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An investigation of maternal psychopathology as a moderator of child response following Hurricane Katrina

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AN INVESTIGATION OF MATERNAL PSYCHOPATHOLOGY
AS A MODERATOR OF CHILD RESPONSE
FOLLOWING HURRICANE KATRINA

A Dissertation

Submitted to the Graduate Faculty of the
Louisiana State University and
Agricultural and Mechanical College
in partial fulfillment of the
requirements for the degree of
Doctor of Philosophy

in

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by
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ABSTRACT

Previous disaster research has focused on possible risk factors that contribute to child psychological distress following disaster exposure. One of these factors, parental psychopathology, has consistently been indicated as associated with and predictive of child functioning post-disaster. In related areas of violence exposure, researchers have gone beyond correlation and prediction in their attempt to elucidate the relationship between parental psychopathology and child functioning post-trauma. Such researchers have investigated and confirmed parental psychopathology as a moderator variable in the relationship between child violence exposure and child functioning. Thus, in considering the status of research regarding risk factors of child functioning post-disaster and the identification of parental psychopathology as a moderator within violence exposure research, the current study attempted to elucidate this possible relationship in a disaster-exposed sample. Participants consisted of 260 children and their mothers who were displaced from New Orleans due to Hurricane Katrina in the late summer of 2005. Child participants completed the Behavior Assessment System for Children, Second Edition-Self Report of Personality, the UCLA PTSD Reaction Index, and the Child Hurricane-Related Traumatic Experiences, among other questionnaires utilized for a larger grant-funded research study. Mother participants completed a demographic questionnaire, the Behavior Assessment System for Children, Second Edition-Parent Report Scale, the Symptom Checklist-90 Revised, and the Posttraumatic Diagnostic Scale, among other questionnaires utilized for a larger grant-funded research study. Hierarchical regression analyses revealed that maternal psychopathology and maternal PTSD were found to moderate the relation between child hurricane exposure and mother-reported child

internalizing and externalizing symptoms. Clinical implications, future research directions, as well as the current study's strength and limitations are discussed.

INTRODUCTION

In recent years, a high level of concern has developed with regard to the way in which disasters may affect children and adolescents. Although many child victims may rebound following disaster exposure (Salzer & Bickman, 1999), a considerable number, possibly one-third, experience symptoms of post traumatic stress disorder (PTSD) that interfere with daily functioning (Vernberg, La Greca, Silverman, & Prinstein, 1996). Thus, the cost of disasters may extend far beyond the financial cost of reconstruction of homes, buildings, infrastructure, and belongings. Disasters can impact children's development and academic success (La Greca, Silverman, Vernberg, & Roberts, 2002).

In August 2005, the southern Gulf region faced one of the worst disasters in U.S. history-Hurricane Katrina. Hurricane Katrina is considered the third deadliest hurricane hitting the U.S., as well as one of the most costly natural disasters (U.S. Department of Homeland Security, 2006; U.S. House of Representatives, 2006). Katrina affected many families, spanning the geographical area between New Orleans, Louisiana to the west and Mobile, Alabama to the east (Gabe, Falk, McCarty, & Mason, 2005). Although affecting a large geographical area, the residents of the New Orleans metropolitan area faced severe flooding, destroying approximately 250,000 homes and nearly 900 schools (U.S. Department of Homeland Security, 2006). Some residents were able to evacuate prior to the storm, while others became stranded and subjected to increased crime and a reduced sense of safety the 5 days following landfall (Gabe et al., 2005; Nossiter, 2005). Whether a family evacuated prior to the storm or remained in New Orleans until rescued, research indicates that many adults experienced a high level of secondary stressors associated with

the hurricane (Brewin et al., 2006). However, the storm's effect on children who had just begun a new school year at the time of landfall is currently not known.

In order to predict child response post-disaster, researchers have begun to identify multiple variables, such as parental psychopathology, that may contribute to (i.e., risk factors) or help prevent (i.e., protective factors) children's adjustment difficulties following a natural disaster (La Greca, Silverman, Vernberg, & Prinstein 1996; Vernberg et al., 1996; Vogel & Vernberg, 1993). For example, parental psychopathology has been found to be correlated with and predictive of child psychological symptoms post-disaster (Swenson et al., 1996; Rustemli & Karanci, 1996; Vila et al., 2001).

In other trauma populations, such as children exposed to community violence, researchers have examined parental psychopathology as a moderator of the relationship between child trauma exposure and psychological symptoms in children and adolescents (Hershom & Rosenbaum, 1985; Self-Brown et al., 2006). A moderational model is preferable over correlational methods as it provides information about the influence that one variable, the moderator, has on the strength and direction of the association between the predictor variable, child trauma exposure, and the criterion variable, child functioning post-trauma (Baron & Kenny, 1986; Holmbeck, 1997; Kliewer and Kung, 1998). Therefore, the purpose of the current study is to examine the relationships among child hurricane exposure, maternal psychopathology, and maternal PTSD on children's post-hurricane outcome. Specifically, maternal psychopathology and PTSD will be tested as moderator variables of the relationship between child hurricane exposure and negative and positive child outcomes.

The following review examines the conceptual nature of disasters, discusses the specific nature of Hurricane Katrina, and reviews research on children's adjustment after experiencing natural disasters, including hurricanes. The correlates and risk factors of child functioning post-disaster also are discussed, with particular attention to the role of parental psychopathology. Finally, the role of parental psychopathology in non-disaster, specific trauma populations is discussed, and a review of moderator and mediator variables is provided.

The Nature of Disasters

The word "disaster" has been defined and used in various ways depending on the source and purpose. However, as Saylor (1993) discusses, general consensus exists that disasters have the following properties:

(1) involves the destruction of property, injury and/or loss of life; (2) has an identifiable beginning and end; (3) adversely affects a relatively large group of people; (4) is 'public' and shared by members of more than one family; (5) is out of the realm of ordinary experience; and, (6) psychologically, is traumatic enough to induce distress in almost anyone, regardless of premorbid functioning or earlier experiences (p.2).

The disaster literature commonly distinguishes between natural and human-made disasters. Natural disasters (e.g., hurricanes, earthquakes, floods, and brushfires) are caused by forces of nature. Conversely, human-made disasters (e.g., airplane crashes, ferry sinkings, toxic waste accidents, school shootings, bombings, terrorist activities, and warfare) are caused by human error, human involvement, or the malfunctioning of technology (Silverman & La Greca, 2002). Further, "disaster victims" include individuals directly and immediately exposed to the trauma (Silverman & La Greca, 2002); individuals affected indirectly via observation of others experiencing direct

exposure (Saylor, 1993); and, persons exposed to the disaster via the media (Lengua, Long, Smith, & Meltzoff, 2005).

Although disasters may share common elements, no two disasters present with identical financial, logistical, and psychological challenges. Factors such as the cultural, geographical, socioeconomic, historical, political, and meteorological qualities of each disaster give it a unique nature and character (Saylor, 1993). Additionally, the secondary stressors incurred due to each disaster may vary (Terr, 1991). Thus, the unique and unprecedented presentation and consequence of Hurricane Katrina calls for an examination of the psychological consequences of its child victims, as well as the possible contributing factors.

The Unique Nature of Hurricane Katrina

During the morning hours on Monday, August 29, 2005, Hurricane Katrina made landfall on the Gulf Coast as a Category 4 storm, directly affecting the geographical area between New Orleans, Louisiana to the west and Mobile, Alabama to the east. Approximately 90,000 square miles were subsequently declared disaster areas by government officials and over 700,000 individuals were directly impacted by extensive flooding and structural damage. Over 1 million people were evacuated, causing a migration of citizens in the U.S. on par with that of the Dust Bowl and the U.S. Civil War, events 70 and 140 years ago which permanently redistributed thousands of families (Gabe et al., 2005; U.S. Department of Homeland Security, 2006; U.S. House of Representatives, 2006). Hurricane Katrina was the third deadliest hurricane hitting the United States, with a final death toll of 1,836 people (U.S. Department of Homeland Security, 2006). It also was one of the most costly natural disasters in U.S. history, with

total economic loss estimated at \$100 billion, and \$50-70 billion estimated in Louisiana alone (U.S. House of Representatives, 2006).

During the storm, the metropolitan area of New Orleans was further devastated by a breached levee system leading to massive flooding, affecting an estimated 77% of Orleans Parish residents and 97% of St. Bernard Parish residents. Immediately following the rise of flood waters, nearly 25,000 New Orleans residents who had not evacuated were stranded in their homes, work places, the New Orleans Superdome, the Ernest N. Morial Convention Center, or were left out in the elements (Gabe et al., 2005; U.S. Department of Homeland Security, 2006). During the 5 day period following Katrina's initial landfall, many New Orleans residents went without food, water, or access to electricity while waiting for later rescue from federal and state troops (Gabe et al., 2005). Beginning on Wednesday, August 31, 2005, local and national news reports indicated an unknown level of increased crime, including theft, assault, murder, rape, and looting (Nossiter, 2005).

The flooding and wind damage resulted in large-scale destruction of homes, schools, and businesses in the three parishes comprising the New Orleans metropolitan area- Orleans Parish, St. Bernard Parish, and Jefferson Parish. Within these parishes, 250,000 homes sustained high levels of flooding. 875 schools were damaged, with 40 completely destroyed. August 2006 estimates by the Army Corps of Engineers indicated that 22 million tons of debris had been removed from the New Orleans area alone since the storm (U.S. Department of Homeland Security, 2006).

Due to the extensive devastation, many New Orleans residents were displaced to both in-state and out-of-state locations. Approximately 210,000 of the 2006 Federal

Emergency Management Agency (F.E.M.A.) applicants have made claims for assistance with out-of-state mailing addresses. Nearly 230,000 applicants have made claims with addresses inside Louisiana, with only 8% using mailing addresses within New Orleans (U.S. Department of Homeland Security, 2006). Job loss was also extensive, with a reported 220,000 Louisiana jobs lost initially after the storm (Gabe et al., 2005).

Due to the housing composition of the New Orleans metropolitan area, Hurricane Katrina heavily impacted the poor and African Americans. Based on 2000 census data, approximately one-fifth of those displaced by Hurricane Katrina were likely to have been poor, and 30% had incomes that were 1.5 times below the poverty line. African Americans are estimated to have accounted for approximately 44% of the storm victims. Also, an estimated 88,000 elderly persons may have been displaced, along with 183,000 school children (Gabe et al., 2005).

Given their post-hurricane experiences and the extensive damage sustained, New Orleans residents experienced a high level of secondary stressors. The Hurricane Katrina Community Advisory Group Report dated August 29, 2006 summarized responses from surveyed adults affected by Hurricane Katrina in Louisiana, Mississippi, and Alabama. Stressors endorsed by adult survey respondents included high dissatisfaction with the insurance industry and F.E.M.A., grief due to the death of a loved one, major financial loss, extreme physical adversity, and extreme psychological adversity (Brewin et al., 2006). All stressors were more frequently endorsed by socially disadvantaged respondents (e.g., poor, minority status, or low education) and respondents with pre-hurricane residences in the New Orleans metropolitan area as compared to other impacted areas (Brewin et al., 2006). Thus, the psychological sequelae following Hurricane

Katrina's landfall may be as extensive as the physical damaged it caused, particularly for those in the New Orleans area.

Research on Child Reactions Post-Disaster

Current conceptualizations of child reactions post-disaster have evolved over previous decades. As discussed by Vogel and Vernberg (1993), early studies beginning in the 1950's, such as that of Perry and colleagues, concluded that children's responses following disasters were relatively mild and transient (Perry, Silber, & Bloch, 1956). By the 1970's and 1980's however, research findings suggested that a proportion of children following disasters experience effects more severe and longer lasting. Symptoms such as crying spells, nightmares, guilt, irritable behavior, specific fears associated with the disaster, sleep difficulties, and sudden onset enuresis were consistently documented (Farberow & Gordon, 1981; Milne, 1977; Ollendick & Hoffman, 1982; Tuckman, 1973). Also during this time period, three influential reports indicated that children may exhibit symptoms as long as 2 to 4 years post-disaster (Gleser, Green, & Winget, 1981; Lacey, 1972; Terr, 1979). Trauma research with children was also stimulated with the introduction of the diagnostic category of PTSD in the Diagnostic and Statistical Manual of Mental Disorders, Third Edition (DSM-III; American Psychiatric Association, 1980) in 1980. With this nosology, research attention was drawn to particular clusters of symptoms not always considered systematically in previous studies (American Psychiatric Association, 1980). In 1987 the DSM-III-Revised (DSM-III-R; American Psychiatric Association, 1987) included child-specific symptoms of PTSD, further aiding researchers examining child reactions following disasters. With the fourth edition of the DSM (DSM-IV; American Psychiatric Association, 1994), researchers began to question

the validity of the diagnostic criteria of PTSD for younger children (Scheeringa, Zeanah, Drell, & Larrieu, 1995). Thus, the history of research focusing on child victims of disasters may be considered short, and many questions remain regarding the nature of child PTSD and other symptoms typically displayed by children post-trauma.

One such uncertainty involves the wide variability in estimated PTSD prevalence rates in children exposed to various trauma types (Yule, 2001). Rates as high as 90% (Goenjian et al., 2001) and as low as 5% (Shannon, Lonigan, Finch, & Taylor, 1994) have been reported. Given these inconsistencies, previous researchers have suggested a conservative overall estimate of 30% of children exposed to traumatic events may develop clinical PTSD (Perry, 1999).

A variety of factors may contribute to the variability in rates of PTSD following exposure to a trauma. One such factor being the type of trauma investigated, such that higher rates of PTSD have been observed following violence exposure (Sauter & Franklin, 1998) or disasters caused by malicious human intent (Norris, Friedman, & Watson, 2002). Other factors that may contribute to the variability in PTSD prevalence include proximity or level of exposure to the trauma (Geonjian et al., 2001), with closer proximity associated with increased levels of PTSD; time since trauma exposure (La Greca et al., 1996), with a decrease in symptomatology over time; measurement issues such as whether diagnosis or symptoms of PTSD are being assessed (Roussos et al., 2005), with a smaller proportion of individuals meeting full diagnostic criteria for PTSD as compared to those demonstrating some level of symptoms; whether parent-, child-, or teacher-report is utilized (Finch & Daugherty, 1993), as child-report is considered a more appropriate indicator of child internalizing symptoms; and, disaster location (Norris et al.,

2002), with higher levels of post-disaster mental health problems observed in developing countries or countries outside of the U.S. Within the following sections, including reviews of child reactions post-disaster, this variability is evident.

Child Reactions Post-Hurricane

The most studied hurricanes have been Hurricane Hugo, hitting South Carolina in 1989; Hurricane Andrew, affecting both Florida and Louisiana in 1992; Hurricane Mitch, striking Nicaragua and Honduras in 1998; and, Hurricane Floyd, hitting North Carolina in 1999. Within these studies, a variety of measures have been used to assess children's reactions post-hurricane, most often during the post-impact phase (i.e., 3 months to 1 year following).

Following Hurricane Hugo, Belter and colleagues (1991) concluded that approximately 69% of the children sampled 5 months post-hurricane experienced a severe level of psychic trauma and increased behavior problems according to a parent-report measure (Belter, Dunn, & Jeney, 1991). In contrast, other researchers found that approximately 5% of the children sampled met diagnostic criteria for PTSD on a child self-report questionnaire 3 months after Hugo (Shannon, Lonigan, Finch, & Taylor, 1994).

