A COMPARISON OF POSTTRAUMATIC DISTRESS RELATED TO SEASONAL NATURAL DISASTERS IN EXPOSED AND NON-EXPOSED CHILDREN

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CHAPTER I

INTRODUCTION

A large number of disasters strike around the world each year, including those that are man-made and those that are a result of natural forces. Increasingly, people have become aware of the damage that occurs not only physically, but mentally to the survivors of these disasters. Prior to the introduction of Posttraumatic Stress Disorder (PTSD) in the third revision of the Diagnostic and Statistical Manual of Mental Disorders (American Psychiatric Association, 1980; DSM-III), clinicians recognized the many problems that trauma could cause in functioning, but most considered them short-lived and transitory (Wilson, 1994). Investigations during the formation of the DSM-III led researchers to realize that a wide range of traumatic events, from man-made (Burgess & Holmstrom, 1974; Chodof, 1963) to natural disasters (Rangell, 1976), produced this distinct disorder.

The reactions of children to disasters were once thought to be less severe and to last a shorter time than the reactions of adults in similar situations. But research since the early 1980s has shown that children have just as profound, or even worse, reactions as adults (Frederick, 1983; Terr, 1983). The most common result of exposure to a trauma is some form of anxiety, with PTSD symptoms being the most common subtype of that (Sugar, 1989). The reactions of children and adolescents have become even more studied

as the harmful effects of trauma on all areas of development, including psychological, biological, and social, become increasingly apparent (Pynoos, 1994).

The purpose of this paper is to examine research that has addressed children's reactions to disaster in the domains of psychological features and symptoms, long-term effects of exposure to traumatic experiences, stability of symptoms. Also examined will be the research concerning possible determinants of long-term distress after a traumatic experience, including environmental and media cues, attribution style, biological changes, and other factors that put one at risk for long-term distress. The purpose of the current study is to examine the posttraumatic distress evidenced by children living in a disaster-prone area and possible factors that could influence the severity of those reactions. Two groups of children will be examined: those who have been recently exposed to a natural disaster and those that have not. The factors examined that could influence such reactions included continued re-exposure to environmental cues, exposure to disaster-related media, attributional style, and biological factors such as age and sex.

Reactions to Trauma in Children

Beginning in the early 1980s, a body of literature concerning children's reactions to trauma began to accumulate. Terr's (1981, 1983a) early case studies of a group of children who had been kidnapped and held hostage were highly influential in developing a conceptualization of PTSD in children. The work of Terr and others (i.e., Gleser, Green, & Winget, 1981) helped to prompt the inclusion of PTSD symptoms specific to children and adolescents in the DSM-III-R (American Psychiatric Association, 1987). Research over the past 20 years has focused on a variety of specific topics in the realm of trauma

reactions, from the long-term effects of trauma on children to the diagnostic utility of current PTSD criteria. These criteria will be examined next.

Current Criteria for Posttraumatic Stress Disorder

The specific criteria for a diagnosis of PTSD have evolved since the DSM-III (American Psychiatric Association, 1980), and are slightly different for children versus adults. As would be expected, one must first be exposed to a traumatic event in which two things have happened. The person must have either experienced or witnessed actual death or severe injury or the threat thereof, and had a response that involved intense fear or feelings of helplessness. Children's responses may instead be expressed as agitation or disorganized behavior. There are three consistent overreaching clusters of symptoms seen in this disorder: reexperiencing, avoidance/numbing, and increased arousal. Symptoms must be present in each of these categories, along with duration of symptoms of at least one month and a significant impairment in functioning, to meet the criteria included in the most recent edition of the DSM (DSM-IV; American Psychiatric Association, 1994).

The reexperiencing cluster of symptoms can manifest itself in several ways, one of which must be present to be diagnosed with PTSD (American Psychiatric Association, 1994). Recurrent and intrusive memories of the event that include perceptions, images, or thoughts are one type of reexperiencing. In younger children, this is often presented as a repetitive play that involves themes relating to the trauma. Distressing dreams that deal with the trauma are another common way of experiencing the trauma again, although in children there could just be distressing dreams with no recognizable content. One of the most widely known reexperiencing methods is that of the flashback, in which the person

acts and feels as though the trauma is once again occurring through hallucinations, illusions, and a sense of reliving the experience. For children, this may be expressed as trauma-specific reenactments. The last way that the trauma may be reexperienced is through psychological or physiological distress when exposed to internal or external cues that either resemble or symbolize some aspect of the trauma.

