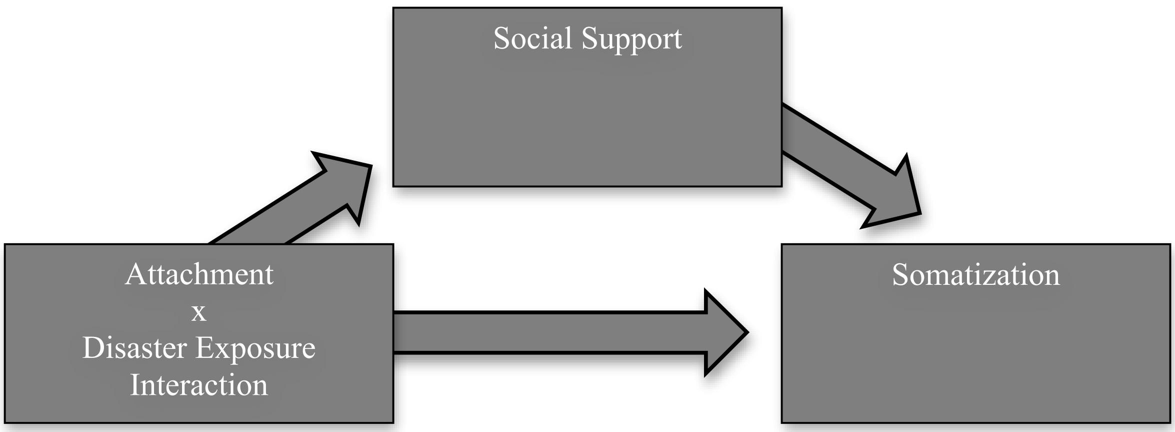

Figure 2

The Prospective Analysis: Pre-Tornado Attachment

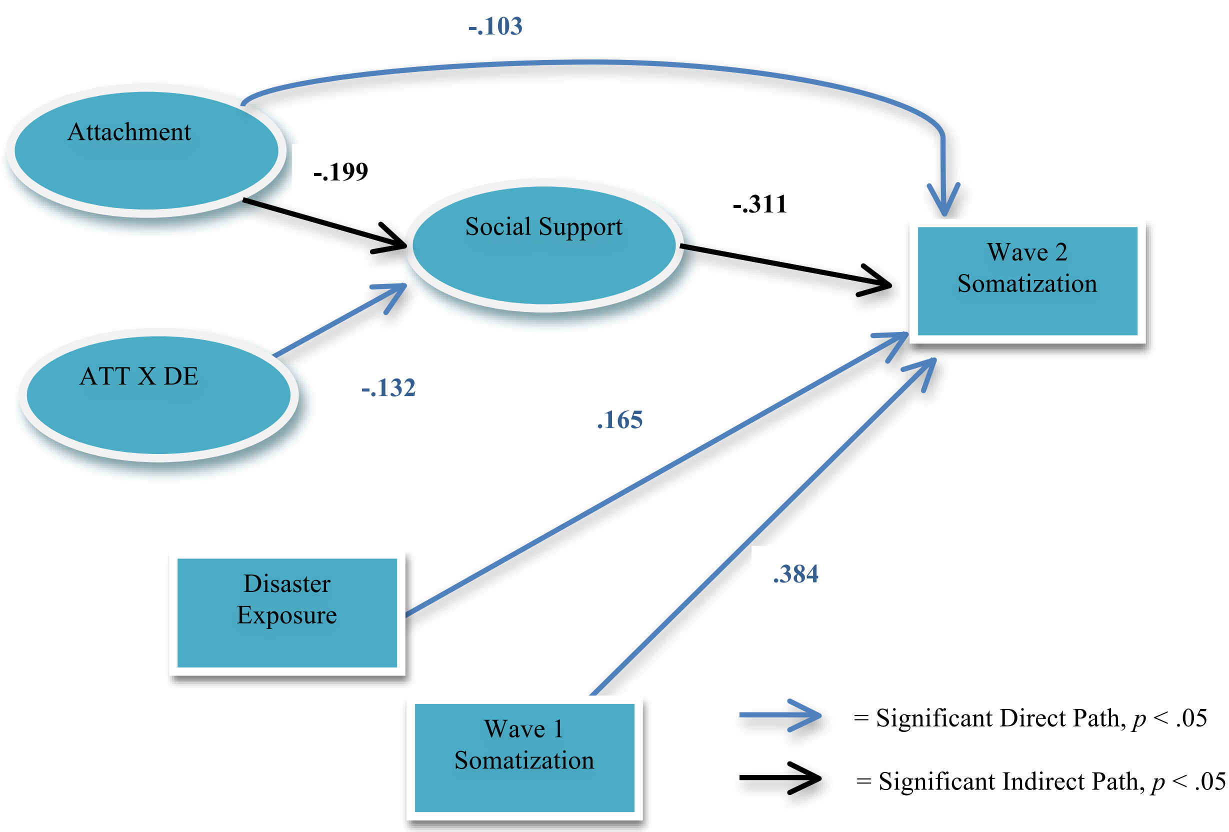

Figure 3

The Cross-Sectional Analysis: Post-Tornado Attachment