With Hurricane Andrew, Vernberg and colleagues (1996) reported that according to child self-report, approximately 30% of the children reported a mild level of symptoms, 26% reported a moderate level, 25% reported a severe level, and 5% were considered very severe at 3 months post-hurricane. In a separate study, La Greca and colleagues, also utilizing self-report questionnaires, reported that PTSD symptoms declined over time in children affected by the storm, but a substantial level of symptoms

was found several months post-hurricane. Specifically, 30% reported severe or very severe levels of PTSD symptoms at 3 months, 18% at 7 months, and 13% at 10 months post-hurricane (La Greca et al., 1996). Similarly, Garrison and colleagues, utilizing structured parent and child telephone interviews, estimated that 5-10% of children met full diagnostic criteria for PTSD 6 months following Hurricane Andrew, and 2-6% met full diagnostic criteria for PTSD greater than 1 year later (Garrison, Weinrich, Hardin, Weinrich, & Wang, 1993; Garrison et al., 1995).

In another study following Hurricane Andrew, Shaw and colleagues (1994) reported that the majority of the children sampled via self-report endorsed PTSD symptoms 8 weeks post-hurricane. Their findings indicated that 87% of children directly in the path of the hurricane (i.e., high impact group) and 80% of children in the county north of the hurricane's direct path (i.e., low impact group) endorsed at least moderate levels of PTSD symptoms. Shaw and colleagues also reported that there was no significant difference in the levels of endorsed PTSD symptoms between the two impact groups. However, there was a significant difference between the groups on other measures of behavior and psychopathology. According to scores on a teacher-report rating scale at 8 and 32 weeks post-hurricane, there was an evident and significant trend, with the low impact group demonstrating higher levels of other forms of psychopathology such as depression, anxiety, social problems, and externalizing behavior problems (Shaw et al., 1994). Shaw and colleagues reasoned that the increase in teacher-reported behavior problems in the low impact group could have been influenced by the sudden influx of students of families who evacuated to the low impact region (1994). In another study, La Greca, Silverman, and Wasserstein examined Andrew's effects on child

anxiety levels, and found that at 3 and 7 months post-hurricane children's anxiety levels were significantly higher than their pre-hurricane levels according to self and teacher ratings (1998).

More recently, high levels of PTSD symptoms and symptoms of depression were found in adolescents 6 months following Hurricane Mitch (Goenjian et al., 2001).

Specifically, Goenjian and colleagues used two adolescent self-report scales to derive estimates of PTSD and depression prevalence rates in the three cities sampled. The estimated rates by city, from most impacted to least impacted, were as follows:

Posoltega: PTSD, 90%; depression, 81%; comorbid PTSD and depression, 79%;

Chinandega: PTSD, 55%; depression, 51%; comorbid PTSD and depression, 38%; Leon:

PTSD, 14%; depression, 29%; comorbid PTSD and depression, 8% (Goenjian et al., 2001).

Six months following Hurricane Floyd, Russoniello and fellow researchers found that 95% of children sampled with a self-report questionnaire experienced at least mild symptoms of PTSD (2002). Seventy-one percent had symptoms of PTSD that were moderate to very severe. The authors concluded that the high PTSD prevalence rates were comparable to findings from other studies involving interpersonal violence, in which 94% of the victims report experiencing symptoms (Pynoos, Frederick, & Nadar, 1987; Russoniello et al., 2002). These studies, together, suggest that the prevalence of PTSD symptoms may be high following a destructive hurricane. Additionally, other forms of psychopathology, such as depression, anxiety, social problems, and externalizing behavior problems, may also be elevated several months post-hurricane.

Child Reactions Following Other Natural Disaster Types

Research attention has also been devoted to child reactions following other natural disaster types, such as earthquakes, floods, and wildfires. Within the area of earthquakes, researchers examining the 1999 earthquake in Ano Liosia, Greece indicated a prevalence rate for PTSD at 4% 3 months following the disaster, with estimates of clinical depression at 14% using self-report questionnaires (Roussos et al., 2005). Eleven months following the 1999 Marmara earthquakes in Sakarya, Turkey, Bulut and colleagues reported much higher PTSD prevalence rates at 73% and 74% for samples in both the heavily affected and moderately affected areas of the city, respectively. (Bulut, Bulut, & Tayli, 2005).

Studies examining children's reactions following severe and widespread flooding have also indicated increased levels of PTSD symptoms in affected children and adolescents. Green and colleagues examined child and adolescent levels of PTSD symptoms 2 years following the 1972 Buffalo Creek dam collapse in West Virginia, which subsequently caused widespread flooding. Their investigation indicated that 37% of the children sampled via structured interview were given a probable diagnosis of PTSD (Green et al., 1991). Other studies have reported elevated levels of behavioral difficulties, anxiety, depression, and enuresis in child flood victims (Durkin, Khan, Davidson, Zaman, & Stein, 1993). In another flood investigation, Kreuger and Stretch (2003) examined the reactions of 3,876 children and adolescents following the Great Flood of 1993 in the Mid-West of the U.S. with self-report measures (2003). The results revealed that 32% of the child participants had elevated anxiety, and 9% showed elevated scores on a measure of depression (Kreuger & Stretch, 2003).

One of the earlier, most influential, and highly-cited studies on child reactions post-disaster was within the area of wildfires. McFarlane and colleagues examined the longitudinal psychological impact of a large-scale brushfire disaster in the south eastern region of Australia in children aged 5 to 12 years utilizing parent- and teacher-report questionnaires (McFarlane, Policansky, & Irwin, 1987). The data collected indicated a consistent increase in the psychological symptoms between 2 and 8 months post-fire, and no significant difference in symptoms between 8 and 26 months post-fire. This study suggested that psychological problems may not manifest until more than 2 months following a disaster and that levels of impairment may not necessarily decrease during subsequent months (McFarlane et al., 1987). In a more recent study examining child reactions via self-report questionnaires, McDermott and colleagues reported that 6 months following the 2003 Australian wildfires 50% of child participants presented with low levels of PTSD, 28.6% with mild PTSD, 12.1% with moderate PTSD, 7.5% with severe PTSD, and 1.5% with very severe PTSD (McDermott, Lee, & Judd 2005).

Thus, similar to studies following hurricanes, researchers examining child reactions following other natural disasters, such as earthquakes, floods, and wildfires, also indicate elevated levels of PTSD and other forms of psychopathology in child victims.

Child Reactions Following Human-Made Disaster Types

Researchers also have attempted to elucidate the reactions of children and adolescents following human-made disasters, such as warfare, acts of terrorism, industrial or nuclear accidents, and transportation accidents. Within the area of warfare, studies conducted while fighting was in progress and immediately following wars have revealed increased levels of depression, anxiety, aggression, and subjective distress in exposed

children using both parent- and child-report questionnaires and interviews (Chimienti, Nsar, & Khalifeth, 1989; Klingman, 2001; Soloman, 1995). Other stress reactions included fears, hypersensitivity, and increased dependency on parents according to parent-, self-, and teacher-report measures (Yule, Perrin, & Smith, 2001). In terms of war-related PTSD, prevalence estimates range to as high as 87% of the children and adolescents sampled via parent- and self-report questionnaires 5 years following the military operation “Anfal” in Iraqi Kurdistan (Ahmad, Sofi, & von Knorring, 2000).

With regard to child reactions following terrorist attacks, the two most widely studied events remain to be that of the 1995 bombing of the Murrah Federal Building in Oklahoma City and the 2001 attack on the World Trade Center in New York City. Researchers’ findings 7 weeks following the Oklahoma City bombing indicated that 63% of the middle and high school students sampled reported increased worry and feelings of a lack of safety according to self-report (Pfefferbaum et al., 1999). Also, nearly 1 year following the bombing, close to 5% of the sampled elementary students reported clinically significant levels of PTSD symptoms. Additionally, nearly one-third continued to be concerned about family members’ safety, and one-fifth reported difficulty calming down after reminders of the bombing (Gurwitch & Pfefferbaum, 1999). Two months following the September 11, 2001 attack on the World Trade Center in New York City, researchers conducted structured phone interviews with parents of children and adolescents, and found increased child symptoms of depression, anxiety, behavioral inhibition, and social withdrawal (Stein et al., 2004). Children exposed to media coverage also demonstrated high levels of PTSD symptoms and worry, with 77%

reporting excessive worry, 68% being upset by reminders, and 39% having upsetting thoughts about the attack 2 months following (Lengua et al., 2005).

Two nuclear and industrial accidents that have received some research attention in terms of child reactions are the 1979 large-scale malfunction of the Three Mile Island nuclear power plant in Pennsylvania, and the 1986 explosion at the Chernobyl nuclear power plant in the Ukraine of the former U.S.S.R. One and a half years following the Three Mile Island accident, children exposed to the disaster were found to have high levels of residual anxiety and consistently reported symptomatic responses to reminders of the accident according to a self-report measure (Hanford et al., 1986). Following the Chernobyl disaster, researchers collected anecdotal parent reports and observations of children missing long periods of school, as well as a wide range of somatic, anxiety, mood, and externalizing symptoms (Bromet, 1995; Havenaar, 1996).

Children exposed to transportation accidents, as either witnesses or passengers, is also a growing area of human-made disaster research. Children assessed 6 to 9 months following auto accidents reported experiencing intrusive thoughts, feelings of acute anxiety and panic, a heightened awareness of danger when traveling, difficulties concentrating in school, and were at high risk for developing PTSD according to self-report questionnaires and unstructured interview (Casswell, 1997; Stallard & Law, 1993). Other researchers, utilizing a self-report measure, have also reported high levels of intrusive thoughts and avoidance in children 1 year following an automobile accident (Winje & Ulvik, 1998).

Thus, children's symptoms after exposure to human-made disasters, like that of natural disasters, include increased internalizing symptoms, externalizing behavior problems, and PTSD symptoms.

Risk Factors for Child Reactions Post-Disaster

Researchers have also examined variables that may be linked to the development of PTSD and other forms of psychopathology in children following disasters. A model providing a conceptual framework of such variables was first developed by Korol (1990) and Green et al. (1991), and later modified following Hurricane Andrew by La Greca and colleagues (1996) and Vernberg and colleagues (1996). The model, as most recently described by La Greca and colleagues (1996), includes the four broad categories of the aspects of the traumatic event (e.g., life threat, loss, or disruption), the pre-existing characteristics of the child (e.g., demographic characteristics and pre-disaster functioning), the child's psychological resources (e.g., coping skills and self-efficacy), and the characteristics of post-disaster recovery environment (e.g., availability of social support, occurrence of major life events or stressors, and parental reactions) (La Greca et al., 1996; Vernberg et al., 1996; Vogel & Vernberg, 1993). Below is a discussion of research findings within each board category.

Aspects of Traumatic Exposure

Several aspects of traumatic exposure have been demonstrated as important for the emergence of child disaster reactions. For example, perceived life threat has been consistently linked to increased PTSD symptoms (La Greca et al., 1996, 1998; Lonigan, Shannon, Finch, Daugherty, & Taylor, 1991). Similarly, actual or perceived loss of possessions and disruption of everyday life, including displacement from home, school,

or community, contribute to children's post-disaster reactions (La Greca et al., 1996; Vernberg et al., 1996). It is important to note that these two studies were conducted following hurricanes, following which children and families are frequently faced with continual life stressors which may last for weeks, months, or possibly years. Stressors such as loss of home, change in school, change in parental employment and finances, and friends moving away seriously challenge a child's and a family's adaptation and coping. Although this may be a significant predictor of child functioning post-disaster, few studies have systematically investigated its effects (Silverman & La Greca, 2002).

Conversely, level of child exposure and proximity to the traumatic event is the most widely studied aspect of disaster experiences. Research following both natural and human-made disasters has demonstrated that closer physical proximity is associated with more severe reactions in children (Goenjian et al., 2001; La Greca et al., 1996; Lengua et al., 2005; McDermott et al., 2005; Nader, Pynoos, Fairbanks, & Frederick, 1990; Russoniello et al., 2002).

Pre-Existing Characteristics of the Child

Several child characteristics have been examined by various researchers in terms of the risk for post-disaster reactions. The most frequently studied pre-disaster child characteristics have been age, gender, and ethnicity. Child age has received substantial research attention, with many researchers finding younger children at greater risk for severe post-disaster reactions (Lonigan et al., 1991; McDermott et al., 2005; Shannon et al., 1994). Other researchers have found no significant differences between older and younger age groups (Green et al., 1991). Conversely, others have asserted that different reactions are more likely for certain age groups, with preschool children showing a higher

incidence of behavioral disturbance, and older children demonstrating more traditional symptoms of PTSD (Huzziff & Ronan, 1999; Yule, 1994). Although diverse manifestations of PTSD and other forms of psychopathology may be more likely at different ages (American Academy of Child and Adolescent Psychiatry, 1998), currently, no normative data on children's disaster reactions are available (Silverman & La Greca, 2002).

Research consistently has found that girls report more PTSD symptoms and other forms of psychopathology than boys following disasters. For example, researchers examining child reactions following a wildfire (McDermott et al., 2005), an earthquake (Roussos et al., 2005), several hurricanes (Garrison et al., 1995; Goenjian et al., 2001; Lonigan et al., 1991; Russoniello et al., 2002; Shannon et al., 1994), a terrorist attack (Jaycox et al., 2004; Lengua et al., 2005), and a shipping disaster (Udwin, Boyle, Yule, Bolton, & O'Ryan, 2000) have consistently shown that females endorse more symptoms of PTSD, anxiety, and depression. Other researchers have asserted that the magnitude of the difference between female and male children is modest (Vernberg et al., 1996), and perhaps the post-disaster reactions of boys and girls depend on the type of disaster and the specific reactions that are investigated (Silverman & La Greca, 2002).

Although not as consistently investigated as child age and gender, child ethnicity have been studied in terms of its relation to child reactions post-disaster. Findings from studies following hurricanes (Garrison et al., 1995; La Greca et al., 1996, 1998; Lonigan et al., 1991), as well as following an act of terrorism (Jaycox et al., 2004; Lengua et al., 2005), have shown that minority (e.g., African American and Hispanic) youth report higher levels of PTSD symptoms and have a more difficult time recovering from such

events than non-minority youth. However, the reasons for the observed ethnic differences are not clear, with the possible effects of confounding variables, such as socioeconomic status (SES) and previous violence exposure, not currently well understood (Silverman & La Greca, 2002).

With scant evidence available due to the nature of disaster research, child pre-disaster psychosocial functioning has also been examined as a contributor to child reactions post-disaster. Recent findings suggest that pre-existing anxiety, depression, other internalizing and externalizing problems, and low social competence may be a significant risk factor for the development of PTSD symptoms following a disaster (La Greca et al., 1998; Lengua et al., 2005; Lonigan, Shannon, Taylor, Finch, & Sallee, 1994; Nolen-Hoeksema & Morrow, 1991). However, continued research is necessary to determine prior psychopathology's role in child reactions post-disaster (Silverman & La Greca, 2002).