Someone with a formal diagnosis of PTSD must also experience three symptoms from the avoidance/numbing cluster (American Psychiatric Association, 1994). Avoidance symptoms include avoiding thoughts, feelings, or talking about the trauma; avoiding people, places, or activities that may invoke memories of the trauma; and an inability to remember important features of the trauma. Numbing symptoms include losing interest in participation of activities once enjoyed; feeling detached from others; displaying a flattened affect; and experiencing a sense of a shortened future.

Finally, there must be two symptoms of increased arousal present that were not there before. These can include difficulty falling or staying asleep, increased irritability or anger outbursts, problems with concentration, hypervigilance, and an increased startle response. As mentioned before the symptoms from each category must be present for at least one month and be causing significant impairment in an important area of functioning (American Psychiatric Association, 1994).

There are a number of symptoms associated with PTSD in children but not required for a formal diagnosis. The most common symptoms include frequent somatic complaints, omen formation, survival guilt, anxiety, and depression (Vogel & Vernberg, 1991). While a large number of children will not present with full PTSD symptoms after a traumatic experience, high numbers have been found to experience significant distress

and elevation in PTSD symptoms (Sullivan, Romero, & Hutchinson, 1993). The literature specifically addressing the prevalence of PTSD will now be reviewed.

PTSD and PTSD Symptom Prevalence in Children

Available studies suggest that a substantial number of adults and children may experience trauma at some point in their lives. A longitudinal study that followed 386 children for 14 years found close to 43% had experienced a trauma by age 18, with almost 12% exposed before age 14 (Giaconia et al., 1994). A study by the U.S. Department of Justice (1990) found that adolescents are two and a half times as likely to be the victim of a violent crime as adults. These data would seem to indicate a need to assess the prevalence of PTSD in children and adolescents, but there have been no epidemiological studies to do so. The disorder appears to be relatively common in younger adults (ages 21-30) when compared to other mental disorders such as depression (Davis & Siegel, 2000). This is evidenced by community samples that exhibit lifetime prevalence rates of 6.3%, slightly higher than the older adult population rate of 5.8% (Reinherz, Giaconia, Lefkowitz, Pakiz, & Frost, 1993).

Rates of PTSD after a disaster vary widely, with ranges in the literature being reported from as low as 5% (Shannon, Lonigan, Finch, & Taylor, 1994) to as high as 85% (Shaw, Applegate, & Schorr, 1996). This wide difference may be partly due to the fact that there is currently no definitive way to assess for PTSD in children. Another complication is the fact that not all assessments are conducted at the same time. Ehrenreich (1999) reported rates as high as 90% immediately post disaster, but found rates dropping to between 20-50% within two or three months after the disaster. Milgram,

Toubiana, Klingman, Raviv, and Goldstein (1988) reported moderate to severe rates of PTSD for almost one-half of a child sample one week following a school bus accident, with only 6% reporting moderate to severe PTSD nine months after the accident.

Little is known about the prevalence of PTSD and its symptoms in disaster- or trauma-prone areas. In an early study on reactions to tornadoes, some 75% of the sample was found to have increased psychological distress five months after a tornado hit their town, but very few of those surveyed were found to be in need of intervention (Penick, Powell, & Sieck, 1976). A recent study on the reactions of children to another type of seasonal natural disaster found that 71% of children were experiencing moderate to very severe distress six months after Hurricane Floyd hit their area (Russoniello et al., 2002). Longer-term research on natural disasters have shown very high levels of overall distress even at one year post-disaster, with estimates ranging from 25% (Parker, 1977) to 45% (Lima, Pai, Lozano, & Santacruz, 1990).

