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A Longitudinal Model of Posttraumatic Stress and Posttraumatic Growth in Adults Affected by Hurricane Katrina

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A LONGITUDINAL MODEL OF POSTTRAUMATIC STRESS AND POSTTRAUMATIC GROWTH IN ADULTS AFFECTED BY HURRICANE KATRINA

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ABSTRACT

Numerous studies have documented the negative psychological outcomes in individuals who experienced Hurricane Katrina. However, little is known about the long-term adjustment of hurricane-exposed individuals, especially with regard to positive outcomes, in the years after the storm. Specifically, few studies have measured posttraumatic growth (PTG), which refers to positive psychological change achieved by individuals who struggled with a traumatic experience. In their model of PTG, Tedeschi and Calhoun theorize that a certain level of trauma-related psychological distress and disruption is necessary for PTG to develop. The current study attempted to test the PTG model with a longitudinal path analysis of hurricane-exposed women. Results indicated that posttraumatic stress predicted general emotional distress at two distinct times. However, posttraumatic stress levels did not decrease with time as expected. PTG accounted for very little in the model. Posttraumatic stress symptoms did not predict future PTG, and PTG did not result in reduced levels of posttraumatic stress or emotional distress. Several possible explanations for these surprising results, including the lack of anticipated recovery, are discussed.

INTRODUCTION

Hurricane Katrina was one of the deadliest and most destructive natural disasters in United States history. Over 1,800 people lost their lives and another 650,000 were forced to abandon their homes as a result of the storm and subsequent flooding (U.S. Department of Commerce, 2006). Those survivors who did not evacuate were stranded and forced to wait to be rescued with little sustenance and no electricity (Haygood & Tyson, 2005). The resulting psychological distress and posttraumatic stress soon after the storm have been well documented (see Galea et al., 2007). Little is known, however, about the long-term psychological adjustment of the traumatized individuals, particularly in the context of recovery and positive outcomes.

In recent years, research has shifted from focusing exclusively on negative outcomes to considering the possibility that some individuals are changed for the better as a result of a traumatic experience. Studies have documented posttraumatic growth (PTG) in samples of sexual assault victims (Frazier, Conlon, & Glaser, 2001), cancer survivors (Salsman, Segerstrom, Brechting, Carlson, & Andrykowsky, 2009; Sears, Stanton, & Danoff-Burg, 2003), combat veterans (McLean et al., 2013), victims of terrorist attacks (Davis & Macdonald, 2004), and motor vehicle accident survivors (Salter & Stallard, 2004). Although PTG is hypothesized to develop from the emotional struggle that often follows a traumatic experience (Tedeschi & Calhoun, 2004), there is disagreement regarding the relationship between posttraumatic stress and PTG (Dekel, Ein-Dor, & Solomon, 2012; Zoellner & Maercker, 2006). The current study evaluates PTG in disaster-affected adults over time. Specifically, the temporal relationship between posttraumatic stress, general emotional distress, and PTG is examined in a sample of largely African American, hurricane-exposed females.

Overview of Posttraumatic Stress Disorder

Over the course of a lifetime, the majority of adults will experience at least one potentially traumatic event (Breslau, Davis, Andreski, & Peterson, 1991). Although most individuals will be reasonably unscathed, a minority will develop significant psychological distress and functional impairments in response to the traumatic experience. The Diagnostic and Statistical Manual of Mental Disorders, 4th Edition, Text Revision (DSM-IV-TR; American Psychiatric Association, 2000) stipulates that in order to qualify for Posttraumatic Stress Disorder (PTSD), an individual must be exposed to a traumatic event in which "the person experienced, witnessed, or was confronted with an event or events that involved actual or threatened death or serious injury, or a threat to the physical integrity of self or others" (p. 467). Traumatic events include but are not limited to violent personal assault, military combat, terrorist attacks, kidnapping, natural or manmade disasters, severe car accidents, and being taken hostage. While exposure to a trauma is essential to the diagnosis of PTSD, the cognitive and affective reactions to the event must be considered. The DSM-IV-TR also states that "the person's response involved intense fear, helplessness, or horror" (APA, 2000, p. 467). Also necessary are the criteria of reexperiencing, avoidance, and increased arousal. Reexperiencing the traumatic event occurs by recurrent and intrusive distressing recollections, distressing dreams, feelings as if the event is recurring, increased distress at exposure to cues that resemble the event, or physiological reactivity on exposure to cues that resemble the event. Avoidance of stimuli associated with the trauma must be exhibited by three of the following: efforts to avoid thoughts, feelings, or conversations associated with the trauma, efforts to avoid activities, places, or people that arouse recollections of the trauma, inability to recall an important aspect of the trauma, diminished interest or participation in activities, feeling of detachment or estrangement,

restricted range of affect, and sense of foreshortened future. Two symptoms of increased arousal are required as well. These symptoms include difficulty sleeping, irritability or outbursts of anger, difficulty concentrating, hypervigilance, and exaggerated startle response (APA, 2000). These symptoms must be experienced for at least one month, and the disturbance must cause clinically significant distress or impairment in social, occupational, or other areas of functioning.

The lifetime prevalence of PTSD is approximately 8% in the adult population of the United States (APA, 2000), although epidemiologic studies report prevalence rates from 1.0% to 12.3% (Fairbank, Ebert, & Caddell, 2001). The symptoms related to reexperiencing, avoidance, and increased arousal typically surface within three months of the trauma, but symptoms may be delayed for months or even years (APA, 2000). Approximately half of individuals diagnosed with PTSD will completely recover within three months, although the symptoms may become chronic for some individuals, lasting for years. Some individuals exhibit a course of symptoms that come and go, and reactivation of symptoms after perceived recovery is possible in response to stressors, new traumas, and stimuli related to the original trauma.

With the recent release of the Diagnostic and Statistical Manual of Mental Disorders, 5th Edition (APA, 2013a), several changes were made to the criteria of PTSD. With regard to the traumatic event itself, sexual violence was explicitly added to the events to be considered traumatic. As for how the trauma is experienced, learning of an actual or threatened death, either by violence or accidentally, of a close family member or friend was added. First responders and police officers were given special consideration as "repeated or extreme exposure to aversive details of the traumatic event" (APA, 2013a, p.271) was also included in criterion A. The requirement for the individual to respond to the event with intense fear, helplessness, or horror was removed because of limited utility in determining the presence of PTSD (APA, 2013b). A

fourth symptom cluster was added that consists of negative alterations in cognitions and mood. This group of symptoms includes criteria from the avoidance symptom cluster from the DSM-IV-TR (APA, 2000) as well as some new criteria including "persistent and exaggerated negative beliefs or expectations about oneself, others, or the world" (p.172). Provided examples include "I am bad", "No one can be trusted", and "The world is completely dangerous". Dissociative symptoms can now be documented by the depersonalization or derealization specifiers.

In response to Hurricane Katrina, research emerged that documented high levels of PTSD in affected samples. Initial rates ranged from 14.9% (Kessler et al., 2008) to 30.3% (Galea et al., 2007). McLaughlin and colleagues (2011) found that delayed onset of PTSD symptoms was common with rates increasing from 17.1% at 7 months post-Katrina to 29.2% at 24 months post-Katrina. Additionally, of the individuals who met criteria for PTSD at the initial assessment, only 39% of them fully recovered from their symptoms within two years of the storm.

Overview of Posttraumatic Growth

As there are many negative consequences of suffering a traumatic event, there are also positive effects that can result. Researchers state that long-term, positive change can occur, and higher levels of functioning, even higher than pre-trauma levels, can be achieved (Calhoun & Tedeschi, 1999, 2006). To capture these positive effects, Tedeschi and Calhoun (1996) coined the term posttraumatic growth (PTG) and defined it as "positive psychological change experienced as a result of the struggle with highly challenging life circumstances" (Tedeschi & Calhoun, 2004, p. 1).

In their theoretical model of PTG, Tedeschi and Calhoun (2004) use an earthquake metaphor to explain the process by which one achieves growth. The model states that certain individuals possess styles of managing distressing emotions and that some of these coping styles

make these individuals more likely to experience PTG. The traumatic event is described as a seismic event (i.e., an earthquake) that shakes and destroys one's schemas—fundamental beliefs and goals. In the wake of the traumatic event, the individual scrambles to manage the emotional distress. Cognitive processing at this point is likely to be automatic and may consist of intrusive thoughts or images (Tedeschi & Calhoun, 2004). Negative rumination is also common. In an effort to reduce the intrusive cognitions and emotional distress, the individual seeks out emotional support from others and describes the distress being experienced. Meanwhile, others provide new perspectives that are integrated into the newly forming schemas. As a result, the individual is better able to manage the emotional distress and control the automatic, negative rumination. This allows the individual to confidently let go of the beliefs and assumptions held before the trauma. The rumination that was once automatic and intrusive becomes more deliberate and contributes to the building of new schemas. Once these new, more positive schemas are firmly standing, growth occurs (Calhoun & Tedeschi, 1998). Any lingering distress maintains the active cognitive processing and allows for continual growth.

In the early days of conceptualizing PTG, perceived changes were sorted into three broad categories (Tedeschi & Calhoun, 1996). Those categories were perceived changes in self, a changed sense of relationships with others, and a changed philosophy of life. Perceived changes in self refers to a feeling of being strong and more experienced as a result of facing the challenges related to a trauma (Joseph, Williams, & Yule, 1993). In previous studies, many traumatized individuals reported feeling more self-assured (Collins, Taylor, & Skokan, 1990), more competent in stressful situations, and more likely to assertively face problems rather than avoid them (Thomas, DiGiulio, & Sheehan, 1991). A changed sense of relationships with others is achieved mostly through disclosing one's emotional distress to and receiving support from

others (Tedeschi & Calhoun, 1996). Counseling was shown to help rape victims learn to protect themselves from abusive relationships, develop healthy romantic relationships, and grow closer to their families (Veronen & Kilpatrick, 1983; Burt & Katz, 1987). Mothers of newborns with serious medical problems reported feeling emotionally closer to their families and a stronger appreciation for how precious their children are (Affleck, Allen, Tennen, McGrade, & Ratzan, 1985). A changed philosophy of life refers to an increased appreciation for one's own existence and a more positive perspective on life (Tedeschi & Calhoun, 1996). Traumatized individuals have reported changing their priorities in order to take life easier and enjoy life more (Taylor, Lichtman, & Wood, 1984) and living each day to the fullest (Joseph et al., 1993). Others have experienced a deepening of their spirituality and an affirmation of their religious beliefs (Andrykowski, Brady, & Hunt, 1993).