Child Psychological Resources

The psychological resources of a child, which may be considered an aspect of the term resilience (i.e., the idea that some children function well despite experiencing multiple adverse circumstances; Garnezy, 1993) have been linked to children's post-disaster functioning (Vernberg, 1999). Psychological resources that have been indicated as protective factors include average or above average intelligence, self-efficacy, good communication skills, an internal locus of control, and effective coping skills (Vernberg, 1999). Although limited to only a few investigations, coping has received the most research attention. For example, two hurricane studies (La Greca et al., 1996; Vernberg et al., 1996) indicated that children and adolescents with negative coping strategies, such

as anger and blaming others, showed higher levels of PTSD symptoms than children with positive coping strategies. Similar findings were reported in a community study following a volcanic eruption (Huzziff & Ronan, 1999), as well as in the non-disaster research area of community violence (Berman, Kurtines, Silverman, & Serafini, 1996). Additionally, children with negative coping styles evidence greater persistence of PTSD symptoms over time (La Greca et al., 1996). Although more research is necessary, these findings have implications for intervention design following disasters (Silverman & La Greca, 2002).

Characteristics of the Post-Disaster Recovery Environment

Several aspects of a child's post-disaster recovery environment have been found to contribute to children's reactions. For example, social support has been found to mitigate the impact of natural and human-made disasters (Huzziff & Ronan, 1999; La Greca et al., 1996; Udwin et al., 2000; Vernberg et al., 1996). Further, both familial and extra-familial social support predicted fewer PTSD symptoms in children exposed to trauma within their school (Berman et al., 1996; Kliwer, Lepore, Oskin, & Johnson, 1998). Parents, in addition to providing valuable support, can in some instances hinder the coping of their children when faced with disasters. Disasters often strike parents as well as their children, thereby possibly affecting parents psychologically in a manner similar to their children. Thus, another important aspect of a child's recovery environment that has previously demonstrated a contribution to child post-disaster reactions is parental psychological functioning and post-disaster reactions (Silverman & La Greca, 2002). The following section is a review of research in the specific area of parental psychopathology and distress following disasters.

Parental Psychopathology and Disasters

Similar to the history of research examining child reactions post-disaster, the history examining the role of parental psychopathology during child recovery post-disaster is also relatively short. This short history begins in the 1950's with a study following the 1953 tornado in Vicksburg, Mississippi. Researchers indicated that parents' mental health and well-being were related to a decrease in children's emotional problems (Perry et al., 1956). Nearly a decade later, following a 1962 cyclone in Oregon, Crawshaw found that child reactions were a "direct reflection of the parents' psychological state" (p.159) (Crawshaw, 1963). Later, utilizing more standardized means of assessment and statistical analysis, Green and colleagues examined the role of parental psychopathology in child reactions following the 1972 Buffalo Creek dam collapse in West Virginia (Green et al., 1991). A multiple regression analysis revealed that both mothers' and fathers' PTSD symptom severity were significantly related to child PTSD symptoms, and, together, were the strongest predictor of child symptoms, accounting for 25% of the variance (Green et al., 1991). Handford and colleagues (1986) later found that parent overreaction and non-competent response to the events associated with the 1979 Three Mile Island nuclear disaster were associated with greater anxiety in children. Similarly, researchers examining child reactions following a severe flood in rural Missouri in 1982 found that children most likely to be adversely affected were those with parents who also reported a high number of symptoms (Earls, Smith, Reich, & Jung, 1988). McFarlane and fellow researchers examined children's reactions following the 1983 Australian brushfire. Their analyses revealed that family disruption (e.g.,

separation, changes in family function, and maternal preoccupation) was a stronger predictor of child PTSD than direct child exposure (McFarlane et al., 1987).

Researchers continue to examine the relationship between parent and child reactions post-disaster. For example, Sullivan and colleagues found that parents' subjective levels of stress were associated with increased parent-reported behavior problems in their preschool children 6 weeks following Hurricane Hugo (Sullivan, Saylor, & Foster, 1991). In a second sample of preschool children, who were evaluated 14 months post-Hurricane Hugo, regression analyses revealed that significant distress of the mother was the only significant predictor of mother-reported behavioral difficulties with their children, accounting for 9% of the variance (Swenson et al., 1996). Although these two studies provide useful information regarding the relationship between parent and child reactions post-hurricane, their results should be interpreted with caution as parents were the sole informants (Silverman & La Greca, 2002). Specifically, the self-report of a child exposed to a disaster is considered the most objective, direct source of information on their symptoms, especially those symptoms of a private nature, such as PTSD symptoms (Finch & Daugherty, 1993).

Recent studies utilizing child-report have found a relationship between parent reactions and child reactions post-disaster. Jones, Ribbe, Cunningham, Weddle, and Langley (2002) found a significant association between the number of PTSD symptoms reported by parents and those reported by their school-aged children ($r=.55$) 6 weeks following the 1990 brushfire in southern California. Similarly, researchers examining the relationship between parent-reported distress and adolescent-reported distress following the 1992 Erzincan, Turkey earthquake found that parent somatization was related to child

somatization and child depression. Parental depression was also related to child somatization. Further, parental somatization was the only significant predictor of overall child distress, accounting for 11% of the variance (Rustemli & Karanci, 1996). Three and 9 months following the 1993 World Trade Center bombing in New York City, Koplewicz and colleagues (2002) assessed both parent and child PTSD symptoms. From the first assessment to the second assessment, the relationship between parent-reported and child-reported PTSD symptoms increased, from $r=.52$ to $r=.81$ (Koplewicz et al., 2002). In another human-made disaster, parents and their school-aged children were assessed for PTSD and other forms of psychopathology 6 months following a large-scale industrial disaster in the Briey region of France (Vila et al., 2001). Researchers found child-reported anxiety and PTSD symptoms to be moderately related to parental symptoms of depression, anxiety, and PTSD (Vila et al., 2001).

Some researchers have attempted to explain why the relationship between parent and child post-disaster symptoms may exist. Some have asserted that parents' personal adjustment greatly affects children's post-disaster adjustment in their possibly diminished ability to provide social support to their child (Silverman & La Greca, 2002), as well as their ability to parent effectively (Appleyard & Osofsky, 2003). Others have argued from a social learning perspective, focusing on parental modeling of symptomatic behavior (Compas & Epping, 1993; Pynoos & Nader, 1988; Vernberg & Vogel, 1993). Although these assertions have not been examined fully, researchers have consistently indicated the relationship between parent and child reactions post-disaster, as well as the predictive power of parental psychopathology on child symptoms following disasters.

Parental Psychopathology and Non-Disaster, Specific Trauma Populations

Within the research areas of community violence exposure (CVE), domestic violence exposure (DVE), child abuse, and pediatric illness and injury, investigators have examined the relationship between parent psychopathology and child functioning. Research within each area has demonstrated significant correlations, predictions, and in some cases, mediation and moderation.

Community Violence Exposure (CVE)

Several researchers have examined the relationship between parental psychological functioning, the level of child CVE, and child psychological functioning. For example, Linares and colleagues (2001) examined the associations among child CVE, maternal distress, and behavior problems in preschool children, aged 3 to 5 years. Analyses indicted a mediational model, as the direct association between CVE and child behavior problems became nonsignificant when maternal distress was introduced as a mediator (Linares et al., 2001). Linares and colleagues explained their finding of parental mental health as a mediator by arguing that preschool children frequently rely heavily on their parents, especially mothers, in seeking affective and social referencing information (2001). Eugene and Ell (2005) later confirmed the mediational role of parental distress within the relationship between child CVE and young child distress and behavior problems. In a study examining similar constructs in adolescents 13- to 16-years-old, Self-Brown et al. (2006) found parental mental health to be a moderator variable in the relationship between adolescent CVE and adolescent-rated symptoms of PTSD. Specifically, results indicated that at higher levels of parental PTSD, adolescents who reported a higher level of CVE indicated significantly more PTSD symptoms than

adolescents with a lower incidence of CVE. However, when parents reported fewer of their own PTSD symptoms, there was not a significant relationship between CVE and adolescent PTSD symptoms. Self-Brown and colleagues explained their finding of parental mental health as a moderator as opposed to a mediator when considering the broader social referencing adolescents utilize in processing events, such as reliance on their peer groups (Self-Brown et al., 2006). Thus, the influence of parental psychopathology has been supported as an important factor in child functioning within the area of CVE.

Domestic Violence Exposure (DVE)

Although limited to a few studies, researchers have begun to investigate the relationship between child DVE, child outcome, and maternal psychological functioning. Jarvis & Novaco (2006), for example, found a significant correlation between child internalizing and externalizing behaviors and maternal depression in children with high levels of DVE. Similarly, child behavioral problems have been found to relate to maternal anxiety and anger (Jarvis, Gordon, & Novaco 2005). In attempting to explain the specific relationship between child DVE, child outcome, and maternal psychological functioning, several other researchers have examined the possible mediating and moderating role of maternal psychological functioning. Maternal psychopathology and distress have been found to significantly moderate child adjustment for children experiencing all levels of marital aggression (Hershom & Rosenbaum, 1985; Shepard, 1992; Kimura, 1999). Lieberman, van Horn, and Ozer (2005) found maternal psychopathology mediated the relationship between child DVE and child behavior problems in preschoolers. In explaining these mediator and moderator relationships,

English, Marshall, & Stewart (2003) argued that family functioning is greatly impacted by domestic violence. In essence, a caregiver's disrupted general well being is significantly associated with decrements in their child's functioning (English et al., 2003). Thus, similar to evidence in CVE research, maternal psychopathology or distress may serve a specific role, such as a moderator or mediator variable, between child exposure and child distress or psychopathology.

Child Abuse

Researchers in the area of child abuse have attempted to discover correlates of child outcome for those children who have either been physically and/or sexually abused. Much attention has been given to the role of the non-offending parent. For example, three separate studies found that high support from a non-offending parent following sexual abuse was associated with better child adjustment; conversely, a lack of support was found to be associated with increased psychological symptoms in the child victim (Cohen & Mannarino, 2000; Elliott & Carnes, 2001; Everson, Hunter, Runyon, & Edelson, 1989). Other researchers have focused on the role of maternal psychological and emotional functioning in terms of predicting child outcome. Researchers have found that maternal PTSD, depression, substance abuse, and emotional distress are significant predictive factors for various outcomes of abused children, such as attention-deficit/hyperactivity disorder (ADHD), conduct disorder (CD), PTSD, and other behavior problems (Cohen & Mannarino, 1996; Famularo, Fenton, Kinscherff, & Ayoub, 1994; Leschied, Chiodo, Whitehead, & Hurley, 2005; Manion et al., 1998; Paredes, Leifer, & Kilbane, 2001). Again, similar to other trauma types, child outcome and functioning following abuse is partially predicted by parental variables.

Pediatric Illness and Injury

In recent years, there has been increasing research attention within pediatric psychology on the use of a PTSD framework for child and family psychological responses to pediatric cancer, pediatric diabetes mellitus, and pediatric injury or accident. Perhaps initiating this recent research interest is the finding that parents of medically ill children are at least as symptomatic, or possibly more symptomatic, as compared to their children in terms of PTSD (Stuber & Shemesh, 2006). For example, Landolt and colleagues examined child and parent PTSD symptoms in various pediatric patient types: an accident, a diagnosis of cancer, or a diagnosis of diabetes mellitus type I. Results revealed that child PTSD symptoms were in the mild range, and 16% of fathers and 23.9% of mothers met full diagnostic criteria for PTSD (Landolt, Vollrath, Ribl, Gnehm, & Sennhauser, 2003).

As compared to other areas of illness in pediatric patients, child and adolescent cancer patients have probably received the most research attention (Kassam-Adams, 2006). Similar to Landolt and colleagues' finding, other researchers focusing solely on pediatric cancer have found that parents report more PTSD symptoms than their child patients (Kazak et al., 2001, 2004; Manne, DuHamel, Gallelli, Sorgen, & Redd, 1998). In examining parents' PTSD symptoms as a risk factor for their children's psychological functioning, Pelcovitz and colleagues (1998) found that 35% of child cancer subjects met criteria for PTSD. Of this subgroup, 83% had mothers with PTSD, possibly supporting maternal PTSD as a risk factor for child PTSD (Pelcovitz et al., 1998). Conversely, perceptions of family adaptability (Kazak & Meadows, 1989) and family coping (Kupst & Schulman, 1988) have been found to be positively associated with psychological

adjustment of adolescent cancer patients, possibly serving as a protective factor. These findings are significant as parental well-being and level of psychopathology may affect parenting style, parent-child interaction, and the ongoing necessary attention to medical concerns for the child survivor (Kazak et al., 2004).

Similar to findings in the area of cancer patients and their parents, elevated rates of PTSD also have been found in parents of children diagnosed with diabetes mellitus type I. In one study, 24% of mothers and 22% of fathers sampled met full diagnostic criteria for PTSD. In addition, 51% of the mothers and 41% of the fathers met criteria for partial or subclinical PTSD (Landolt et al., 2002). Other researchers have focused on other parental variables that may affect child outcome, such as “pediatric parenting stress” (p. 182) (e.g., the stress related to caring for a child with a serious illness or medical condition; Streisand & Tercyak, 2004). Specifically, increased pediatric parenting stress within the area of diabetes has been associated with increased stress experienced by the affected child (Melamed & Ridley-Johnson, 1988), as well as poor child self-management of diabetes (Auslander, Thompson, Dreitzer, & Santiago, 1997; Hanson et al., 1996). Further, some researchers have found that treatment of parental distress, in the form of relaxation training, may positively impact the metabolic control of children with diabetes mellitus type I (Guthrie, Sargent, Speelman, & Parks, 1990). Although this research indicates that parent psychological and behavioral functioning are important, continued work is necessary for determining the specific nature of the relationship between parental stress levels and child functioning.

Lastly, within the area of pediatric injury researchers have begun to identify the psychological impact on both child victims and their parents. In a study examining the

relationship between parent and child psychological functioning after experiencing one of several injury types, the authors found that parental worry served as a mediator in the relationship between child trauma and child-reported PTSD symptoms (Meiser-Stedman, Yule, Dalgleish, Smith, & Glucksman, 2005). De Vries et al. (1999) specifically focused on child victims of traffic accidents, and found that 25% of child participants and 15% of parents reported diagnostic levels of PTSD symptoms. Correlational analyses indicated that child PTSD was strongly associated with parent PTSD ($r=.65$) (de Vries et al., 1999). The authors argued that the potential influence of parental responses on child adaptation after traumatic injury highlights the importance of attending to parents' reactions when assessing injured children (de Vries et al., 1999). Similarly, Landolt et al. (2005) found the severity of parental PTSD symptoms to be predictive of child PTSD symptoms 12 months following a traffic accident (Landolt et al., 2005). Related research has been conducted within the area of child burn victims. Specifically, positive family relationships have demonstrated a strong association with child-reported health-related quality of life (Landolt, Grubermann, & Meuli, 2002). Additionally, parental anxiety has been found to increase parent-child conflict following severe burns to the child (Hall et al., 2006). Although limited by a low number of studies, parental functioning for children suffering from traumatic injury may also have a significant impact on child adjustment post-injury.

Mediator and Moderator Variables

As mentioned previously, numerous researchers have attempted to identify variables of specific relationship types, such as moderator and mediator variables. Moderator variables are variables that affect the strength or direction of the relation between a

predictor variable and a criterion variable. By contrast, mediator variables are those that account for or explain the relation between the predictor and criterion variable (Baron & Kenny, 1986; Holmbeck, 1997). According to Kliever and Kung (1998), moderators influence the degree of association between a predictor and a criterion variable, whereas, mediators indicate the mechanism of the relationship between the two variables.