Several studies conducted in different parts of Oklahoma, have found higher than normal rates of posttraumatic stress symptoms (PTSS), even in children not exposed to a disaster. Oklahoma is somewhat geographically unique in that it is situated directly in "Tornado Alley" and experiences an average of 54 tornadoes a year (National Weather Service, 2002). Indeed, one recent study found highly elevated levels of distress 13 months after initial exposure to a disaster, with 52% of the sample reporting moderate to very severe posttraumatic distress (Lack & Sullivan, 2003). After an additional six months (19 months post-disaster), close to 40% of the children were still reporting moderate to severe distress. Romero (1997) found that 66% of a sample of Oklahoma children with no record of tornado exposure in the past five years had moderate or higher

levels of PTSS, as measured by the Reaction Index (Frederick, Pynoos, & Nader, 1992). It should be noted that this sample was collected during tornado season, which could have caused a sensitization effect. While such an effect has not been found in research using tornado-exposed samples (Lack & Sullivan, 2003), the same may not hold true for non-exposed samples. The levels of symptoms are still as elevated as trauma samples such as a sniper attack (Pynoos et al., 1987), but lower than previous Oklahoma disaster-exposed samples (Knight, 2001; Sullivan, Romero, & Hutchison, 1993).

Due to the multiple methods used to assess for PTSD, most studies on the subject evaluate for the presence of PTSS rather than a full diagnosis of PTSD (i.e., La Greca, Silverman, & Wasserstein, 1998; Lonigan et al., 1998). This is also done because most children will display at least some signs of distress, even if they do not meet full PTSD diagnostic criteria. As reported in several sources, the most common short-term problems include sleeping problems, such as refusing to go to sleep or having disturbing dreams, repetitive play representing part of the trauma, conduct problems, fearing another trauma will occur shortly, hyperarousal, avoidance and withdrawal from things that will remind them of the disaster, and somatic problems such as head and stomach aches (Ehrenreich, 1999). Rates of PTSS tend to be much higher, as would be expected, than a full diagnosis of PTSD, but differences in which psychological and symptomatic features are assessed for can influence the rates at which PTSS and PTSD are detected. Such features will now be examined.

Psychological and Symptomatic Features of PTSD in Children

As with many mental disorders, PTSD was once thought to be the same in both adults and children, consistent with the idea that children are miniature adults (Ollendick & Hersen, 1989). But beginning with the groundbreaking work of Lenore Terr in the early 1980s, the conceptualization of PTSD in children began to change (Vogel & Vernberg, 1993). Terr conducted a case study following a group of 26 children kidnapped on a school bus and held hostage in an underground trailer for 27 hours (Terr, 1979; 1981; 1983a). She eventually isolated four common characteristics present in most cases of childhood trauma: experiencing strongly envisioned or repeatedly perceived memories, engaging in repetitious behaviors, exhibiting fears specific to the trauma, and changed attitudes concerning the future, aspects of life, and people in general (Terr, 1991).

Terr's work with children who had been traumatized led her to classify traumatic events into two separate categories (Terr, 1991). Traumas that are unanticipated, such as car accidents, were deemed Type I traumas. These traumas are often engraved on the child's memory and followed by misperceptions of the time leading up to the event, where children seek to understand why the trauma occurred and what signs there were that could have signaled the trauma. Typically called "omen formations," this reaction was first identified by Terr (1983b), and is believed to be an attempt by the child to gain a level of control over part of the past due to an inability to cope with the present. Type I traumas have been associated with higher levels of PTSD (Terr, 1981). The second type of trauma, caused by long-term exposure to repeated traumatic events, such as physical or sexual abuse, was deemed Type II traumas. Natural disasters appear to share characteristics of both Type I and II traumas, mostly due to the potentially long-lasting

effects of traumas such as hurricanes or tornadoes. These will be discussed later in this paper.

Although many of the symptoms of PTSD have been described above, not all typical features are present in the DSM-IV's criteria or if present, little description is given concerning the behavior of children with those symptoms. Reenactment of the disaster through play is commonly reported in preschool and grade school children that have experienced a significant trauma. Whether this is a reflection of the presence of pathology or merely a useful coping mechanism is debated (Vogel & Vernberg, 1993). The factor that seems to be the key is whether children become fixated on one aspect of the disaster, as did several of the children in the Chowchilla group (Terr, 1981), or show a development in their play. Saylor, Powell, and Swenson (1992) observed the latter type of play among preschoolers who survived Hurricane Hugo, with their play moving from copying aspects of the disaster to mimicking the reconstruction of the destroyed homes.

