THE INVESTIGATION OF POSTTRAUMATIC STRESS SYMPTOMS, COPING STRATEGIES, AND ATTRIBUTIONS IN CHILDREN FOLLOWING A TORNADO

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CHAPTER I

INTRODUCTION

A number of disasters occur each year, including both man-made, and those that have natural causes. Levels of physical damage are easily visible, while the psychological damage endured by victims of these disasters is harder to detect. Posttraumatic Stress Disorder (PTSD) was originally introduced in the third version of the Diagnostic and Statistical Manual of Mental Disorders (DSM-III; American Psychiatric Association, 1980), and the aversive effects of trauma exposure were acknowledged.

In its original conceptualization, PTSD was not believed to be applicable to children and adolescents, presuming they had less severe and shorter-lived reactions to traumatic events compared to adults. However, in 1987 the diagnosis of PTSD was extended to children and adolescents, with child-specific criteria being added to the third edition revision of the DSM (DSM-III-R; American Psychiatric Association, 1987). This recognition of posttraumatic stress reactions in children sparked research and demonstrated that children may experience posttraumatic stress symptoms (PTSS) as a result of a variety of events (La Greca, Silverman, & Wasserstein, 1998; Yelland et al., 2010).

The purpose of this paper is to review existing research addressing children's psychological reactions to traumatic events, the behavioral manifestations of posttraumatic symptoms, and measures currently available to assess post-trauma functioning in children. A review of research examining effective coping strategies used to deal with a traumatic event, as well as attributions for the trauma is also included. Next, the current investigation is discussed. The purpose of the current study was to examine the short and long-term effects of exposure to a natural disaster, specifically a tornado touchdown, the strategies that children have used in coping with the event, and the attributions they have given to the cause of the event. Symptoms of PTSD, attributions, and coping strategies were assessed in two samples of children age 8 to 12 during two different time periods since exposure to the tornadoes. One sample of children was exposed to a single tornado, while the other sample of children was exposed to multiple tornadoes during the same time period.

CHAPTER II

BRIEF REVIEW OF THE LITERATURE

Potentially traumatic events include sexual abuse, exposure to domestic violence, physical abuse, neglect, natural disasters, war, and terrorist attacks. Generally, traumatic events can be categorized as chronic long-standing or repeated interpersonal traumas (i.e. sexual abuse, domestic violence, neglect) and single episode events (i.e. natural disasters, car accidents, industrial accidents) (Terr, 1991). Given the vast differences between these categories of trauma, the remainder of the literature reviewed will include disasters or events that are relatively sudden, highly disruptive, time limited, and public as defined by the American Psychological Association task force (Vogel & Vernberg, 1993). Family violence (such as physical and sexual abuse), political violence, and warfare are excluded because of the significant differences that are likely to occur with repeated exposure to the stressor, compared to a single and time-limited exposure (Vogel & Vernberg, 1993).

Once this effect was demonstrated, based largely on the influential work of Lenore Terr (1979, 1983) literature examining the effects on children began to accumulate. Currently the DSM-IV-TR (APA; 2000) offers diagnostic criteria for PTSD in children, and more considerations for children are being contemplated for the DSM-V (APA, 2010).

An individual must have experienced, been witness to, or been confronted with an event in which actual or threatened death, serious injury, or the threat of physical integrity occurred (APA, 2000), all which can be consequences of a natural disaster. Additionally, the experience of a natural disaster can induce fear, helplessness, or horror in children. Once a traumatic event has been experienced, symptoms fall into three general categories.

Reexperiencing may be exhibited with a range of symptoms, but only one is necessary for a diagnosis (APA, 2000). Symptoms include intrusive and recurrent thoughts, which in children may be manifested as repetitive traumatic play. For example, following Hurricane Hugo, children were reported to be engaging in "hurricane" play, and were observed knocking down broccoli trees (Sullivan, Saylor, & Foster, 1991). Distressing dreams are another symptom of reexperiencing, and may be observed in children as frightening dreams without any recognizable content. Lastly, this group of symptoms includes flashbacks or intense physiological distress when reminders of the trauma are encountered (APA, 2000).

Avoidance and a general numbing of responsiveness must be observed in at least three of the following symptoms (APA, 2000): observable efforts are made to avoid thoughts, feelings or conversations of the event; or efforts to avoid activities, places, or people that may trigger thoughts of the trauma. Additionally, the inability to remember details associated with the trauma, anhedonia, detachment from others, a restricted range of affect, or feelings of a foreshortened future are symptoms that fall into the avoidance category of symptoms (APA, 2000). For example, children involved in the Chowchilla kidnapping reported decreased expectations for their futures following the incident (Terr, 1983).

The last category of symptoms of PTSD is hyperarousal, where at least two symptoms are necessary for a diagnosis (APA, 2000). Symptoms of hyperarousal may be manifested in children as night terrors or difficulties sleeping (Davis & Siegel, 2000), an increase in the frequency and severity of problem behaviors, becoming easily frustrated or irritable, and temper tantrums (Sullivan, et al., 1991). Although not necessary for a diagnosis, there are a number of

other symptoms often exhibited by children following a trauma. Symptoms include somatic complaints such as headaches and stomachaches, feelings of guilt, anxiety, depression, decline in school performance (La Greca, et al., 1998; Vogel & Vernberg, 1993), increase in absenteeism (McFarlane, Policansky, & Irwin, 1987) and developmental regressions (Terr, 1991).

Existing research suggests that a substantial number of individuals, including many children will experience trauma at some point throughout their lifetime, although not all will develop PTSD. Reportable prevalence rates for adolescents and children have not been easily established. Estimates range from 6% (Reinherz, Giaconia, Lefkowitz, Pakiz, & Frost, 1993) to 43% (Giaconia et al., 1994) of the population, experiencing a range of traumas. Of children who have experienced a natural disaster, prevalence rates for children meeting full diagnostic criteria range from 10% (La Greca & Prinstein, 2002) to 90% (Pynoos et al., 1993). Additionally, La Greca and Prinstein (2002) found moderate to severe symptoms of PTSD (although not meeting diagnostic criteria) in 30% to 50% of children who were exposed to a natural disaster. In a meta-analysis of 34 samples of children, Fletcher (2006) found that 36% of children met diagnostic criteria for PTSD in a range of disasters. These rates did not differ across developmental levels. While prevalence rates can be estimated based upon different findings, to date, there are no population-based epidemiological studies examining the prevalence rates of PTSD in children (Gabbay, Oatis, Silva, & Hirsch, 2004).

The wide range of prevalence rates of PTSD in children could be due to many factors. First, there is no definitive way to assess symptoms of PTSD in children. Assessment procedures and measures vary across studies, and in most research, posttraumatic stress symptoms (PTSS) are assessed rather than a full diagnosis of PTSD (Lonigan, Anthony, & Shannon, 1998). However, research has shown that it is important to continue to assess for PTSS, as children may still be reporting distress following a traumatic event (Lack, 2001). Subclinical levels of PTSD are common (Aaron, Horacio, & Emery, 1999) and can cause sufficient distress to require treatment even without full diagnostic criteria being met (Pfefferbaum, 1997). Additionally, not

all assessments are conducted at the same time interval of time from the disaster, and PTSS typically decrease with time (La Greca, Silverman, Vernberg, & Prinstein, 1996; Stallard, Salter, Velleman, 2004).

Although PTSS symptoms may decrease with the passage of time, long-term effects of trauma have been noted across many studies. Heightened levels of anxiety and inattention, and decreases in academic achievement have been observed at 7-months post-disaster (La Greca et al., 1998), and at 8-and 26-months post-disaster (McFarlane, Policansky, & Irwin 1987). At a 15-month follow-up following a severe hurricane, elevated levels of PTSS and depression were found (Jaycox et al., 2010). Similar elevations in PTSS, along with increased guilt and difficulty concentrating were found at 18-months following an earthquake (Pynoos et al., 1993) and 28 months after a flood (Bokszczanin, 2007). Four years after the Chowchilla school bus kidnapping, Terr (1983; 1991) found significant levels of distress being displayed in children with symptoms including a foreshortened future, nightmares, repetitive play, thought suppression, and omen formation.

Another area that is important to consider following a disaster is social functioning. Loss of jobs, relocation, and changes in daily routines can remove children from their social support groups. Research shows that changes in social support as a consequence of a natural disaster has been shown to be a leading contributor to depressive symptoms (Kaniasty & Norris, 1995) and higher levels of PTSD (Vernberg, La Greca, Silverman & Prinstein, 1996). While social support has been shown to be associated with fewer depressive symptoms following a natural disaster, it is also shown to be a positive coping strategy to dealing with a natural disaster (Russoniello et al., 2002; Vernberg et al., 1996).

In general, research of coping strategies following natural disasters is extremely limited, however, it has been shown that the coping strategies that a child uses to cope with disaster can affect his/her PTSS and other mental health issues. Coping strategies considered negative, such as social withdrawal, self-blame, and emotion regulation are associated with more symptoms of

depression (Jeney-Gammon, Daugherty, Finch, Belter, & Foster, 1993) and are more strongly associated with PTSS (Russoniello et al., 2002). Coping strategies such as cognitive restructuring and seeking social support were found to be more effective (Jeney-Gammon et al., 1993) and are considered to be positive coping strategies. Huzzif & Ronan (1991) found that the largest predictive factor of PTSS was children's initial coping with the disaster. However, since PTSS can change over time, and appear to be affected by coping strategies, there is a need for more research in this area over numerous time periods (Compas & Epping, 1993).

Also worth considering in children's reactions to natural disasters are attributions for the disaster. According to the attribution theory, people generally have a need to give an explanation to why something has happened, particularly when the event is unusual, unexpected, or unwanted (Joseph, Brewin, Yule, & Williams, 1993). While there is ample research examining the role of attribution styles in other areas of life, such as depression in adolescents (Conley Haines, Hilt, & Metalsky, 2001; Garber, Keiley, & Martin, 2002; Joiner & Wagner, 1995), there is little research addressing the role of attributions in traumatic situations, particularly natural disasters. Many of the findings from other areas of attribution research (i.e. chronic illness, depression) are generalized to traumatic situations instead. Some disaster-specific studies have shown that attribution style can play a significant role in mediating reactions to a traumatic event or disaster (Greening, Stoppelbein, & Docter, 2002).

Existing research does suggest a link between number of attributions made for a situation and amount of distress for the situation (Dollinger, 1986; Downey, Silver, & Wortman, 1990). In general, individuals who make more attributions for a situation, or are more concerned about attributions, tend to be more distressed (see Bulman & Wortman, 1977; Greening et al., 2002; Rubonis & Bickman, 1991 for a discussion of attributions in adults). While there is little research on attributions following natural disasters, there are even fewer studies investigating attributions and natural disasters in children. Dollinger (1986) found that school-age children who made any attribution for a lightning bolt strike to a soccer field were more upset than children who did not

make an attribution for the disaster. However, attributions made to God or random chances were not associated with more distress. Dollinger (1986) suggests this could indicate less time spent dwelling on the traumatic event. Following a tornado, Lack and Sullivan (2008) found that the more attributions a child made was related to higher levels of long-term distress. Based on this limited research, children's attributions are important because attributions may influence many aspects of life, including self-perception and peer relationships, while also contributing to distress level and PTSS (Dollinger, Staley, & McGuire, 1981).

Research is limited examining both coping strategies and attributions in children who have been exposed to a natural disaster. However, it is probable that coping strategies, attributions, or a combination of the two may affect symptom severity of distress or the duration of impairment in functioning following exposure to a traumatic natural disaster. For a thorough review of the literature, see Appendix A.

Much of the aforementioned research examined PTSS in children exposed to a single traumatic event. It is rare for people to experience multiple single-event traumas such as natural disasters or severe car accidents. Much of the literature of multiple traumas examines trauma related to combat or abuse. However, for certain areas of the United States, multiple single-events are experienced due to weather patterns. Therefore, research examining multiple single-event traumas is important, but is also an area that is also lacking.

Current Investigation

The year 2011 is preliminarily the 6th deadliest tornado year in United States' history (National Oceanic and Atmospheric Administration, 2011). Additionally, in the year 2010, Oklahoma experienced 102 tornadoes (NewsOK, 2010), a number well above the state's yearly average of 62 tornadoes (NOAA, 2012). The current study examines long-term effects of natural disasters on children over two time periods. One group of children was exposed to a single tornado in 2010. The other group of children was exposed to multiple tornadoes during the same time. The study also assessed factors contributing to these effects, including coping strategies

and attributions. PTSS, coping strategies and attributions about the tornado were assessed longitudinally in two groups of children who have been exposed to a significant natural disaster. It was hypothesized that the children who have been exposed to more than one tornado will have higher PTSS scores, will report using more coping strategies, and will report more attributions compared to those who have only been exposed to a single tornado. Additionally, it is expected that from time 1 to time 2, both groups of children will show lower rates of PTSS, the use of fewer coping strategies, and fewer attributions for the tornado.

CHAPTER III

METHODOLOGY

Procedure

The schools were targeted for recruitment because they fell within 10 miles of the single tornado or the multiple tornadoes as previously discussed. The principals of each school were contacted by phone or email to determine their willingness to participate in the study. Additional information about the study was provided to each of the principals as asked. After the principals agreed that their school could participate in the study, written permission for the OSU IRB was obtained. Packets were dropped off to each school to be taken home to the parents of children in grades 3 through 6. The packets included an introductory letter explaining the study, a parent consent form, a demographic questionnaire, the TEQ-P, UCLA-PTSD-RI-Parent Version, and the BASC-2-PRS. Parents were informed of the longitudinal aspect of the study and gave consent to participate. Parents also gave consent for the child to participate in data collection at both time periods. To withdraw participation, the parents were able to contact the researcher. Completed parent packets were returned to the school and picked up by the researchers. To be included in the study, parents had to report that their child was present when the tornado went through the area.