Although there is ample evidence that some individuals experience positive changes in the aftermath of a trauma, growth is not the direct result of a stressful life event. Most individuals are, in fact, resilient in the wake a traumatic event (Westphal & Bonanno, 2007). That is to say that the majority of individuals are relatively unaffected by trauma. They maintain their levels of functioning or quickly return to their pre-trauma levels of functioning and experience little to no PTSD symptoms after traumatic events (Clay, Knibbs, & Joseph, 2009; Scales, Benson, Leffert, & Blyth, 2000). Posttraumatic growth, on the other hand, refers to the achievement of higher levels of functioning as a result of struggling through adversity in the wake of a traumatic event (Linley & Joseph, 2004). It requires that the stressful event challenges, contradicts, or invalidates the individual's core beliefs and causes intense emotional distress (Tedeschi & Calhoun, 2004). Resilient individuals are not challenged in such a way and

are therefore less likely to experience PTG (Levine, Laufer, Stein, Hamama-Raz, & Solomon, 2009).

Desiring a tool for measuring these perceived benefits, Tedeschi and Calhoun (1996) developed the Posttraumatic Growth Inventory (PTGI). Factor analysis produced a 21-item, five factor measure that utilized a 6-point Likert scale. Respondents rate the degree to which they have experienced positive changes as a result of their crisis. The five factors are Relating to Others, New Possibilities, Personal Strength, Spiritual Change, and Appreciation for Life. Initial development of the measure showed strong internal consistency ($\alpha = .90$). The PTGI has been widely used to measure positive effects in the wake of various traumas and with a large range of age groups (see Linley & Joseph, 2004; Clay, Knibbs, & Joseph, 2009; Zoellner & Maerker, 2006). Additionally, the PTGI has been translated into several languages for use in different countries (Teixeira & Pereira, 2013; Ho, Law, Wang, Shih, Hsu, & Hou, 2013; Maercker & Langner, 2001; Kunst, 2010).

The Relationship between Posttraumatic Stress and Posttraumatic Growth

Although PTG is becoming an extensively studied construct, there exists a great deal of controversy as to its association with another important construct contained in its theoretical model: posttraumatic stress. Often thought to be opposites, growth and stress have shown mixed associations (see Zoellner & Maecker, 2006). Such inconsistencies have given rise to various study designs including linear, curvilinear, and longitudinal. Dekel, Ein-Dor, and Solomon (2012) posit that posttraumatic stress and PTG have three possible types of associations. First, they suggest that distress and growth exist as opposing ends on the same spectrum. As such, negative relations should arise. In contrast, a positive association would imply that higher levels of distress result in more growth. Finally, the two constructs could be independent of each other

and result in non-significant relations (Dekel et al., 2012). The authors postulate that the inconsistent findings may be, in part, the result of methodological problems.

In attempts to explain this range of associations between PTG and posttraumatic stress, several researchers have found methodological patterns in the literature. Zoellner and Maecker (2006) noted that most cross-sectional studies that used standardized measures of PTG (e.g., PTGI) found either a positive relationship or a non-significant relationship between the two constructs. For example, Butler and colleagues (2005) used the PTGI (Tedeschi & Calhoun, 1996) with a sample of victims of the September 11, 2001, terrorist attacks. Results showed that PTG and posttraumatic stress symptoms were positively associated. The authors suggest that in accordance with Tedeschi and Calhoun's (2004) model of PTG, in the wake of a trauma, growth and distress can, and often do, coexist. Positive correlations were also found in military medical personnel (McLean et al., 2013). In this study, PTSD symptoms from two different sources of trauma (i.e., combat exposure, healthcare exposure) were predictive of PTG as measured by the PTGI. Symptoms of avoidance and intrusion were positively correlated with PTGI scores in hospital patients that were involved in accidents and victims of assault (Snape, 1997). In their development of the Stress-Related Growth Scale (SRGS), Park, Cohen, and Murch (1996) found growth to be positively related to traumatic distress in college students. Another study of college students found that global posttraumatic distress symptoms were positively associated with PTGI scores (Shigemoto & Poyrazli, 2013). Israeli former prisoners of war also endorsed experiencing symptoms of PTSD and growth simultaneously (Solomon & Dekel, 2007). Similar results were found in a sample of terror-exposed adolescents from Israel (Levine, Laufer, Hamama-Raz, Stein, & Solomon, 2008). The investigators proposed that PTSD and PTG are not mutually exclusive and that they cannot be thought of as the opposite ends of the same continuum. Kunst

(2010) used a translation of the PTGI and found positive correlations in a sample of Dutch victims of various traumas (e.g., sexual assault, physical assault, theft with violence). As one can see, a positive linear relationship between PTG and PTSD is often found when using a standardized measure of PTG. However, non-significant associations were found in a sample of women suffering from breast cancer (Cordova, Cunningham, Carlson, & Andrykowski, 2001) and in war-exposed refugees from Sarajevo (Powell, Rosner, Butollo, Tedeschi, & Calhoun, 2003).

Zoellner and Maercker (2006) also reported that cross-sectional studies that employ unstandardized measures or open-ended interview questions to assess for PTG often found negative correlations between PTG and posttraumatic distress. For example, Frazier and colleagues (2001) developed a 17-item posttraumatic life change measure specifically for their study of sexual assault victims. The instrument was derived from open-ended responses from an earlier study (Frazier & Burnett, 1994) and from a literature review of life changes in the wake of a trauma. Results showed that positive changes were negatively associated with PTSD. Kimhi, Eshel, Zysberg, and Hantman (2010) also developed a measure of PTG for their study. They found negative associations as well. A large sample of veterans also rated desirable effects of combat (e.g., broader perspective, learned to cope with adversity) to be negatively associated with PTSD symptoms (Aldwin, Levenson, & Spiro III, 1994). Interestingly, these three studies assessed *positive and negative* life changes simultaneously, within the same measure. This method differs from the majority of studies that use scales to measure positive life changes in isolation (e.g., PTGI, SRGS) and find mostly positive associations. It is possible that when participants are given the choice to report their posttraumatic life changes as *positive or negative*, many will associate their trauma with more negative changes.

In addition to linear associations, curvilinear relations have been reported by several researchers in efforts to further explain the complex relationship between PTG and PTSD symptoms. The first of these studies found a significant curvilinear association in individuals exposed to terrorist attacks (Butler et al., 2005). The investigators commented that, when graphed, the regression equation took the form of an inverted U. They explained that participants who endorsed moderate levels of PTSD symptoms reported the highest amount of growth. Similar results were seen in former prisoners of war, and it was suggested that there may be an optimal level of distress in order for growth to occur (Solomon & Dekel, 2007). The quadratic (inverted U) relationship was also found in traumatized adolescents (Levine et al., 2008), Sri Lankan university students (McCaslin et al., 2009), and British assault victims (Kleim & Ehlers, 2009). While Kunst (2010) found that PTSD did not significantly predict PTG linearly, the curvilinear regression was significant. McLean and colleagues (2013) reported that posttraumatic stress symptoms from providing healthcare to wounded soldiers and combat itself produced similar curvilinear associations with PTG. An insignificant quadratic association was reported by Shigemoto and Poyrazli (2013). These authors explained that their sample of college students may have been exposed to relatively minor stressors, which were not sufficiently severe enough to elicit traumatic distress. Aldwin and colleagues (1994) also found a non-significant curvilinear regression. However, as mentioned above, this study assessed positive and negative life changes simultaneously.

Although efforts to clarify the relationship between posttraumatic stress and PTG have increased in recent years, there remains a great many discrepancies across studies. Several researchers have proposed that the persistent reports of inconsistent results are due to the cross-sectional nature of the studies (see Lowe, Manove, & Rhodes, 2013; Dekel et al., 2012; Linley,

Joseph, & Goodfellow, 2008). These authors state that a better understanding of the temporal course of PTG may clear up the statistical inconsistencies. The need for longitudinal studies has been stressed (see Maercker & Zoellner, 2004; Linley & Joseph, 2004), and researchers have attempted to meet that need, but once again, varying results have been revealed thus far.

The majority of longitudinal studies examining the course of PTG and posttraumatic stress use growth to predict reduced distress at follow up. For example, McMillen, Smith, and Fisher (1997) assessed perceived benefits in individuals who were exposed to three different disasters (i.e., tornado, mass killing, plane crash). Four to six weeks after their respective disasters, participants were asked a single, yes or no item to assess for positive changes that came as a result of the disaster. The authors found that those who perceived at least one benefit were significantly less likely to meet criteria for PTSD three years later than those who did not perceive benefits. Growth was divided into two conceptualizations, sense making and benefit finding, by Davis, Nolen-Hoeksema, and Larson (1998) in their study of bereaved individuals. Sense making was found to be negatively predictive of distress at six months post-loss, and benefit finding was negatively predictive of distress at thirteen and eighteen months post-loss. The authors proposed that developing an explanation for a trauma (i.e., sense making) is important in the early stages of adjustment, while finding positive changes is a long-term process and may prove more important in maintaining psychological adjustment. A previously mentioned study (Frazier et al., 2001) measured PTSD and posttraumatic life changes, both positive and negative, in sexual assault victims at two weeks, two months, six months, and one year post-trauma. In this study, those who reported positive changes at all four times experienced the least distress at one year follow up. Ickovics, Meade, Kershaw, Milan, Lewis, and Ethier (2006) found that adolescents who reported more PTG twelve months after a stressful

life event also rated less emotional distress at eighteen months post-event. Furthermore, participants who endorsed high emotional distress pre-event and low post-event PTG continued to suffer from high emotional distress at twelve-month follow-up. Lechner, Carver, Antoni, Weaver, and Phillips (2006) used curvilinear relationships to create three groups in their sample of women living with breast cancer: low growth, intermediate growth, and high growth. Women with intermediate growth six months after diagnosis had higher levels of intrusive thoughts, avoidant behavior, and distress related to their diagnosis than women with high and low growth. It was hypothesized that those with high growth used positive coping to alleviate their distress, and those with low growth failed to experience the events as a crisis; therefore, neither of these groups experienced high distress. In another longitudinal study, individuals who experienced positive life changes after various traumas had lower rates of PTSD symptoms, depression, and anxiety at the six-month follow up (Linley, Joseph, & Goodfellow, 2008).