Children experiencing difficulty falling or staying asleep after a traumatic occurrence have been reported in multiple studies. Almost 80% of parents surveyed after an earthquake in the Bay Area reported their children had sleep problems (Ponton, Silber, & Bloch, 1991 as cited in Vogel & Vernberg, 1993), making it the most common symptom reported. Similar results were found with a hurricane disaster sample, with over half of the parents of preschoolers reporting sleep refusal or resisting to go to sleep as a problem (Sullivan, Saylor, & Foster, 1991). These results would suggest that sleep problems might be the most common symptom in the increased arousal cluster of DSM symptoms. However, the degree of sleep difficulties has also been associated with the

severity of the disaster (Pynoos et al., 1987), suggesting it may be a typical response and not indicative of pathology.

Several other symptoms have been reported in studies to be present post-disaster, such as increased irritability (Ollendick & Hoffman, 1982), enuresis (Milne, 1977), somatic distress (McFarlane et al., 1987) and guilt (Schwarz & Kowalski, 1991). Unfortunately, research on these symptoms has been rare, leaving little certainty concerning the rates or how indicative of pathology such problems are. More research on possible changes in psychological and behavioral functioning after a disaster is needed. It may be that these symptoms and the others described above differ in their relationship to pathology based on the developmental level of the individual child.

Several authors have seen symptoms of PTSD as being specifically linked to developmental stages, giving evidence of a need for differentiation between adult and childhood PTSD (AACAP, 1998). Many of the non-physical symptoms of PTSD are related to the cognitive development of the child and his or her understanding of that event (Keppel-Benson & Ollendick, 1993). Several developmental issues in particular have been put forth as related to traumatic stress in children, including age at exposure and independence (Pynoos, 1993). Exposure to trauma prior to age 11 was found to result in three times the PTSD levels as exposure afterwards (Davidson & Smith, 1990). Mothers' reactions to a disaster were found to be surprisingly more predictive of development of PTSD in younger children than actual proximity to the disaster (McFarlane, 1987). Such prediction of development is important considering the potential long-term effects of trauma, which will be reviewed now.

Long-term Effects of Trauma

Although some early authors believed that traumatic events could not cause serious psychological distress in children (e.g. Quarantelli, 1985; Quarantelli & Dynes, 1977), research has since shown otherwise. The multitude of problems associated with PTSD symptoms has been shown to be both long lasting and presented in a variety of ways. Adams and Adams (1984) presented some of the first empirical, rather than anecdotal, evidence for a long-term increase in problem behaviors following a disaster. They observed increases of over 200% in monthly mental illness and psychosomatic complaints following the eruption of the Mount St. Helens volcano, as well as an increase in illness related to stress by close to 200% some seven months after the eruption. These increases were equally prevalent in children and adults. Substantial increases in vandalism, arrests, and charges of disorderly conduct of juveniles in the months following the disaster were also observed. The authors postulated that the increase in problem behaviors was the observable result of the psychological trauma inflicted by the eruption.

These long-term effects can cause problems in areas of life such as school functioning (La Greca, Silverman, & Wasserstein, 1998; Shannon, Lonigan, Finch, & Taylor, 1994). Both self-reports (Shannon et al., 1994) and teacher reports (McFarlane, Policansky, & Irwin, 1987) indicate a decline in school performance following a disaster. McFarlane et al. (1987) found significant decreases in achievement in school among youths exposed to a devastating bushfire eight months post-disaster. Even more surprising is that the rate of under achievement actually increased over time, with almost

25% of the sample not performing to their full expected potential at 26 months post-disaster. In a large sample of school-age children, Shannon et al. (1994) found that memory and attentional difficulties were displayed in a large percentage of the children who had been exposed to a disaster (43.8% and 32.9%, respectively). In addition, children who could be classified as having PTSD had a decrease in school performance over three times greater than those not having PTSD, with older children being the most at risk for a drop in performance.

Social functioning is another area in which long-term problems emerge for victims of disasters (Kaniasty & Norris, 1995). Loss of perceived support from the community has been documented across different disasters (Kaniasty, Norris, Murrell, 1990; Solomon, Bravo, Rubio-Stipec, & Camino, 1993). Both studies demonstrated a discrepancy between how much support disaster victims expected to receive and how much they actually received. Behavior problems such as more aggressive tendencies and withdrawal also tend to be more pronounced in children with PTSD symptoms (Galante & Foa, 1986; Shaw, Applegate, & Schorr, 1996). These studies demonstrate the long-term effects of disasters, but the degree to which such functioning is disturbed over time, or stability, must also be taken into account. The issue of the stability of PTSD symptoms will now be addressed.