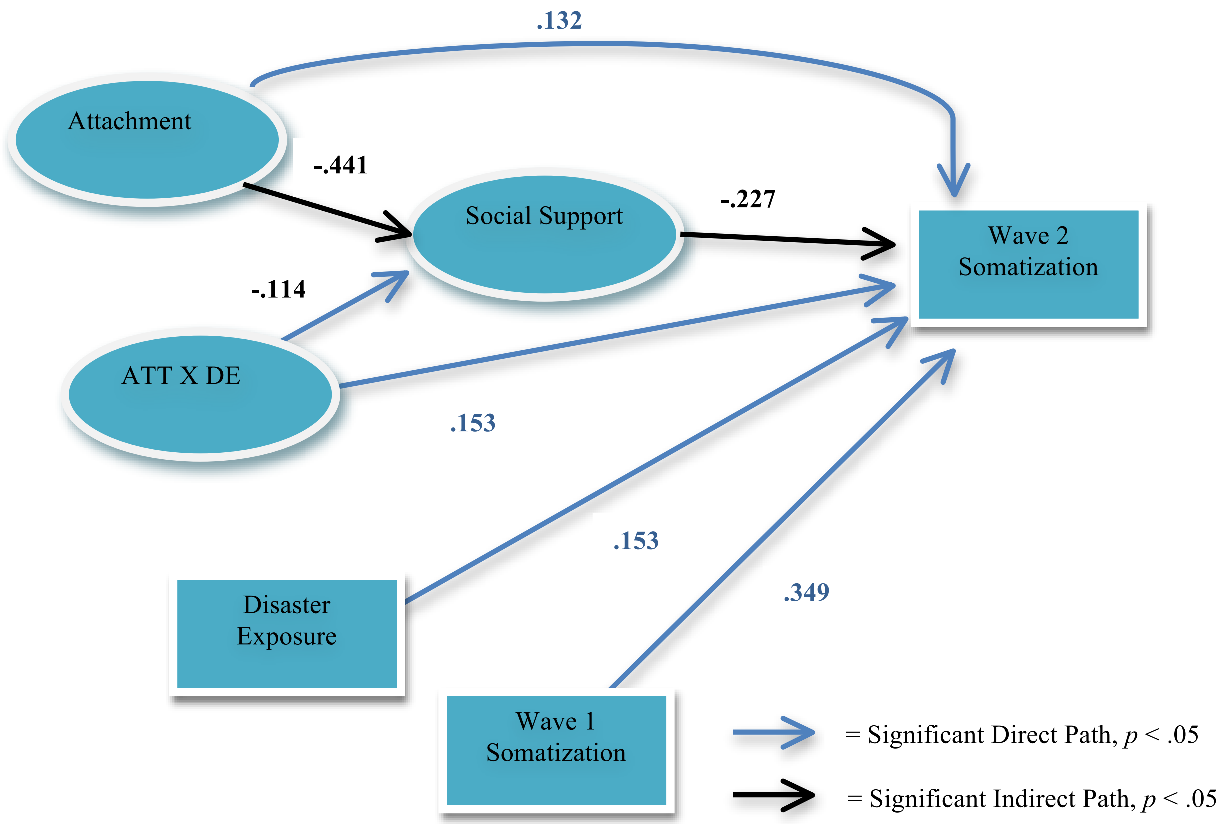

Table 1

Measures

Construct	***Measure***
Wave 1	
Attachment Style	ECR-R
Somatization	SOMS
	PHQ-15
Wave 2	
Social Support	ISEL
Storm Exposure	SEQ
Attachment Style	ECR-R
Somatization	SOMS
	PHQ-15