During the first data collection point in January (single exposure) and February (multiple exposure), children who received parental consent to partake in the study were called out of class at their schools and asked to assent to participate. All the children assented and completed the TEQ-C, UCLA-PTSD Reaction Index-Child Version, TAC, and Kidcope in groups (20 – 25 students). The experimenter was present in each group to explain each questionnaire to the children. Other graduate and undergraduate research assistants circulated around the room to answer individual questions. Each question was read aloud to the students. At the end of the data collection, children were provided with an explanation of why they were asked to participate in the study. The questionnaires took the children approximately 35 minutes to complete. At the conclusion of participation, information about signs of distress was left with the teachers and principals for continuous monitoring of distress.

Time two data collection was conducted in the same way. The children with previous permission to participate completed the UCLA-PTSD-RI, the TAC, and the Kidcope with the assistance of the researcher and graduate research assistants. The questionnaires took approximately 15 minutes to complete. Children in both the single and multiple exposure groups completed time 2 data 63 days after the time 1 data were collected.

Recruitment

Single Exposure Group.

The single exposure group was exposed to tornado approximately two years ago. On May 10, 2010 a tornado that (wind gusts 136 to 165 mph) developed a multiple vortex and tore across northern Oklahoma. [The Enhanced Fujita Scale (EF Scale) is used to categorize each tornado based on the intensity, size, estimated wind speed and damage associated with the tornado. The scale has six categories ranging from EF0 (Gale; wind gusts 65 to 85 mph) to EF5 (Incredible; wind gusts over 200 mph) (NOAA, 2011a).] This tornado had a path of 33 miles and caused significant structural, tree, and power line damage in the area, and resulted in one fatality before

dissipating (NCDC, 2011). Prior to this tornado, northern Oklahoma did not experience a tornado larger than EF0 since before 1999.

The elementary school targeted in this area consisted of approximately 90 students in 3rd through 6th grade. Of the 25 packets returned (28% return rate), 24 children participated in the first data collection. One child was absent on the day of data collection. The majority of the children were female (54.2%; *n* = 12) and Caucasian (72%; *n* = 18). Twenty-two children participated in the second data collection. The mean age was 10.38 years (*SD* = 1.35; range 8 – 13). No participants were excluded. For additional demographic information, see Table 1.

Multiple Exposure Group.

On May 3, 1999 an EF5 tornado formed in central Oklahoma resulting in 40 fatalities and 675 tornado related injuries. Since this devastating tornado, central Oklahoma has been hit with numerous other tornados ranging in size from EF0 (2003, 2004) to EF3 (2003). In 2010, three separate tornadoes (two EF1 and one EF4) threatened the area a statewide tornado outbreak (NDCD, 2011).

The elementary school in the multiple exposure group consisted of approximately 250 students in 3rd through 6th grade. Of the 70 packets returned (28% return rate), 61 children participated in the first data collection. Two children were not given permission to participate in the study, one child had moved out of the school district, and six children were absent. The majority of the children were female (56.9%; *n* = 33) and Caucasian (51.8%; *n* = 29). Sixty children participated in the second data collection. Three children were excluded from the analyses because their parents reported they had never experienced a tornado. The mean age was 10.0 years (*SD* = 1.0; range 8 – 13). For additional demographic information, see Table 2.

Measures

Parent Measures.

Demographic questionnaire. Parents who consented to participate in the study completed a demographic questionnaire used to gather the following information about

themselves and their spouse/partner: age, race/ethnicity, their relationship to the child, education level, marital status, and income. The child's age, race/ethnicity, sex, and school grade were also gathered. This measure provided basic descriptive information about the families.

Tornado Exposure - Tornado Exposure Questionnaire-Parent Report (TEQ-P; Lack& Sullivan, 2008). Parents completed a brief measure designed to assess the family's level of exposure during the tornado. The parents provided the following information about the tornado: family's location during the tornado, subjective severity of the tornado (*mild, moderate, severe, very severe, catastrophic*), the presence and degree of damage to their home (*0 to 100%*), injuries sustained, degree to which living situations were disrupted by the tornado, if the child were separated from the parents, if the tornado resulted in parental unemployment, if assistance (medical, financial, clean-up) was obtained, if psychological services were obtained (any type of services), and the parent's perception of his/her child's reaction to the tornado. Responses were coded in a yes/no format or on a likert scale. A Total exposure score was calculated by summing responses on the TEQ-P. Scores on this measure range from 0 to 45, with higher scores indicating more exposure to the tornado or negative events caused by the tornado. This measure was also used to exclude families that currently live in the area but did not directly experience the tornado (i.e. recently moved into the area, were out of town when the tornado hit).

General Functioning - Behavioral Assessment Scale for Children-Second Edition-Parent Report Scale (BASC-2-PRS; Kamphaus & Reynolds, 2004). The BASC-2-PRS is a psychometrically sound parent-report measure of adaptive and problem behaviors in the home and community setting. It provides information on internalizing (e.g. depression and anxiety) and externalizing (e.g. aggression and hyperactivity) behaviors, and can be used to evaluate children 2 to 21 years of age (Reynolds & Kamphaus, 2004). The 139-item measure uses a four-point (0 to 3) response format *N(*never,) *S(*sometimes), *O (*often), *A (*always). Clinical and at-risk scores are provided for each of the subscales. For the clinical scales, scores with *T*-scores above 60 are considered at-risk, and *T*-scores above 70 are considered clinically significant. For the adaptive

scales, *T*-scores below 40 are considered at-risk, and those below 30 are considered clinically significant. The BASC-2-PRS has demonstrated good reliability with alpha coefficients ranging from .76 to .95 in the general norm sample (Kamphaus & Reynolds, 2004). Test-retest reliabilities for the composite scales are high (low .80s to low .90s) with the exception of Internalizing Problems (.78; Kamphaus & Reynolds, 2004). Convergent validity with the Conners' Parent Rating Scale –Revised (CPRS-R) shows moderate to high correlations on the scales (.51 to .84) with the exception of the anxiety scales (.41; Conners, 1997). The Behavioral Symptom Index subscale score was used to assess overall functioning of the children. Given that the BASC-2 is a well-validated, standardized measure, a Cronbach's alpha was not calculated for the current sample.

Posttraumatic Stress Symptoms - UCLA PTSD Index for DSM-IV –Parent Version (Steinberg, Brymer, Decker, & Pynoos, 2004). The UCLA PTSD Reaction Index, the updated version of the Reaction Index (RI; Frederick, Pynoos, & Nadar, 1992) is a paper and pencil screening measure to assess for trauma exposure and post-traumatic stress symptoms. The parent version of this measure was designed to closely resemble the child version, and is intended to complement the child's report of PTSD symptoms. Three parts make up the measure. Part I screens for lifetime traumatic experiences and items are scored as present or absent. Part II includes a systematic assessment of A1 and A2 DSM-IV criterion (Steinberg et al., 2004), including objective and subjective aspects of the traumatic exposure. Items are scored as absent or present. Part III is a thorough evaluation of the frequency of posttraumatic stress symptoms during the past month and rated on a 5-point scale (0 = *none of the time* to 4 = *most of the time*). Twenty of the items assess for PTSD symptoms, while two items assess for associated features, fear of reoccurrence and trauma-related guilt. This scale is not used as a diagnostic scale, but rather provides preliminary information about symptoms of posttraumatic stress. Scores range from 0 to 68 with higher scores being indicative of more severe posttraumatic stress symptoms. Studies have shown high validity and internal consistency, with Cronbach's alphas falling in the

range of .90 across versions of the measure (Steinberg, 2004). Test-retest reliability has ranged from good to excellent, with a test-retest inter-item agreement of 94% (Pynoos et al., 1987). Convergent validity (.70) has also been shown with the PTSD Module of the Schedule for Affective Disorders and Schizophrenia for School-Age children (Rodriguez, Steinberg, Saltzman, & Pynoos, 2001). For the current study, the Total score of this measure was used to assess posttraumatic stress symptoms as perceived by the child's parent. Cronbach's alpha for the current sample (both groups) was .87 for the total score.

Child Measures.

Tornado Exposure - Tornado Exposure Questionnaire-Child Report (TEQ-C; Lack & Sullivan, 2008). The child version of the Tornado Exposure Questionnaire assessed the child's perceived threat, life-threatening experiences, and loss or disruption of experiences based on the tornado. This measure, first used by Knight (2001), and subsequently Lack (2003), is an assessment form that is similar in structure and content to the questionnaire used by Vernberg et al., (1996) for working with elementary-age children following Hurricane Andrew. Questions include: "How scared were you during the tornado?" (*not at all scared, somewhat scared, very scared, terrified*; "How much damage did the tornado cause to your home?" (*none, a little, a medium amount, a lot, totally destroyed*); and "Were your clothes or toys ruined by the tornado?" (*yes, no*). A total score was calculated by summing the number of items endorsed ranging from 0 to 22. Higher scores are indicative of increased exposure to the tornado. The TEQ-C was only administered during the first data collection period to assess the child's viewpoint on his or her degree of exposure to the tornado.

Posttraumatic Stress Symptoms - UCLA PTSD Index for DSM-IV –Child Version (Steinberg, Brymer, Decker, & Pynoos, 2004). The child version of the UCLA PTSD Reaction Index assessed exposure to the tornado, reactions to the tornado during or right after exposure, and continued thoughts and feelings during the past month. The Clinician Administered Trauma History Profile was not used, since all of the children recruited were exposed to the traumatic

event. This was also verified through the TEQ Parent and Child measures, and by the UCLA-PTSD-RI Parent Version. The children were asked to concentrate on the tornado that hit their community to answer the questions assessing their feelings during the last 30 days. This is answered on a 5-point scale ranging from 0 (*none*) to 4 (*a whole lot*). The frequency of their symptoms were assessed using a similar 5-point scale (0 = *none*, 1 = *little*, 2 = *some*, 3 = *much*, 4 = *most*). The Total score of this measure was included to assess the child's reactions and perception of exposure to the tornado. Cronbach's alpha for the current sample (both groups) was .92 for time 1 and time 2. Scores greater than 38 for a single incident traumatic experience has the greatest sensitivity and specificity for detecting PTSD (Steinberg et al., 2004). This measure was administered during both data point collections to assess symptoms of posttraumatic stress.

Attributions - Trauma Attribution Checklist (TAC; Knight & Sullivan, 2006). This measure was included to assess children's attributions about the tornado. The TAC is a 27-item self-report measure that assesses internal vs. external causes for the traumatic event. Subscale scores on the measure include the importance of attributing responsibility, expectations, hypervigilance, perceived meanings about the trauma, omen formation, and an open-ended question about the cause of the trauma. Except for the open-ended question, all items are rated on a three-point likert scale from 0 (*not much*) to 2 (*a lot*). The TAC showed a .79 correlation with RI scores in a sample of trauma-exposed children (Knight, 2001). The Total TAC score was used to assess the total number of attributions provided by the children. Scores range from 0 to 48, with higher scores being indicative of more attributions for the tornado. The TAC was administered during both data collection points. Cronbach's alpha for the current sample (both groups) was .86 and .89, respectively, for the total score.

Coping Skills - Kidcope (Spirito et al., 1988). The Kidcope is a 15-item checklist that was developed to assess the frequency of use of different types of coping strategies and the effectiveness of each one. Ten coping strategies are assessed, some by two items (distraction, social withdrawal, problem solving, emotional regulation, and wishful thinking) and some by a

single item (cognitive restructuring, self-criticism, blaming others, social support, and resignation). Validity studies indicated moderate to high correlations (.33 to .77) with other coping measures (Spirito et al., 1988). The younger version of the Kidcope is designed for children between 7 and 12 years old. The measure includes frequency ("Did you do this?") and efficacy ("Did it help?") scales and has variable wording to reflect coping to a specific event. The total frequency score of the Kidcope was used to assess the total number of coping strategies used by the children in dealing with the tornado. Scores ranged from 0 to 15, with higher scores being indicative of using more coping strategies. Additionally, the scores for positive coping strategies and negative coping strategies were used for exploratory analyses. Positive coping was measured by six items that assessed cognitive restructuring, problem-solving, social support, and emotional regulation. The use of negative coping was measured by six items assessing distraction, blaming others, wishful thinking, and resignation. This measure was administered during each data collection point. Cronbach's alpha for the frequency and efficacy scales were .77 and .79, respectively in the current study.

CHAPTER IV

RESULTS

To insure that findings were not due to differences on demographic variables between the two groups (single and multiple tornado exposure), analyses were conducted to test for statistical differences for each of the demographic variables. To compare the continuous demographic variables (parent age, child age) 2-tailed, independent samples *t*-tests were conducted for each of the variables. No significant differences were found between the two groups. To compare the categorical demographic variables (relationship to child, sex of respondent, level of education, yearly family income, marital status, ethnicity, sex of child, grade of child) 2-way chi-square tests were conducted for each of the variables. No significant differences were found. The remainder of the analyses was conducted assuming equivalence on demographic variables. See Table 1 and Table 2 for additional information about all demographic variables.

For means, standard deviations and ranges of the individual measures see Table 3. At time 1, children from the single exposure group reported scores of PTSS with a range from 0 to 53. Most children reported mild to moderate symptoms, with 8.4% (n = 2) reporting severe PTSS (score above 38; Steinberg et al., 2004). At time 2, children continued to report PTSS in the mild to moderate range with 13.5% (n = 3) endorsing symptoms falling in the severe range. Children

utilized coping strategies at both data collections, but no significant differences were found between time 1 and time 2 $t(160)$, $p = .951$.

The use of positive coping strategies was more at time 1 than time 2, but not statistically different $t(160)$, $p = .991$. More negative coping strategies were utilized at time 1 than time 2, although there was not a statistical difference $t(160)$, $p = .918$. Children reported making attributions for the tornado at both time 1 and time 2, with fewer attributions being reported at time 1. Overall behavioral functioning, as assessed by the Behavioral Symptoms Index on the BASC-2, fell mostly within the normal range of functioning ($T = 40$ to 60).