There are also studies that used the presence of posttraumatic stress to predict later PTG; however, many of these found non-significant results. Combat veterans with high levels of PTSD experienced more growth than resilient soldiers who endorsed low levels of PTSD (Dekel et al., 2012). In a similar study, PTSD was not predictive of PTG in former prisoners of war (Erbes, Eberly, Dikel, Johnsen, Harris, & Engdahl, 2005). One possible explanation for this result is the long time span between the traumatic event and data collection as participants were veterans of World War II and the Korean War, and data was collection in the early 1990's and in 2002. In contrast, a short time span (six to twelve months) was suggested as a contributor to the non-significant correlations between PTG and PTSD in amputees (Phelps, Williams, Raichle, Truner, & Ehde, 2008) and in victims of violence and theft (Kunst, 2010). Time since diagnosis was significantly predictive of PTG in a sample of women with breast cancer (Sears et al., 2003);

however, PTG was not related to cancer related stress or negative mood. Salsman and colleagues (2009) also found growth and cancer-related distress to be unrelated colorectal cancer survivors.

Summary and Hypotheses

In attempts to test Tedeschi and Calhoun's (2004) model of PTG, many researchers have examined the relationship between PTG and PTSD. The cross-sectional studies mentioned above, both linear and curvilinear, are informative, but the study of posttraumatic distress and recovery is one in which time must be taken into account. The cross-sectional design cannot provide information about the process by which change is occurring because the data are providing a mere snapshot of the participants' symptoms (Nolen-Hoeksema & Davis, 2004). The progression from experiencing a trauma to developing posttraumatic stress symptoms and finally to achieving growth takes time, and a sufficient amount of time must be given in order to allow the symptoms to develop and for recovery to take place. For those traumatized individuals who develop PTSD, the temporal course of their symptoms is unique to them. Therefore, PTG must also be considered to have a distinct course.

It is becoming apparent to researchers that these constructs may be best studied longitudinally rather than cross-sectionally if the goal is to explain the mechanisms by which they develop. Several longitudinal studies have been conducted; however, these studies are plagued with methodological problems. For example, the majority of longitudinal studies can be split into two groups: those with time spans that were relatively short (e.g., Butler et al., 2005; Frazier et al., 2001; Davis et al., 1998) and those with time spans that were very long (Solomon et al., 2007; Dekel et al., 2012; Erbes et al., 2005). Studies that employ a moderate time span are lacking, particularly when considering that PTSD symptoms can persist for years or have a

delayed onset (McLaughlin et al., 2011). Additionally, most existing studies analyze data from only two times (e.g., baseline, follow-up) rather than from a series of assessments spaced out over years. Also problematic is the use of unstandardized, and often single-item, measures of growth that lack statistical development to say nothing of reliability and validity testing (see Frazier et al., 2001; Sears et al., 2003; McMillen et al., 1997; Davis et al., 1998). Moreover, some studies designed to test the PTG model fail to adequately assess for PTSD symptoms and measure general distress or depression instead (Ickovics et al., 2006; Lechner et al., 2006). Finally, most studies measure growth's effects on posttraumatic stress symptoms but neglect the path from distress to growth.

The current study examined the temporal relationships between PTG, PTSD, and general emotional distress. The proposed longitudinal model (Figure 1) evaluated Tedeschi and Calhoun's (2004) model of PTG. To correct for the methodological problems of the previously mentioned studies, standardized measures of all variables were used, and the study incorporated data collected at four times over 4 ½ years. In accordance with Tedeschi and Calhoun's (2004) model, it was expected that PTSD and emotional distress would remain stable and decrease over time and that PTSD scores would predict emotional distress scores. The following are hypothesized:

1. PTSD at Time 1 (T1) and T2 will positively predict PTG at T3.
2. PTG at T3 will negatively predict PTSD at T4.
3. PTG at T3 will negatively predict global emotional distress at T4.

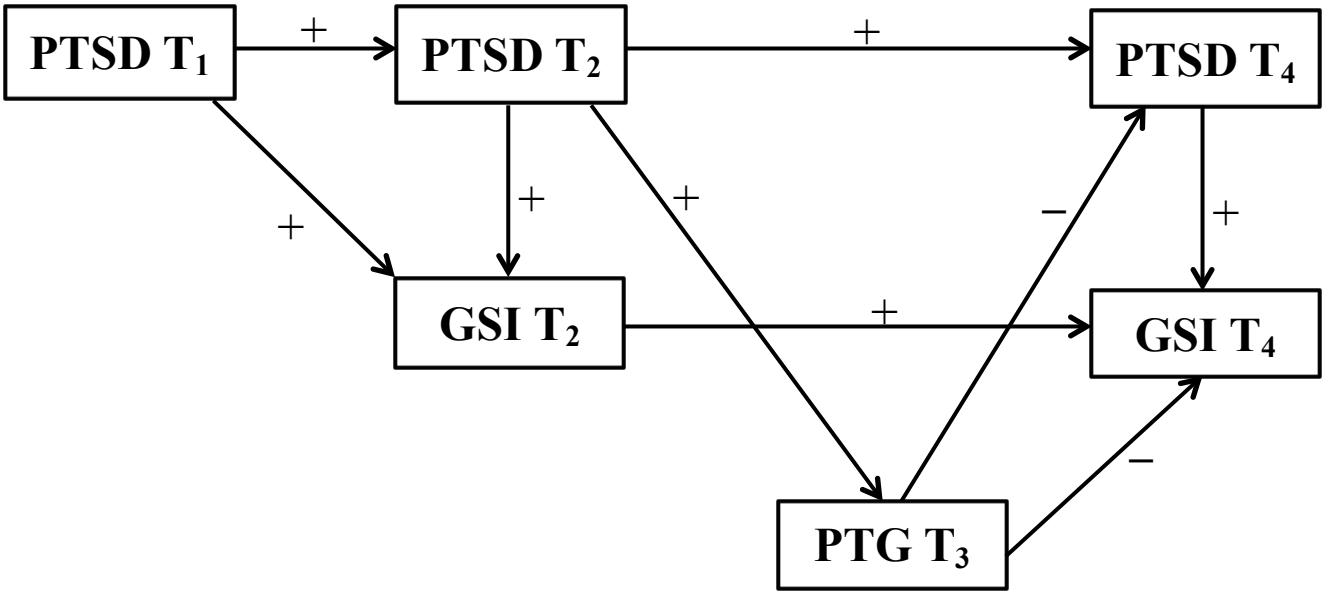

Figure 1. Proposed Longitudinal Model of PTSD, PTG, and emotional distress

METHOD

Participants

Participants were adult females who lived in and around the city of New Orleans, Louisiana when Hurricane Katrina made landfall (i.e., August 29, 2005). The sample was a subset of individuals who participated in a large longitudinal study that began data collection in October 2005. The original sample (N = 379) consisted of mother-child dyads, and they were recruited to study several variables within families and their influences on adjustment and recovery (see Kelley et al., 2010). As there was an emphasis on studying parenting behaviors in the original study, mother-child dyads were sought out, and therefore all adult participants are female and mothers of school-age children. The study was funded by grants from the National Institute of Mental Health (1R21MH078148-01) and the Department of Homeland Security (2008-ST-061-ND 0001).

For the purposes of this study, 84 females participated at T1, 83 at T2, 86 at T3, and 75 at T4. At T1, participants' ages ranged from 26 to 59 years with an average of 40.2 (SD = 7.5). African Americans made up the majority of the sample (61.6%), 32.6% were Caucasian, 4.7% were Asian, and 1.2% were Hispanic. Thirty-two percent of the participants earned a college degree or higher, 53% earned at least a high school diploma, and approximately 15% did not graduate high school. Forty-seven percent reported earning less than $15,000 annually, 28% reported earning between $15,000 and $49,999, and 25% reported earning at least $50,000 annually. Approximately 54% were married, while 46% were single, divorced, or separated.

Measures

Demographic Questionnaire. Each participant completed a demographic questionnaire (See Appendix A) at T1. Information provided included age, gender, race, marital status, income level, education level, and employment status.

Posttraumatic Growth Inventory (PTGI; Tedeschi & Calhoun, 1996). The self-report PTGI (See Appendix B) contains 21 items related to posttraumatic growth. The measure is made up of five factors: New Possibilities (α = .85), Relating to Others (α = .92), Personal Strength (α = .88), Appreciation for Life (α = .83), and Spiritual Change (α = .81). Participants rate items on a 6-point Likert scale indicating the degree to which they experienced each positive change as a result of their struggle with a trauma. The scale ranges from 0 ("I did not experience this change as a result of my crisis) to 5 ("I experienced this change to a very great degree as a result of my crisis"). Several studies have found the PTGI to be a psychometrically sound measure. Linley, Andrews, and Joseph (2007) and Taku, Cann, Calhoun, and Tedeschi (2008) showed that the hypothesized oblique five-factor model fit their respective data better than other possible models including three-factor and higher order models. In three studies that examined the factor loadings of the PTGI, all 21 items had loadings between .50 and .91, suggesting that they are suitable for their respective factors (Tedeschi & Calhoun, 1996; Burnet, McDonough, Hadd, Crocker, & Sabiston, 2010; Purc-Stephenson, 2014). The measure has acceptable test-retest reliability (r = .71; Tedeschi & Calhoun, 1996). Additionally, studies have shown the PTGI to have strong content validity (Shakespeare-Finch, Martinek, Tedeschi, & Calhoun, 2013), concurrent and discriminant validity (Tedeschi & Calhoun, 1996), and construct validity (Shakespreare-Finch & Barrington, 2012; Lee, Luxton, Reger, & Gahm, 2010). PTG was assessed at T3, and the total score was used (α = .96 in the current sample).