Table 2

Zero-Order Correlations (PHQ)

		PHQ Wave 1	PHQ Wave 2	PHQ Resid.	DE	ISEL	Anx. Att. Wave 1	Anx. Att. Wave 2	Av. Att. Wave 1	Av. Att. Wave 2
PHQ Wave 1	Pearson N	1 390								
PHQ Wave 2	Pearson N	**.422** 390	1 397							
PHQ Resid.	Pearson N	.000 390	**.906** 390	1 390						
DE	Pearson N	**.136** 397	**.130** 397	.078 390	1 397					
ISEL	Pearson N	**-.130** 390	**-.178** 397	**-.133** 390	-.09 397	1 397				
Anx. Att. Wave 1	Pearson N	**.191** 386	**.112** 392	.029 386	.085 392	**-.193** 392	1 392			
Anx. Att. Wave2	Pearson N	**.233** 390	**.292** 397	**.218** 390	.057 397	**-.402** 397	**.490** 392	1 397		
Av. Att. Wave 1	Pearson N	.043 386	-.043 392	-.083 386	.034 392	**-.211** 392	**.275** 392	**.146** 392	1 392	
Av. Att. Wave 2	Pearson N	.098 380	.025 397	-.021 390	**.106** 397	**-.417** 397	**.182** 392	**.373** 397	**.563** 392	1 397

Bold = significant at the .05 level.

Table 3

Zero-Order Correlations (SOMS)

		SOMS Wave 1	SOMS Wave 2	SOMS Resid.	DE	ISEL	Anx. Att. Wave 1	Anx. Att. Wave 2	Av. Att. Wave 1	Av. Att. Wave 2
SOMS Wave 1	Pearson N	1 389								
SOMS Wave 2	Pearson N	**.394** 389	1 397							
SOMS Resid.	Pearson N	.000 389	**.919** 389	1 389						
DE	Pearson N	.092 389	**.226** 397	**.207** 389	1 397					
ISEL	Pearson N	**-.023** 389	**-.308** 397	**-.325** 389	-.09 397	1 397				
Anx. Att. Wave 1	Pearson N	**.183** 384	.062 392	-.012 384	.085 392	**-.193** 392	1 392			
Anx. Att. Wave 2	Pearson N	**.164** 389	**.286** 397	**.246** 389	.057 397	**-.402** 397	**.490** 392	1 397		
Av. Att. Wave 1	Pearson N	.032 384	.030 392	.021 384	.034 392	**-.211** 392	**.275** 392	**.146** 392	1	
Av. Att. Wave 2	Pearson N	.051 389	**.181** 397	**.183** 389	**.106** 397	**-.417** 397	**.182** 392	**.373** 397	**.563** 392	1 397

Bold = significant at the .05 level.

Table 4

Narratives of Exposure for Personal Physical Exposure

Descriptives	*Score for the Described Level of Exposure*	*Narrative*
1 S.D. Below Mean = 3.256	3	Participant A watched live coverage of the storm 30 minutes before the storm and saw or heard tree damage at the moment the storm was closest.
Mean = 6.27	6	Participant B physically experienced increased wind speed both 30 minutes before the storm and when the storm was closest, and saw or heard tree damage when the storm was closest.
1 S.D. Above Mean = 9.284	9	30 minutes before the storm, Participant C physically saw and heard the storm as it approached and physically experienced increased wind speed. When the storm was closest, Participant C physically saw the storm, experienced increased wind speed, and saw or heard roof and tree damage. Additionally, the structure Participant C was in experienced mild damage.