Summary and Purpose

Research indicates that a considerable proportion of children experience symptoms of PTSD following exposure to natural or human-made disasters (La Greca et al., 1996, 1998; Shannon et al., 1994; Winje & Ulvik, 1998). Although symptoms tend to remit over time in many children, a sizable proportion continues to experience symptoms long after the traumatic experience (Garrison et al., 1993; La Greca et al., 1996). Additionally, increased levels of children's depression, anxiety, and behavior problems have been documented following disasters (Shaw et al., 1995; Swenson et al., 1996; Yule et al., 2001). Both parent- and child-report have been utilized in this research area, although child-report is considered a more objective and direct source of information on child functioning (Finch & Daugherty, 1993).

Investigating beyond the prevalence of post-disaster psychological problems, some researchers have identified factors that are related to and partially predict child symptom development following a disaster (La Greca et al., 1996; Vernberg et al., 1996). This research has supported a post-disaster model delineating four broad categories of factors that may affect child functioning (e.g., aspects of the traumatic event, pre-existing child characteristics, child psychological resources, and post-disaster environment characteristics) (La Greca et al., 1996; Roussos et al., 2005; Vernberg, 1999). For

example, parental psychopathology, considered a significant factor within the post-disaster environment, has been found to predict child psychological symptoms post-disaster (Swenson et al., 1996; Rustemli & Karanci, 1996; Vila et al., 2001). This relationship has also been supported within other trauma exposed populations, such as children experiencing CVE (Self-Brown et al., 2006), DVE (Lieberman et al., 2005), abuse (Cohen & Mannarino, 1996), and medical illness (Landolt et al., 2003).

In the areas of CVE and DVE, researchers have examined parental psychopathology as a moderator or mediator in the relationship between child trauma exposure and subsequent child psychological symptoms (Eugene & Ell, 2005; Hershom & Rosenbaum, 1985; Linares et al., 2001; Self-Brown et al., 2006). The literature consistently has indicated that parents' psychological maladjustment moderates the relationship between exposure and psychological symptoms in school-aged and adolescent children, and serves as a mediator for preschool children (Linares et al., 2001; Self-Brown et al., 2006). Researchers have attributed this inconsistent finding to developmental factors (Self-Brown et al., 2006).

Thus, to investigate beyond the prevalence of post-disaster psychological problems in children, and in considering the research findings in the areas of CVE and DVE, the current study examined maternal psychopathology and PTSD as risk factors for child post-disaster psychopathology, as well as positive child outcome. This is significant as no hurricane studies have investigated moderators of negative, as well as positive, outcomes of children. Specifically, the current study will investigate the possible moderating effects of maternal psychopathology and maternal PTSD symptoms on the relationship between child exposure to events associated with Hurricane Katrina

and child post-disaster PTSD symptoms, child post-disaster internalizing behavior, child post-disaster externalizing behavior, child post-disaster self-reliance, and child post-disaster social skills. Both parent- and child-report will be utilized in measuring child symptoms and positive behaviors. Current hypotheses are listed below:

Hypothesis 1

It is hypothesized that maternal psychopathology will moderate the relation between child exposure to events associated with Hurricane Katrina and the following four negative child criterion variables: child-reported PTSD symptoms, child-reported internalizing symptoms, mother-reported child internalizing symptoms, and mother-reported child externalizing symptoms. It is expected that maternal psychopathology will serve as a risk factor, increasing the strength of the positive relationship between child exposure and these negative post-hurricane child variables.

Hypothesis 2

It is hypothesized that maternal psychopathology will moderate the relation between child exposure to events associated with Hurricane Katrina and the following two positive child criterion variables: child-reported self-reliance and mother-reported child social skills. In contrast to Hypotheses 1, it is expected that lower levels of maternal psychopathology will be associated with increased levels of these positive post-hurricane child variables.

Hypothesis 3

It is hypothesized that maternal PTSD will moderate the relation between child exposure to events associated with Hurricane Katrina and the following four negative child criterion variables: child-reported PTSD symptoms, child-reported internalizing

symptoms, mother-reported child internalizing symptoms, and mother-reported child externalizing symptoms. It is expected that maternal PTSD will serve as a risk factor, increasing the strength of the positive relationship between child exposure and these negative post-hurricane child variables.

Hypothesis 4

It is hypothesized that maternal PTSD will moderate the relation between child exposure to events associated with Hurricane Katrina and the following two positive child criterion variables: child-reported self-reliance and mother-reported child social skills. In contrast to Hypotheses 3, it is expected that lower levels of maternal PTSD will be associated with increased levels of these positive post-hurricane child variables.

METHOD

Participants

Participants were 260 mother-child dyads recruited from various public and private elementary and middle schools within Orleans Parish, Jefferson Parish, and East Baton Rouge Parish 3 to 7 months post-Hurricane Katrina. All participants had been displaced by the hurricane. Children who were suspected as unable to comprehend or read the questionnaires, such as children in special education for cognitive disabilities or autism, were excluded. As seen in Table 1 child participant ages ranged from 8 to 16 years, with an average age of 12 years, with 112 male and 148 female students participating. The sample consisted of mostly African American families, as well as Caucasian, Hispanic, Asian, and Native American families. Family income ranged from \$0 to over \$100,000, and averaged between \$15,000-24,999.

Measures

Demographic Questionnaire

A demographic questionnaire (see Appendix A) was designed in order to obtain information regarding child participant age, grade, gender, and family characteristics. Mother participants completed the questionnaire. Family income, parent education, child gender, child age, and race served as control variables at the first step of analyses.

Behavior Assessment System for Children, Second Edition (BASC-2)

The BASC-2 Parent Report Scale (PRS) is a parent-report questionnaire that measures numerous aspects of behavior and personality, including positive (adaptive) as well as negative (clinical) dimensions of child behavior. There are three versions: one for

Table 1

Demographic Characteristics of the Sample

	N	%
Child Age (years)		
8	2	1
9	21	8
10	43	17
11	57	22
12	51	20
13	58	22
14	24	9
15	3	1
16	1	.4
Child Grade*		
3	2	1
4	34	13
5	57	23
6	54	21
7	60	24
8	46	18
Child Gender		
Male	112	43
Female	148	57
Family Race*		
African American	174	68
Caucasian	61	24
Hispanic	7	3
Asian	13	5
Native American	1	.4
Other	1	.4
Family Income (per year)*		
\$14,999 and Below	96	40
\$15,000-49,999	100	41
\$50,000 and Above	43	19
Mother Education*		
6 th Grade or Less	2	1
Junior High School	7	3

(table cont.)

(table cont.)

Partial High School	31	12
High School Graduate	79	32
Part College/Special Training	80	32
College/University Graduate	37	15
Professional Degree	15	6

Note. * indicates missing data.

preschool children aged 3-5 years, one for children aged 6-11 years, and one for children aged 12-18 years. The latter two versions were used for the current study. All versions yield five composite scales (Adaptive Skills, Behavioral Symptoms Index, Externalizing Problems, Internalizing Problems, and School Problems), 16 primary scales, and seven content scales. The BASC-2 PRS uses a four-choice response format, and is written at approximately the fourth grade reading level. Mother participants completed the BASC-2 PRS. The Internalizing Problems and Externalizing Problems composite scales were used as indicators of mother-reported child psychological symptoms, and the Social Skills primary scale was used as an indicator of mother-reported child adjustment, or positive outcome, for the current study.

The BASC-2 Self Report of Personality (SRP) is a self-report measure analogous to the BASC-2 PRS. It also has multiple forms depending on child age: one for children aged 8-11 years, one for children aged 12-21 years, and one for young adults aged 15-25 years. The first two versions were used for the current study. These two versions have an identical set of 18 primary scales and five composite scales. The composite scales are as follows: School Problems, Internalizing Problems, Inattention/Hyperactivity, Personal Adjustment, and the Emotional Symptoms Index. Child and adolescent participants completed the BASC-2 SRP. The Internalizing Problems composite scale was used as an

indicator of child-reported internalizing symptoms, and the Self-Reliance primary scale was used as an indicator of child-reported personal adjustment, or positive outcome, for the current study.

Similar to the previous edition of this multi-informant rating scale system, the BASC-2 has demonstrated adequate internal consistency, test-retest reliability, and validity (Reynolds & Kamphaus, 1998; Reynolds & Kamphaus, 2004; Waggoner, 2006).

UCLA PTSD Reaction Index

The UCLA PTSD Reaction Index is a revised version of the widely used and researched Child PTSD Reaction Index (CPTSD-RI; Nader et al., 1990). This 24-item, self-report instrument screens for the diagnosis of PTSD in children and adolescents according to the DSM-IV (American Psychiatric Association, 1994). It yields a separate score for the B cluster of PTSD symptoms (re-experiencing of the traumatic event), the C cluster (avoidance of stimuli and numbing of responses), and the D cluster (increased arousal), as well as an Index Summary Score and a Diagnosis Score. This revised measure has demonstrated high internal consistency and test-retest reliability. It has also shown high sensitivity and specificity (Pynoos, Goenjian, & Steinberg, 1998; Rodriguez, Steinberg, Saltzman, & Pynoos, 2001; Steinberg, Brymer, Decker, & Pynoos, 2004). Child participants completed this measure, and the Index Summary Score was used as an overall index of child-reported PTSD symptoms in the current study.

Hurricane-Related Traumatic Experiences (HURTE)

The HURTE was recently designed by disaster researchers in an effort to establish a measure of hurricane-related traumatic experiences. Based on the sum of child responses of either “yes” or “no” to a series of trauma experience-related questions, it

yields two factor scales, that of Threat and Loss. Although evidence of its psychometric properties is limited by its fairly recent development, the HURTE has demonstrated sufficient test-retest reliability as well as predictive validity (La Greca et al., 1996; Vernberg et al., 1996). As previous researchers have suggested, the Loss and Threat scores were used as a combined variable to represent child exposure to traumatic experiences for the purposes of the current study.

Symptom Checklist-90-Revised (SCL-90-R)

The SCL-90-R is a 90-item self-report inventory of adult psychological symptoms with nine primary symptom dimensions (Somatization, Obsessive-Compulsive, Interpersonal Sensitivity, Depression, Anxiety, Hostility, Phobic Anxiety, Paranoid Ideation, and Psychoticism) and three global indices (Global Severity Index, Positive Symptom Distress Index, and Positive Symptom Total). This measure has been shown to have high test-retest reliability and internal consistency. Additionally, it has demonstrated high concurrent, convergent, discriminant, and construct validity. (Derogatis & Cleary, 1977; Derogatis, Rickels, & Rock, 1976; Gotlib, 1984; Koeter, 1992). Mothers completed this measure and the Global Severity Index, which is the average rating given to all 90 items, was used as a measure of global maternal psychological distress.

Posttraumatic Diagnostic Scale (PDS)

The PDS is a self-report scale designed to support clinical assessment of the presence and severity of PTSD in adults. Containing 49 items, the PDS was written to parallel the diagnostic criteria of PTSD in the DSM-IV (American Psychiatric Association, 1994). The PDS has demonstrated high internal consistency and test-retest

reliability, high diagnostic agreement with the PTSD module of the Structured Clinical Interview for the DSM-III-R (SCID; Spitzer, Williams, Gibbons, & First, 1990), and has demonstrated good sensitivity and specificity. The PDS has satisfactory validity as supported by its high correlations with other measures of trauma-related psychopathology (Foa et al., 1997). Mother participants completed this measure and the PTSD Total Severity Score was used as a measure of maternal PTSD. See Table 2 for a summary of all measures used and their corresponding description and variable type.

Table 2

Summary of Measures and Predictor, Moderator, and Criterion Variables

Measure	Description	Variable Type
BASC-2 PRS	Mother-reported internalizing symptoms	Criterion
	Mother-reported externalizing symptoms	Criterion
	Mother-reported social skills	Criterion
BASC-2 SRP	Child-reported internalizing symptoms	Criterion
	Child-reported self-reliance	Criterion
UCLA PTSD RI	Child-reported PTSD symptoms	Criterion
HURTE	Child hurricane exposure	Predictor
SCL-90	Maternal psychopathology	Moderator
PDS	Maternal PTSD	Moderator

Procedure

Following Institutional Review Board (IRB) approval and school board approval in Orleans, Jefferson, and East Baton Rouge Parish, individual schools were contacted and provided information on the current research study. Following individual school approval, students in grades 3 through 8 were recruited via various procedures based on school personnel preferences. Recruitment procedures included the use of flyers sent

home to mothers and questionnaire packets sent directly home. The majority of mothers and students were recruited via mother questionnaire packets sent home directly through the child. These packets included information on the research study, parent consent forms (see Appendix B), contact information for researchers for the purpose of psychological referrals if appropriate, and the above-described parent-report questionnaires (Demographic Questionnaire, BASC-2 PRS, SCL-90-R, and PDS) as well as other measures included in a larger grant-funded research project. Following the return of a completed mother packet to the child's school, including parent consent for their child to participate, the child then was given information regarding the study, and was allowed to sign assent forms (see Appendix C). After assent was obtained, child participants then completed the above-described child-report questionnaires (BASC-2 SRP, UCLA PTSD Reaction Index, and HURTE), among other questionnaires utilized for a larger grant-funded research study. While completing the questionnaires on their school's campus, the child participants were under the supervision of trained members of the research team. Children with reading difficulties were given the option of having measures read to them by the researcher. Mothers were subsequently telephoned by a trained researcher in order to confirm participation status and give appropriate referral information for mental health services if requested or if indicated per child response to the questionnaires.

Depending on the preference of school personnel at each school campus, various incentives and forms of compensation were utilized. For child participants, these included a \$5 cash prize or participation in a pizza party. Mother participants were either entered into a drawing for a cash prize or were individually paid \$20 for their

participation. Mother and child responses were anonymous and packets were coded to match their data.

RESULTS

Missing Data and Invalid Data Analyses

In order to address missing mother or child responses in the current study, the Bayesian multiple imputation (MI) procedure, as described by Schafer and Graham (2002), was utilized. With this procedure, each missing value was replaced with a list of $m > 1$ simulated values. Using techniques suggested by Rubin (1987) or Schafer (1997), each of the m data sets were then analyzed by a complete data method, and the results were combined by simple arithmetic to give parameter estimates and standard errors that took into account the uncertainty due to the missing data values (Schafer & Graham, 2002).

Description of the Predictor Variable

The frequencies of the HURTE items were examined to determine the rates of endorsement of each item by child respondents (see Table 3). In terms of the life threat items, a relatively small percentage of child respondents reported direct injury to self, and larger percentages indicated perceived life threat and observing others become injured. With regard to the loss and disruption items, higher percentages, overall, were indicated as compared to the life threat items. Losses endorsed included damage or loss of homes, loss of jobs for parents, temporary separation from parents, and difficulty seeing friends.