Posttraumatic Stress Diagnostic Scale (PDS; Foa, 1995). The PDS (See Appendix C) is a 49-item, self-report measure that assesses PTSD symptoms as stated in the DSM-IV (APA, 1994). The number and type of traumatic events experienced are assessed, as well as the time since the respective trauma(s). Participants also rate the frequency of re-experiencing, avoidance, and hyperarousal symptoms. Duration of symptoms and level of impairment are also assessed. The PDS has been shown to be a reliable and valid tool for assessing PTSD symptoms (Foa, Cashman, Jaycox, & Perry, 1997; Sheeran & Zimmerman, 2002). The total severity score was used at T1, T2, and T4 (α = .94 for all times in the current sample).

Brief Symptom Inventory-18 (BSI-18; Derogatis, 2000). The BSI-18 (See Appendix D) is an 18-item abridged version of the 53-item Brief Symptom Inventory (Derogatis, 1993). It was originally developed to measure psychological distress in both community and medical settings. The measure contains three factors: Depression, Anxiety, and Somatization. Participants rate how much they are bothered by various psychological symptoms on a 5-point Likert scale ranging from 0 ("Not at all") to 4 ("Extremely"). A Global Severity Index (GSI) can be calculated and reflects a full-scale score across the entire measure. Studies have shown the BSI-18 to be a valid and reliable measure of psychological distress (Zabora et al., 2001; Recklitis et al., 2006). The GSI of the BSI-18 was used at T2 and T4 (α = .95 for both times in the current sample).

Procedure

The data used in the present study comes from a large study on the aftereffects of Hurricane Katrina among mothers and their children. Upon receiving approval from the institutional review board, as well as from the Orleans Parish, Jefferson Parish, and East Baton Rouge Parish school systems, hurricane-exposed children were recruited for the study through

their respective schools. The children's parents were sent information about the study and consent forms for participation. Once parental consent was obtained, children were visited at school and supervised while they completed a packet of questionnaires. The participating mothers were mailed packets of questionnaires such as the demographic questionnaire, PDS, PTGI, and BSI-18 and were provided a prepaid envelope for returning the packet. Data collection was conducted six times over the course of 52 months after Hurricane Katrina. For the purposes of this study, T1 is 3 months post-Katrina, T2 is 20 months post-Katrina, T3 is 40 months post-Katrina, and T4 is 52 months post-Katrina. Adult participants were compensated monetarily for completing the questionnaires and mailing them back—$20 or entered into a cash prize drawing for T1, $25 for T2, $50 for T3 and T4.

RESULTS

Descriptive Statistics and Zero Order Correlations

Means, ranges, standard deviations, and intercorrelations for predictor and outcome variables are listed in Table 1. T1 PTSD did not differ from T2 PTSD or T4 PTSD. PTSD scores decreased from T2 to T4, $t(67) = 2.54$, $p < .05$. GSI scores also decreased from T2 to T4, $t(67) = 2.88$, $p < .05$. Participant age, race, and marital status were not associated with any predictor or outcome variables. Income level was significantly related to T2 PTSD ($r = -.35$, $p < .01$), T2 GSI ($r = -.40$, $p < .01$), T4 PTSD ($r = -.32$, $p < .01$), and T4 GSI ($r = -.31$, $p < .01$). Education level was significantly related to T2 PTSD ($r = -.25$, $p < .05$), T2 GSI ($r = -.36$, $p < .01$), T4 PTSD ($r = -.29$, $p < .05$), and T4 GSI ($r = -.26$, $p < .05$). Income and education level also significantly correlated with each other ($r = .61$, $p < .01$). As Time 4 saw the largest loss of participants, analyses were conducted to compare those missing individuals to the rest of the sample. No differences were found on any variable.

Table 1. Means, Standard Deviations, Ranges, and Intercorrelations among Variables

Variable	Mean	SD	Range	1	2	3	4	5
1. T1 PTSD	12.29	12.25	0 – 48					
2. T2 PTSD	13.60	11.35	0 – 45	.606*				
3. T2 GSI	11.77	13.96	0 – 58	.400*	.708*			
4. T3 PTG	60.30	27.00	0 – 104	.075	.223	.075		
5. T4 PTSD	9.41	10.15	0 – 38	.350*	.527*	.638*	.184	
6. T4 GSI	9.52	12.12	0 – 59	.233	.542*	.867*	.107	.738*

*$p < .01$

Path Analysis

Path analysis is type of structural equation modeling that utilizes measured, or observed, variables rather than latent variables to measure the relationships between one or more independent variables and one or more dependent variables (Ullman, 2007). EQS 6.1 (Bentler, 2001) was used to conduct the path analysis. Path coefficients, variances, and covariances were estimated from the proposed model to produce an estimated population covariance matrix. Another covariance matrix was created directly from the sample data. The chi-squared test was used to determine how well the estimated covariance matrix fit to the actual data with a non-significant test indicating a good fit. The Bentler-Bonett non-normed fit index (NNFI), comparative fit index (CFI), and root mean square error of approximation (RMSEA) were also used to measure fit. When NNFI, CFI, and 1-REMSEA are larger than .95, a model is thought to be a good fit to the data (Bollen & Curran, 2006).

Variable distributions and frequencies were examined and revealed no univariate outliers. Mahalanobis distances were used to search for multivariate outliers, and none were found. As some of the predictor and outcome variables were judged to be non-normal by their distributions, univariate and multivariate assumptions of normality were tested with SPSS, and several variables were found to differ significantly from the normal distribution. Additionally, the Bonett-Woodward-Randall test (Bonett, Woodward, & Randall, 2002) showed excess kurtosis indicative of non-normality. Therefore the maximum likelihood estimation method was used based on the covariance matrix with the Yuan-Bentler scaled chi-squared correction (Yuan & Bentler, 1998) to obtain robust estimates.

Expectation maximization (EM) was used to estimate missing data (6% in this study). EM is an iterative procedure consisting of a repeating two-step process. First, a covariance

matrix was created using the available data. Then regression equations were generated from the covariance matrix to predict missing values. New covariance matrices and regression equations were created to predict more accurate values, and the process continued (Tabachnik & Fidell, 2007). EM is the preferred method for imputing missing data because it adds residual variance to the imputed values (Enders, 2003).

Hypothesized Model. The hypothesized model (Figure 2) was not a good fit to the data, $\chi^2(6) = 20.66$, $p < .01$, CFI = .97, NNFI = .92, 1-RMSEA = .90. Analysis revealed that PTSD and GSI remained stable over time. There was a direct effect of T2 PTSD on T2 GSI ($\beta = .72$, $p < .05$). The relationship between these two variables decreased in T4, but the prediction remained significant ($\beta = .36$, $p < .05$). There was no direct effect of T1 PTSD on T2 GSI. T2 PTSD was predictive of T3 PTG, but the relationship was small ($\beta = .23$, $p < .05$). T3 PTG was not predictive of T4 PTSD or T4 GSI.