Children from the multiple exposures group reported a range of PTSS with 14.2% ($n = 8$) of the children endorsing severe PTSS symptoms at time 1. At time 2, 18.7% (n = 11) of children reported severe PTSS with the remainder of the children varying in reports of PTSS. A wide range of positive and negative coping strategies were used at both data collection points, with negative coping strategies being utilized more than positive coping strategies. The use of total attributions used had an appropriate range during each data collection, with more attributions being reported at time 2. Overall functioning had an appropriate range, with the majority of children falling into the normal functioning range ($T = 40$ to 60).

Comparison of Parent and Child Reports

Pearson product-moment correlations were used to assess similarity in items from the parent and child reports on the Tornado Exposure Questionnaire (TEQ). Significant correlations were found between parent and child reports of how scared the child was during the tornado ($r = .59$, $p = .001$) and overall perception of child exposure to the tornado ($r = .31$, $p = .010$). An association was also found between parents' reports of their children's PTSS and children's self-report of PTSS during the last six months ($r = .48$, $p = .001$). Significant correlations were not found between parent and child reports of the amount of damage that occurred to the child's location during the tornado ($r = .20$, $p = .098$). This indicates that the parents' reports

corroborate the children's reports about feelings of being scared, overall perception of exposure and levels of PTSS.

Post-Traumatic Stress Symptoms

Previous research has shown that level of exposure may be associated with PTSS (La Greca et al., 1998; Vernberg et al., 1996). To determine if the level of exposure needed to be controlled for when examining PTSS, level of exposure (TEQ-C total score) was correlated with PTSS (UCLA-PTSD-RI child score) using a Pearson product-moment correlation coefficient. Level of exposure was significantly correlated with symptoms of PTSS at time 1 (r = .59, p = .001) and at time 2 (r = .63, p = .001). Therefore, level of exposure was controlled for using an analysis of co-variance (ANCOVA) in further analyses conducted with the UCLA-PTSD-RI child score.

A 2 (group) X 2 (time) ANCOVA with level of exposure (TEQ-C) as the covariate and PTSS (UCLA-PTSD-RI total score) as the dependent variable was conducted. Group was used as the between-groups factor and time was the repeated measures factor. It was hypothesized that there would be a significant main effect of group on UCLA-PTSD-RI scores, with children in the single exposure group exhibiting significantly different scores than the children in the multiple exposure group. A main effect of group was found, $F(1, 140) = 7.12$, p =.009, $\eta\rho^2 = .048$, indicating that levels of PTSS (UCLA-PTSD-RI total score) were significantly different between the single exposure and multiple exposure groups when controlling for level of exposure. A post-hoc 1-tailed, independent samples t-test was conducted indicating significantly lower scores, $t(79)$, p = .007, in the single exposure group (M = 12.04) compared to the multiple exposure group (M = 20.68). This supports the hypothesis that exposure to a single tornado would result in lower PTSS than exposure to multiple tornados.

Next, it was hypothesized that there would be a main effect of time. A main effect of time was not found, $F(1, 140) = .18$, p = .675, $\eta\rho^2 = .001$, indicating that when controlling for level of exposure, scores did not differ significantly between time 1 and time 2. Thus, there was

stability of PTSS across time, with no significant change in symptoms over the 63 days between data collection.

It was also hypothesized that there would be a significant interaction effect on levels of PTSS, and that the change in scores from time 1 to time 2 would differ for the two groups. A significant interaction effect was not found, $F(1, 140) = 1.36$ $p = .246$, $\eta\rho^2 = .010$, indicating that the scores from time 1 to time 2 did not differ for the two groups. For both groups, there was little change in levels of PTSS across time, and scores remained stable. See Figure 1.

Coping Strategies

A 2 (group) X 2 (time) mixed design ANOVA was conducted to examine coping strategies. Group served as the between-groups factor, time served as the repeated measures factor, and total number of coping strategies on the Kidcope was the dependent variable. It was hypothesized that there would be a significant main effect of group on coping strategies. This, was supported by the findings, $F(1, 140) = 8.26$, $p = .005$, $\eta\rho^2 = .056$, indicating a significant difference in total number of coping strategies used between the single exposure group ($M = 5.60$) and the multiple exposure group ($M = 7.08$). Two, separate post-hoc 1-tailed, independent-samples *t*-tests were conducted to test whether children in the single exposure group, reported using fewer coping strategies than children in the multiple exposure group. While the two groups were not significantly different at time 1 (Single exposure $M = 6.00$, Multiple exposure $M = 7.00$; $t(79) = -1.23$, $p = .110$), there was a significant difference at time 2, $t(76) = -2.49$, $p = .007$, with children from the single exposure group ($M = 5.20$) reporting significantly fewer coping strategies than children from the multiple exposure group ($M = 7.16$).

Next, it was hypothesized that there would be a significant main effect of time on the total number of coping strategies used with more coping strategies being used at time 1 than at time 2. This hypothesis was not supported by the findings, $F(1, 140) = 3.04$, $p = .083$, $\eta\rho^2 = .021$. The number of coping strategies used did not change significantly across time.

Lastly, it was hypothesized that there would be a significant interaction effect on total number of coping strategies used, which was not supported by the findings, $F(1, 104) = 1.53$, $p = .219$, $\eta\rho^2 = .011$), indicating that for both groups, there was little change in use of coping strategies, and that scores remained stable. See Figure 2.

As exploratory analyses, the differences between the number of positive and negative coping strategies were examined using separate 2 (group) X 2 (time) mixed ANOVAs. No specific hypotheses were made for these exploratory analyses. Positive coping strategies were examined first. There was no main effect of group on use of positive coping strategies, $F(1, 69) = .33$, $p = .566$, $\eta\rho^2 = .005$. However, there was a main effect of time, $F(1, 69) = 105.95$, $p = .001$, $\eta\rho^2 = 606$. A post-hoc 1-tailed, dependent samples *t*-test was conducted as a follow-up analysis. Children reported using more positive coping strategies at time 1 ($M = 2.85$) than at time 2 ($M = .61$; $t(70) = 11.49$, $p = .001$)). There was no interaction effect, $F(1, 69) = .19$, $p = .692$, $\eta\rho^2 = .002$, indicating that the change from time 1 to time 2 did not differ for the two groups.

Similar exploratory analyses were conducted for negative coping strategies. There was no main effect of group, $F(1, 70) = 2.40$, $p = .126$, $\eta\rho^2 = .033$, indicating that the use of negative coping strategies did not differ between the two groups of children. There was a main effect of time, $F(1, 70) = 36.68$, $p = .001$, $\eta\rho^2.344$, indicating that children's use of negative coping strategies changed from time 1 to time 2. A post-hoc 1-tailed, dependent samples *t*-test was conducted as a follow-up analysis. Children reported using more negative coping strategies at time 1 ($M = 2.99$) than at time 2 ($M = 1.78$; $t(71) = 7.45$, $p = .001$). Overall, children used more coping strategies, both positive and negative, at time 1 than at time 2. Lastly, an interaction effect was not found, $F(1, 70) = 2.50$, $p = .118$, $\eta\rho^2 = .034$,indicating that there was little change in use of negative coping strategies, and that scores remained stable for both the single exposure and multiple exposure groups.

Attributions

The next set of analyses examined attributions using a 2 (group) X 2 (time) mixed design ANOVA. Group served as the between-groups factor, time served as the repeated measures factor, and total number of attributions on the TAC was the dependent variable. It was hypothesized that there would be a significant main effect of group on the total number of attributions, with the children in the single exposure group exhibiting different number of attributions than the children in the multiple exposure group. This was supported by the results, $F(1, 140)= 13.07$, $p = .001$, $\eta\rho^2 = .085$. A post-hoc 1-tailed, independent samples *t*-test was conducted to determine if the single exposure group reported using fewer attributions than the multiple exposure group, as hypothesized. At time 1 (Single: $M = 9.75$; Multiple: $M = 14.36$; $t(80) = -2.43$, $p = .008$) children in the single exposure group reported using fewer attributions than children in the multiple exposure group. At time 2 (Single Exposure: $M = 10.16$; Multiple Exposure: $M = 16.55$; $t(75) = -2.75$, $p = .003$), the single exposure group again reported using fewer attributions than the multiple exposure group. Collectively, during both data collections, the children who only experienced one tornado reported making fewer attributions than children who had experienced multiple tornadoes.

It was also hypothesized that there would be a significant main effect of time, which was not supported by the results, $F(1, 140) = 1.93$, $p = .166$, $\eta\rho^2 = .014$,suggesting that the use of attributions did not change from time 1 to time 2.

Finally, it was hypothesized that there would be a significant interaction effect on the total number of attributions reported, this was not supported by the findings, $F(1, 140) = 1.33$, $p = .251$, $\eta\rho^2 = .009$, indicating that the change from time 1 to time 2 did not differ for the two groups of children. See Figure 3.

In the interest of learning more about the attributions of children who have experienced a tornado, additional exploratory analyses were conducted. As research questions, specific details about the different types of attributions used by children (attribution of responsibility, importance

of attributing responsibility, expectations/hypervigilance, search for meaning, and omen formation) were examined. Since all analyses were exploratory, there were no specific hypotheses. The traditional *p*-value of .05 was not used for interpretation because this would not provide any correction for family wise error. However, it was determined that a Bonferroni adjustment would be too stringent for exploratory analyses, yielding a *p*-value of .007. Given the large number of analyses that were conducted, and in an effort to control family wise error, the following analyses were interpreted with a *p*-value of .001.

First, attributions of responsibility were examined. There was a significant main effect of group,$F(1, 144) = 13.66$, $p = .001$, demonstrating that the number attributions of responsibility was significantly different for the single exposure group and the multiple exposure group. There was no main effect of time $F(1, 144) = 2.29$, $p = .132$, indicating that the use of attributions of responsibility did not change significantly from time 1 to time 2. No significant interaction was found $F(1, 144) = 3.41$, $p = .067$, suggesting that the change between time 1 and time 2 for the single vs. multiple group did not differ. To further investigate the main effect of group, simple effects analyses were conducted. In the single exposure group, there was no simple effect of time $F(1, 43) = .003$, $p = .959$ indicating that use of attributions of responsibility was not significantly different from time 1 to time 2. There was also no simple effect for the multiple exposure group $F(1, 114) = 4.658)$, $p = .033$ suggesting there was no significant change in the use of attributions of responsibility from time 1 to time 2. Although this met the conventional alpha level of .05, the simple effect did not meet the alpha level of .001 set for these exploratory analyses. Met conventional of .05 but not value of .001

The next analyses examined the importance of attributing responsibility. A main effect of group was not found $F(1, 144) = .19$, $p = .668$ suggesting that the difference between the single exposure group and the multiple exposure group were not statistically different. A main effect of time was not found $F(1, 144) = 2.33$, $p = .129$ demonstrating that there were no changes between time 1 and time 2 for the importance of attributing responsibility. Lastly, no significant

interaction was found $F(1, 144) = 1.03$, $p = .313$ suggesting the change from time 1 to time 2 did not differ for the two groups.

Next, attributions of expectations/hypervigilance were examined. A main effect of group was not found $F(1, 147) = 8.66$, $p = .004$ suggesting that there is not a significant difference in the use of expectations/hypervigilance between the single exposure group and the multiple exposure group. No main effect of time was found $F(1, 147) = 1.40$, $p = .238$ indicating that from time 1 to time 2 no significant changes in attributions of expectations/hypervigilance were reported. No interaction effect was found $F(1, 147) = .24$, $p = .628$ demonstrating that there was little change in the use of expectations/hypervigilance, and that scores remained stable.

The search for meaning was examined next. A significant main effect of group was found $F(1, 144) = 15.39$, $p = .001$ suggesting that the search for meaning was different between the single exposure group and the multiple exposure group. A main effect of time was not found $F(1, 144) = .57$, $p = .450$ indicating that the use of search for meaning did not differ from time 1 to time 2. A significant interaction was not found $F(1, 144) = 2.85$, $p = .093$ suggesting that the change from time 1 to time 2 did not differ for the single exposure and multiple exposure groups. To further examine the main effect of group, simple effects analyses were conducted. A simple effect of time was not found for the single exposure group $F(1, 44) = .002$, $p = .966$ indicating that the use of search for meaning was not different from time 1 to time 2 in the single exposure group. A simple effect of time was not found for the multiple exposure group $F(1, 114) = 1.67$, $p = .199$.

The last type of attribution examined was omen formation. A main effect of group was not found $F(1, 144) = 5.54$, $p = .020$. This suggests that the use of omen formation did not differ between the single exposure and the multiple exposure groups. There was no significant main effect of time $F(1, 144) = .18$, $p = .674$ showing that the use of omen formation did not differ from time 1 to time 2. There was no significant interaction $F(1, 144) = .18$, $p = .674$ indicating that the change from time 1 to time 2 did not differ for the two groups.

Overall Functioning

The next set of analyses examined overall functioning and was exploratory in nature to gain a better understanding of child functioning following a tornado. To test for a significant main effect of group on school problems, a one-way ANOVA was conducted to examine school problems between the single exposure and the multiple exposure groups. No significant differences were found $F(1, 69) = .316$, $p = .576$.

Predictors of Posttraumatic Stress Symptoms

To further explore how coping strategies and attributions contribute to posttraumatic stress symptoms in children, two regression analyses were conducted. It was determined that this would best be accomplished with the children who had been exposed to multiple tornadoes, therefore, only the children in the multiple exposure group were included in these analyses.

The first analysis examined predictors of PTSS approximately 20 months after the latest tornadoes went through central Oklahoma. A forward stepwise hierarchical regression was conducted using the children's UCLA-PTSD-RI score at Time 1 as the predicted variable. The level of exposure (child TEQ score) explained 32.2% of the variance, $(1, 53) = 25.19$, $p < .001$, $\beta = .568$, $p = .001$. Attributions (TAC total Time 1) in the second step of the regression accounted for an additional 17.4% of variance, $F(1, 52) = 17.93$, $p < .001$, $\beta = .525$, $p = .001$. Lastly, coping strategies (Kidcope total score time 1) was entered into the equation, which did not account for any added variance, $F(1, 51) = 2.05$, $p < .159$, $\beta = .170$, $p = .159$. See Table 4.