Stability of PTSD Symptoms

The stability of PTSD symptoms has been supported in a variety of different studies (i.e. Pynoos et al., 1988). Terr (1983) found that four years after the Chowchilla kidnapping, every child involved was still experiencing significant PTSD symptoms.

Other studies have seen decreases in some PTSD symptoms but increases in social problems (Shaw et al., 1996), while another study found increases in PTSD symptoms from two to eight months post-disaster (McFarlane, Policansky, & Irwin, 1987). As demonstrated by the preceding study, PTSD symptoms are expected to increase initially for a time after the disaster. However, such symptoms are then expected to decrease as one gets further from the disaster. Oddly enough, the same study found there to be no decrease in symptoms from 8 to 26 months post-disaster (McFarlane, Policansky, & Irwin, 1987). A recent study (Knight, 2001) failed to find a decline in level of PTSD symptoms. Knight's study found that PTSD levels in a disaster-exposed sample did not show the expected decrease from 19 to 24 months post-disaster, but instead were steady. Knight conjectured that the stability seen in her study could be due to possible seasonal effects. A study specifically examining the possibility of seasonal effects, however, found no evidence to support the hypothesis that the distress levels of disaster-exposed children are subject to seasonal influence (Lack & Sullivan, 2003).

A series of studies following victims of Hurricane Andrew found steady decreases in the number of children whose PTSD symptom prevalence was severe, steady increases in the number of children whose PTSD symptoms were in doubtful to mild range, and a slight increase followed by a decrease in the number of children whose PTSD symptoms were in the moderate range over a 21-month period (Shaw, Applegate, Tanner et al., 1995; Shaw, Applegate, & Schorr, 1996). They further saw that while 46.7% of the children showed improvement in symptom level between 2 and 21 months, the same percentage showed no change in symptomology (Shaw, Applegate, & Schorr, 1996). All told, over 70% of the sample showed moderate to very severe PTSD symptomology at 21

months post-disaster. In what is to date the longest follow-up to a disaster, a study examining the effects of the Buffalo Creek disaster found 37% of subjects demonstrated possible PTSD 17 years after the disaster (Green, Korol, Grace, & Vary, 1991). Unfortunately, this study did not differentiate between those who were adults and children at the time of the disaster. So while there are indubitably long-lasting effects of trauma on children, it appears that both how the trauma manifests itself and how stable those effects can be are less well-defined.

Recent work in the area of stability and long-term effects has yielded some interesting results. Romero (1997) saw elevated levels of PTSD symptoms, as measured by the Reaction Index (RI), in a sample of non-trauma exposed Oklahoma children during tornado season. In fact, the RI scores for that sample were as high as those in a sample of children exposed to a sniper attack on their school (Pynoos et al., 1987). Although lower in rates of symptoms, these data supported previous studies that had also found high levels of reported distress in non-disaster samples in a disaster prone area (Romero, 1991; Sullivan, Hutchinson, & Romero, 1993). These findings suggest that children who live in a disaster-prone area, such as Tornado Alley, have some factor or factors that maintain these symptoms regardless of their level of actual exposure. There are several possible hypotheses as to what could cause this maintenance, which will be discussed in the next section.

Possible Determinants of Long-Term Distress

Many factors have been examined as possibly contributing to the development and maintenance of posttraumatic stress disorder. Green et al. (1991) identified four

primary factors that can determine both short- and long-term adaptation: characteristics of the trauma, cognitive processing of the trauma, characteristics of the individual, and characteristics of the environment. This section will examine the research findings concerning a variety of factors that could contribute to the development and long-term maintenance of PTSD, as well factors that may increase the risk of developing PTSD or PTSD symptoms. The first factor addressed will be re-exposure to environmental cues.

Re-exposure to Environmental Cues

There has been little empirical research examining the effect that the predictability of certain types of natural disasters, such as hurricanes or tornadoes, has on the occurrence or maintenance of PTSD symptoms. One author (Shannon, et al., 1994) proposed that the minimal trauma effects seen after a flooding disaster detailed in a study by Earls, Smith, Reich, and Jung (1988) could have been due to the predictability of seasonal flooding, but had no empirical evidence to support this claim. Burke, Moccia, Borus, and Burns (1986) put forth a similar hypothesis to explain their findings of disaster response following a blizzard and flood combination. Lack & Sullivan (2003) found that, for children who were exposed to a disaster, predictability of occurrence did not influence the degree of reported distress. Instead, a slight decrease across time from outside of tornado season to during tornado season was found. A question still unexamined is how the possibility of a seasonal influence may effect those who have not been exposed to a disaster. Other cues may also play a similar role as well, including the effects of exposure to the media. This will now be examined.