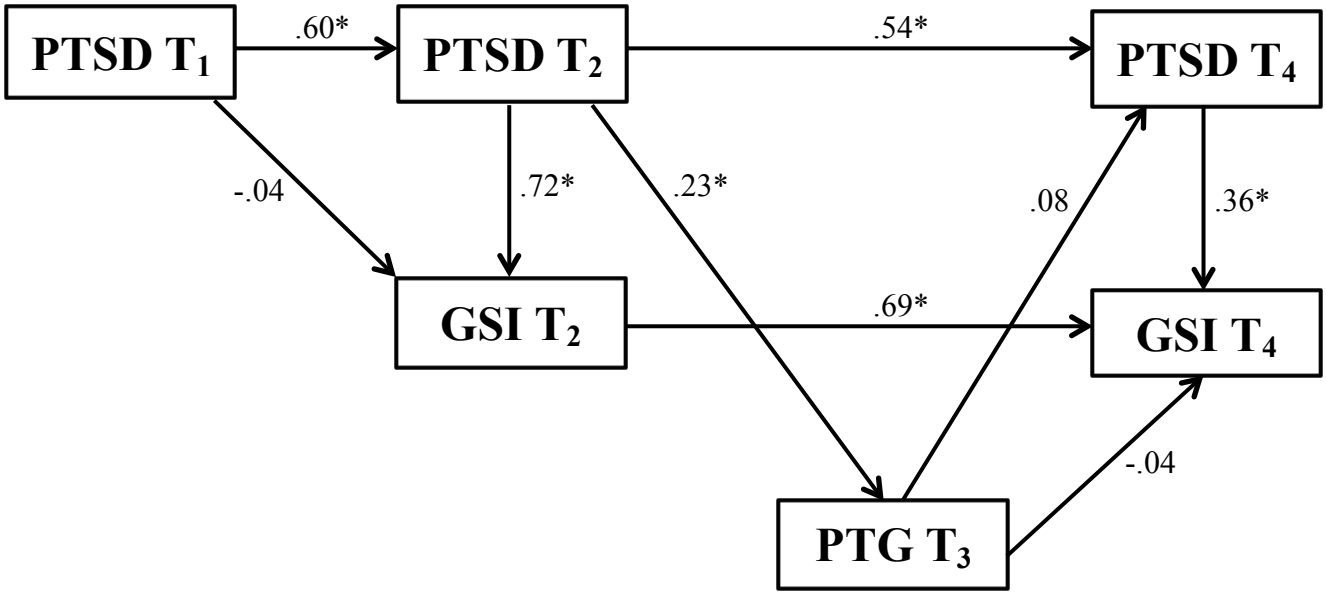

Figure 2. Hypothesized Model of PTSD, PTG, and emotional distress
*p < .05

Revised Model. Because the hypothesized model was not a good fit to the data, theoretically relevant post hoc modifications were made. The Lagrange Multiplier test for adding parameters (Rao, 1948) suggested that a parameter be added to the model from T2 GSI to T4 PTSD. The standardized residual matrix was also examined, and it suggested that the same parameter be added. With this addition, the model proved a good fit to the data, $\chi^2(5) = 9.53$, $p = .09$, CFI = .99, NNFI = .99, 1-RMSEA = .96 (Figure 3). Analyses showed that several of the path coefficients remained largely unchanged. T1 PTSD continued to predict T2 PTSD ($\beta = .61$, $p < .05$), and GSI remained stable over time ($\beta = .66$, $p < .05$). There was a direct effect of T2 PTSD on T2 GSI ($\beta = .72$, $p < .05$), and the same went for T4 ($\beta = .32$, $p < .05$). PTG still did not account for much in the revised model, as all of its path coefficients were not significant. A full mediation was found between T2 PTSD, T2 GSI, and T4 PTSD as the new parameter showed that emotional distress at T2 strongly predicted T4 PTSD ($\beta = .61$, $p < .05$). Additionally, the relationship between T2 PTSD and T4 PTSD dropped to near zero and was no longer significant in the revised model. This would suggest that effect of T2 PTSD on T4 PTSD is fully mediated by T2 GSI.

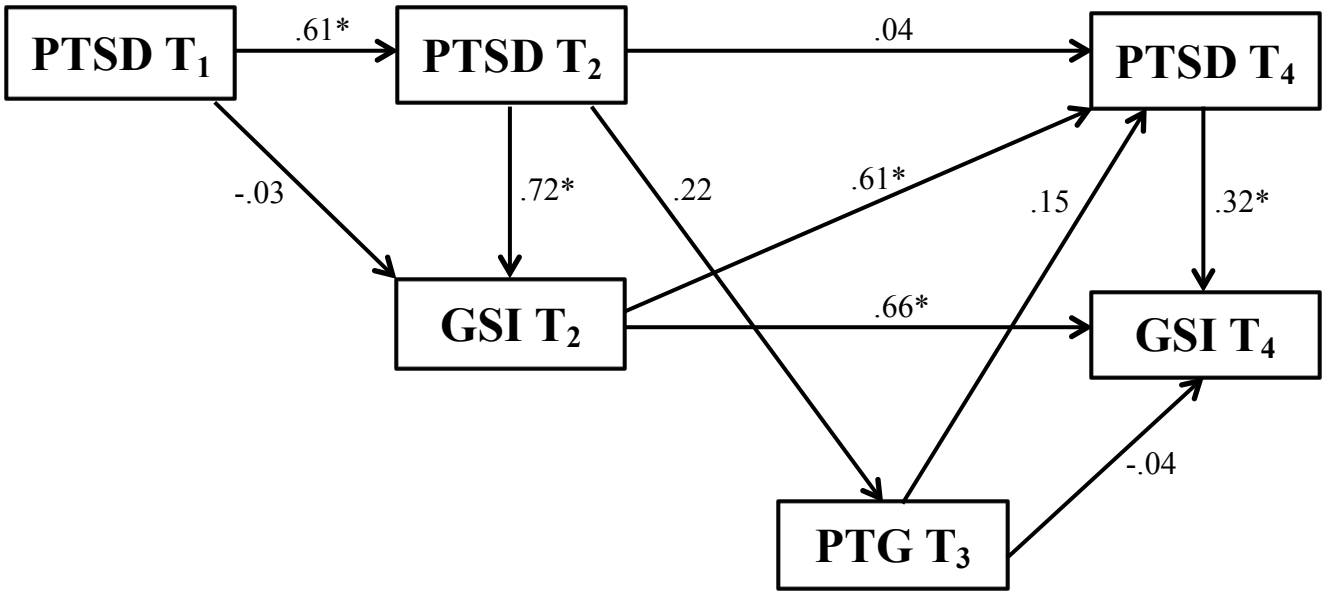

Figure 3. Revised Model of PTSD, PTG, and emotional distress
*p < .05

DISCUSSION

The present study explored the processes by which traumatized individuals recover and experience positive psychological change over time. A longitudinal path analysis was designed to test Tedeschi and Calhoun's (2004) model of PTG in a sample of adult females who experienced Hurricane Katrina. According to the original model, it was expected that posttraumatic stress and general emotional distress symptoms would show stability and systematically decrease over time. It was hypothesized that posttraumatic stress symptom severity at T1 and T2 would predict posttraumatic growth at T3. Also, hypothesized was that posttraumatic growth would have a direct effect and predict lower levels of posttraumatic stress symptoms and emotional distress at T4. Hypotheses were partially supported.

Posttraumatic Stress and Emotional Distress

Although the original model was a poor fit to the data, it did produce some significant paths. Posttraumatic stress and emotional distress were stable over time. Additionally, at both T2 and T4, PTSD was related to emotional distress which was consistent with the results of previous studies (Salsman et al., 2009; Linley et al., 2008). This result suggests that after a trauma, posttraumatic stress acts as a prominent contributor to additional psychological distress (i.e., anxiety and depression). This finding is in contrast to Phelps and colleagues (2008); however, the authors noted their sample of amputees might have not been sufficiently traumatized.

Interestingly, the typical path of recovery after a traumatic event was not found in the current sample. Although the majority of individuals who develop PTSD recover within three months (APA, 2000), the present study found that PTSD levels remained stable over a 20 month span of time post-Katrina. It was not until 52 months post-disaster that PTSD symptom severity

fell to lower levels. Recovery occurred more slowly than what would be expected based on existing literature. However, in a similar study, four years after experiencing Hurricane Katrina, 33% of participants met criteria for PTSD, and 30% had high levels of psychological distress (Paxson, Fussell, Rhodes, & Waters, 2012). Delayed onset of posttraumatic stress symptoms may be contributing to the slower than expected recovery of Katrina victims (McLaughlin et al., 2011).

In attempts to explain why Hurricane Katrina survivors specifically did not follow the path of recovery typical of other disaster-exposed individuals, Gill (2007) makes the distinction between natural disasters and technological disasters. Technological disasters are said to be "mechanical and technological malfunctions, human errors, organizational failures, inadequate response, and the like" (p. 617). He refers to Hurricane Katrina as a natural disaster *and* a technological disaster because of the poor response from the Federal Emergency Management Agency, insurance disputes, relocation of residents, failure of the Road Home program, and the increase in crime rates after the storm. As technological disasters are more likely to bring about secondary traumas, Gill (2007) notes that recovery is likely to take much longer than originally anticipated.

A statistical change was made to the original model in order to make the hypothesized paths better fit the data. The most noticeable difference in the revised model was the full mediation of the relationship between T2 PTSD and T4 PTSD by T2 GSI. This suggests that the association among posttraumatic stress symptoms at 20 months and 52 months post-Katrina works entirely through emotional distress at 20 months. This finding is surprising to say the least, especially when considering the strong relationship between the two PTSD variables in the original model. One possible explanation involves a closer look at the BSI-18 (Derogatis, 2000).

The items themselves are likely capturing distress from minor, daily stressors, rather than from traumas, that were experienced in the months and years after the hurricane. It is in this way that the measure may be acting more as a checklist of *stressors* rather than a measure of *distress*. It might be these stressors and ongoing struggles (e.g., frequent relocation, difficulty obtaining insurance payments, increased crime) caused by the technological disaster that maintain PTSD symptoms (Gill, 2007). These difficulties are likely causing secondary traumas and preventing individuals from recovering in a timely manner.

Posttraumatic Growth

Contrary to expectations, posttraumatic growth contributed little to the original model, and statistical modifications failed to strengthen the relations between PTG and other variables. This is in contrast to Tedeschi and Calhoun's (2004) theoretical model of PTG. One possible explanation for this lack of meaningful relationships is the timing of data collection. Recovery from Hurricane Katrina occurred more slowly than expected, and the individuals in this study may require more time to rebuild their schemas. A principal goal of this study was to provide a longitudinal model that spanned a larger period of time than many previous studies, but it appears as though more time is still needed.

In order to further explain the present findings within the context of prior research, the path from PTSD to PTG will be considered first. As the model states, traumatized individuals struggle because their pre-existing schemas were destroyed by a psychologically seismic event, and in time, they rebuild those schemas with new, positive experiences (Tedeschi & Calhoun, 2004). This was not found to be true as PTSD symptom severity did not predict growth at follow up. Although this finding is consistent with studies involving similar variables (Erbes et al., 2005; Phelps et al., 2008; Salsman et al., 2009), studies more closely resembling the current one

found a significant relationship between PTSD and future PTG (Dekel et al., 2012; Lowe et al., 2013).

The expectation that PTG would result in less posttraumatic distress was not supported. This gives support to the notion that positive change and stress experienced after a trauma are independent and do not influence one another (Joseph et al., 1993). It could also be reasoned that PTG is an outcome experienced by those who have recovered (Tedeschi & Calhoun, 2004) rather than a coping mechanism or self-enhancing appraisal (Taylor & Armor, 1996). Dekel and colleagues (2012) also found PTG to have no effect on PTSD symptoms or emotional distress, and the authors proposed that growth improves some types of well-being but not all. They also suggested that the value of PTG may be less functional and more illusory (Zoellner & Maercker, 2006).