The next analysis examined the predictors of PTSS approximately 23 months after the tornadoes. Another stepwise hierarchical regression was conducted using children's total PTSS at time 2 as the predicted variable. Level of exposure (child TEQ score) explained 35% of the variance $F(1, 49) = 26.34$, $p < .001$, $\beta = .591$, $p = .001$. Total number of attributions (TAC total time 2) in the second step of the regression accounted for an additional 30% of the variance $F(1, 48) = 41.09$, $p < .001$, $\beta = .610$, $p = .001$. Lastly, total number of coping strategies (Kidcope total

score time 2) was added into the equation, which did not account for any added variance $F(1,47) = 1.36$, $p < .26$, $\beta = .135$, $p = .250$. See Table 5.

CHAPTER V

DISCUSSION

The present study was designed to assess posttraumatic stress symptoms, use of coping skills, and attributions in two groups of school-age children following exposure to tornadoes. The first group of children experienced exposure to a single tornado in May 2010, while the second group, was exposed to multiple tornadoes during the same time period. There were two primary goals for this study. The first goal was to assess long-term presence and the degree of PTSS in the two groups of children. This was done by collecting data from the children at 20 and 23 months post-disaster. The second goal of the project was to gather information about factors that could be contributing to the development and long-term maintenance of PTSS including level of exposure, coping strategies, and attributions.

Interpretation of Results

Prior to examining PTSS, coping strategies, and attributions, parent and child data were compared to gain a greater understanding of their experiences during the tornadoes. Parents and children were asked about these experiences via separate self-report questionnaires. Parents were asked to report on their perceptions of their child's exposure to the tornado, their child's anxiety/fear during the tornado, their children's PTSS, and their child's overall functioning during

the last six months. Children were asked to report on their own perception of exposure to the tornado, anxiety or fear during the tornado, and PTSS during the last six months.

The data demonstrated high correspondence between parent and child reports on how scared the child was during the tornado, overall perception of exposure to the tornado, and levels of PTSS. This suggests that parents were successful in estimating their children's degree of fear, perception of tornado exposure, and current symptoms of distress. These findings are inconsistent with the majority of existing literature, which typically reports poor to moderate consistency between parent and child reports (e.g. Vogel & Vernberg, 1993; Martin et al., 2004; Stover et al., 2010).

On the other hand, parent and child reports about the amount of damage that occurred to the child's location was not associated. This could be due to a number of reasons. First, data were collected at 20-months post-disaster, a time period in which information could be easily forgotten. Secondly, children likely have minimal understanding about property damage above the extremes of "none" and "totally destroyed" skewing their perceptions. It is also possible that the children's perception of damage may have been based on the amount of fear that the children experienced during the tornado instead of actual damage that occurred.

It is well documented in previous literature that level of exposure can be associated with levels of PTSS (La Greca et al., 1998; Vernberg et al., 1996); however, few studies have explored this association over time. Findings of the current study are consistent with previous literature, showing a strong association between level of exposure and level of PTSS. This correlation was found at both data collection points, showing that even with time; levels of exposure continue to be associated with symptoms of posttraumatic stress. This suggests that initial levels of exposure and PTSS may continue to affect children months or years after exposure to traumatic events. Given that childhood is a time of rapid growth in numerous areas, this finding is important as many aspects of a child's life may be affected following exposure to a traumatic event.

Additionally, children may continue to be affected long after the initial exposure, even if they appear to be exhibiting no distress.

Previous research about the maintenance of long-term PTSS has found differing patterns. Some research suggests that symptoms decrease overtime (e.g., Vogel & Vernberg, 1993), while other studies show no decrease in long-term distress (e.g., Knight, 2001). However, a comparison of PTSS in single versus multiple exposures groups has not received attention in the literature. The current study found that levels of PTSS were different for the two groups of children, notably the children who experienced multiple tornadoes reported higher levels of PTSS than the children who experienced a single incident. However, both groups had a wide range of symptomology with a number of children from both groups falling into the clinical range. When symptoms were examined from time 1 to time 2, no differences were found, suggesting that from 20- and 23-months post-disaster PTSS remained stable. It is possible that once a child has experienced a tornado, he/she does not return to baseline functioning, or that it could take more than two years post-disaster for this to happen. More specifically, the children will continue to show symptoms of distress even years after the exposure, perhaps because clinical services have not been sought. Second, it is possible that children who live in areas where tornadoes are common or more frequent (such as Tornado Alley) may, in general, report more PTSS given that each year during tornado season (April – July) they have the potential to experience another tornado. Additionally, in Oklahoma when a tornado is forming anywhere in the state, regularly scheduled television programs are interrupted to cover the development and locations of the tornadoes. Children may not understand that a tornado across the state is of no harm to them because the local television stations are covering it. It is also possible that there are intergenerational effects of tornadoes on families. The children were not born until after the May 1999 tornadoes, but their parents are likely to remember the devastation caused by these tornadoes. On May 3, 1999 Oklahoma experienced 58 confirmed tornadoes. The tornado that went through Moore was rated an EF5 (wind gusts over 200 mph), killing 11 people and injuring 293 people (NOAA, 2011b). Parents

may see the coverage on the tornadoes and experience heightened arousal because they previously experienced these tornadoes, and this may increase arousal in the children too.

Another interesting finding is parents reported a normal range of functioning for both the single and multiple exposures groups, suggesting that the majority of children were doing well despite their elevated levels of PTSS. Are the children functioning just fine although they are continuing to exhibit symptoms of distress? It is possible that children are exhibiting symptoms in areas that were not assessed in this study. This is consistent with previous literature, specifically the recognition that reactions to trauma are not transient, but can have long-term effects on children (La Greca et al., 1998). McFarlane and colleagues (1987) found declines in academic achievement, increases in absenteeism, behavioral disturbances (i.e. aggression), and anxiety up to 26-months after a bushfire in Australia. Similarly, Pynoos and colleagues (1993) found elevated levels of guilt and difficulties concentrating 18-months after an earthquake. Collecting academic records from the schools for the children who participated in the current study would have been beneficial to gage how children are functioning academically approximately two years after the tornadoes hit. Another possibility is that children may be reporting elevated symptoms of distress, but have found a way to effectively deal with the distress, as discussed next.

Another main goal of this study was to examine factors that may be effective in dealing with PTSS. First, coping strategies were examined. It was hypothesized that the use of overall coping strategies would be different for the two groups of children. This hypothesis was supported, with children exposed to a single tornado reporting fewer coping strategies than the children exposed to multiple tornadoes. A closer look at the use of coping strategies showed that at time 1 there was no difference in the total number of coping strategies used between the two groups. However, at time 2 the single exposure group reported using fewer coping strategies. This suggests that children who experienced multiple tornadoes may be affected more by the tornadoes, and may be employing coping strategies longer than the children who experienced a

single tornado. Next, it was hypothesized that the use of coping strategies would decrease from time 1 to time 2. This was not supported by the findings, as children were reporting stable use of coping strategies from time 1 to time 2. Given that the second data collection was during tornado season, it is possible that children may re-employ the use of coping strategies to effectively deal with the danger of another tornado.

Coping strategies following a tornado is an area of little research. Therefore, exploratory analyses were conducted to gain a better understanding of the use of positive and negative coping strategies in the current sample. The use of positive coping strategies was not different between the two groups of children. However, the use of positive coping strategies was different from time 1 to time 2, with more positive coping strategies being used at time 1 than at time 2. In terms of negative coping strategies, there was no difference for the two groups of children. Like with positive coping strategies, the use of negative coping strategies was different from time 1 to time 2, with more negative coping strategies being utilized at time 1 than time 2. These findings are interesting because the children are reporting using more positive and negative coping strategies at time 1, but the children are continuing to experience symptoms of distress at time 2. This could suggest that although the use of coping strategies may not be effective in alleviating PTSS, it appears to be useful in helping the children maintain normal levels of functioning. Findings of the current study seem to be inconsistent with the existing coping strategies literature. Generally, it has been found that positive coping strategies, such as cognitive restructuring techniques and social support, are associated with lower levels of distress (Jeney-Gammon et al., 1993). However, much of the previous literature has examined short-term coping strategies, ignoring long-term coping. Furthermore, previous literature does not dichotomize coping strategies into positive and negative. Instead, the literature looks at individual coping strategies (e.g., distraction, social withdrawal, wishful thinking). Although the Kidcope can provide 10 individual scores, it was determined that this study would use more inclusive scores of positive and negative coping strategies. There have been criticisms of the Kidcope using single items to

assess a subtype of coping strategies (Spirito et al., 1988) limiting the ability to assess reliability, or having difficulties when items may represent more than one coping strategy. Given the different definitions of coping the emphasis of coping varies between studies, there is no "gold standard" measure or technique that has been found to assess coping (Spirito, 1996).

Another area that has limited research in response to natural disasters is attribution styles. Studies show that children who make attributions report being more upset than the children who do not make attributions (Bulman & Wortman, 1977). However, attributions made to God or random chances were not associated with more distress (Dollinger et al., 1981; Dollinger, 1986; Knight, 2001). The current study assessed attributions during both time points to gain a better understanding of children's attributions of natural disasters. It was hypothesized that the total number of attributions reported would differ for the two groups of children, with the single exposure group reporting fewer attributions than the multiple exposure group. This was supported at both at time 1 and time 2. It was also hypothesized that the report of attributions would be lower at time 1 than at time 2, this was not supported by the results of the study. The five individual attributions (attribution of responsibility, importance of attributing responsibility, expectations/ hypervigilance, search for meaning, and omen formation) were also examined individually. It was found that attributions of responsibility were different for the two groups of children. Specifically, the children from the multiple exposure group used the attribution more than the children from the single exposure group. Likewise, differences were found based on single exposure vs. multiple exposures for the search for meaning. No differences were found for omen formation or importance of attributing responsibility. Overall, these findings suggest that children in the multiple exposures group make more attributions about why their town was hit. This makes sense, given they have to rationalize why their town was hit numerous times, compared to the children in the single exposure group who may think that their town was hit by random chance. This appears to be in line with the few existing studies that have looked at attributions.

This study was only the third study to use the recently developed measure of children's attributions, the Trauma Attribution Checklist (TAC; Knight, 2001). It appears to provide additional support for the usefulness of the TAC as a measure of children's attributions. The relationship between the TAC and PTSS supports hypotheses of the study. It also provides general support that attributions should be assessed in children who have experienced a traumatic event. This is consistent with the little amount of research in the area (Dollinger, 1986; Downey et al., 1990).

Regression analyses were conducted to examine the predictive ability of exposure, coping strategies, and attributions on PTSS. At neither of the time points were coping strategies found to be significant predictors of PTSS. The child's perceived level of exposure and attributions made about the tornadoes did significantly contribute to the prediction. At time 1, the level of perceived exposure (TEQ-C) explained 32.2% of the variance in PTSS, while the addition of total number of attributions (TAC) explained an additional 17.4% of the variance. At time 2, the level of exposure explained 35% of the variance in PTSS, while the addition of total numbers of attributions accounted for an additional 30% of the variance. The findings about the use of attributions on long-term PTSS are consistent with the few previous studies examining attributions. For example, Lack (2001) found that at three different time points, attributions accounted for around 50% of the variance in PTSS. Overall, the current study found level of exposure and use of attributions accounted for between 50% and 65% of the variance in PTSS. Although this shows that exposure and use of attributions are important, it also suggests that there is another part of the equation that is not currently being studied.

Clinical Implications

Results from the current study have several clinical implications. First, it provides further evidence that children may exhibit continued distress resulting from a natural disaster up to 23-months following the disaster. While many parents monitor their children's distress immediately following a disaster, long-term monitoring of distress is also warranted. Follow-up

in school may also be beneficial given that communities, not individuals, are affected by natural disasters. Awareness in school settings would also be beneficial since many of the long-term effects may adversely affect a child's functioning in the classroom (i.e., decrease in academic achievement, aggression, difficulties concentrating). Attention to coping strategies used by a child following a traumatic event is also important. Children who can utilize effective coping skills will likely continue to function at a normal level, however, children who do not utilize effective coping skills would benefit from being taught more effective techniques. Lastly, it appears to be increasingly important to assess the types of attributions, if any, that a child is making for the trauma, which could be a predictor of later PTSS. Pinpointing maladaptive attributions could aid in earlier intervention leading to less distress over time. There is a high probability that children in Oklahoma will be affected by another tornado. Teaching effective coping skills and having discussions of attributions with children could generalize to other potential tornadoes or even other traumas they may experience.

Limitations and Strengths

Several limitations should be noted about the current study. First the sample size, particularly for the single exposure group, was small compared to other studies conducted with survivors of natural disasters. G-power was used to estimate a sample size large enough to achieve a medium effect size. It was estimated that a sample size of 60 would be a sufficient sample size for each group, to achieve a medium effect size. Although the samples sizes for each group were lower than what was estimated by G-power, it appears as though there were sufficient power as some statistically significant findings were observed. Additional research with larger sample sizes is warranted in future research.

In general, the parents who provided information on their children were homogenous, with most being female biological parents. Although there was some variability in ethnicity, the majority identified as Caucasian, with some identifying as Hispanic/Latino, African American, American Indian, and Asian American. Given the lack of variability in the sample, findings may

not be generalizable to other populations. Additionally, the sample came from Oklahoma, an area that is used to, and often prepared for, the threat of tornadoes. The findings from the current study may not be applicable to victims of disaster that were unexpected. The high probability of tornado reoccurrence and the intense media coverage provides a unique environment for children living in Oklahoma during tornado season.