Exposure to Media

Another reason for the prolonged stability seen in PTSD symptoms could involve effects of the media. Although less well researched than the role of attributions in disaster response (see below), these studies have produced interesting results. Multiple studies have found evidence that the media plays an important role in the development of risk perceptions and attitudes toward risk (i.e., Raviv, 1993; Zeidner, 1993). Long, Chamberlain, and Vincent (1994) found that the degree to which Vietnam veterans followed the media coverage of the Gulf war was related to revived memories of their own war experience, which in turn triggered higher levels of PTSD symptoms such as anxiety and distress. Increased anxiety has been linked to media exposure of earthquakes in a correlational manner (Hirose, 1986) as well as experimentally to coverage of terrorist activities (Slone, 2000).

Several studies have found positive relationships between exposure to media coverage of disasters and PTSD symptoms in children after a terrorist attack (e.g. Pfefferbaum et al., 1999; Pfefferbaum et al., 2001). Of special interest to the current study, Oklahoma children with no direct physical or interpersonal exposure to the 1995 Oklahoma City terrorist attack have been found to have increased PTSD and distress as a result of exposure to both broadcast and print media (Pfefferbaum et al., 2003). Unfortunately, there is no decided lack of research examining the role the media has in contributing to PTSD symptoms after a natural disaster in children who both have and have not been exposed to traumatic events. This type of research is needed, especially in

light of the amount of news coverage and information that one is hit with during and after disasters.

The above results are especially interesting considering the large amount of coverage that weather changes garner in Oklahoma, especially during tornado season. From early March through the summer months, weather systems that have even the slightest risk of producing severe weather are broadcast over all the local news channels, with maps taking up at least one-eighth of the screen during regular programming. This is in addition to commercials advertising new meteorological equipment and special reports, which show previous tornados and the damage they caused. Many schools also participate in educational programs in which meteorologists come to the school and give presentations on how to stay safe in the event of a storm. One study (Lack, 2003) found no relationship between viewing of disaster-related television or movies and posttraumatic distress in children who had been previously exposed to a disaster. It should be noted that 80% of the children in that study never viewed such media or only viewed them a few times each year, suggesting selection on the part of their parents. Whether such selection also occurs in all parents of children living in disaster-prone areas or just those who have been exposed to a disaster is, at present, unknown.

With the evidence that long-term exposure to stress (such as that generated by constant storm warnings) can cause permanent changes in the brain (i.e. Bremner et al., 1995) and that media exposure can contribute to anxiety and increased vigilance (Slone, 2000), there is a need to examine the possible longitudinal effects that living in a disaster prone area has on PTSD symptoms, even if there has no been in vivo exposure to a

disaster. Attributional style, which may also influence the development and maintenance of PTSD symptoms, will now be examined.

Attribution Style

Another area that is currently lacking in research concerning the impact of natural disasters is the study of attributions. An attribution is commonly defined as a reason or explanation for an occurrence (Peterson & Seligman, 1984). Causal attributions can be characterized as statements acknowledging some factor(s) that contributed to a given event (Joseph, Brewin, Yule, & Williams, 1993). Although there has been a significant amount of research examining the roles that attribution style plays in diverse areas of life, such as depression in adolescents (Garber, Keiley, & Martin, 2001) and adults (Peterson & Seligman, 1984), only a small amount of work has specifically addressed the role of attributions in disaster situations. Instead, many of the findings in other areas of attribution research have been generalized to traumatic situations. The little specific research that exists seems to suggest that attributions can play a significant role in mediating one's reactions to a trauma or disaster (Greening, Stoppelbein, & Docter, 2002; Mannarino, Cohen, & Berman, 1994), but the exact relation of the two is still unclear. The attributions that children have concerning a disaster are important because they may influence aspects of life such as self-perception and peer relationships, while also contributing to level of distress and PTSS (Dollinger, Staley, & McGuire, 1981).