Methodological differences between the present study and previous longitudinal studies may have also contributed to the lack of direct effects. The PTGI (Tedeschi & Calhoun, 1996) was used to assess PTG because it is the most empirically supported and widely used instrument of growth. Less validated and non-standardized measures have been used in the past (see Sears et al., 2003; Ickovics et al., 2006). Some studies assessed for positive and negative life changes simultaneously (Frazier et al., 2001; Linley et al., 2008) while others used single-item measures (McMillen et al., 1997; Davis et al., 1998). One study also integrated curvilinear and longitudinal designs and discouraged the use of linear models (Lechner et al., 2006).

Limitations

The present study has several limitations that must be mentioned. First, the data from this study was compiled from self-report measures, and observational data was not used. Also, the relationships discussed should be considered predictions rather than causal. The sample used

was a subset of a larger study, and the potential for generalizability is limited. Specifically, only females who experienced the same trauma participated in this study. Sample size is a weakness of this study, and the longitudinal design may have resulted in a self-selection bias as some individuals might have chosen not to participate because recalling the events around the storm were too distressing.

Implications and Future Directions

The theoretical model of posttraumatic growth (Tedeschi & Calhoun, 2004) was not supported by this study. PTSD levels did not predict PTG, and growth did not lead to reduced levels of distress. The continued endorsement of posttraumatic stress symptoms suggests that the victims of Hurricane Katrina did not recover as anticipated. The nature of the storm was such that the trauma experienced may not have been a singular isolated event for survivors. That is to say, in addition to a short lived natural disaster, the hurricane also acted as an inciting incident that introduced many other traumatic and/or stressful circumstances (e.g., learning of the deaths of loved ones, lasting financial struggles, disruption of social support networks and communities). This information should be useful from a clinical perspective in that the treatment of traumatized individuals should concentrate on reduction of posttraumatic stress symptoms, but it should also attempt to prevent potential traumas and stressful events that might hinder recovery. Additionally, emergency preparedness among governmental and community organizations should be emphasized as the results of this study could have been very different if New Orleans and the Gulf Coast had been better prepared for such a catastrophic storm.

Although PTG did not relate to the other posttraumatic variables, it does not completely discount the current theoretical model of PTG. More research is needed, especially longitudinal designs, to understand the mechanisms of recovery and paths to growth. Trajectories should be

studied to take a more exploratory approach to examining posttraumatic stress and growth. Pre-trauma variables, although rarely available, may also play a key role in predicting individuals who successfully achieve growth.

REFERENCES

Affleck, G., Allen, D. A., Tennen, H., McGrade, B. J., & Ratzan, S. (1985). Causal and control cognitions in parents' coping with chronically ill children. *Journal of Social and Clinical Psychology, 3*, 367-377.

Aldwin, C. M., Levenson, M. R., & Apiro III, A. (1994). Vulnerability and resilience to combat exposure: Can stress have lifelong effects? *Psychology and Aging, 9*, 34-44.

American Psychiatric Association. (1994). *Diagnostic and statistical manual of mental disorders* (4th ed.). Washington D.C.: Author.

American Psychiatric Association. (2000). *Diagnostic and statistical manual of mental disorders* (4th ed.) Text Revision. Washington D.C.: Author.

American Psychiatric Association. (2013). Diagnostic and statistical manual of mental disorders (5th ed.) Washington D.C.: American Psychiatric Publishing.

American Psychiatric Association. (2013). Posttraumatic Stress Disorder Fact Sheet. Retrieved from http://www.dsm5.org/Documents/PTSD%20Fact%20Sheet.pdf

Andrykowski, M. A., Brady, M. J., & Hunt, J. W. (1993). Positive psychosocial adjustment in potential bone marrow transplant recipients: Cancer as a psychosocial transition. Psycho-Oncology, 2, 261-276.

Bentler, P. M. (1995). *EQS structural equations program manual*. Encino, CA: Multivariate Software, Inc.

Bollen, K. A., & Curran, P. J. (2006). *Latent curve models. A structural equation perspective*. Hoboken, NJ: Wiley.

Bonett, D. G., Woodward, J. A., & Randall, R. L. (2002). Estimating p-values for Mardia's coefficients of multivariate skewness and kurtosis. *Computational Statistics, 17*, 117-122.

Breslau, N., Davis, G. C., Andreski, P., & Peterson, E. (1991). Traumatic events and posttraumatic stress disorder in an urban population of young adults. *Archives of General Psychiatry, 48*, 216-222.

Brunet, J., McDonough, M. H., Hadd, V., Crocker, P. R. E., & Sabiston, C. M. (2010). The posttraumatic growth inventory: An examination of the factor structure and invariance among breast cancer survivors. *Psycho-Oncology, 19*, 830-838.

Burt, M. R. & Katz, B. L. (1987). Dimensions of recovery from rape: Focus on growth outcomes. *Journal of Interpersonal Violence, 2*, 57-81.

Butler, L. D., Blasey, C. M., Garlan, R. W., McCaslin, S. E., Azarow, J., Chen, X.,…Speigel, D. (2005). Posttraumatic growth following the terrorist attacks of September 11, 2001: Cognitive, coping, and trauma symptom predictors in an Internet convenience sample. *Traumatology, 11,* 247-267.

Calhoun, L. G. & Tedeschi, R. G. (1998). Posttraumatic growth: Future directions. In R. G. Tedeschi, C. L. Park, & L. G. Calhoun (Eds.), *Posttraumatic growth: Positive change in the aftermath of crisis* (pp. 215–238). Mahwah, NJ: Lawrence Erlbaum Associates.

Calhoun, L. G. & Tedeschi, R. G. (1999). *Facilitating posttraumatic growth: A clinician's guide.* Mahwah, NJ: Erlbaum.

Calhoun, L. G. & Tedeschi, R. G. (2006). *The handbook of posttraumatic growth: Research and practice.* London: Erlbaum.

Clay, R., Knibbs, J., & Joseph, S. (2009). Measurement of posttraumatic growth in young people: A review. *Clinical Child Psychology and Psychiatry, 14,* 411-422.

Collins, R. L., Taylor, S. E., & Skokan, L. A. (1990). A better world or a shattered vision? Changes in life perspectives following victimization. *Social Cognition, 8*, 263-285.

Cordova, M. J., Cunningham, L. L. C., Carlson, C. R., & Andrykowsky, M. A. (2001). Posttraumatic growth following breast cancer: A controlled comparison study. *Health Psychology, 20*, 176-185.

Davis, C. G. & Macdonald, S. L. (2004). Threat appraisals, distress and the development of positive life changes after September 11th in a Canadian sample. *Cognitive Behaviour Therapy, 33*, 68-78.

Davis, C. G., Nolen-Hoeksema, S., & Larson, J. (1998). Making sense of loss and growing from the experience: Two construals of meaning. *Journal of Personality and Social Psychology, 75*, 561–574.

Dekel, S., Ein-Dor, T., & Solomon, Z. (2012). Posttraumatic growth and posttraumatic distress: A longitudinal study. *Psychological Trauma: Theory, Research, Practice, and Policy, 4*, 94-101.

Derogatis, L. (1993). *Brief Symptom Inventory (BSI): Administration, scoring, and procedures manual* (3rd ed.). Minneapolis, MN: Pearson.

Derogatis, L. R. (2000). *Brief Symptom Inventory (BSI) 18: Administration, scoring, and procedures manual*. Minneapolis, MN: Pearson.

Enders, C. K. (2003). Using the expectation maximization algorithm to estimate coefficient alpha for scales with item-level missing data. *Psychological Methods, 8*, 322-337.

Erbes, C., Eberly, R., Dikel, T., Johnsen, E., Harris, I., & Engdahl, B. (2005). Posttraumatic growth among American former prisoners of war. *Traumatology, 11*, 285-295.

Fairbank, J. A., Ebert, L., & Caddell, J. M. (2001). Posttraumatic stress disorder. In P. B. Sutker & H. E. Adams (Eds.), *Comprehensive handbook of psychopathology 3rd ed*. (pp. 183-209). New York, NY: Kluwer Academic/Plenum Publishers.

Frazier, P. & Burnett, J. (1994). Immediate coping strategies among rape victims. *Journal of Counseling and Development, 72*, 633-639.

Frazier, P., Conlon, A., & Glaser, T. (2001). Positive and negative life changes following sexual assault. *Journal of Consulting and Clinical Psychology, 69*, 1048-1055.

Foa, E. B. (1995). *PDS Manual*. Minneapolis, MN: NCS, Pearson Inc.

Foa, E. B., Cashman, L., Jaycox, L., & Perry, K. (1997). The validation of a self-report measure of posttraumatic stress disorder: The Posttraumatic Diagnostic Scale. *Psychological Assessment, 9*, 445-451.

Galea, S., Brewin, C. R., Gruber, M., Jones, R. T., King, D. W., King, L. A.,…Kessler, R. C. (2007). Exposure to hurricane-related stressors and mental illness after Hurricane Katrina. *Archives of General Psychiatry, 64,* 1427-1434.

Gill, D. A. (2007). Secondary trauma or secondary disaster? Insights from Hurricane Katina. *Sociological Spectrum, 27*, 613-632.

Haygood, W. & Tyson A. S. (2005, September 15). It Was as if All of Us Were Already Pronounced Dead. *The Washington Post*. Retrieved from http://www.washingtonpost.com/wp-dyn/content/article/2005/09/14/AR2005091402655.html

Ho, S. M. Y., Law, L. S. C., Wang, G. Shih, S., Hsu, S., & Hou, Y. (2013). Psychometric analysis of the Chinese version of the posttraumatic growth inventory with cancer patients in Hong Kong and Taiwan. *Psycho-Oncology, 22*, 715-719.

Ickovics, J. R., Meade, C. S., Kershaw, T. S., Milan, S., Lewis, J. B., & Ethier, K. A. (2006) Urban teens: Trauma, posttraumatic growth, and the emotional distress among female adolescents. *Journal of Consulting and Clinical Psychology, 74,* 841-851.