Description of the Moderating Variables

The two moderating variables, maternal psychopathology and maternal PTSD, were examined to determine the percentage rates of occurrence within this study's sample. For maternal psychopathology, the SCL-90 Global Severity Index was scored. Results

Table 3

Frequency of Endorsement of “Yes” for HURTE Items

Item	% Endorsing Item
Perceived Life Threat	
At any time during the hurricane, did you think you might die?	27
Life-Threatening Experiences	
Did windows or doors break in the place you stayed during the hurricane?	18
Did you get hurt during the hurricane?	3
Did you see anyone else get hurt during the hurricane?	21
Did you have to go outside during the hurricane because the building you were staying in was badly damaged?	9
Did a pet you liked get hurt or die during the hurricane?	23
Did you get hit by anything falling or flying during the hurricane?	4
Loss-Disruption Experiences	
Was your home damaged badly or destroyed by the hurricane?	53
Did you have to go to a new school because of the hurricane?	67
Did you move to a new place because of the hurricane?	44
Did one of your parents lose his or her job because of the hurricane?	37
Has it been hard to see your friends since the hurricane because they moved or you moved?	73
Did your family have trouble getting enough food or water after the hurricane?	21
Were your clothes or toys ruined by the hurricane?	48
Did your pet run away or have to be given away because of the hurricane?	9
Did you have to live away from your parents for a week or more because of the hurricane?	15

indicated that 76% of the mothers scored at less than the 50th percentile for global psychological distress, 23% scored between the 50th and 84th percentile, and 1% scored above the 84th percentile. No mother respondents scored at or above the 98th percentile, what the authors of the measure consider ‘caseness’ (Derogatis, 1994). The PDS was scored for maternal PTSD, and results indicated that 58% of mother respondents were in the mild range, 20% were in the moderate range, 18% were in the moderate to severe range, and 5% were in the severe range.

Zero-Order Analyses

Bivariate correlations between the control, predictor, moderator, and criterion variables were conducted (see Table 4). With regard to significant correlations, child age was positively correlated with externalizing problems. Race was negatively and significantly correlated with family income, indicating that minority groups reported lower incomes. Parental education was positively and significantly correlated with family income, and negatively and significantly correlated with child hurricane exposure, maternal psychopathology, maternal PTSD, as well as mother-reported child internalizing and externalizing problems. Child hurricane exposure was positively and significantly correlated with maternal psychopathology, maternal PTSD, child PTSD, child-reported internalizing problems; and, was negatively and significantly correlated with mother-reported child social skills.

The moderating variables of maternal psychopathology and maternal PTSD were positively and significantly correlated with each other. Maternal psychopathology was positively and significantly correlated with the following criterion variables: child self-reported PTSD, child- and mother-reported internalizing problems, and mother-reported

child externalizing problems. Maternal PTSD was significantly associated with these negative criterion variables as well, with the exception of mother-reported child externalizing problems.

Table 4

Correlation Matrix of the Control, Predictor, Moderator, and Criterion Variables

Variable	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1. Age	-	.11	-.09	-.04	.06	.06	-.09	.02	.01	-.06	.00	.15*	-.01	-.02
2. Gender		-	.01	-.09	-.11	-.06	-.04	-.08	.05	-.08	-.05	.12	.06	-.04
3. Race			-	-.08	-.31**	.01	-.05	.00	-.09	-.05	.02	.04	-.00	-.04
4. Parental Education				-	.44**	-.14*	-.16*	-.19**	-.06	-.02	-.18**	-.21**	-.03	.03
5. Family Income					-	-.13*	-.18**	-.05	-.14*	-.11	-.28**	-.32**	.11	.12
6. Child Hurricane Exposure						-	.17**	.21**	.27**	.25**	.13	.09	.05	-.17*
7. Maternal Psychopathology							-	.50**	.24**	.27**	.49**	.29**	.06	-.05
8. Maternal PTSD								-	.18**	.19**	.16*	.05	.15	.03
9. Child Self-Reported PTSD									-	.63**	.24**	.15*	-.06	-.09
10. Self-Reported Child Internalizing Problems										-	.29**	.11	-.15*	-.16*
11. Mother-Reported Child Internalizing Problems											-	.66**	-.16*	-.17*
12. Mother-Reported Child Externalizing Problems												-	-.28**	-.35**
13. Child-Reported Self-Reliance													-	.17*
14. Mother-Reported Child Social Skills														-

* $p < .05$. ** $p < .01$.

Each of the negative child criterion variables, including child self-reported PTSD, child- and mother-reported internalizing problems, and mother-reported child externalizing problems were positively and significantly associated with each other, with the exclusion of the relationship between child-reported internalizing problems and mother-reported child externalizing problems. Additionally, the positive child criterion variables, child-reported self-reliance and mother-reported child social skills, were positively and significantly associated with one another, and negatively and significantly associated with child- and mother-reported internalizing problems, as well as mother-reported child externalizing problems. Child self-reported PTSD, although showing a negative association with both positive criterion variables, was not significantly associated with them.

Regression Analyses

As recommended by Baron and Kenny (1986), hierarchical regression analyses were calculated in order to determine whether maternal psychopathology and maternal PTSD symptoms moderated the relationship between child exposure to traumatic events associated with Hurricane Katrina and the four negative and two positive post-disaster child criterion variables: child-reported PTSD symptoms, child-reported internalizing symptoms, mother-reported child internalizing symptoms, mother-reported child externalizing symptoms, child-reported self-reliance, and mother-reported child social skills. Separate analyses were conducted with maternal psychopathology and PTSD symptoms with each criterion variable. Prior to conducting the regression analyses, the predictor variables were centered to prevent the negative impact of multicollinearity as recommended by Aiken and West (1991). The mean was subtracted from each individual

scale score to create variables with a mean of zero. The centered predictor variables were multiplied to create the interaction terms.

Thus, in order to examine Hypothesis 1 and 2 separate hierarchical regression analyses were calculated investigating maternal psychopathology as a potential moderator between child hurricane exposure and the four negative and two positive criterion variables. For each analysis, demographic variables (child age, child gender, race, family income, and parent education) were entered on the first step to control for their effects. In step two, the main effects of maternal psychopathology and child hurricane exposure were entered. A two-way interaction between maternal psychopathology and child hurricane exposure was entered in step three.

Similarly, in order to examine Hypothesis 3 and 4 separate hierarchical regression analyses were calculated investigating maternal PTSD as a potential moderator between child hurricane exposure and the four negative and two positive criterion variables. For each regression analysis, demographic variables (child age, child gender, race, family income, and parent education) were entered on the first step. In step two, the main effects of maternal PTSD symptoms and child hurricane exposure were entered. A two-way interaction between maternal PTSD symptoms and child hurricane exposure was entered in step three.

Any significant interactions identified in the regression analyses were then examined in follow-up simple slope analyses and plots. Post-hoc probing with t-tests of the significant interactions was conducted to determine which simple slopes were significantly different from zero. This procedure was used to determine under which conditions of the moderators the interaction was significant. To further examine a

possible interaction, a plot was then created by solving the regression equation at specific levels of the moderator variables, particularly one standard deviation above and below the mean (Aiken & West, 1991; Holmbeck, 2002; Tabachnick & Fidell, 2001).

Regression Analyses with Maternal Psychopathology as a Moderator

In the regression equation with child PTSD as the criterion variable (see Table 5), demographic variables, together, were not significant predictors. Child hurricane exposure (CHE) and maternal psychopathology (MP) were entered on the second step and, were significant [$F(7, 217) = 5.47, p < .001$]. The interaction between CHE and MP was significant on the third step, [$F(8, 216) = 4.77, p < .001$]. These variables accounted for 15% of the variance in child PTSD. Examination of the variables within the third block revealed that CHE ($B = 1.40, p < .01$) and MP ($B = .26, p < .01$) were significant predictors of child PTSD, such that greater CHE and MP were related to greater child PTSD. The interaction between CHE and MP was not significant. Thus, Hypothesis 1 was not supported for this criterion variable.

Table 5

Hierarchical Regression Analysis Evaluating the Moderating Effects of Maternal Psychopathology on Child Self-Reported PTSD

Variable	Step One		Step Two		Step Three	
	<i>B</i>	β	<i>B</i>	β	<i>B</i>	β
Age	.06	.10	.10	.02	.09	.02
Gender	1.39	.05	2.44	.08	2.44	.08
Race	-2.5	-.13	-2.00	-.10	-2.00	-.10
Parent Education	-.54	-.04	.35	.03	.35	.03

(table cont.)

(table cont.)

Income	-1.01	-0.15	-0.67	-0.10	-0.68	-0.10
CHE			1.40**	.23**	1.40**	.23**
MP			.26***	.23***	.26**	.23**
CHE x MP					.00	.01

Note. $R^2 = .04$ for Step 1; $\Delta R^2 = .11$ *** for Step 2; $\Delta R^2 = .00$ for Step 3. Child Self-Reported PTSD=Index Summary score of UCLA PTSD RI; CHE=Child Hurricane Exposure; MP=Maternal Psychopathology.

* $p < .05$. ** $p < .01$. *** $p < .001$.

In the regression equation with child self-reported internalizing symptoms as the criterion variable (see Table 6), demographic variables were not significant at the first step. CHE and MP were entered on the second step and were significant [$F(7,183) = 3.46, p < .01$]. The interaction between CHE and MP was significant in the third step [$F(8, 182) = 3.06, p < .01$]. These variables accounted for 12% of the variance in child self-reported internalizing symptoms. Examination of the variables within the third block revealed that CHE ($B = 1.01, p < .01$) and MP ($B = .17, p < .01$) were both significant predictors of child self-reported internalizing symptoms, such that greater CHE and MP were related to greater child internalizing symptoms. The interaction between CHE and MP was not significant. Thus, Hypothesis 1 was not supported for this criterion variable.

Table 6

Hierarchical Regression Analysis Evaluating the Moderating Effects of Maternal Psychopathology on Child Self-Reported Internalizing Symptoms

Variable	Step One		Step Two		Step Three	
	<i>B</i>	β	<i>B</i>	β	<i>B</i>	β
Age	-.51	-.07	-.13	-.02	-.09	-.01

(table cont.)

(table cont.)

Gender	-2.31	-.11	-1.82	-.08	-1.81	-.08
Race	-1.05	-.07	-.64	-.05	-.59	-.04
Parent Education	-.27	-.03	.36	.04	.36	.04
Income	-.57	-.12	-.31	-.06	-.30	-.06
CHE			1.00**	.22**	1.01**	.22**
MP			.18**	.21**	.17**	.20**
CHE x MP					-.01	-.04

Note. $R^2 = .03$ for Step 1; $\Delta R^2 = .09^{***}$ for Step 2; $\Delta R^2 = .00$ for Step 3. Child Self-Reported Internalizing Symptoms=Internalizing Problems of BASC-2 SRP; CHE=Child Hurricane Exposure; MP=Maternal Psychopathology.

* $p < .05$. ** $p < .01$. *** $p < .001$.

In the regression with mother-reported child internalizing symptoms as the criterion variable (see Table 7), demographic variables, together, were significant predictors [$F(5,192) = 3.10, p < .05$]. CHE and MP were entered on the second step and were significant [$F(7, 190) = 9.21, p < .001$]. The interaction between CHE and MP was significant at the third step [$F(8,189) = 10.30, p < .001$]. These variables accounted for 30% of the variance in mother-reported child internalizing symptoms. Examination of the variables within the third block revealed that family income ($B = -1.12, p < .05$) and MP ($B = .47, p < .001$) were significant predictors of mother-reported child internalizing symptoms, such that children of families with lower income levels and children with mothers reporting higher MP had higher levels of mother-reported child internalizing symptoms. The CHE main effect was negated as the interaction between CHE and MP ($B = -.09, p < .001$) was significant. Therefore, the regression line for children whose mothers endorsed low levels of psychopathology was significantly different from the

regression line for children whose mothers indicated high levels of psychopathology.

This finding indicates that MP serves as a moderating variable in the relationship between CHE and mother-reported child internalizing symptoms. Thus, Hypothesis 1 was supported for this criterion variable.

Table 7

Hierarchical Regression Analysis Evaluating the Moderating Effects of Maternal Psychopathology on Mother-Reported Child Internalizing Symptoms

Variable	Step One		Step Two		Step Three	
	<i>B</i>	β	<i>B</i>	β	<i>B</i>	β
Age	-.33	-.04	.34	.04	.61	.07
Gender	-1.29	-.04	-.89	-.03	-.77	-.03
Race	-1.63	-.09	-.93	-.05	-.60	-.03
Parent Education	-.70	-.06	.31	.03	.30	.02
Income	-1.63**	-.25**	-1.17*	-.18*	-1.12*	-.17*
CHE			.32	.05	.37	.06
MP			.48***	.44***	.47***	.43***
CHE x MP					-.09***	-.23***

Note. $R^2 = .08^*$ for Step 1; $\Delta R^2 = .18^{***}$ for Step 2; $\Delta R^2 = .05^{***}$ for Step 3. Mother-Reported Child Internalizing Symptoms=Internalizing Problems of BASC-2 PRS; CHE=Child Hurricane Exposure; MP=Maternal Psychopathology.

* $p < .05$. ** $p < .01$. *** $p < .001$.

Follow-up simple slope analyses were conducted for the interaction of CHE and MP. Analyses revealed that the interaction was significant at lower levels of MP, $t(226) = 2.95, p < .01$, but not at higher levels of MP, $t(226) = -1.64, p > .10$. The plot (see Figure 1) indicated that children whose mothers reported low levels of psychopathology had more internalizing symptoms as their level of hurricane exposure increased. The

relation between child hurricane exposure and child internalizing symptoms was not significant at higher levels of maternal psychopathology.

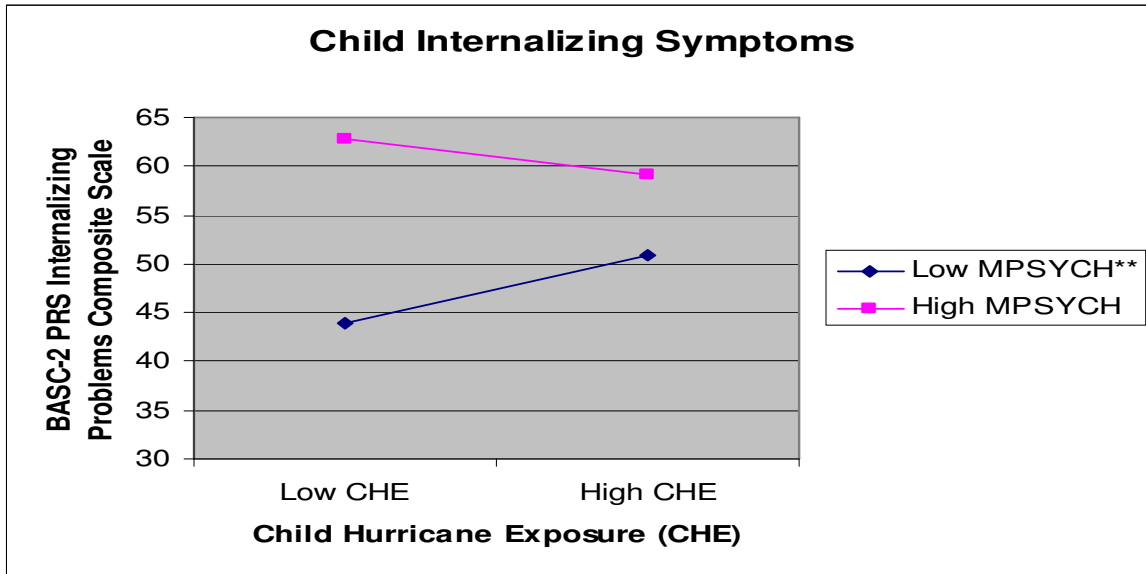


Figure 1. Moderator Effects of Maternal Psychopathology on the Relationship Between Child Hurricane Exposure and Mother-Reported Child Internalizing Symptoms

** $p < .01$.

In the regression with mother-reported child externalizing symptoms as the criterion variable (see Table 8), demographic variables, together, were significant predictors at the first step [$F(5, 174) = 4.84, p < .001$]. CHE and MP were entered on the second step and were also significant [$F(7, 172) = 5.13, p < .001$]. The interaction between CHE and MP was significant at the third step [$F(8, 171) = 5.06, p < .001$]. These variables accounted for 19% of the variance in mother-reported child externalizing symptoms. Examination of the variables within the third block revealed that child age ($B = 1.65, p < .01$), income ($B = -1.28, p < .05$), and MP ($B = .23, p < .01$) were significant predictors of mother-reported child externalizing symptoms. This indicates that older children, children of families with lower incomes, and children with mother's reporting high levels of MP had higher levels of mother-reported externalizing symptoms. The CHE main

effect was negated as the interaction between CHE and MP ($B = -.06, p < .05$) was significant. Therefore, the regression line for children whose mothers endorsed low levels of psychopathology was significantly different from the regression line for children whose mothers indicated high levels of psychopathology. This finding indicates that MP serves as a moderating variable in the relationship between CHE and mother-reported child externalizing symptoms. Thus, Hypothesis 1 was supported for this criterion variable.