A final limitation is that the children did not provide any information about their own behaviors. Although this study did utilize reports from multi-respondents, information was only collected from parents during the initial data collection, and no information was collected from the schools or teachers to assess levels of functioning at school. It should be noted that the multiple exposure group was in the vicinity of a tornado two weeks before the second data collection. The tornado touched down in a neighboring city, causing no reported damage to the immediate area, but many families sought shelter. Additionally, some children were still at school during the tornado and were separated from their families. It is unknown how this incident may have affected the findings of the current study. While it is possible that data collection during tornado season could have retriggered the symptoms, a significant difference was not found in the level of PTSS from time 1 to time 2.

It should also be noted that this study was only the third study to utilize the TAC to assess the presence of attributions. Given that the TAC is a relatively new measure, there is little psychometric data behind it. However, the few previous studies using the TAC have shown great promise, indicating strong relationships to both posttraumatic stress and coping (Knight, 2001; Lack, 2001). These relationships are expected given existing research on attributions; however, the validity of the TAC has not been established due to the lack of comparable measures to compare it with.

The current study also has several notable strengths. Although it has been proposed for future research, few studies have successfully examined PTSS, coping strategies, and attributions in the same group of children following a natural disaster. The current study assessed all three

factors in order to provide information about PTSS, coping strategies, and attributions following exposure to natural disasters.

The longitudinal design of the study allowed for comparison of PTSS, coping strategies, and attributions across two time periods in two groups of children. This study is unique in that both groups were included for comparison instead of just utilizing one group to compare across the two time periods. Additionally, the data collection points were chosen to assess longer-term symptoms, coping strategies, and attributions. Much of the existing literature examines children closer to time of exposure, with little being known about functioning at two years post-disaster.

Additionally, the study was designed to utilize a multi-informant approach, gathering information from caregivers and children. By collecting data from both caregivers and children, a more comprehensive picture can be painted about a child's overall level of functioning since the tornadoes. Parent's not only reported on general functioning of their children, but also provided information about their child's PTSS, which can be compared to children's self-report of PTSS.

The next strength of the study was the standardization in protocol used at each school and data collection. The researcher used a standard script to administer the measures, and had her research assistants circulating the room to offer individual assistance to children as needed. Identical scripts were used for each school and during each data collection. Standardization such as this will allow comparisons to other long-term studies and replication of data collection protocol of the current study.

Existing literature examining both coping and attributions across time in relation to children's distress is rare. Coping is often assessed at initial data collection, but is not followed through multiple time points. Research on attributions and natural disasters is scarce, and tracking attributions across time is even more difficult to find.

Given that the TAC is still a relatively new measure, the current project provides additional information about the utility of the measure and expands the research of attributions in

children related to trauma. Most of the current literature looks at attributions of academic achievement, social interaction, chronic illness and depression.

Overall, the current study offers information that can aid in closing gaps in the existing literature. It is one of few studies that investigates how exposure, coping strategies, and attributions work together to maintain or alleviate long-term symptoms of posttraumatic stress. Additionally, it corroborates existing literature, that even up to two years post-disaster; children are reporting elevated levels of PTSS, which appear to be related to both the use of coping strategies and attributions. Furthermore, the study shows that although elevated levels of PTSS are reported, children are exhibiting normal levels of general functioning. Collectively, findings from the current study should provide valuable information to the field of child trauma research.

Future Directions for Research

A number of future directions come from the results of this study. First, it would be important to have long-term assessment of children in Oklahoma who have not been exposed to a tornado. This would allow for a normative sample that the results of this study and others (Knight, 2001; Lack, 2001) could be compared. It has been discussed, that perhaps children living in Tornado Alley have elevated levels of PTSS because of the constant threat of tornadoes, however this has not been verified by research. It would also be interesting to compare results of the single exposure group to an area that experienced a single tornado touchdown, but is not accustomed to the threat of tornadoes. This would provide information about the differences in children who can expect to be threatened again by tornadoes to those who are not habituated to the yearly threat of tornadoes.

Given that in the current study children are still reporting elevated levels of PTSS at 23 months post-disaster, further long-term assessment is warranted. Few studies have examined long-term effects of natural disaster past 24 months, but such research is warranted to determine the manifestation and maintenance of symptoms as children continue to develop. Investigation into this area of research is important in that it can advance effective interventions and give

researchers a better understanding of children who are exposed to traumatic events but do not seek clinical intervention.

As with many studies, the utilization of various assessment measures would be beneficial in future research. For example, the current study utilized a broadband measure of general functioning, the BASC-2. Use of a more fine-grained measure of general functioning would be beneficial and may identify areas in which the children are not functioning well following exposure to a natural disaster. It would also be useful to include other measures of academic achievement and absenteeism. Teacher reports for each of the children would provide multi-informant information about functioning as school. Additionally, collecting attendance reports prior to and following exposure to the tornadoes would also be beneficial to include as these reports could provide an unbiased assessment of school attendance.

An examination of attributions in children who experienced other traumatic events is also needed. Given the lack of research on attributions and trauma, this would provide a comparison of different types of trauma. This would also aid in further investigation into the link between PTSS, level of exposure, and attributions. Similarly, use of the TAC in other populations is also warranted to aide in establishing reliability and validity for this measure of children's attributions.

As with attributions, similar follow-up studies are needed for coping strategies. Examination of other traumas and how coping strategies effect functioning would be worth investigating. Additionally, the examination of the relationship between attributions and coping strategies would offer more information about possible efficacious interventions with survivors of traumatic experiences.

The current study and many others have investigated reactions to trauma of school-age children. Similar investigations with other age ranges are warranted, as children continue to develop into young adulthood. Given the scarcity of studies examining coping and attributions in the same study, future research should consider examining these in adolescents or young adults to

gain an understanding of how development may affect the use of coping strategies and attributions.

Lastly, additional research is needed with a wide range of populations to determine if long-term distress, as noted in the current study, is generalizable to other populations and types of trauma. Examples of possible participants include older populations (adolescents and young adults), individuals exposed to different types of traumas (both natural disasters and other traumas), ethnic groups not largely represented in the current study, and individuals with varying socioeconomic status. Attributions and coping strategies should also be assessed in each of these populations to continue to fill gaps in the current research. Given that the majority of parent reports came from mothers in the current study, it would also be of interest to see if consistencies in parent and child report stand if fathers are asked to report on their children's PTSS and general functioning.

Conclusions

It is hoped that the current study has contributed to gaps in child trauma research, and that it will serve as a stepping-stone for future research in this area. Overall, the study supported existing literature, showing maintenance of long-term posttraumatic distress following exposure to tornadoes. The findings were consistent in two groups of children, children exposed to a single tornado in 2010 and children exposed to multiple tornadoes in 2010. Contributions were made to the literature by examining PTSS, coping strategies, and attributions in two groups of children over two time periods. One group of children had a single exposure to a traumatic event, while the other group had multiple exposures to traumatic events. The current study served as confirmation that although children may appear to be functioning at normal levels, children continue to exhibit elevated levels of PTSS up to two years post-trauma. Based on regression analyses, these PTSS seem to be explained partially by the use of attributions, but that coping strategies were not successful at predicting PTSS. It is hoped that the current project can be

expanded on to provide additional contributions to the current literature and to the field of child trauma research.

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APPENDIX A

COMPLETE LITERATURE REVIEW

Introduction

A number of disasters occur each year, including both man-made, and those that have natural causes. Levels of physical damage are easily visible, while the psychological damage endured by victims of these disasters is harder to detect. The aversive psychological effects of trauma exposure were first acknowledged with the introduction of Posttraumatic Stress Disorder (PTSD) in the third edition of the Diagnostic and Statistical Manual of Mental Disorders (DSM-III; American Psychiatric Association (APA), 1980).

In its original conceptualization, PTSD was not believed to be applicable to children and adolescents, presuming less severe shorter-lived reactions to traumatic events compared to adults. However, in 1987 the diagnosis of PTSD was extended to children and adolescents, with child-specific criteria, in the third edition revision of the DSM (DSM-III-R; APA, 1987). This recognition of posttraumatic stress reactions in children sparked research and demonstrated that children may experience posttraumatic stress symptoms (PTSS) as a result of traumatic events (La Greca, Silverman, & Wasserstein, 1998; Robinson, Lock, La Greca, Kokegei, Ridgeway, & Lai, 2010).

The purpose of this paper is to review extant research addressing children's psychological reactions to traumatic events, the behavioral manifestations of posttraumatic symptoms, and a review of measures currently available to assess post trauma functioning in children. A review of research examining effective coping strategies in response to a traumatic event, as well as attributions for the trauma, will also be included.

Children's Reactions to Trauma

Potentially traumatic events include sexual abuse, exposure to domestic violence, physical abuse and neglect, natural disasters, war, and terrorist attacks. Generally, traumatic events can be categorized as chronic long-standing or repeated interpersonal traumas (i.e. sexual abuse, domestic violence, neglect) and single episode events (i.e. natural disasters, car accidents, industrial accidents) (Terr, 1991). Given the vast differences between these categories of trauma,

the remainder of the literature reviewed will include disasters or events that are relatively sudden, highly disruptive, time limited, and public as defined by the American Psychological Association task force (Vogel & Vernberg, 1993). The task force was formed because of the limited information available to psychologists called to respond to children's needs following a disaster. Here, a disaster is defined as an event with the following characteristics: "involves the destruction of property, injury, and/or loss of life, has an identifiable beginning and end; adversely affects a relatively large group of people; is "public" and shared by members of more than one family; is out of the realm of ordinary experience; and psychologically, is traumatic enough to induce distress in almost anyone, regardless of premorbid function or earlier experience" (Saylor, 1993, p. 2). Family violence (such as physical and sexual abuse), political violence, and warfare are excluded because of the significant differences that likely occur with repeated exposure to the stressor, compared to a single exposure to the stressor (Vogel & Vernberg, 1993).

Current PTSD Diagnostic Criteria

According to the DSM-IV-TR (APA, 2000), an individual must have experienced, been witness to, or been confronted with an event in which actual or threatened death, serious injury, or the threat of physical integrity occurred. Additionally, the response to the event must include fear, helplessness, or horror. Once a traumatic event has been experienced, symptoms fall into three general categories: reexperiencing the event, avoidance of the event or numbness in response to event reminders, and hyperarousal. In children, responses may be expressed more as agitated or disorganized behavior. For a diagnosis, an individual must exhibit symptoms from each of the categories for more than one month following exposure to the event, and significant impairment of functioning must be noted (APA, 2000).

Reexperiencing can be exhibited in a range of symptoms, but only one is necessary for a diagnosis (APA, 2000). Symptoms include intrusive and recurrent thoughts, which in children may be manifested as repetitive traumatic play. For example, following Hurricane Hugo, children were reported to engage in "hurricane" play, and were observed knocking down broccoli

trees (Sullivan, Saylor, & Foster, 1991). Distressing dreams, another symptom of reexperiencing, are often present in children as frightening dreams without any recognizable content. Lastly, flashbacks or intense physiological distress may be experienced when reminders of the trauma are encountered (APA, 2000).

Avoidance and a general numbing of responsiveness must be observed in at least three of the following symptoms (APA, 2000): efforts to avoid thoughts, feelings or conversations of the event; or efforts to avoid activities, places, or people that may trigger thoughts of the trauma. Additionally, the inability to remember details associated with the trauma, decreased interest or participation in activities, detachment from others, a restricted range of affect, or feeling as if the future is foreshortened are symptoms of avoidance (APA, 2000). For example, children involved in the Chowchilla kidnapping reported decreased expectations for their futures following the incident (Terr, 1983).

The last category of symptoms of PTSD is hyperarousal. At least two symptoms of hyperarousal are required, and include difficulties falling or staying asleep, increased irritability or outbursts of anger, difficulties concentrating, hypervigilance, or an exaggerated startle response. As previously mentioned, symptoms must be present for at least one month following the traumatic event and must cause significant impairment in functioning (APA, 2000).

Although not necessary for a diagnosis, there are a number of other symptoms exhibited by children following a trauma. Sullivan et al. (1991) found that following a hurricane, preschoolers exhibited a significant increase in the frequency and severity of problem behaviors, such as being demanding, becoming easily frustrated or irritable and throwing temper tantrums. Other symptoms include somatic complaints such as headaches and stomachaches, feelings of guilt, anxiety, depression, decline in school performance (Vogel & Vernberg, 1993; La Greca, et al., 1998), increase in absenteeism (McFarlane, Policansky, & Irwin, 1987), sleep problems, night terrors, (Davis & Siegel, 2000) irritability, developmental regressions, and hypervigilance (Terr, 1991).

Prevalence Rates and PTSD in Children

Existing research suggests a substantial number of individuals, both children and adults, will experience trauma at some point throughout their lifetime, although not all will develop PTSD. Lifetime prevalence rates for adults with PTSD are approximately 6.8% (Kessler, Berglund, Demler, Jin, Merikangas, & Walters, 2005); however, rates for adolescents and children are not as easily established. A longitudinal study following 386 individuals from kindergarten to high school found that nearly 43% had experienced trauma by age 18, with almost 12% being exposed as early as 14 (Giaconia et al., 1994). In a sample of older adolescents (ages 15 to 18), 6% met diagnostic criteria, with the predominant traumas including rape, physical assault, witnessing someone being hurt or killed, and receiving news of sudden death or accident (Reinherz, Giaconia, Lefkowitz, Pakiz, & Frost, 1993). In a follow-up study of youth (8 to 16 years old) who experienced the 1988 Armenian earthquake, 90% met DSM-III PTSD diagnostic criteria (Pynoos, et al., 1993).

La Greca and Prinstein (2002) found moderate to severe symptoms of PTSD in 30% to 50% of children who were exposed to a natural disaster, while 5% to 10% met full diagnostic criteria. In a meta-analysis of 34 samples of children, Fletcher (2006) found that 36% of children, compared to 24% of adults, met diagnostic criteria for PTSD in a range of disasters. These rates did not differ across developmental levels.

Given the aforementioned rates, PTSD appears to be one of the most common disorders among young adults (ages 21 to 30) when compared to other disorders such as depression (Davis & Siegel, 2000), and is likely prevalent in child samples as well. However, to date, there are no population-based epidemiological studies examining the prevalence rates of PTSD in children (Gabbay, Oatis, Silva, & Hirsch, 2004).