Joseph, S., Williams, R., & Yule, W. (1993). Changes in outlook following disaster: The preliminary development of a measure to assess positive and negative responses. *Journal of Traumatic Stress, 6*, 271-279.

Kelley, M. L., Palcic, J. L., Vigna, J. F., Wang, J., Spell, A. W., Pellegrin, A., …Ruggiero, K. (2010). The effects of parenting behavior on children's mental health after Hurricane Katrina: Preliminary findings. In R.P. Kilmer, V. Gil-Rivas, R.G. Tedeschi, & L.G. Calhoun, (Eds.), *Helping families and communities recover from disaster: Lessons*

learned from Hurricane Katrina and its aftermath (pp. 77-96). Washington, DC: American Psychological Association.

Kessler, R. C., Galea, S., Gruber, M. J., Sampson, N. A., Ursano, R. J., & Wessely, S. (2008). Trends in mental illness and suicidality after Hurricane Katrina. *Molecular Psychiatry, 13*, 374-384.

Kimhi, S., Eshel, Y., Zysberg, L., & Hantman, S. (2010). Postwar winners and losers in the long run: Determinants of war related stress symptoms and posttraumatic growth. *Community Mental Health Journal, 46*, 10-19.

Kleim, B. & Ehlers, A. (2009). Evidence of a curvilinear relationship between posttraumatic growth and posttraumatic depression and PTSD in assault survivors. *Journal of Traumatic Stress, 22*, 45-52.

Kunst, M. J. J. (2010). Peritraumatic distress, posttraumatic stress disorder symptoms, and posttraumatic growth in victims of violence. *Journal of Traumatic Stress, 23*, 514-518.

Lechner, S. C., Carver, C. S., Antoni, M. H., Weaver, K. E., & Phillips, K. M. (2006). Curvilinear associations between benefit finding and psychological adjustment to breast cancer. *Journal of Consulting and Clinical Psychology, 74*, 828-840.

Lee, J. A., Luxton, D. D., Reger, G. M., & Gahm, G. A. (2010). Confirmatory factor analysis of the posttraumatic growth inventory with a sample of soldiers previously deployed in support of the Iraq and Afghanistan wars. *Journal of Clinical Psychology, 66*, 813-819.

Levine, S. Z., Laufer, A., Hamama-Raz, Y., Stein, E., & Solomon, Z. (2008). Posttraumatic growth in adolescence: Examining its components and relationship with PTSD. *Journal of Traumatic Stress, 21*, 492-496.

Levine, S. Z., Laufer, A., Stein, E., Hamama-Raz, Y., & Solomon, Z. (2009). Examining the relationship between resilience and posttraumatic growth. *Journal of Traumatic Stress, 22*, 282-286.

Linley, P. A., Andrews, L., & Joseph, S. (2007). Confirmatory factor analysis of the posttraumatic growth inventory. *Journal of Loss and Trauma, 12*, 321-332.

Linley, P. A. & Joseph, S. (2004). Positive change following trauma and adversity: A review. *Journal of Traumatic Stress, 17*, 11-21.

Linley, P. A., Joseph, S., & Goodfellow, B. (2008). Positive changes in outlook following trauma and their relationship to subsequent posttraumatic stress, depression, and anxiety. *Journal of Social and Clinical Psychology, 27*, 877-891.

Lowe, S. R., Manove, E. E., & Rhodes, J. E. (2013). Posttraumatic stress and posttraumatic growth among low-income mothers who survived Hurricane Katrina. *Journal of Consulting and Clinical Psychology, 81*, 877-889.

Maercker, A. & Langner, R. (2001). Posttraumatic personal growth: Validation of German versions of 2 questionnaires. *Diagnostica, 47*, 153-162.

Maercker, A. & Zoellner, T. (2004). The Janus face of self-perceived growth: Toward a two-component model of posttraumatic growth. *Psychological Inquiry, 15*, 41-48.

McCaslin, S. E., de Poysa, P., Butler, L. D., Hart, S., Marmar, C. R., Metzler, T. J., & Koopman, C. (2009). The relationship of posttraumatic growth to peritraumatic reactions and posttraumatic stress symptoms among Sri Lankan university students. *Journal of Traumatic Stress, 22*, 334-339.

McLaughlin, K. A., Berglund, P., Gruber, M. J., Kessler, R. C., Sampson, N. A., & Zaslavsky, A. M. (2011). Recovery from PTSD following Hurricane Katrina. *Depression and Anxiety, 28*, 439-446.

McLean, C. P., Handa, S., Dickstein, B. D., Benson, T. A., Baker, M. T., Isler, W. C.,…Litz, B. T. (2013). Posttraumatic growth and posttraumatic stress among military medical personnel. *Psychological Trauma: Theory, Research, Practice, and Policy, 5*, 62-68.

McMillen, J. C., Smith, E. M., & Fisher, R. H. (1997). Perceived benefit and mental health after three types of disaster. *Journal of Consulting and Clinical Psychology, 65*, 733-739.

Nolen-Hoeksema, S. & Davis, C. G. (2004). Theoretical and methodological issues in the assessment and interpretation of posttraumatic growth. *Psychological Inquiry, 15*, 60-64.

Park, C. L., Cohen, L. H., & Murch, R. L. (1996). Assessment and prediction of stress-related growth. *Journal of Personality, 64,* 71−105.

Paxson, C., Russell, E., Rhodes, J., & Waters, M. (2012). Five years later: Recovery from post traumatic stress and psychological distress among low-income mothers affected by Hurricane Katrina. *Social Science and Medicine, 74*, 150-157.

Phelps, L. F., Williams, R. M., Raichle, K. A., Turner, A. P., & Ehde, D. M. (2008). The importance of cognitive processing to adjustment in the 1st year following amputation. *Rehabilitation Psychology, 53*, 28-38.

Powell, S., Rosner, R., Butollo, W., Tedeschi, R. G., & Calhoun, L. G. (2003). Posttraumatic growth after war: A study with former refugees and displaced people in Sarajevo. *Journal of Traumatic Stress, 59*, 71-83.

Purc-Stephenson, R. J. (2014). The posttraumatic growth inventory: Factor structure and invariance among persons with chronic diseases. *Rehabilitation Psychology, 59*, 10-18.

Rao, C. R. (1948). Large sample tests of statistical hypotheses concerning several parameters with applications to problems of estimation. *Mathematical Proceedings of the Cambridge Philosophical Society, 44*, 50-57.

Recklitis, C. J., Parsons, S. K., Shih, M., Mertens, A., Robison, L. L., & Zeltzer, L. (2006). Factor structure of the brief symptom inventory-18 in adult survivors of childhood cancer: Results from the childhood cancer survivor study. *Psychological Assessment, 18*, 22-32.

Salsman, J. M., Segerstrom, S. C., Brechting, E. H., Carlson, C. R., & Andrykowski, M. A. (2009). Posttraumatic growth and PTSD symptomatology among colorectal cancer survivors: A 3–month longitudinal examination of cognitive processing. *Psycho-Oncology, 18*, 30–41.

Salter, E. & Stallard, P. (2004). Posttraumatic growth in child survivors of a road traffic accident. *Journal of Traumatic Stress, 17,* 335-340.

Scales, P. C., Benson, P. L., Leffert, N., & Blyth, D. A. (2000). Contribution of developmental assets to the prediction of thriving among adolescents. *Applied Developmental Science, 4,* 27–46.

Sears, S. R., Stanton, A. L., & Danoff-Burg, S. (2003). The yellow brick road and the emerald city: Benefit finding, positive re-appraisal coping, and posttraumatic growth in women with early-stage breast cancer. *Health Psychology, 22*, 487-497.

Shakespeare-Finch, J. & Barrington, A. J. (2012). Behavioural changes add validity to the construct of posttraumatic growth. *Journal of Traumatic Stress, 25*, 433-439.

Shakespeare-Finch, J., Martinek, E., Tedeschi, R. G., & Calhoun, L. G. (2013). A qualitative approach to assessing the validity of the posttraumatic growth inventory. *Journal of Loss and Trauma, 18*, 572-591.

Sheeran, T. & Zimmerman, M. (2002). Screening for posttraumatic stress disorder in a general psychiatric outpatient setting. *Journal of Consulting and Clinical Psychology, 70*, 961-966.

Shigemoto, Y. & Poyrazli, S. (2013). Factors related to posttraumatic growth in U.S. and Japanese college students. *Psychological Trauma: Theory, Research, Practice, and Policy, 5*, 128-134.

Snape, M. C. (1997). Reactions to a traumatic event: The good, the bad and the ugly? *Psychology Health and Medicine, 2,* 237−242.

Solomon, Z. & Dekel, R. (2007). Posttraumatic stress disorder and posttraumatic growth among Israeli ex-POWs. *Journal of Traumatic Stress, 20*, 303-312.

Tabachnik, B.G. & Fidell, L.S. (2007). *Using Multivariate Statistics* (5th Ed.). Boston: Pearson.

Taku, K., Cann, A., Calhoun, L. G., & Tedeschi, R G. (2008). The factor structure of the posttraumatic growth inventory: A comparison of five models using confirmatory factor analysis. *Journal of Traumatic Stress, 21*, 158-164.

Taylor, S. & Armor, D. (1996). Positive illusions and coping with adversity. *Journal of Personality, 64*, 873-898.

Taylor, S. E., Lichtman, R. R., & Wood, J. V. (1984). Attributions, beliefs in control, and adjustments to breast cancer. *Journal of Personality and Social Psychology, 46*, 489-502.

Tedeschi, R. G. & Calhoun, L. G. (1996). The posttraumatic growth inventory: Measuring the positive legacy of trauma. *Journal of Traumatic Stress, 9,* 455–471.

Tedeschi, R. G. & Calhoun, L. G. (2004). Posttraumatic growth: Conceptual foundations and empirical evidence. *Psychological Inquiry, 15*, 1-18.