Table 8

Hierarchical Regression Analysis Evaluating the Moderating Effects of Maternal Psychopathology on Mother-Reported Child Externalizing Symptoms

Variable	Step One		Step Two		Step Three	
	<i>B</i>	β	<i>B</i>	β	<i>B</i>	β
Age	1.15	.14	1.48*	.18*	1.65**	.20**
Gender	2.96	.11	3.27	.12	3.22	.12
Race	-.83	-.05	-.44	-.02	-.28	-.02
Parent Education	-.60	-.05	-.10	-.01	-.12	-.01
Income	-1.60**	-.27**	-1.32*	-.22*	-1.28*	-.21*
CHE			.28	.05	.33	.06
MP			.23**	.23**	.23**	.22**
CHE x MP					-.06*	-.14*

Note. $R^2 = .12***$ for Step 1; $\Delta R^2 = .05**$ for Step 2; $\Delta R^2 = .02^*$ for Step 3. Mother-Reported Child Externalizing Symptoms=Externalizing Problems of BASC-2 PRS; CHE=Child Hurricane Exposure; MP=Maternal Psychopathology.

* $p < .05$. ** $p < .01$. *** $p < .001$.

Follow-up simple slope analyses were conducted for the interaction of CHE and MP. Analyses revealed that the interaction was not significant at lower, $t(207) = 1.25, p$

> .20, or higher levels of MP, $t(207) = -.49, p > .60$. The plot indicated (see Figure 2) that children whose mothers reported low levels of psychopathology had more externalizing symptoms as their level of hurricane exposure increased. The relation between child hurricane exposure and child externalizing symptoms was weaker at higher levels of maternal psychopathology.

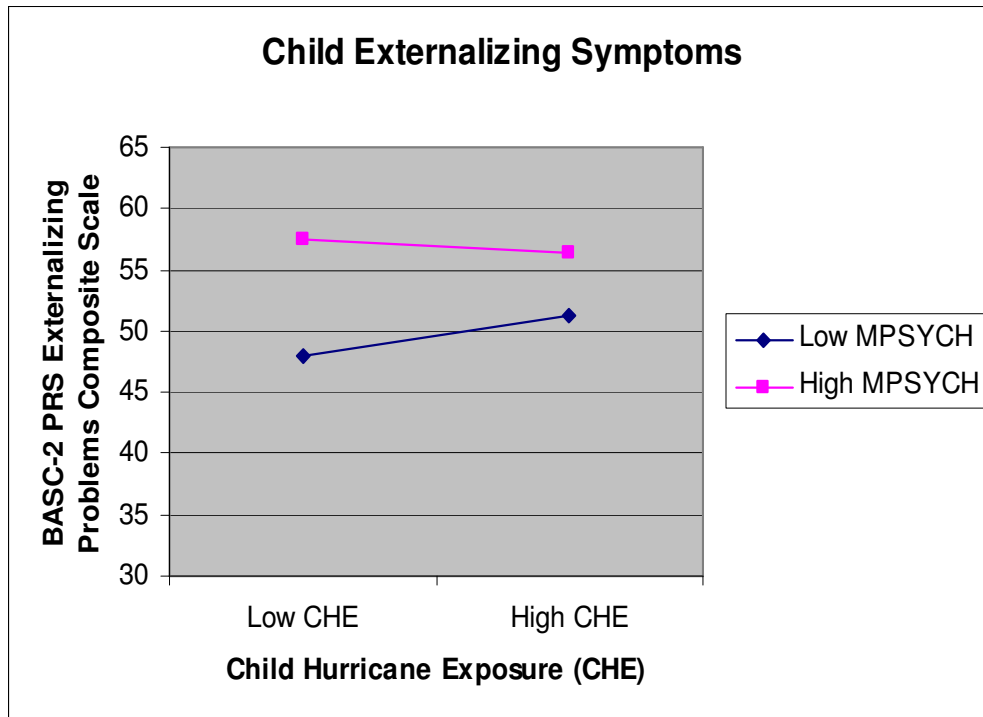


Figure 2. Moderator Effects of Maternal Psychopathology on the Relationship Between Child Hurricane Exposure and Mother-Reported Child Externalizing Symptoms

In the regression with child-reported self-reliance as the criterion variable (see Table 9), demographic variables, CHE and MP, and the interaction of CHE and MP were not significant predictors. These variables accounted for 4% of the variance in child-reported self-reliance. Income ($B = .98, p < .05$) was the only significant predictor in the third block, indicating that children of families with higher income levels had higher levels of self-reported self-reliance. Hypothesis 2 was not supported for this criterion variable.

Table 9

Hierarchical Regression Analysis Evaluating the Moderating Effects of Maternal Psychopathology on Child-Reported Self-Reliance

Variable	Step One		Step Two		Step Three	
	<i>B</i>	β	<i>B</i>	β	<i>B</i>	β
Age	-.35	-.05	-.23	-.03	-.21	-.03
Gender	.65	.03	.78	.04	.79	.04
Race	1.55	.10	1.71	.12	1.73	.12
Parent Education	-1.11	-.11	-.93	-.10	-.93	-.10
Income	.89*	.18*	.98*	.19*	.98*	.19*
CHE			.39	.08	.40	.08
MP			.05	.05	.05	.05
CHE x MP					.01	-.02

Note. $R^2 = .03$ for Step 1; $\Delta R^2 = .01$ for Step 2; $\Delta R^2 = .00$ for Step 3. Child-Reported Self-Reliance=Self-Reliance of BASC-2 SRP; CHE=Child Hurricane Exposure; MP=Maternal Psychopathology.

* $p < .05$. ** $p < .01$. *** $p < .001$.

In the regression with mother-reported child social skills as the criterion variable (see Table 10), demographic variables, CHE and MP, and the interaction of CHE and MP were not significant predictors. These variables accounted for 5% of the variance in mother-reported child social skills. CHE ($B = -.82, p < .05$) emerged as a significant predictor in the third block, indicating that greater CHE was related to lower child social skill levels. The interaction of CHE and MP was not significant. Hypothesis 2 was not supported for this criterion variable.

Table 10

Hierarchical Regression Analysis Evaluating the Moderating Effects of Maternal Psychopathology on Mother-Reported Child Social Skills

Variable	Step One		Step Two		Step Three	
	<i>B</i>	β	<i>B</i>	β	<i>B</i>	β
Age	-.22	-.03	-.40	-.06	-.42	-.06
Gender	-.51	-.02	-.77	-.04	-.77	-.04
Race	.16	.01	-.00	.00	-.02	-.00
Parent Education	-.20	-.02	-.51	-.05	-.51	-.05
Income	.61	.12	.50	.10	.50	.10
CHE			-.82*	-.18*	-.82*	-.18*
MP			-.03	-.03	-.03	-.03
CHE x MP					.00	.02

Note. $R^2 = .02$ for Step 1; $\Delta R^2 = .03^*$ for Step 2; $\Delta R^2 = .00$ for Step 3. Mother-Reported Child Social Skills=Social Skills of BASC-2 PRS; CHE=Child Hurricane Exposure; MP=Maternal Psychopathology.

* $p < .05$. ** $p < .01$. *** $p < .001$.

Regression Analyses with Maternal PTSD as a Moderator

In the regression with child self-reported PTSD as the criterion variable (see Table 11), demographic variables were not significant at the first step. Child hurricane exposure (CHE) and maternal PTSD (MPTSD) were entered on the second step and were significant [$F(7, 217) = 4.04, p < .001$]. The interaction between CHE and MPTSD was significant at the third step [$F(8, 216) = 3.57, p < .01$]. These variables accounted for 12% of the variance in child PTSD. Examination of the variables within the third block revealed that CHE ($B = 1.41, p < .01$) was a significant predictor of child PTSD, such that

greater CHE was related to greater child PTSD. The interaction between CHE and MPTSD was not significant. Hypothesis 3 was not supported for this criterion variable.

Table 11

Hierarchical Regression Analysis Evaluating the Moderating Effects of Maternal PTSD on Child Self-Reported PTSD

Variable	Step One		Step Two		Step Three	
	<i>B</i>	β	<i>B</i>	β	<i>B</i>	β
Age	.06	.01	-.03	-.01	-.05	-.01
Gender	1.39	.05	2.32	.08	2.41	.08
Race	-2.52	-.13	-2.44	-.13	-2.48	-.13
Parent Education	-.54	-.04	.31	.02	.28	.02
Income	-1.01	-.15	-.90	-.14	-.89	-.14
CHE			1.42**	.23**	1.41**	.23**
MPTSD			.14	.13	.14	.12
CHE x MPTSD					.02	.04

Note. $R^2 = .04$ for Step 1; $\Delta R^2 = .08^{***}$ for Step 2; $\Delta R^2 = .00$ for Step 3. Child-Reported PTSD=Index Summary score of UCLA PTSD RI; CHE=Child Hurricane Exposure; MPTSD=Maternal PTSD.

* $p < .05$. ** $p < .01$. *** $p < .001$.

In the regression with child self-reported internalizing symptoms as the criterion variable (see Table 12), demographic variables, together, were not a significant predictors at the first step. CHE and MPTSD were significant at the second step [$F(7,183) = 2.95, p < .01$]. The interaction between CHE and MPTSD was significant at the third step [$F(8,182) = 2.57, p < .05$]. These variables accounted for 10% of the variance in child self-reported internalizing symptoms. Within the third block, CHE ($B = .92, p < .01$) and MPTSD ($B = .14, p < .05$) were significant predictors of self-reported child internalizing

symptoms, such that greater CHE and MPTSD were related to greater child internalizing symptoms. The interaction between CHE and MPTSD was not significant. Thus, Hypothesis 3 was not supported for this criterion variable.

Table 12

Hierarchical Regression Analysis Evaluating the Moderating Effects of Maternal PTSD on Child Self-Reported Internalizing Symptoms

Variable	Step One		Step Two		Step Three	
	<i>B</i>	β	<i>B</i>	β	<i>B</i>	β
Age	-.51	-.07	-.41	-.06	-.41	-.06
Gender	-2.31	-.11	-1.76	-.08	-1.76	-.08
Race	-1.05	-.07	-.97	-.07	-.97	-.07
Parent Education	-.27	-.03	.42	.04	.41	.04
Income	-.57	-.12	-.48	-.10	-.48	-.10
CHE			.92**	.20**	.92**	.20**
MPTSD			.14*	.16*	.14*	.16*
CHE x MPTSD					.00	.00

Note. $R^2 = .03$ for Step 1; $\Delta R^2 = .07^{**}$ for Step 2; $\Delta R^2 = .00$ for Step 3. Child-Reported Internalizing Symptoms=Internalizing Problems of BASC-2 SRP; CHE=Child Hurricane Exposure; MPTSD=Maternal PTSD.

* $p < .05$. ** $p < .01$. *** $p < .001$.

In the regression with mother-reported child internalizing symptoms as the criterion variable (see Table 13), demographic variables, together, were significant predictors at the first step [$F(5,192) = 3.10, p < .05$]. CHE and MPTSD were entered on the second step and were significant [$F(7,190) = 2.73, p < .05$]. The interaction between CHE and MPTSD was significant at the third step [$F(8,189) = 3.73, p < .001$]. These variables accounted for 14% of the variance in mother-reported child internalizing symptoms.

Examination of the variables within the third block revealed that income ($B = -1.67, p < .01$) was a significant predictor of mother-reported child internalizing symptoms, such that children of families with lower income levels had higher levels of mother-reported internalizing problems. The interaction between CHE and MPTSD ($B = -.12, p < .01$) was significant. Therefore, the regression line for children whose mothers endorsed low levels of PTSD was significantly different from the regression line for children whose mothers indicated high levels of PTSD. This finding indicates that MPTSD serves as a moderating variable in the relationship between CHE and mother-reported child internalizing symptoms. Thus, Hypothesis 3 was supported for this criterion variable.

Table 13

Hierarchical Regression Analysis Evaluating the Moderating Effects of Maternal PTSD on Mother-Reported Child Internalizing Symptoms

Variable	Step One		Step Two		Step Three	
	<i>B</i>	β	<i>B</i>	β	<i>B</i>	β
Age	-.33	-.04	-.30	-.03	.04	.00
Gender	-1.29	-.04	-.99	-.03	-1.42	-.05
Race	-1.63	-.09	-1.67	-.09	-1.31	-.07
Parent Education	-.70	-.06	-.22	-.02	-.07	-.01
Income	-1.63**	-.25**	-1.61**	-.25**	-1.67**	-.26**
CHE			.33	.05	.29	.05
MPTSD			.13	.11	.14	.12
CHE x MPTSD					-.12**	-.22**

Note. $R^2 = .08^*$ for Step 1; $\Delta R^2 = .02$ for Step 2; $\Delta R^2 = .05^{**}$ for Step 3. Mother-Reported Child Internalizing Symptoms=Internalizing Problems of BASC-2 PRS; CHE=Child Hurricane Exposure; MPTSD=Maternal PTSD.

* $p < .05$. ** $p < .01$. *** $p < .001$.

Follow-up simple slope analyses were conducted for the interaction of CHE and MPTSD. Analyses revealed that the interaction was significant at lower levels of MPTSD, $t(226) = 3.15, p < .01$, but not at higher levels of MPTSD, $t(226) = -1.23, p > .20$. The plot indicated (see Figure 3) that children whose mothers reported low levels of PTSD had more internalizing symptoms as their level of hurricane exposure increased. The relation between child hurricane exposure and child internalizing symptoms was not significant at higher levels of maternal PTSD.