The wide range of prevalence rates of PTSD in children could be because there is no definitive way to assess symptoms in children. Additionally, not all assessments are conducted at the same interval of time from the disaster, and it is known that symptoms typically decrease with

time. For example, Stallard, Salter, and Velleman (2004) found that rates of children aged 7 to 18 years meeting PTSD criteria following motor vehicle accidents varied based on the time since the accident. At four weeks post-accident, 29% of the children met diagnostic criteria, while 14% met criteria at 9-month follow-up. La Greca and colleagues (La Greca, Silverman, Vernberg, & Prinstein, 1996) also found decreasing rates of PTSD symptoms over time in a sample of children ages 7 to 10 after Hurricane Andrew. More specifically, 29.8% of the children were reporting severe to very severe levels of PTSD symptoms at 3 months post-disaster, while rates decreased to 18.1% at 7 months, and 12.5% at 10 months following the hurricane.

Assessment procedures and measures used in studies vary, and in most research, posttraumatic stress symptoms (PTSS) are assessed rather than a full diagnosis of PTSD (Lonigan, Anthony, & Shannon, 1998). However, it is important to continue to assess for PTSS. Although children may not exhibit enough symptoms for a diagnosis of PTSD, many children still report distress following a traumatic event (Lack, 2001). Extant literature suggests that PTSS are relatively stable over time, particularly without any form of intervention. In a prospective study by La Greca et al., (1996) children who reported moderate to severe levels of PTSD had also been observed to be previously demonstrating higher levels of distress. Research has shown that subclinical levels of PTSD are common (Aaron, Horacio, & Emery, 1999) and can cause significant enough distress to require treatment even without full diagnostic criteria being met (Pfefferbaum, 1997). Given this knowledge, it continues to be important to assess for PTSS in children, who are in need of intervention even though they may not meet criteria for PTSD.

Long-term Effects of Trauma

With the increase of child-related PTSD research, it has been recognized that reactions are not transient, but have potential long-term effects on children. Four years following the Chowchilla school-bus kidnapping, Terr (1983) found significant levels of distress in the children as evidenced by thought suppression, omen formation, a sense of foreshortened future, nightmares, repetitive play, and somatic disturbance (i.e. bladder control, increase in weight,

stomachaches). Uncharacteristic changes in attitudes towards others and about life were also observed (Terr, 1991).

In a study of 92 children ages 7 to 10 attending school in a neighborhood that was moderately affected by a hurricane, La Greca et al., (1998) found that levels of anxiety and inattention were elevated at 7 months post-disaster. Decreases in academic achievement were also seen. Another study of 533 children and adolescents (ages 11 to 21) who were affected by the 1997 flood in southwestern Poland, found that at 28 months post-disaster, 17.7% of the participants were still meeting criteria for PTSD (Bokszczanin, 2007). More symptoms were observed in younger participants than in older participants, and also more symptoms in older girls than in older boys. Similarly, Pynoos and colleagues (1993) found that 18 months after an earthquake, symptoms of PTSD were elevated, as were levels of guilt and difficulties concentrating. In a 15-month follow-up after a severe hurricane, more than 60% of children (grades 4 to 8) showed elevated PTSS and levels of depression (Jaycox et al., 2010).

Other long-term effects of trauma include academic functioning. McFarlane, Policansky, and Irwin (1987) found a decline in academic achievement, increases in absenteeism, behavioral disturbances, and anxiety between 8 months and 26 months after a bushfire in Australia. Similar decreases in functioning were reported both from parents and teachers of the exposed children. Additionally, in a sample of school-aged children, many demonstrated memory (43.8%) and attention (32.9%) difficulties post-disaster (Shannon et al., 1994). Those with a formal diagnosis of PTSD demonstrated a greater decrease in school performance, with older children being at the greatest risk.

Social functioning and support is another area that should be assessed following a disaster. Loss of jobs, relocation, and changes in daily routines can remove disaster victims from their social support groups. Kaniasty and Norris (1995) found that changes in social support as a consequence of a natural disaster have been shown to be a leading contributor to depressive symptoms. Decreased social support was also related to higher levels of PTSD in children

exposed to a hurricane and support from peers and teachers appeared particularly important for the well-being of children following a major disaster (Vernberg, La Greca, Silverman, Prinstein, 1996).

Children and adolescents who are exposed to traumatic events exhibit varying levels of symptoms and severity. Green and colleagues (1991) developed a conceptual working model of the processing of a traumatic event for children, noting the primary factors that interact to determine short- and long-term responses and adaptations to events. The following factors are included: 1) characteristics of the stressor itself, such as loss and threat of lives, and physical disturbance; 2) cognitive processes about the event, including magical thinking, appraisals, avoidance and intrusion; 3) individual characteristics, (age, sex, intelligence, and coping style); and 4) environmental traits, such as family reactions, disruption of routines, support systems (peer and school) and other life events (Green et al., 1991).

Characteristics of exposure to the disaster can predict the development and severity of posttraumatic stress symptoms. Vernberg et al., (1996) found that more than 60% of the variance of children's self-report symptoms 3 months after Hurricane Andrew was accounted for by previous exposure to traumatic events, individual characteristics of the children, access to social support, and coping strategies. La Greca et al., (1998) also found that exposure to the event and preexisting individual characteristics were positive predictors of PTSS in children. Additionally, perceived life threat and loss, and disruption following the event contributed to PTSS. Following the Buffalo Creek dam collapse; the primary predictors of PTSS were loss and life threat, demographic characteristics, parental functioning, and family environment (violent, irritable, depressed, supportive) (Green et al., 1991). Following Australian bushfires, it was found that early identification of individuals with a greater perception of threatened life and more ongoing life disruption may be associated with a greater risk for persistent and increased levels of severity in PTSS (Yelland et al., 2010).

Overall, level of exposure has been most consistently associated with PTSS (Pine & Cohen, 2002) following a variety of traumas including a bus accident (Milgram et al., 1988; Tyano et al., 1990), sniper attack (Nadar et al., 1990, Pynoos & Nadar, 1989), and hurricane exposure (Shaw, Applegate, et al., 1995; Shaw, Applegate, & Schorr, 1996). Empirical evidence denotes that many variables contribute to the development of PTSS; therefore, a multi-dimensional assessment of post disaster functioning is warranted. Variables worth including in a multi-dimensional assessment include attributions and coping strategies.

Demographic Characteristics as a Prediction of Distress

Subsequent research has investigated differences in the development of PTSS in children following disasters. Multiple studies have found gender, age, and ethnic differences to be factors in the development and duration of PTSS. Females generally experience more PTSS, at a greater level of severity (Green et al., 1991; Pynoos et al., 1993; Shannon et al., 1994; Yule et al., 2000; Foa et al., 2001) and for a longer duration (Shaw et al., 1996; Vernberg et al., 1996), while boys show higher rates of behavioral symptoms, such as aggression and acting out (Dyregrov & Yule, 2006). While the reasons for gender differences are not known, Pynoos et al., (1993) suggests females may express their concerns more readily compared to boys. However, not all studies find this gender difference (La Greca et al., 1996; La Greca et al., 1998; Valentino, Berkowitz, & Stover, 2010), so further examination of gender differences is necessary.

Several researchers have also found age as a positive predictor of PTSS, with younger children having the greatest risk for symptoms (McFarlane, 1987; Shannon et al., 1994). Again, not all studies support a significant age difference (Green et al., 1991; Foa et al., 2001; Valentino et al., 2010).

Lastly, some research has supported ethnic differences in PTSS. La Greca and colleagues (1998) found that after controlling for level of exposure, African-American children reported more persistent PTSS than Caucasian, Hispanic, and Asian American children 7 months following exposure to a hurricane. Consistent with La Greca et al., (1996), ethnic differences

have not been found immediately following the hurricane, but have only been observed in longer term PTSS. Following a hurricane in Florida, Perilla, Norris, and Lavizzo (2002) examined ethnic and cultural differences. They found that Caucasians showed the lowest rates of PTSS at a six-month follow up, while Latinos preferring to speak Spanish showed the highest rate of symptoms. African-American rates fell between these groups. Collectively, ethnic differences in relation to trauma are not well understood and should be examined more closely. It is unclear if true differences exist, or if some differences may be explained by measurement limitations, particularly in the assessment of PTSS.

Challenges to PTSS Assessment

Understanding how and to what extent children experience PTSS following a traumatic event requires the use of measures and assessment tools to detect PTSS. Such measures are typically found in the form of rating scales and interviews. While many self-report and parent-report tools exist, there is not a gold-standard assessment tool and few well-validated DSM-IV based standardization measures (Hawkins & Radcliffe, 2006).

With existing literature documenting differences in PTSS in children and adults, the quality and quantity of assessment scales available are still lacking. Other challenges surround the assessment of PTSS in children. Many of the scales are not designed to assess chronic trauma or multiple traumas (Hawkins & Radcliffe, 2006), but rather single traumatic events. While the measures do ask the informant to specify a traumatic event, valuable information may be lost if the child has experienced chronic or multiple traumas.

The majority of the measures are child interviews, with companion parent interviews, or self-report scales. Few studies include both parent and child reports, and diagnoses based solely on child report may be problematic. Research supports the reliability of youth-reports for internalizing symptoms, but parent or teacher reports are often needed to assess externalizing symptoms (Vogel & Vernberg, 1993). In a recent study, Stover and colleagues (2010) found that agreement between parents and children about the type of potentially traumatic event, the impact

of the event on the child, and the symptoms following the event were relatively poor. Consistent with previous research, some of the poor outcomes on agreement of perception of traumatic events could also be due to internalizing symptoms, as they are more difficult for parents to report (Achenbach, McConaughy, & Howell, 1987; Sourander, Helstela, & Helenius, 1999; Martin, Ford, Dyer-Friedman, Tang, & Huffman, 2004).

Additionally, the measures are often used with ethnic minorities, although most were standardized on Caucasian, non-Hispanic, samples from the United States. As previously stated, not all research is U.S. based, and oftentimes ethnic minorities are included in studies. Perhaps more information on ethnic differences related to trauma could offer insight to the contrasting results of higher rates of symptoms. Jensen and colleagues (1999) propose that an ideal trauma assessment would be multi-informant including child and parent, and possibly teacher reports. Findings about the congruence between parent and child reports are mixed, and further systematic investigation using multiple informants is warranted. While difficulties with reporting and assessment of PTSS continue, coping strategies have also been targeted as having an effect on PTSS and should be considered when studying the impact of trauma on children.

Coping Strategies

The most widely used definition of coping comes from Lazarus and Folkman (1984), who state that coping is an emotional and behavioral process that changes with time and within each individual, and is a function of encountered stressors, individual appraisals of the stressors, and the efficacy of coping strategies. It is suggested that successful coping can increase general flexibility and childhood resiliency, as well as increasing the likelihood of adaptive stress management in the future. Recurring failures in coping can result in anxiety, frustration, and defensive rigidity (Curry & Russ, 1985).

Several dimensions of coping are discussed in the literature. The most widely used dimensions of coping are "problem- versus emotion-focused coping, primary versus secondary control coping, and engagement (approach) versus disengagement (avoidance) coping" (Compas,

Conner-Smith, Saltzman, Thomsen, & Wadsworth, 2001, pp. 91). Problem-focused strategies include seeking out information, generating possible solutions to the problem, and taking action to change the stressful circumstances. In contrast, emotion-focused strategies include expressing one's emotions, seeking comfort and support from others, and trying to avoid the source of the stress (Lazarus & Folkman, 1984). Problem-focused and emotion-focused strategies are the two general types of strategies on which Spirito's well-known coping measure, Kidcope, is based (Spirito, Stark, & Williams, 1988). Although widely used, this dimension of coping has been widely criticized for placing many types of coping into these two general categories (Compas et al., 2001). First, to avoid difficulties in scale construction, each coping strategy is assessed with a single item on the Kidcope, limiting the ability to assess reliability. Additionally, items may represent more than one coping strategy (i.e. behavioral avoidance, emotion regulation, problem solving), making it difficult for researchers to know which strategy a child was actually using to cope with the traumatic event.

An alternative dimension of coping is primary control versus secondary control. Primary control refers to strategies directly used to regulate one's own emotions or to influence objective events (problem solving). Secondary control involves efforts to adapt or fit into the environment and may include cognitive restructuring or acceptance. These dimensions have been used to describe the nature of coping responses and the goals expected to come from the responses, however, this does not include many forms of disengagment coping such as denial, avoidance, or wishful thinking (Compas et al., 2001).

Engagement and disengagment coping have received significant attention in children and adolescents (e.g. Ebata & Moos, 1991). Engagement coping incorporates responses toward the source of the stress or one's emotions or thoughts (seeking support or problem solving), while disengagement refers to responses oriented away from the stress or thoughts and emotions (denial or withdrawal) (Compas et al., 2001; Ebata & Moos, 1991; Lazarus & Folkman, 1984). These

dimensions, similar to problem- and emotion-focused strategies, have also received criticism for being overly broad and for the failure to distinguish distinct subtypes of coping.

A variety of specific subtypes of coping in children and adolescents has been proposed, including: problem solving, information seeking, seeking understanding, blaming others, self-criticism, catastrophizing, avoidance, cognitive restructuring, emotional release, wishful thinking, suppression, humor, withdrawal, distraction, acceptance, denial, substance use, seeking social support or information, and religion. These categories were identified through factor analyses, conceptual grouping of items, or a combination of these methods. However, there has been little consistency in the use of these subtypes across coping measures and studies of coping making a comprehensive understanding of child and adolescent coping difficult (Compas et al., 2001). Given that there are different definitions of coping, and that the emphasis of coping varies from study to study, there is no "gold standard" measure that has been found to assess coping (Spirito, 1996).