Teixeira, R. J. & Pereira, M. G. (2013). Growth and the cancer caregiver experience: Psychometric properties of the Portuguese posttraumatic growth inventory. *Families, Systems, & Health*. Advanced online publication. doi: 10.1037/a0032004

Thomas, L. E., DiGiulio, R. C., & Sheehan, N. W. (1991). Identifying loss and psychological crisis in widowhood. *International Journal of Aging and Human Development, 26*, 279-295.

Ullman, J. B. (2007). Structural equation modeling. In B. G. Tabachnik & L. S. Fidell (Eds.), *Using multivariate statistics 5th edition* (pp.709-811). Boston: Pearson.

U.S. Department of Commerce, Economics and Statistics Administration. (2006). *Gulf Coast recovery: 17 months after the hurricanes*. Retrieved from http://www.esa.doc.gov/sites/default/files/reports/documents/april2006.pdf

Veronen, L. J. & Kilpatrick, D. G. (1983). Rape: A precursor of change. In E. J. Callahan & K. A. McCluskey (Eds.), *Life-span development psychology: Nonnormative life events* (pp. 167-191). New York: Academic Press.

Westphal, M. & Bonanno, G. A. (2007). Posttraumatic growth and resilience to trauma: Different sides of the same coin or different coins? *Applied Psychology: An International Review, 3*, 417-427.

Yuan, K. H. & Bentler, P. M. (1998). Robust mean and covariance structure analysis. *British Journal of Mathematical and Statistical Psychology, 51*, 63-88.

Zabora, J., BrintzenhofeSzoc, K., Jacobsen, P., Curbow, B., Piantadosi, S., Hooker, C.,…Derogatis, L. (2001). A new psychosocial screening instrument for use with cancer patients. *Psychosomatics, 42*, 241–246.

Zoellner, T. & Maercker, A. (2006). Posttraumatic growth in clinical psychology—A critical review and introduction to a two component model. *Clinical Psychology Review, 26*, 626-653.

APPENDIX A: DEMOGRAPHIC QUESTIONNAIRE

Demographic Questionnaire

ABOUT YOU AND YOUR FAMILY

Please fill out the following background information about yourself and your family. Read each item carefully.

Your age: _____
Your spouse's age: _____
Your child's age: _____
Your child's sex: _____

Your Child's School History:
Your child's current grade: _____
School your child attended BEFORE the hurricane? _____
(Circle one: Public or Private)
School your child attends NOW, after the hurricane? _____
(Circle one: Public or Private)

Race:

____ White
____ Black
____ Hispanic
____ Asian
____ Native American
____ Pacific Islander
____ Other

Marital Status:

____ Never Married
____ Married
____ Separated
____ Divorced
____ Widowed

Education: What is the highest level of education completed by?

Yourself	Your Spouse
____ 6th grade or less	____ 6th grade or less
____ Junior High school (7th, 8th, 9th grade)	____ Junior High school (7th, 8th, 9th grade)
____ Partial high school (10th, 11th grade)	____ Partial high school (10th, 11th grade)
____ High school graduate	____ High school graduate
____ Partial college (at least 1 year) or specialized training	____ Partial college (at least 1 year) or specialized training
____ Standard college or university graduate	____ Standard college or university graduate
____ Graduate professional degree (Master's, Doctorate)	____ Graduate professional degree (Master's, Doctorate)

Past Income: What was the total annual income of your household **BEFORE** the hurricane? (Combine the income of all the people living in your house right now as well as any government assistance.)

____ $0-4,999	____ $15,000-24, 999	____ $50,000-74,999
____ $5,000-9,999	____ $25,000-34,999	____ $75,000-99,999
____ $10,000-14,999	____ $35,000-49,999	____ $100,000 and up

Current Income: What is the total and **CURRENT** annual income of your household? (Combine the income of all the people living in your house right now as well as any government assistance.)

____ $0-4,999	____ $15,000-24, 999	____ $50,000-74,999
____ $5,000-9,999	____ $25,000-34,999	____ $75,000-99,999
____ $10,000-14,999	____ $35,000-49,999	____ $100,000 and up

If you are unable to say what your annual income is, what is your monthly income?
$_____

Past Occupation: Please provide the following information about you and your spouse's job(s) **BEFORE** the hurricane.

About You

What was your occupation/job title? (If you were retired, pleased write "retired" and your past occupation. If you did not work outside the home, write "unemployed.")

_____

If employed, what kind of industry or company? (For example, elementary school, clothing store, hospital, restaurant, etc.)

_____

If employed, what were your job duties? (Please be specific.)

_____

_____

If you were **unemployed before** the hurricane, were you seeking a new job? Yes / No

About Your Spouse

What was your spouse's occupation/job title? (If he was retired, pleased write "retired" and his past occupation. If they did not work outside the home, write "unemployed.")

_____

What kind of industry or company did they work for? (For example, elementary school, clothing store, hospital, restaurant, etc.)

_____

What were their job duties? (Please be specific.)

_____

_____

If your spouse was **unemployed before** the hurricane, were they seeking a job? Yes / No

Current Occupation: Please provide the following information about you and your spouse's job(s) **CURRENTLY.**

About You

What is your occupation/job title? (If you are retired, pleased write "retired" and your past occupation. If you do not work outside the home, write "unemployed." If your job is the same as it was before the hurricane, please write "same.")

_____

If employed, what kind of industry or company? (For example, elementary school, clothing store, hospital, restaurant, etc.)

_____

If employed, what are your job duties? (Please be specific.)

_____

_____

If you are **currently unemployed**, are you currently seeking a new job? Yes / No

About Your Spouse

What is your spouse's occupation/job title? (If he is retired, pleased write "retired" and his past occupation. If they do not work outside the home, write "unemployed." If their job is the same as it was before the hurricane, please write "same.")

_____

What kind of industry or company did they work for? (For example, elementary school, clothing store, hospital, restaurant, etc.)

_____

What are their job duties? (Please be specific.)

_____

_____

If your spouse is **currently unemployed**, are they currently seeking a new job? Yes / No

Family: Please list the age and sex of all those living in your household **BEFORE** the hurricane, including yourself, your spouse, other relatives, and all children.

Relationship to you	Age	Sex
_____	____	Male/Female
_____	____	Male/Female
_____	____	Male/Female
_____	____	Male/Female
_____	____	Male/Female
_____	____	Male/Female
_____	____	Male/Female
_____	____	Male/Female
_____	____	Male/Female
_____	____	Male/Female
_____	____	Male/Female

What was the TOTAL number of people, including yourself, living in your home **BEFORE** the hurricane? _____

What was the TOTAL number of adults over 18, including yourself, living in your home **BEFORE** the hurricane? _____

What was the TOTAL number of children under 18 living in your home **BEFORE** the hurricane? _____

APPENDIX B: INSTITUTIONAL REVIEW BOARD APPROVAL

Institutional Review Board
203 B-1 David Boyd Hall
Louisiana State University and A&M College
Baton Rouge LA 70803

(225) 578-8692
FAX: 578-6792
irb @lsu.edu

INSTITUTIONAL REVIEW BOARD

ACTION ON PROTOCOL APPROVAL REQUEST

TO: Mary Lou Kelley
Department of Psychology

FROM: Robert C. Mathews
Chair, Institutional Review Board for Research with Human Subjects

DATE: November 9, 2005

RE: **IRB# 2561**
TITLE: "Predictors of Recovery I children Evacuated from Hurricane Katrina"

New Protocol/Modification/Continuation :N

Review type: Full __X__ Expedited _____ **Review date:** **10/14/2005**

Approved__X__ **Disapproved** _____ [1]**Developmental Approval** _____

Approval Date: 11/09/2005 **Approval Expiration Date:** 11/09/2006

Risk Assessment: Minimal ___X___ Uncertain _____ Greater than Minimal _____

Re-review frequency: (annual unless otherwise stated) _____

Number of subjects approved: 400

By: Robert C. Mathews, Chairman 

PRINCIPAL INVESTIGATOR: PLEASE READ THE FOLLOWING -- Continuing approval is CONDITIONAL on:

1. Adherence to the approved protocol, familiarity with, and adherence to the ethical standards of the Belmont Report, and LSU's Assurance of Compliance with DHHS regulations for the protection of human subjects*
2. Prior approval of a change in protocol, including revision of the consent documents or an increase in the number of subjects over that approved.
3. Obtaining renewed approval (or submittal of a termination report), prior to the approval expiration date, upon request by the IRB office (irrespective of when the project actually begins); notification of project termination.
4. Retention of documentation of informed consent and study records for at least 3 years after the study ends.
5. Continuing attention to the physical and psychological well-being and informed consent of the individual participants including notification of new information that might affect consent.
6. A prompt report to the IRB of any adverse event affecting a participant potentially arising from the study.
7. Notification of the IRB of a serious compliance failure.
8. SPECIAL NOTE:

**All investigators and support staff have access to copies of the Belmont Report, LSU's Assurance with DHHS, DHHS (45 CFR 46) and FDA regulations governing use of human subjects, and other relevant documents in print in this office or on our World Wide Web site at http://www.fas.lsu.edu/osp/irb*

[1] Developmental Approval means that the project can proceed to develop instruments to be used in the study. However, no data on human subjects can be collected until all instruments have been approved by the IRB.

VITA

Mark Schexnaildre was born and raised in South Louisiana. He graduated with a Bachelor of Science degree in psychology from Louisiana State University in 2007. He began his graduate studies at Louisiana State University under Dr. Mary Lou Kelley in August of 2008. There, he earned his master's degree in 2011. His master's thesis studied positive psychological change in children and adolescents who were exposed to Hurricane Katrina.

Upon defending his dissertation in August 2014, Mark completed his doctoral internship at the Kennedy Krieger Institute in Baltimore, Maryland. He subsequently accepted a postdoctoral fellowship at the Cognitive Behavioral Therapy Center of New Orleans. He is currently interested in working with children and families, and his main research interests lie in the areas of family responses to trauma and positive psychological change.