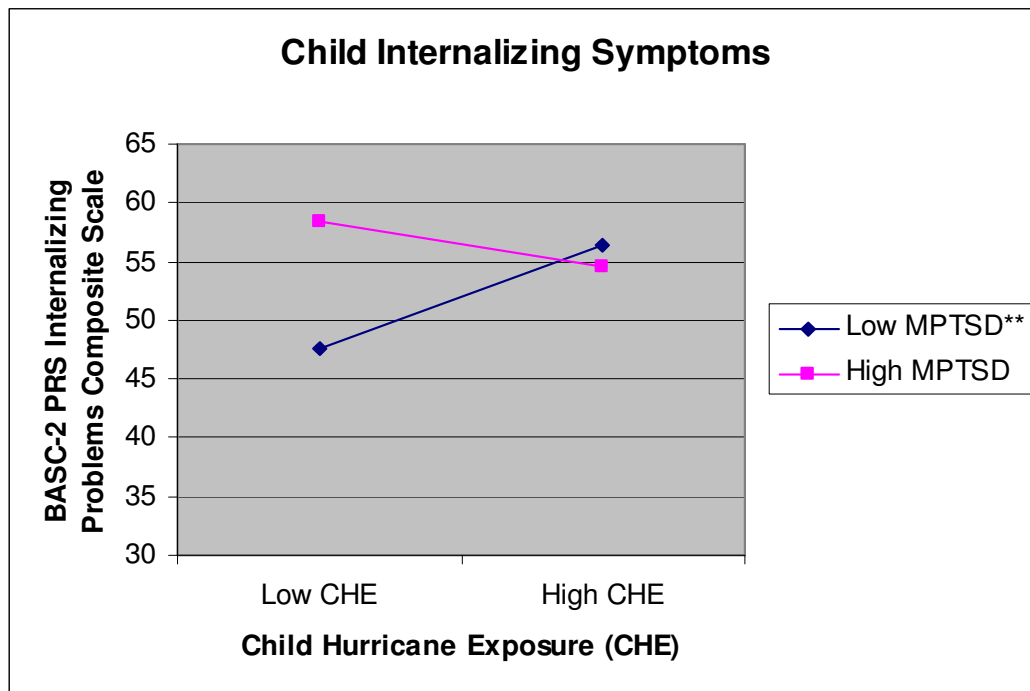


Figure 3. Moderator Effects of Maternal PTSD on the Relationship between Child Hurricane Exposure and Mother-Reported Child Internalizing Symptoms
 ** $p < .01$.

In the regression with mother-reported child externalizing symptoms as the criterion variable (see Table 14), demographic variables, together, were significant predictors at the first step [$F(5,174) = 4.84, p < .001$]. CHE and MPTSD were significant at the second step [$F(7,172) = 3.57, p < .01$]. The interaction between CHE and MPTSD was

significant at the third step [$F(8,171) = 3.99, p < .001$]. These variables accounted for 16% of the variance in mother-reported child externalizing symptoms. Within the third block, child age ($B = 1.48, p < .05$) and income ($B = -1.56, p < .01$) were significant predictors of mother-reported child externalizing symptoms, such that older children and children of families with lower income had higher levels of mother-reported externalizing symptoms. The interaction between CHE and MPTSD ($B = -.09, p < .05$) was significant. Therefore, the regression line for children whose mothers endorsed low levels of PTSD was significantly different from the regression line for children whose mothers indicated high levels of PTSD. Thus, MPTSD serves as a moderating variable in the relationship between CHE and mother-reported child externalizing symptoms.

Hypothesis 3 was supported for this criterion variable.

Table 14

Hierarchical Regression Analysis Evaluating the Moderating Effects of Maternal PTSD on Mother-Reported Child Externalizing Symptoms

Variable	Step One		Step Two		Step Three	
	<i>B</i>	β	<i>B</i>	β	<i>B</i>	β
Age	1.15	.14	1.22	.15	1.48*	.18*
Gender	2.96	.11	3.04	.11	2.58	.09
Race	-.83	-.05	-.78	-.04	-.46	-.03
Parent Education	-.60	-.05	-.58	-.05	-.55	-.05
Income	-1.60**	-.27**	-1.56**	-.26**	-1.56**	-.26**
CHE			.40	.07	.37	.06

(table cont.)

(table cont.)

MPTSD	-0.03	-0.03	-0.02	-0.02
CHE x MPTSD			-0.09*	-0.18*

Note. $R^2 = .12^{***}$ for Step 1; $\Delta R^2 = .01$ for Step 2; $\Delta R^2 = .03^*$ for Step 3. Mother-Reported Child Externalizing Symptoms=Externalizing Problems of BASC-2 PRS; CHE=Child Hurricane Exposure; MPTSD=Maternal PTSD.

* $p < .05$. ** $p < .01$. *** $p < .001$.

Follow-up simple slope analyses were conducted for the interaction of CHE and MPTSD. Analyses revealed that the interaction was significant at lower levels of MPTSD, $t(207) = 2.33, p < .05$, but not at higher levels of MPTSD, $t(207) = -.93, p > .30$. The plot indicated (see Figure 4) that children whose mothers reported low levels of PTSD had more externalizing symptoms as their level of hurricane exposure increased. This relation was not significant at higher levels of maternal PTSD.

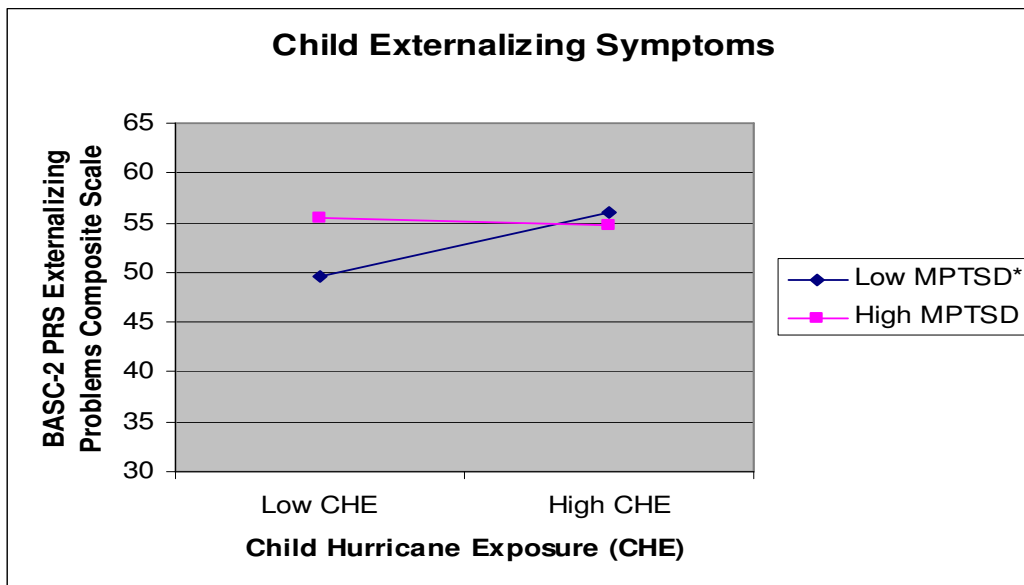


Figure 4. Moderator Effects of Maternal PTSD on the Relationship between Child Hurricane Exposure and Mother-Reported Child Externalizing Symptoms

* $p < .05$.

In the regression with child-reported self-reliance as the criterion variable (see Table 15), demographic variables, CHE and MPTSD, and the interaction between CHE and MPTSD were not significant predictors. These variables accounted for 7% of the variance in child-reported self-reliance. Within the third block, income ($B = .92, p < .05$) was a significant predictor of child-reported self-reliance. Thus, children of families of higher income indicated higher levels of self-reliance. The interaction of CHE and MPTSD was not significant. Hypothesis 4 was not supported for this criterion variable.

Table 15

Hierarchical Regression Analysis Evaluating the Moderating Effects of Maternal PTSD on Child-Reported Self-Reliance

Variable	Step One		Step Two		Step Three	
	<i>B</i>	β	<i>B</i>	β	<i>B</i>	β
Age	-.35	-.05	-.36	-.05	-.34	-.05
Gender	.65	.03	.94	.04	.92	.04
Race	1.55	.10	1.45	.10	1.47	.10
Parent Education	-1.11	-.11	-.50	-.05	-.49	-.05
Income	.89*	.18*	.92*	.18*	.92*	.18*
CHE			.23	.05	.23	.05
MPTSD			.18	.20	.18	.20
CHE x MPTSD					-.01	-.01

Note. $R^2 = .03$ for Step 1; $\Delta R^2 = .04$ for Step 2; $\Delta R^2 = .00$ for Step 3. Child-Reported Self-Reliance=Self-Reliance of BASC-2 SRP; CHE=Child Hurricane Exposure; MPTSD=Maternal PTSD.

* $p < .05$. ** $p < .01$. *** $p < .001$.

In the regression with mother-reported child social skills as the criterion variable (see Table 16), demographic variables, CHE and MPTSD, and the interaction between CHE and MPTSD were not significant predictors. These variables accounted for 5% of the variance in mother-reported child social skills. Examination of the variables within the third block revealed that CHE ($B = -.87, p < .05$) was a significant predictor, indicating that greater CHE was related to lower child social skill levels. The interaction between CHE and MPTSD was not significant. Thus, Hypothesis 4 was not supported for this criterion variable.

Table 16

Hierarchical Regression Analysis Evaluating the Moderating Effects of Maternal PTSD on Mother-Reported Child Social Skills

Variable	Step One		Step Two		Step Three	
	<i>B</i>	β	<i>B</i>	β	<i>B</i>	β
Age	-.22	-.03	-.40	-.06	-.42	-.06
Gender	-.51	-.02	-.68	-.03	-.65	-.03
Race	.16	.01	-.01	-.00	-.03	-.00
Parent Education	-.20	-.02	-.30	-.03	-.31	-.03
Income	.61	.12	.52	.11	.52	.11
CHE			-.87*	-.19*	-.87*	-.19*
MPTSD			.06	.07	.06	.07
CHE x MPTSD					.01	.02

Note. $R^2 = .02$ for Step 1; $\Delta R^2 = .03^*$ for Step 2; $\Delta R^2 = .00$ for Step 3. Mother-Reported Child Social Skills=Social Skills of BASC-2 PRS; CHE=Child Hurricane Exposure; MPTSD=Maternal PTSD.

* $p < .05$. ** $p < .01$. *** $p < .001$.

DISCUSSION

The current study was unique in its analysis of maternal psychopathology and PTSD beyond simple correlation and prediction. These maternal factors were investigated as moderator variables- for their possible contribution to child risk toward psychological distress following hurricane exposure. Although previous researchers have examined the correlation and prediction of maternal factors on child outcome post-disaster (Sullivan et al., 1991; Swenson et al., 1996; Vila et al., 2001), this is the first attempt within the disaster literature to examine maternal psychopathology and PTSD as risk factors, specifically. In other trauma research areas, such as community violence and domestic violence, maternal psychological distress not only consistently serves to predict child outcome following child violence exposure, but also serves as a risk factor, or a moderator variable, potentiating the relationship between child violence exposure and negative child outcome in children and adolescents (Kimura, 1999; Self-Brown et al., 2006).

Similar to the findings obtained within the violence exposure literature, the current predictions were partially supported. Maternal psychopathology and PTSD served as moderator variables in the relationship between child hurricane exposure and child internalizing and externalizing symptoms. These results, among others, are discussed within the following sections.

Child Hurricane Exposure and Its Correlates

In examining the current sample's endorsement of exposure events, results indicated a relatively higher rate of loss and life-disruption as compared to life threat. These results are significant as researchers following Hurricane Andrew and the 1983 brushfire in

eastern Australia found that post-disaster loss and disruption of family life and routine was a stronger predictor of child PTSD symptoms than the life-threatening experiences endorsed (McFarlane et al., 1987; Vernberg et al., 1996). Thus, it seems critical to assess for both a child's experience of life threat and injury, as well as any loss and disruption they experience following a disaster (Vernberg et al., 1996).

Although the current study did not address the relative predictive power of the two aspects of exposure, the current results support the consistently documented association between disaster exposure and child outcome (La Greca et al., 1996, 1998; Lonigan et al., 1991; Vernberg et al., 1996). Child hurricane exposure was significantly and positively associated with child self-reported PTSD and internalizing symptoms. Additionally, it was significantly and negatively associated with mother-reported child social skills. Child hurricane exposure also served as a main effect in all regression analyses on these three criterion variables. These significant associations and main effects support the current conceptual model identifying variables, such as disaster exposure, that may be risk factors for post-disaster child outcome (Green et al., 1991; Korol, 1990; La Greca et al., 1996).

Demographic Variables

The main effect of income was consistently demonstrated for mother-reported child internalizing and externalizing symptoms, as well as child-reported self-reliance. Children of lower income families experienced greater psychological distress and lower levels of self-reliance than those at higher income levels. This is an interesting finding as very little mention is made in the child disaster literature regarding the possible predictive power or association of family income on child functioning. However, this has been

considered a risk factor in the general disaster literature, as poorer individuals have been described as more at risk for developing psychological symptoms post-disaster (Freedly, Kilpatrick, & Resnick, 1993). Although the possible association between a family's susceptibility to stressors (Junn, Guerin, & Rushbrook, 1990) and access to resources (Vogel & Vernberg, 1993) has been discussed, income level has not been consistently evaluated in terms of its possible contribution to child risk post-disaster. Further, it is not considered in the currently accepted model of risk factors for negative child outcome (La Greca et al., 1996; Vernberg et al., 1996). Thus, the current finding, indicated with both child- and mother-report, calls for the inclusion of family income when investigating the possible risk factors for child functioning post-disaster.

A main effect for child age on mother-reported child externalizing symptoms emerged, such that mothers of older children indicated higher levels of child externalizing symptoms. This significant main effect contrasts previous research findings that depict younger children as reporting a higher level of symptoms than their older counterparts (Lonigan et al., 1991; Shannon et al., 1994), as well as findings indicating no significant differences (Green et al., 1991). Additionally, no significant main effects for child gender or race were indicated throughout all regression analyses. This contrasts previous disaster researchers reporting that girls (Garrison et al., 1995; McDermott et al., 2005; Roussos et al., 2005) and minority children (Jaycox et al., 2004; Lengua et al., 2005) endorse higher levels of psychological symptoms. However, this finding is in agreement with other studies indicating no significant differences for child gender (Vernberg et al., 1996) or race or ethnicity (Vernberg et al., 1996). Thus, based on the current results and in consideration of the mixed findings of previous disaster research,

more research attention is warranted within the area of possible demographic risk factors of child functioning post-disaster (Silverman & La Greca, 2002).

Maternal Psychopathology and PTSD

Results revealed relatively higher levels of maternal PTSD as compared to maternal psychopathology. Significant main effects of both variables were found. Similar to previous studies indicating parental psychopathology as a strong predictor of child outcome following a disaster (Earls et al., 1988; Handford et al., 1986; McFarlane et al., 1987; Rustemli & Karanci, 1996; Sullivan et al., 1991; Swenson et al., 1996), maternal psychopathology served as a significant and positive main effect for all four negative criterion variables. It is significant that this main effect was indicated with both child- and mother-report measures (Silverman & La Greca, 2002). Maternal PTSD also emerged as a main effect on child self-reported internalizing symptoms, such that mothers who reported higher levels of PTSD had children who endorsed higher levels of internalizing symptoms.