Differences in Coping

The use of coping strategies appears to differ with age. Altshuler and Ruble (1989) found an age-related increase in the ability to managing emotions in uncontrollable situations using cognitive instead of behavioral activities. They also reported that cognitive abilities allow older children more flexibility in coping with stressful situations. Spirito, Stark, Grace, and Stamoulis (1991) found that younger children (9 to 11 years) used cognitive restructuring, problem solving, emotional regulation, and wishful thinking more than older children (age 14) independent of their perceived problem. Furthermore, Curry and Russ (1985) found that when faced with a dentist visit, older children (age 10) used more cognitive and fewer behavioral strategies, and tended to focus more on positive aspects of the stressor, using more cognitive responses for coping compared to the younger children (age 8). Children tend to have underdeveloped cognitive mechanisms (Gibbs, 1989), have more reliance on their parents (Atkins, 1991), and less life

experience to learn and incorporate other skills (Huzziff & Ronan, 1999). Findings suggest there may be changes in coping based on developmental levels.

Gender differences in the use of coping strategies are mixed. No differences in coping strategies were found in a sample of children (8- to 10-years-old) visiting the dentist (Curry & Russ, 1985). However, Spirito et al., (1991) found a few gender differences in a group of children (9- to 13-years-old) who were being grounded by their parents. Specifically, females were more likely to use problem-solving skills, while males were more likely to blame others. However, Stark, Spirito, Williams, and Guevremont (1989) found greater differences in older adolescents (14 to 17 years old) who were asked to think about a problem they had experienced in the previous month. Females reported using social support more than males, and found it to be more effective. Males used wishful thinking and perceived resignation, finding it more effective than females. Likewise, Russoniello et al. (2002) found that females were more likely than males to use social support to cope following Hurricane Floyd. Findings such as these suggest that females are more expressive and seek more social support to deal with stressful situations, compared to males more solitary strategies (Stark et al., 1989). While additional research is needed to make more definitive conclusions about possible gender and age differences in coping strategies, research does suggest that children use a variety of strategies to cope with stress.

Coping, PTSD Symptoms, and Natural Disasters

Research of coping strategies following exposure to natural disasters is extremely limited, and the coping strategies that a child uses to cope with the disaster can affect his/her symptoms of posttraumatic stress and other mental health issues. Following exposure to a hurricane, social withdrawal, self-blaming, and emotional regulation were all associated with more symptoms of depression in a group of third- to fifth graders (Jeney-Gammon, Daugherty, Finch, Belter, & Foster, 1993). Lower levels of depressive symptoms were found in children who engaged in cognitive restructuring techniques and sought social support from others. Huzzif & Ronan (1991) studied 187 children recruited from surrounding communities following the Mount Ruapehu

eruptions in New Zealand. They found that home factors (upsetting talk at home about volcano, perception of parental upset), positive caregiver communication, and initial coping were the largest predictive factors for overall coping. At one month post-disaster, exposure explained the most variance in children's coping abilities; however, with time the largest predicative factor was the children's initial coping.

Russoniello et al., (2002) found that six months after Hurricane Floyd, fourth grade children were more likely to use wishful thinking, cognitive restructuring, social support, distraction, emotional regulation, and problem solving strategies to cope. Wishful thinking was the most used coping strategy, and the strategy found to be least associated with PTSS. Social withdrawal, resignation, blaming others, and self-criticism were used less often, but were most strongly associated with PTSS.

Following Hurricane Andrew, Vernberg et al., (1996) examined four types of coping and the effects on child trauma related stress. The four factors examined were positive coping (efforts to maintain/regain a positive emotional or cognitive state), blame and anger, wishful thinking, and social withdrawal. Coping in general explained 21% of the variance in total PTSS, with higher levels of coping variables being associated with more PTSS. Blame and anger accounted for 36% of the variance for the total effects of the coping variables.

Since PTSS change over time, and appear to be affected by coping strategies, there is a need for more research in this area. Compas and Epping (1993) stated that coping strategies and PTSS should be studied at different points following a disaster to determine demands and changes in the stressor, relative to strategies employed by children and other resources available.

Overall, there are a variety of more and less efficacious coping strategies that children can employ following a natural disaster. In addition to these individual coping strategies, friends, parents, and teachers can also aid in the coping process by offering coping assistance. Through the employment of effective coping strategies and assistance, it would be expected that symptom levels and severity of PTSS would decline overtime following a traumatic event. However,

coping mechanisms that children use following a disaster is a gap in the extant literature (Vogel & Vernberg, 1993; Vigna, Hernandez, Kelley, & Gresham, 2010). Patterns of coping have not been extensively examined and therefore information on coping over time (Russoniello et al., 2002; Prinstein et al., 1996; Compas & Epping, 1993) and across situations (Compas & Epping, 1993) is lacking. Research suggests that the number of coping strategies is associated with higher levels and severity of PTSS (Vernberg et al., 1996; Jeney-Gammon et al., 1993). More longitudinal designs to assess coping strategies and the changes over time would be particularly helpful.

Attribution Styles

Similar to research on children's coping, there is limited research on children's attribution styles in response to natural disasters. According to the attribution theory, people generally have a need to give an explanation to why something has happened, particularly when the event is unusual, unexpected, or unwanted (Joseph, Brewin, Yule, & Williams, 1993). While there is ample research examining the role of attribution styles in other areas of life, such as depression in adolescents (Garber, Keiley, & Martin, 2002; Conley, Haines, Hilt, & Metalsky, 2001; Joiner & Wagner, 1995), there is little research addressing the role of attributions in disaster situations, particularly natural disasters. Instead, many findings from other areas of attribution research (i.e. chronic illness, depression) are generalized to traumatic situations. Some disaster-specific studies have shown that attribution style can play a significant role in mediating reactions to a traumatic event or disaster (Greening, Stoppelbein, & Docter, 2002).

Existing research does suggest a link between number of attributions made for a situation and amount of distress for the situation (Dollinger, 1986; Downey, Silver, & Wortman, 1990). In general, individuals who make more attributions for a situation, or are more concerned about attributions, tend to be more distressed. Rubonis and Bickman (1991) studied attributions of adult victims of a flood, which resulted in 10 deaths and millions of dollars of damage. Generally, it was found that blaming an external source for the traumatic event (flood) was

related to a higher incidence of pathology than was self-blame (Rubonis & Bickman, 1991). In a sample of individuals paralyzed with spinal cord injuries, self-blame was a predictor of more positive coping and adjustment, while blaming another and feeling as if the accident could be avoided were predictors of poorer coping and adjustment (Bulman & Wortman, 1977).

More recently, Greening and colleagues (2002) investigated attributions of undergraduates following an earthquake leaving 72 people dead, and the community severely damaged. One year after the earthquake, attributions of negative outcomes to internal, stable, and global causes were mediators of the link between disaster exposure and depressive symptoms. More specifically, characterological self-blame (blaming the event on negative personal attributes) was a significant mediator between earthquake exposure and depressive symptoms. However, negative attributions were not found to be a mediating factor between disaster exposure and PTSD symptoms, meaning no significant differences were found in behavioral self-blame (actions of the victim to cause the disaster). This may be explained, because unlike other natural disasters, survivors cannot be forewarned to take safety measures and avoid the consequences of the impending earthquake.

While there is little research on attributions following natural disasters, there are even fewer studies investigating attributions and natural disasters in children. Dollinger (1986) investigated fifth- and sixth graders playing soccer that experienced a lightning bolt strike to the field. Three children were knocked unconscious, one who later died. Generally, the children who made any attribution were more upset than the children who did not make an attribution for the disaster. However, attributions made to God or random chances were not associated with more distress. Dollinger (1986) suggests this could indicate less time spent dwelling on the traumatic event. Based on this limited research, children's attributions are important because attributions may influence many aspects of life, including self-perception and peer relationships, while also contributing to distress level and PTSS (Dollinger, Staley, & McGuire, 1981).

One of the problems that have been noted with research in this area is the lack of measures designed to assess attributions and distress in children exposed to a traumatic event. Many measures include the use of hypothetical situations, which provide limited insight into how children actually make real-life attributions (Palmer & Rholes, 1989). These measures also provide little information when trying to explore the links between attributions and disasters (Downey et al., 1990). Additionally, depending upon the age of the child, they may not have the cognitive abilities necessary to properly understand and report on hypothetical situations. Other methods use open-ended questions, limiting reliability across individuals and studies (Dollinger et al., 1981).

Recently, attempts have been made to design new questionnaires to effectively assess attributions of children and reduce problems with reliability and relevance. The Children's Attributional Style Interview (CASI; Conley, Haines, Hilt, & Metalsky, 2001) is a measure designed to assess attributions in children age five and up. Data suggest that the CASI is a psychometrically sound measure of attribution styles (Conley et al., 2001; Rueger & Malecki, 2007; Rueger, Haines, & Malecki, 2010), but so far has only been used with a depressed population. Findings may not generalize to other populations, such as those who have experienced a natural disaster. The Trauma Attribution Checklist (TAC; Knight & Sullivan, 2006) is a self-report measure that was designed to measure children's trauma-related attributions. Attributions such as internal and external causes, controllability, responsibility, expectations, hypervigilance, meaning, and omen formation are examined. Preliminary data of the TAC shows it to be highly related to PTSD symptoms, and coping strategies. Further use of the TAC supports previous research, showing that attributions in children as young as 8-years-old is related to the amount of long-term distress, being most predictive of distress, especially when searching for meaning to a disaster (Lack & Sullivan, 2008). Given the limited amount of research examining attribution styles and disasters in children, further research is necessary,

particularly with natural disasters. Additionally, attributions measures such as the TAC are still in their infancy of development, and further study is warranted.

Summary

Based largely on the influential work of Terr, PTSD and PTSS became recognized in the early 1980s as a disorder that affects adolescents and children. Research has shown that children experiencing a disaster are likely to have some sort of negative experience, even if only for a short period of time. However, for some children, these negative experiences may persist and cause disruptions in their daily functioning. Impacts such as these have been observed as worry or anxiety, a decrease in academic functioning, diminished social functioning or support, and difficulties in concentration. While aversive side effects are well documented, further research is needed to examine and compare short- and long-term distress with a more systematic approach.

It is well documented that various factors contribute to PTSS following a natural disaster. Although models are available for some types of trauma in children (sexual abuse; Finkelhor, 1984; Ward & Hudson, 2001), there is no widely accepted theoretical model of PTSS. In 1991, Green and colleagues proposed a conceptual working model of the processing of a traumatic event for children, noting factors that may determine short- and long-term responses. Conceptualizations, such as the one proposed by Green et al., (1991), have led to changes in PTSS research and PTSD criteria in recent revisions of the DSM-IV, such as the inclusion of perceived threat of a traumatic event. However, to date, no single model (including Green et al., 1991) has been empirically tested or is widely accepted in the PTSS child literature.

Although criteria for PTSD are evolving and researchers have acknowledged that subclinical levels of PTSS are important, at this time, the generalizability of child research is limited. Currently, measures that assess presence of PTSS include interviews, self-report scales, and parent scales. However, there is an inconsistency of measures and reporters used across studies. Some studies are based solely on the self-reported distress of children, and others are based on the perceived distress observed by others (parents or teachers). At this time, there are

mixed findings about the usefulness of multi-informant reports on symptoms of posttraumatic stress. Generally, research shows that although parents and teachers are not the best informants for internalizing symptoms of stress, they are more reliable when providing information about externalizing symptoms. Additionally, research suggests that self-report (for children over 8-years-old) is necessary to fully understand how a child is functioning following a traumatic event. To expand on the existing literature, a more thorough investigation is needed comparing multi-informant reports; such studies should include the use of standardized and comparable self-report and other-report measures.

While more recent research has suggested that children with subclinical levels of PTSD are still important and warrant further investigation, existing studies are difficult to compare based on their varying levels of symptomology. Some studies only included children with diagnosable PTSD, while other studies included varying levels of symptoms and severity. One way to combat such issues is to ensure the use of accepted and psychometrically sound assessment tools in future research. Particularly of importance are tools that assess PTSS. Through the use of standardized tools, researchers should be able to gather more systematic data that should facilitate comparison across studies.

Several studies documenting negative outcomes in children up to two years post-disaster are available. However, studies examining outcomes during multiple points throughout this period are more limited. Therefore, researchers are unsure when or if children who have experienced a traumatic event return to pre-disaster levels of functioning. Furthermore, it is unknown if functioning fluctuates over time after exposure. Childhood is a time of rapid growth in many areas of functioning (physically, socially, and academically), and a time that children may be more receptive to change if needed. Given the importance of this time in a child's life, it is crucial to understand how exposure to a traumatic event changes and affects them over time. Knowledge and documentation of these changes can ensure appropriate and timely interventions, in hopes of returning children to their pre-disaster functioning in all domains.

As discussed in the literature review, it is well accepted that many factors can lead to the development and maintenance of PTSS. Two such factors that have been of interest in children who have experienced traumatic events are coping strategies and attributions. The use of coping strategies has been shown to be associated with levels of distress. To this point, most of the research investigating coping strategies has been completed with children diagnosed with chronic illnesses, with generalizations being made to traumatic events. To better understand how children are able to cope with traumatic events, specifically natural disasters; more research on coping strategies is necessary. An investigation of the use of different coping strategies and number of coping strategies across time is warranted. The identification of more or less efficacious coping strategies can aid in the interventions provided by professionals following future traumatic events.

The second factor of interest is attributions about the cause of a traumatic event. While there has been an abundance of pediatric research in attributions, it is focused more on psychopathology such as depression. Generally, the number of attributions made about an event appears to be associated with levels of depression. However, there is very limited research into the attributions children provide for natural disasters, possible links between attributions and PTSS, and how attributions vary across different time periods. An understanding of children's attributions following a traumatic event, and the link between attributions and PTSS would be a definite contribution to the existing literature.

There is limited research examining coping strategies and attributions separately in children who have been exposed to a natural disaster. There is virtually no research that has simultaneously investigated both factors among children. Based on the literature, it is probable that coping strategies, attributions, or a combination of the two may affect symptom severity of distress or the duration of impairments in functioning following exposure to a traumatic natural disaster.