Table 5

Narratives of Exposure for Personal Harm

Descriptives	*Score for the Described Level of Exposure*	*Narrative*
1 S.D. Below Mean = -.256	N/A	N/A
Mean = .05	0	Participants at the mean level of Personal Harm were not physically injured by the storm.
1 S.D. Above Mean = .356	1	Participant C was slightly injured by the storm, but did not require medical care, and received no permanent scars or permanent partial or total loss of a function.

Table 6

Narratives of Exposure for Exposure to Death/Injury

Descriptives	*Score for the Described Level of Exposure*	*Narrative*
1 S.D. Below Mean = -.156	0	Participants one standard deviation below the mean did not see, in-person, anyone who was killed or severely injured in the storm.
Mean = 1.72	2	Participant B saw or heard, in-person, someone trapped in the rubble, and watched or listened to media reports of the location of the tornado or of the damage that it caused.
1 S.D. Above Mean = 3.596	4	Participant C saw, in-person, a severely injured person, and watched or listened to media reports of the location of the tornado or the damage that it caused.

Table 7

Narratives of Exposure for Property Damage

Descriptives	*Score for the Described Level of Exposure*	*Narrative*
1 S.D. Below Mean = 3.624	4	Participant A experienced loss of electrical power and television in the place where he/she was staying.
Mean = 7	7	Participant B experienced loss of electrical power, telephone service, television, and internet connection in the place where he/she was staying.
1 S.D. Above Mean = 10.376	10	Participant C experienced loss of running water, electrical power, telephone service, television, and internet connection in the place where he/she was staying.

Table 8

Standardized Estimates of Direct Effects

The Prospective Analysis	ISEL (SOMS)	ISEL (PHQ)	Somatization (SOMS)	Somatization (PHQ)
Anx. Att. Wave 1	**-.199**	**-.188**	**-.103**	-.013
Interaction	**-.132**	**-.142**	.074	.067
Overall Exposure	-.054	.047	**.165**	.059
ISEL			**-.311**	**-.12**
The Cross-Sectional Analysis				
Anx. Att. Wave 2	**-.441**	**-.442**	**.132**	**.192**
Interaction	**-.114**	**-.113**	**.153**	.074
Overall Exposure	-.041	0.034	**.153**	.055
ISEL			**-.227**	-.04

Interaction = Anxious Attachment / Disaster Exposure Interaction

Bold result = significant at .05 level

Table 9

Wave 1 Anxious Attachment Factor Loadings

Item Number	Estimate	S.E.
1	**.674**	.030
2	**.763**	.023
3	**.776**	.023
4	**.786**	.021
5	**.744**	.023
6	**.752**	.023
7	**.739**	.024
8	**.729**	.023
9	**.411**	.040
10	**.639**	.032
11	**.467**	.037
12	**.649**	.031
13	**.649**	.030
14	**.560**	.034
15	**.650**	.030
16	**.627**	.031
17	**.663**	.029
18	**.653**	.032

Bold estimate = significant at .05 level

Table 10

Wave 1 Avoidant Attachment Factor Loadings

Item Number	Estimate	S.E.
19	**.651**	.029
20	**.737**	.026
21	**.638**	.029
22	**.729**	.026
23	**.719**	.022
24	**.678**	.026
25	**.610**	.030
26	**.711**	.026
27	**.632**	.030
28	**.759**	.024
29	**.741**	.023
30	**.760**	.023
31	**.753**	.025
32	**.697**	.027
33	**.564**	.034
34	**.612**	.030
35	**.666**	.029
36	**.720**	.026

Bold estimate = significant at .05 level

Table 11

Wave 2 Anxious Attachment Factor Loadings

Item Number	Estimate	S.E.
1	**.766**	.020
2	**.837**	.015
3	**.930**	.012
4	**.800**	.018
5	**.741**	.022
6	**.752**	.022
7	**.742**	.024
8	**.775**	.021
9	**.416**	.038
10	**.776**	.024
11	**.463**	.037
12	**.715**	.027
13	**.664**	.029
14	**.543**	.037
15	**.636**	.031
16	**.710**	.026
17	**.630**	.030
18	**.723**	.029