Hypotheses regarding maternal psychopathology and PTSD as moderator variables were partially supported. Specifically, both maternal psychopathology and PTSD were found to significantly moderate the relationship between child hurricane exposure and mother-reported child internalizing symptoms. Results indicated that at lower levels of maternal psychopathology and PTSD, children with higher levels of hurricane exposure experienced significantly higher levels of internalizing symptoms than those children with lower levels of hurricane exposure. At higher levels of maternal psychopathology and PTSD, there was not a significant difference in the level of internalizing symptoms

experienced by children who had been exposed to high versus low levels of hurricane events.

Additionally, maternal PTSD was also found to moderate the relation between child hurricane exposure and mother-reported child externalizing symptoms. Specifically, at lower levels of maternal PTSD, children with higher levels of hurricane exposure experienced significantly higher levels of externalizing symptoms than those children with lower levels of hurricane exposure. Conversely, at higher levels of maternal PTSD, there was not a significant difference in the level of externalizing symptoms experienced by children who had been exposed to high versus low levels of hurricane events. In examining this moderating effect with maternal psychopathology, visual inspection of regression lines support the same moderating role of maternal psychopathology with child externalizing symptoms. However, post-hoc probing demonstrated that the simple slopes did not significantly differ from zero at either low or high levels of maternal psychopathology. Thus, it is possible that a third variable influenced this particular moderating relation.

In interpreting the nature of these moderating effects, examination of the post-hoc simple slopes indicated that when mothers experience psychological difficulties children may experience similar levels of psychological symptoms irrespective of the child's level of hurricane exposure. Further, the lack of maternal psychopathology or PTSD (i.e., healthy mother personal adjustment) may be considered a protective factor for children exposed to a low level of disaster events. Conversely, high maternal psychopathology or PTSD may be considered a risk factor for children with low hurricane exposure. The results may also indicate the relative power of child exposure, as irrespective of the level

of maternal psychopathology or PTSD, children with high hurricane exposure experienced a high level of internalizing and externalizing symptoms. As child self-report is considered the most objective source of information on their symptoms following a disaster, caution should be taken in interpreting these significant findings which solely used mother-report criterion variables (Finch & Daugherty, 1993; Silverman & La Greca, 2002).

The moderating and main effects of maternal psychopathology and PTSD are consistent with previous research. Several disaster researchers have noted a positive association between child psychological symptoms and parental psychopathology (Green et al., 1991; Jones et al., 2002; Kopelwicz et al., 2002; Vila et al., 2001). Results also support the assertion of Silverman and La Greca in a recent book chapter (2002). They argue that parents who experience difficulty with their personal adjustment post-disaster are less able to provide the necessary support to their children, which may adversely affect a child's adjustment. In contrast, if children feel that their parents are in control of their post-disaster circumstances, it may mitigate escalation of child symptoms (Silverman & La Greca, 2002). Similar arguments have been made by violence exposure researchers (Appleyard & Osofsky, 2003). They argue that maternal psychopathology and PTSD symptoms can negatively impact parents' functioning; their ability to effectively parent; and, due to their own stresses, their ability to sensitively address their child's needs (Appleyard & Osofsky, 2003). Thus, parents experiencing psychological symptoms post-disaster may become overwhelmed with their own psychological difficulties, and, thereby, demonstrate negative parenting behaviors that may increase the risk for their child's poor psychological outcome. Other researchers have argued from a

social learning perspective, explaining that parents should be considered models for coping with disaster. Thus, their post-disaster behavior influences their children's post-disaster behavior through observational learning (Compas & Epping, 1993; Pynoos & Nader, 1988; Vernberg & Vogel, 1993).

Strengths of the Current Study

The current investigation compliments previous disaster research in the area of child outcome following a large-scale disaster. The current study was a unique attempt to examine the exact influence of maternal psychopathology and PTSD on children's functioning post-hurricane. Additionally, multi-informant data was utilized, and the measures selected have demonstrated good psychometric properties. The current sample consisted of several racial groups, income levels, and males and females were adequately represented. An additional strength of the current study is its utilization of multiple indicators of child functioning post-hurricane, both positive and negative.

Study Limitations

The current investigation is limited by its overall correlational design, with no ability to assert causality in the relationships examined. Also, no child or mother observational data was included. Due to the varied preferences by each school principal where data was collected, groups of participants were compensated for their participation with various means. Also, the current investigation utilized only mother-report, and no inclusion of father-report was made. It may have been beneficial for participating, two-parent families to have provided information on the father's functioning, as this may also be influential in a child's post-disaster functioning. Also, the current results may possess

generalizability only to families who experienced Hurricane Katrina and similar events, as disasters differ on several factors (Saylor, 1993; Terr, 1991).

Clinical Implications

Although disasters vary according to several factors (Saylor, 1993; Terr, 1991), the current study does lend information regarding the assessment and treatment of families following a large-scale disaster. In terms of assessment, it is important for clinicians to note that both parents and children are exposed to disaster events (McFarlane et al., 1987). Thus, their assessment would be well-informed with evaluation of parent and child psychological functioning. Researchers within the violence exposure research area have argued for assessment to include both a parent's and child's developmental, psychosocial, and trauma histories to ensure that the entire family's needs are met (Appleyard & Osofsky, 2003). They also assert that parental functioning is a key factor in determining which children are most at risk, and suggest utilizing a multi-modal assessment including the following assessment tools: interviewing, structured observations, home visits, and the use of psychometrically sound questionnaires (Appleyard & Osofsky, 2003).

In terms of treating children exposed to hurricanes, researchers following Hurricane Andrew designed a school-based treatment program for children following a natural disaster (La Greca, Vernberg, Silverman, Vogel, & Prinstein, 1994). The program utilizes a cognitive behavioral approach, focusing on the development of coping skills. Researchers following the 2004 hurricane season in Florida designed a similar intervention program for both children and their families who experience chronic hurricane-related anxiety (Allen, Saltzman, Brymer, Oshri, & Silverman, 2006). The

intervention incorporates parent psychoeducation of child reactions, as well as a cognitive behavioral approach in addressing child symptoms (Allen et al., 2006). In consideration of the current results, the involvement of parents in treatment who themselves may be symptomatic seems crucial. Some trauma researchers have asserted that it is primarily important to attend to the parent's symptomatology (Scheeringa & Zeanah, 2001). They argue that for many children, the most powerful change agent is their relationship with a primary caregiver (Crockenberg & Leerkes, 2000; Schaeeringa & Zeanah, 2001). In the case of a parent experiencing psychological symptoms following a trauma or disaster, sustained change in a parent's symptom level could possibly increase the likelihood of their ability to respond effectively to their child's needs (Groves, 1997; Scheeringa & Zeanah, 2001).

Directions for Future Research

Although the current study has identified maternal psychopathology and PTSD as moderator variables in the relationship between child hurricane exposure and child post-hurricane outcome, continued research is needed to fully identify the mechanism of these moderators. As previously discussed, maternal psychological distress may affect parenting behaviors, thereby affecting a child's post-disaster outcome (Appleyard & Osofsky, 2003; Silverman & La Greca, 2002). However, in order to fully investigate this proposed mechanism of maternal psychopathology and PTSD, parenting behaviors should be examined as a mediator variable in the relationship between maternal psychological distress and child functioning. Investigating the possible mediating effects that parenting behaviors have in this relationship would allow researchers to better explain and support the specific mechanism that accounts for the relationship between

maternal psychopathology and PTSD and child functioning post-hurricane (Baron & Kenny, 1986). In similar argument, other researchers have asserted the need for longitudinal analysis of parent-child interactions, including in-vivo observation in naturalistic settings, to better account for the possible relationship between parental psychological functioning and child functioning post-trauma (Scheeringa & Zeanah, 2001).

The current results also support the continued investigation of possible demographic variables that serve as risk factors for child functioning post-disaster. These factors should continue to include what has been consistently examined, such as child age, gender, and race or ethnicity. The addition of family income should be considered in the examination of demographic variables, as the current results indicate its relationship with three post-disaster child variables.

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APPENDIX A

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:

Marital Status:

<input type="checkbox"/> White	<input type="checkbox"/> Never Married
<input type="checkbox"/> Black	<input type="checkbox"/> Married
<input type="checkbox"/> Hispanic	<input type="checkbox"/> Separated
<input type="checkbox"/> Asian	<input type="checkbox"/> Divorced
<input type="checkbox"/> Native American	<input type="checkbox"/> Widowed
<input type="checkbox"/> Pacific Islander	
<input type="checkbox"/> Other	

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

Yourself

Your Spouse

<input type="checkbox"/> 6 th grade or less	<input type="checkbox"/> 6 th grade or less
<input type="checkbox"/> Junior High school (7 th , 8 th , 9 th grade)	<input type="checkbox"/> Junior High school (7 th , 8 th , 9 th grade)
<input type="checkbox"/> Partial high school (10 th , 11 th grade)	<input type="checkbox"/> Partial high school (10 th , 11 th grade)
<input type="checkbox"/> High school graduate	<input type="checkbox"/> High school graduate
<input type="checkbox"/> Partial college (at least 1 year) or specialized training	<input type="checkbox"/> Partial college (at least 1 year) or specialized training
<input type="checkbox"/> Standard college or university graduate	<input type="checkbox"/> Standard college or university graduate
<input type="checkbox"/> Graduate professional degree (Master's, Doctorate)	<input type="checkbox"/> 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, please 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 they were retired, please write "retired" and their 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, please 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 they are retired, please write "retired" and their 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.

<u>Relationship to you</u>	<u>Age</u>	<u>Sex</u>
_____	_____	<u>Male/Female</u>
_____	_____	<u>Male/Female</u>
_____	_____	<u>Male/Female</u>
_____	_____	<u>Male/Female</u>
_____	_____	<u>Male/Female</u>
_____	_____	<u>Male/Female</u>
_____	_____	<u>Male/Female</u>
_____	_____	<u>Male/Female</u>
_____	_____	<u>Male/Female</u>
_____	_____	<u>Male/Female</u>
_____	_____	<u>Male/Female</u>

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

CONSENT FORM

1. Study Title: Predictors of Recovery in Children Evacuated from Hurricane Katrina
2. Performance Sites: Schools in Louisiana
3. Names and Telephone Numbers of Investigators: The following investigators are available for questions about this study, M-F, 8:00 a.m.-4:30 p.m:

Mary Lou Kelley, Ph.D. (225)578-4113
4. Purpose of the Study: The purpose is to study the effects of Hurricane Katrina on the adjustment of children and their parents and identify factors that aid adjustment.
5. Participant Inclusion: Mothers and their children ages 7-14
6. Number of Participants: 400
7. Study Procedures: You and your child will spend approximately 1.5 hours completing several questionnaires, and return them to the researchers. You and your child may be asked to participate in a structured interview subsequent to completing the questionnaires. You and your child will be asked to complete the questionnaire packet at three, six and twelve month time periods. You child's teacher will also be asked to complete two questionnaires as well.
8. Benefits: A greater understanding of variables related may be a possible benefit. Also, in the case of a needed referral for psychological services if you desire, referral information will be available. Such referrals may include Baton Rouge Mental Health (225-922-9445) or the Psychological Services Center (225-578-1494). Some participants may even find it beneficial to have an opportunity to describe and recall their experiences during and after Hurricane Katrina. Each mother and child pair who complete a packet of questionnaires may be compensated with a monetary and/or other form of reward.
9. Risks: You and your child may become upset while completing the questionnaires because there are questions related to your experiences associated with Hurricane Katrina. We will give referral cards for further psychological services to all participants in the case that they may become emotionally upset. Also, as a mandated reporter of abuse and neglect, any disclosure or threat of abuse revealed during data collection will be reported to Child Protective Services immediately. You will be verbally notified of this risk prior to data collection. Also, the clinician will inform you if a report is warranted.

10. Right to Refuse: Participants may choose not to participate or to withdraw from the study at any time without penalty.

11. Right to Privacy: Results of the study may be published, but no names or identifying information will be included in the publication. Participant identity will remain confidential unless disclosure is required by law.

This study has been discussed with me and all my questions have been answered. I may direct additional questions regarding study specifics to the investigators. If I have questions about participants' rights or other concerns, I can contact Robert C. Matthews, Chairman, LSU Institutional Review Board, (225) 578-8692. I agree to participate in the study described above and acknowledge the researchers' obligation to provide me with a copy of this consent form if signed by me.

Signature of Parent Participant

Date

The study participant has indicated to me that he/she is unable to read. I certify that I have read this consent form to the participant and explained that by completing the signature line above, the participant has agreed to participate.

Signature of Reader

Date

I grant permission for this study's researchers to access my child's past academic records, including his or her school lunch status, placements, and achievement test scores. I understand that my child's identifying information will be removed and coded to ensure privacy of the information. Also, I understand that by consenting to my and my child's participation in this study, I grant my permission for my child's teacher to complete questionnaires regarding my child's behavior and functioning.

Signature of Parent Participant

Date

APPENDIX C

ASSENT FORM

1. Study Title: Predictors of Recovery in Children Evacuated from Hurricane Katrina
2. Performance Sites: Schools in Louisiana
3. Names and Telephone Numbers of Investigators: If you have any questions about the study, you can call Dr. Mary Lou Kelley at (225)578-4113 during the day.
4. Purpose of the Study: This study will look at how you, your family, and other children and families may have been affected by Hurricane Katrina.
5. Participant Inclusion: Mothers and their children ages 7-14
6. Number of Participants: 400
7. Study Procedures: You and your mother will spend about 1.5 hours answering some questions in a packet. Then, you and your mom will return them to the researchers. You may be asked to answer more questions than others. Also, you will complete a question packet at three, six and twelve month. Your teacher will also be asked some questions as well.
8. Benefits: A better idea of how a hurricane may affect children and families. Also, you and your mom may get a reward after you and she complete your packets of questions.
9. Risks: You may become upset after thinking about what happened to you and your family during Hurricane Katrina. In case of this, we will give you cards with phone numbers and addresses of clinics that may help you if you do become upset. Also, if you tell us that you have been abused, we will tell your mother as well as Child Protection.
10. Right to Refuse: You may choose not to complete the packets or quit the study at any time without any problem.
11. Right to Privacy: This study may be published, but your and your mom's names will not be included in the publication.

_____ Child Participant's Age

Child Participant's Name

Child Participant's Signature

Date

Witness

VITA

Ann Elisabeth Wingate Spell earned her Bachelor of Science degree in psychology in May 2002 at the University of Louisiana-Lafayette in Lafayette, Louisiana. She later earned her Master of Arts degree in the Department of Psychology at Louisiana State University and Agricultural and Mechanical College in Baton Rouge, Louisiana, where she is currently a candidate for the degree of Doctor of Philosophy. She is in the Clinical Child Psychology Program under Dr. Mary Lou Kelley. Her current research interests have been shaped by the occurrences in her home-state, Louisiana, since the landfall of Hurricane Katrina in August 2005. Her research interests include child functioning post-disaster, and maternal factors that are significant in a child's recovery. Ms. Spell completed her pre-doctoral internship in clinical psychology at the Houston Independent School District in Houston, Texas in July 2007. There she provided assessment and treatment services to both children of Texas and children evacuated from New Orleans due to Hurricanes Katrina and Rita. She plans to pursue a clinical post-doctoral position in her hometown of Lafayette, Louisiana.