APPENDIX B

TABLES

Table 1
Single Exposure Demographic Information

Relationship to Child	*n*	Percent
Biological Parent	23	100.0

Gender of Respondent	*n*	Percent
Male	3	13.0
Female	20	87.0

Ethnicity	*n*	Percent
Caucasian	18	78.3
Hispanic/Latino	3	8.7
African American	2	13.0

Marital Status	*n*	Percent
Married	17	73.9
Divorced	5	21.7
Widowed	1	4.3

Years of Education	*n*	Percent
Completed High School	15	65.2
1-3 Years of College	5	13.0
Completed Bachelor's	3	8.7

Child Grade	*n*	Percent
3	3	13.6
4	7	31.8
5	5	22.7
6	7	31.8

Family income (yearly)	*n*	Percent
Less than $10,000	1	4.5
$10,001 - $20,000	3	13.6
$20,001 - $30,000	4	18.2
$30,001 - $40,000	2	9.1
$40,001 - $50,000	2	9.1
$50,001 - $60,000	2	9.1
$60,001 - $70,000	6	27.3
$70,001 - $80,000	0	0.0
$80,001 - $90,000	1	4.5
$90,000 - $100,000	0	0.0
Over $100,000	1	4.5

Age of Respondent	*M*	*SD*	Range
	34.96	6.9	26 to 52

Child Age (Child Report)	*M*	*SD*	Range
	10.38	1.3	8 to 13

Gender of Child (Child Report)	*n*	Percent
Male	11	45.8
Female	13	54.2

Foot Note: *n*'s may not equal total sample number due to questions left unanswered on the questionnaire

Table 2
Multiple Exposure Demographic Information

Relationship to Child	*n*	Percent
Biological Parent	50	87.7
Step-parent	2	3.5
Adoptive Parent	1	1.8
Other	4	7.0

Gender of Respondent	*n*	Percent
Male	7	12.1
Female	52	87.9

Ethnicity	*n*	Percent
Caucasian	37	64.9
Hispanic/Latino	8	14.0
American Indian	4	7.0
African American	3	5.3
Asian/Asian-American	2	3.5
Biracial	2	3.5
Other	1	1.8

Marital Status	*n*	Percent
Married	38	66.7
Divorced	6	10.5
Separated	3	5.3
Single	6	10.5
Widowed	1	1.8
Living with partner	3	5.3

Years of Education	*n*	Percent
1st to 11th grade	10	17.7
Completed High School	17	25.0
1-3 Years of College	22	38.6
Completed Bachelor's	4	7.0
Graduate Education	4	7.0

Family income (yearly)	*n*	Percent
Less than $10,000	4	7.0
$10,001 - $20,000	12	21.1
$20,001 - $30,000	9	15.8
$30,001 - $40,000	10	17.5
$40,001 - $50,000	4	7.0
$50,001 - $60,000	2	3.5
$60,001 - $70,000	5	8.8
$70,001 - $80,000	3	5.3
$80,001 - $90,000	1	1.8
$90,000 - $100,000	4	7.0
Over $100,000	3	5.3

Age of Respondent	*M*	*SD*	Range
	36.8	7.0	26 to 56

Gender of Child (Child Report)	*n*	Percent
Male	25	43.1
Female	33	56.9

Child Age (Child Report)	*M*	*SD*	Range
	10.0	1.0	8 to 13

Child Grade	*n*	Percent
3	13	23.2
4	15	26.8
5	18	32.1
6	10	17.9

Foot Note: *n*'s may not equal total sample number due to questions left unanswered on the questionnaire

Table 3

Group and Time Descriptive Information for Measures

	UCLA-PTSD-RI	Kidcope Total Coping Strategies	Positive Coping Strategies	Negative Coping Strategies	TAC Total Attributions	BASC-2 Behavioral Symptoms Index
Single Exposure						
Time 1						
M	12.38	6.33	2.88	2.54	9.75	52.20
SD	15.07	3.67	1.96	1.69	7.17	12.03
Range	0 to 53	0 to 13	0 to 6	0 to 5	0 to 27	35 to 86
Time 2						
M	15.36	5.20	0.40	1.71	10.16	
SD	15.84	3.52	0.82	1.1	8.04	
Range	0 to 51	0 to 13	0 to 3	0 to 4	0 to 25	
Multiple Exposure						
Time 1						
M	21.13	7.10	2.88	3.19	14.36	50.53
SD	13.47	3.07	1.57	1.42	8.06	10.96
Range	0 to 57	0 to 13	0 to 6	0 to 5	0 to 30	34 to 87
Time 2						
M	22.28	7.16	0.76	1.91	16.55	
SD	15.74	2.85	0.82	1.05	9.01	
Range	0 to 55	0 to 13	0 to 3	0 to 4	0 to 37	

Table 4

Time 1 Summary of Stepwise Regression for Variables Predicting the PTSS

Step	β	Multiple *R*	R^2	Adjusted R^2	R^2 Change	*F* Change
1. Level of Exposure	0.568	0.568	0.322	0.309	0.322	25.194*
2. Total # of Attributions	0.525	0.704	0.496	0.477	0.174	17.934*
3. Total # of Coping Strategies[a]	0.170	0.718	0.515	0.487	0.019	2.045

[a] = Excluded Variable * $p < .001$

Table 5

Time 2 Summary of Stepwise Regression for Variables Predicting the PTSS

Step	β	Multiple *R*	R^2	Adjusted R^2	R^2 Change	*F* Change
1. Level of Exposure	0.591	0.591	0.350	0.336	0.350	26.338*
2. Total # of Attributions	0.610	0.806	0.650	0.635	0.300	41.085*
3. Total # of Coping Strategies[a]	0.135	0.812	0.659	0.638	0.010	1.355

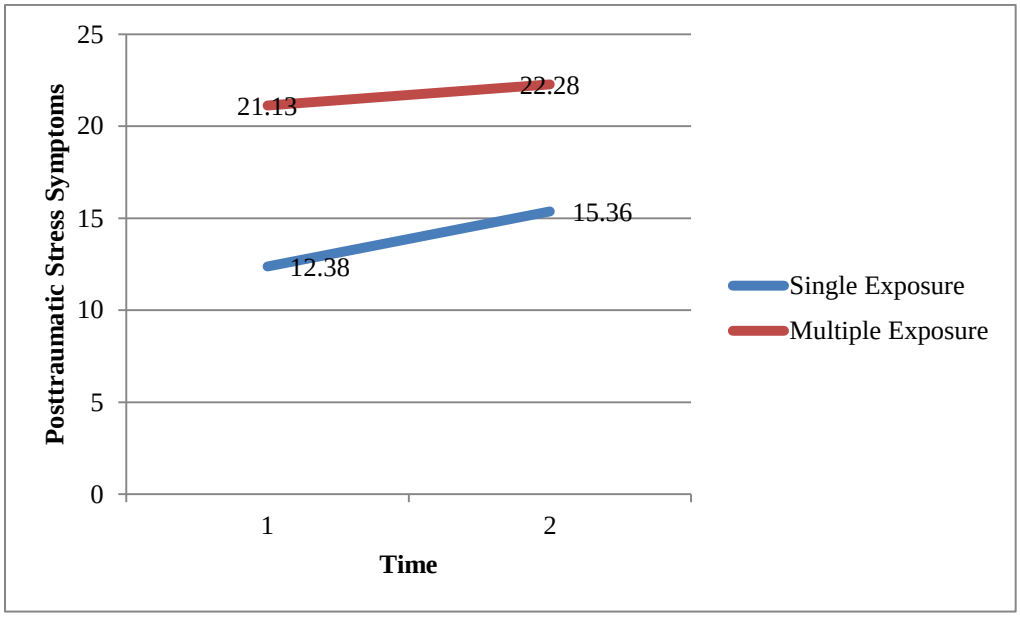
[a] = Excluded Variable * $p < .001$

APPENDIX C

FIGURES

Figure 1

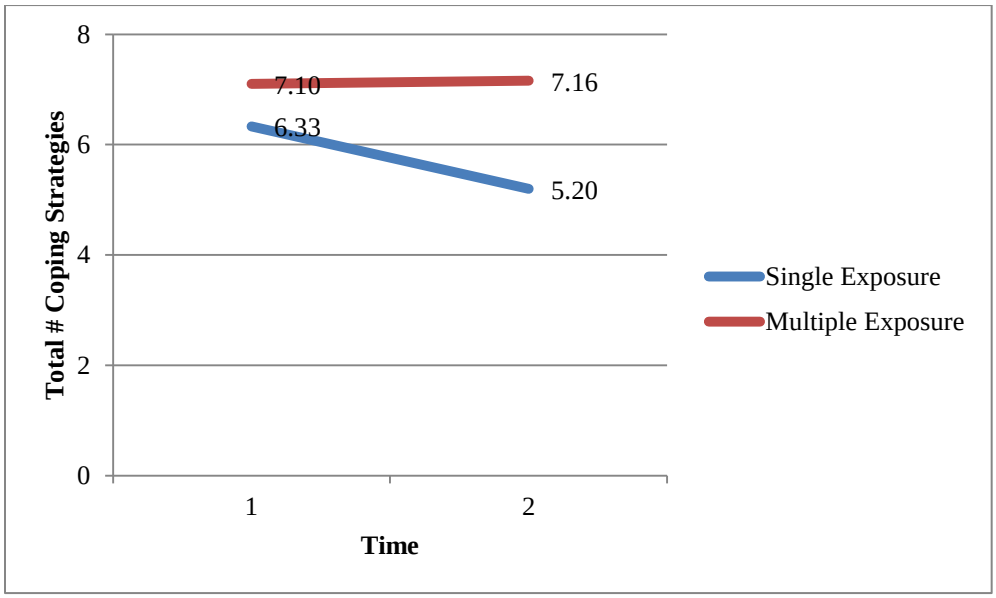
Posttraumatic Stress Symptoms



Note: Significant main effect of group (p = .009)

Figure 2

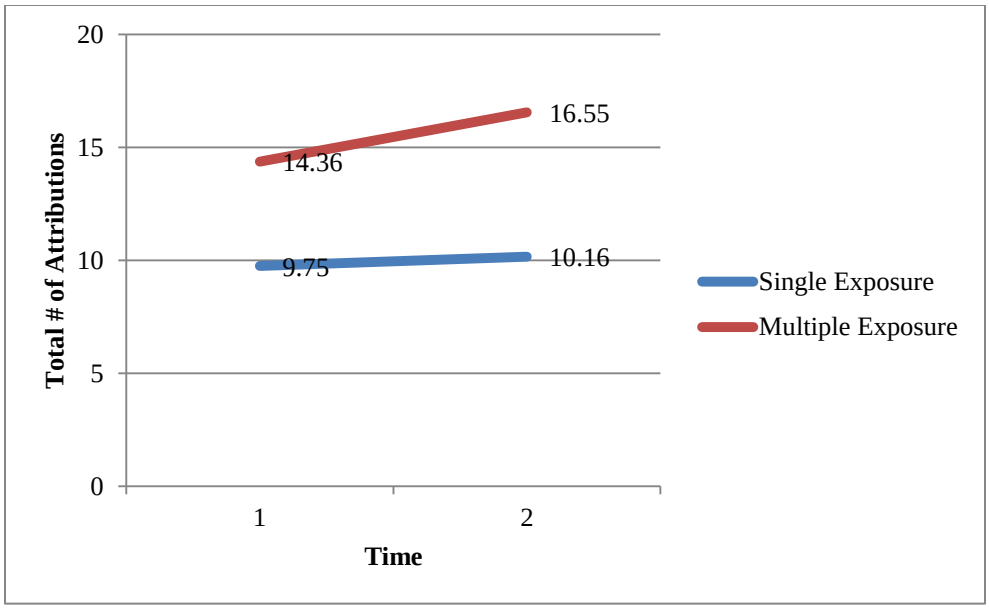
Total Number of Coping Strategies



Note: Significant main effect of group (p = .005)

Figure 3

Total Attributions



Note: Significant main effect of group (p = .001)

VITA

Sasha D. Jaquez

Candidate for the Degree of

Doctor of Philosophy

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Name: Sasha D. Jaquez Date of Degree: July, 2013

Institution: Oklahoma State University Location: Stillwater, Oklahoma

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Major Field: Clinical Psychology

Scope and Method of Study:

This project was designed to assess long-term posttraumatic stress symptoms, coping strategies and attributions in two groups of children. The first group of children was exposed to a single tornado in May 2010. The second group of children was exposed to multiple tornadoes during the same time period. Parents provided information about their children's exposure to the tornado(es), symptoms of posttraumatic stress symptoms, and general overall functioning. Children provided information about their own symptoms of posttraumatic stress symptoms, use of coping strategies, and attributions at two different data collection points (20-months and 23-months post-disaster).

Findings and Conclusions:

This project provided long-term follow-up for two groups of children who were exposed to either a single tornado or multiple tornadoes in May 2010. The results of the study show that even two years post-disaster, children in both the single and multiple exposure groups were exhibiting elevated levels of posttraumatic stress symptoms, but were continuing to exhibit normal levels of functioning. Both groups of children reported using numerous coping strategies and multiple attributions to deal with the tornados. Given that the use of coping strategies and attributions were significantly correlated with symptoms of posttraumatic stress at both time points, findings may suggest that the children have learned to adapt to the tornado exposure. Between the two groups, children in the multiple exposure group reported higher levels of PTSS, use of more coping strategies, and making more attributions than the children from the single exposure group. Exploratory analyses were conducted to examine differences in the use of positive and negative coping strategies, and individual attributions. The results of the study provide valuable information to contribute to gaps in the literature about PTSS, use of coping strategies, and attributions over a longer term following exposure to either a single or multiple traumas. Furthermore, this is one of few studies that have assessed long-term symptoms of posttraumatic stress longitudinally following exposure to tornadoes.

ADVISER'S APPROVAL: Maureen A. Sullivan, Ph.D.