Bold estimate = significant at .05 level

Table 12

Wave 2 Avoidant Attachment Factor Loadings

Item Number	Estimate	S.E.
19	**.996**	.041
20	**.781**	.023
21	**.700**	.023
22	**.771**	.022
23	**.731**	.024
24	**.674**	.024
25	**.549**	.031
26	**.785**	.021
27	**.683**	.027
28	**.798**	.020
29	**.809**	.018
30	**.841**	.015
31	**.848**	.017
32	**.607**	.029
33	**.747**	.021
34	**.802**	.018
35	**.714**	.025
36	**.811**	.020

Bold estimate = significant at .05 level

Table 13

Wave 2 Appraisal-Based Social Support Factor Loadings

Item Number	Estimate	S.E.
1	**.567**	.045
4	**.691**	.037
8	**.692**	.036
13	**.804**	.029
15	**.824**	.026
17	**.883**	.026
20	**.648**	.038
23	**.699**	.040
28	**.769**	.032
29	**.680**	.049

Bold estimate = significant at .05 level

Table 14

Wave 2 Tangible Social Support Factor Loadings

Item Number	Estimate	S.E.
2	**.529**	.049
6	**.644**	.036
10	**.563**	.042
12	**.614**	.039
14	**.804**	.028
18	**.758**	.035
22	**.657**	.038
25	**.784**	.033
27	**.726**	.031
30	**.672**	.040

Bold estimate = significant at .05 level

Table 15

Wave 2 Belonging-Based Social Support Factor Loadings

Item Number	Estimate	S.E.
3	**.779**	.033
5	**.641**	.046
7	**.606**	.040
9	**.664**	.048
11	**.699**	.036
16	**.708**	.030
19	**.612**	.042
21	**.670**	.038
24	**.757**	.034
26	**.598**	.048

Bold estimate = significant at .05 level

Appendix A

Scoring of the Storm Experience Questionnaire

As described in the body of the paper, the Storm Experience Questionnaire (SEQ) included a sum of Overall Exposure, which captures physical exposure to the tornado by combining the sums of Personal Physical Exposure to the tornado, Personal Harm, Exposure to Death/Injury, and Property damage.

Personal Physical Exposure

Participants were asked to select what they saw and heard 30 minutes before the storm. These responses were scored from 1 to 4, and the highest response was used as their score for this question. Possible responses were:

- watching live video coverage of the storm (scored 1)
- physically seeing the storm (scored 2)
- physically hearing the storm (scored 2)
- physically experiencing increased wind speed (scored 3)
- experiencing flying debris (4).

Participants were also asked about the moment the storm was closest to them. These responses were scored from 0 or 2 through 8, and the highest response was used as their score for this question. Possible responses were:

- physically seeing the storm (scored 2)
- physically hearing the storm (scored 2)
- seeing or hearing tree damage (scored 2)

- seeing or hearing roof damage (scored 2)
- physically experiencing increased wind speed (scored 3)
- experiencing flying debris (4)
- being hit by flying debris (scored 6)

Additionally, if the structure the participant was in was damaged by the storm, they were assigned a score of 6, 7, or 8 for mild, moderate, or severe damage, respectively, to the structure. This score was combined with their score from 30 minutes before the storm to create the Personal Physical Exposure sum.

Personal Harm

Participants were asked to select one of the following responses to describe any injuries during and immediately after the storm:

- no physical injury (scored 0)
- slight injury not requiring medical care (scored 1)
- minor injury treated by an outpatient clinic or paramedics (scored 2)
- significant injuries requiring medical care, but no hospitalization (scored 3)
- significant injuries requiring hospitalization (scored 4)

The sum for Personal Harm was created by adding this score to a sum of scores for the following items further describing physical injury:

- no permanent physical injury (scored 0)
- having scars from injuries (scored 1)
- having permanent, partial loss of function (scored 2)
- having permanent total loss of function (scored 3)

Exposure to Death/Injury

The sum for Exposure to Death/Injury was equal to the highest score on a question about what participants did in the 6 hours immediately after the storm had passed closest to them. Possible responses were:

- not seeing, in-person, anyone who was killed or severely injured in the storm (scored 0)
- watching or listening to media reports of the location of the tornado or the damage it caused (scored 1)
- seeing or hearing in-person someone trapped in rubble (scored 2)
- having physical contact with a person trapped in rubble (scored 3)
- seeing in-person another severely injured person (scored 4)
- having physical contact with a severely injured person (scored 5)
- seeing in-person someone who died in the storm or human remains (scored 6)
- or having physical contact with (touching) a person who died in the storm or with human remains (scored 7)

Property Damage

Participants were asked to report minor (scored 3) or major (scored 4) loss of or damage to their personal possessions. The highest of these scores was added to their highest score for:

- mild car damage (scored 1)
- major car damage (scored 2)
- complete loss of their car (scored 3)

To create the overall sum for Property Damage, this sum was then added to the sum of their responses on questions about utility damage in the place they were staying in the days after the storm. Responses included:

- utility service was uninterrupted (scored 0)
- loss of internet connection (scored 1)
- loss of television (scored 1)
- loss of telephone service (scored 2)
- loss of electrical power (scored 3)
- loss of running water (scored 3)

Appendix B

Institutional Review Board (IRB) Certification

Office for Research

Institutional Review Board for the
Protection of Human Subjects

THE UNIVERSITY OF
ALABAMA
RESEARCH

April 9, 2013

Ian Sherwood
Department of Psychology
College of Arts and Sciences
Box 870348

Re: IRB # 13-OR-117, "Attachment, Social Support, and Somatization after a Natural Disaster"

Dear Mr. Sherwood:

The University of Alabama Institutional Review Board has granted approval for your proposed research.

Your application has been given expedited approval according to 45 CFR part 46. Approval has been given under expedited review category 7 as outlined below:

(7) Research on individual or group characteristics or behavior (including, but not limited to, research on perception, cognition, motivation, identity, language, communication, cultural beliefs or practices, and social behavior) or research employing survey, interview, oral history, focus group, program evaluation, human factors evaluation, or quality assurance methodologies.

Your application will expire on April 8, 2014. If the study continues beyond that date, you must complete the IRB Renewal Application. If you modify the application, please complete the Modification of an Approved Protocol form. Changes in this study cannot be initiated without IRB approval, except when necessary to eliminate apparent immediate hazards to participants. When the study closes, please complete the Request for Study Closure form.

Should you need to submit any further correspondence regarding this application, please include the assigned IRB application number.

Good luck with your research.

Sincerely,

[redacted]

358 Rose Administration Building
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IRB Project #:

UNIVERSITY OF ALABAMA
INSTITUTIONAL REVIEW BOARD FOR THE PROTECTION OF HUMAN SUBJECTS
REQUEST FOR APPROVAL OF RESEARCH INVOLVING HUMAN SUBJECTS

I. Identifying information

	Principal Investigator	Second Investigator	Third Investigator
Names:	Ian Sherwood	James Hamilton	
Department:	Psychology	Psychology	
College:	Arts and Sciences	Arts and Sciences	
University:	The University of Alabama	The University of Alabama	
Address:	370C Gordon Palmer Hall	375 Gordon Palmer Hall	
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Title of Research Project: Attachment, Social Support, and Somatization after a Natural Disaster

Date Submitted:
Funding Source: National Science Foundation

Type of Proposal ☒ New ☐ Revision ☐ Renewal (Please attach a renewal application) ☐ Completed ☐ Exempt

Please attach a continuing review of studies form

Please enter the original IRB # at the top of the page

UA faculty or staff member signature: [redacted]

II. NOTIFICATION OF IRB ACTION (to be completed by IRB):
Type of Review: ______ Full board __X__ Expedited

IRB Action:
___ Rejected Date: ________
___ Tabled Pending Revisions Date: ________
___ Approved Pending Revisions Date: ________
X Approved-this proposal complies with University and federal regulations for the protection of human subjects.

Approval is effective until the following date: 4/8/14

Items approved: X Research protocol (dated 4/9/13)
___ Informed consent (dated ________)
___ Recruitment materials (dated ________)
___ Other (dated ________)

Approval signature ______________________ Date ______________