Multiple aspects of attributions and their relation to distress have been examined. Several studies have suggested a relationship between number of attributions made for a situation and level of distress over a situation (Dollinger, 1986; Downey, Silver, &

Wortman, 1990). Generally speaking, those people that either make more attributions or are more concerned with attributions tend to be more distressed. Rubonis and Bickman (1991) found that blaming an external source for a traumatic event was related to a higher incidence of pathology than self-blame. Bulman and Wortman (1977) also found that blaming something other than one's self resulted in worse adjustment. However, attributions to God or chance have not been found to be associated with more distress, which may be indicative of less time spent dwelling upon the trauma (Dollinger, 1986).

Recent studies have found that those people who demonstrate trauma-specific attributions that are global, stable, and internal more likely to experience PTSD symptoms after a disaster (Gray, Pumphrey, & Lombardo, 2003; Greening, Stoppelbein, & Docter, 2002), a finding consistent with attribution research in other areas (Peterson & Seligman, 1984). One study that examined a disaster-exposed Oklahoma population found information that was both consistent and inconsistent with previous research (Knight, 2001). Consistent with previous research, the study found that those children with higher levels of posttraumatic distress made more attributions and were more concerned with making attributions. Unlike previous research, however, attributions to God were not found to be associated with higher levels of distress. These inconsistencies in research point to the need for more systematic research on various samples.

In the precursor to the current study, the presence of attributions for the disaster was found to be highly predictive of distress, especially searching for meaning to the disaster and being hypervigilant or expecting another disaster (Lack & Sullivan, 2004). This relationship between attributions and distress was found to be above and beyond even that of perceived exposure and distress, suggesting that exposure may drive

attributions, which in turn drive distress. Clearly, more research is needed to gain a thorough understanding of the relationship between attributions and distress.

Identified Risk Factors for the Development of PTSD

A considerable list of environmental and demographic factors has been associated with an increased risk of developing PTSD. Vernberg et al. (1996) found that disaster exposure, as based on children's self-reports, accounted for some 35% of the variance in PTSD symptoms. The relationship between degree of exposure and symptom severity has been found in children following other disasters, including hurricanes (La Greca, Silverman, & Wasserstein, 1998), tornadoes (Polusny et al., 1999), and collapse of a slag dam (Green et al., 1991). However, other studies have reported other factors, such as self-reports of negative emotions (Lonigan et al., 1994) or changed family functioning (McFarlane, 1987), as better able to predict the resulting level of PTSD symptoms than exposure. These apparent discrepancies may be due in part to the different definitions of degree of exposure used in these studies. Of a certainty, though, prior exposure to trauma greatly increases the risk for development of PTSD (Daviss et al., 2000; Garrison et al., 1995), even if the traumas are dramatically different (Pfefferbaum, North, Doughty, Gurwitch, & Fullerton, 2003).

Recent studies have examined demographic differences in the development of PTSD symptoms among children. Some research has shown that males tend to experience PTSD symptoms to a lesser degree (Garrison et al., 1995; Shannon et al., 1994) and for a shorter period of time (Shaw, Applegate, & Schorr, 1996; Vernberg et al., 1996) than females. But other studies have failed to find differences between genders (La

Greca, Silverman, & Wasserstein, 1998). The effects of age on PTSD development have similar, conflicting results. Some researchers have found younger children at an increased risk for development of symptoms compared to older children (Lonigan et al., 1991; Shannon et al., 1994) while another found no relationship (Green et al., 1991). Yet another has found that the parents' level of PTSD symptoms was a better predictor of the child's distress in two- through seven-year-olds than age (Garrison et al., 1995). Possible racial or ethnic differences in the development of PTSD are currently not well understood, with the AACAP urging further investigation of the subject (1998).

The reaction of a child's family after a traumatic event has also been implicated in the development of posttraumatic distress. McFarlane (1987) found a strong relationship between the mother's level of anxiety and the child's distress, while Kilic, Ozguven, and Sayil's (2003) study suggested that the father's reaction had a greater impact on children's symptomology. Other researchers have theorized that it is the functioning of the family as a whole that truly determines the way a child reacts to disaster (e.g., Green et al., 1991; Newman, 1976). Overall, the exact interplay of familial factors and a child's posttraumatic distress is still unclear and in need of further research (Yule, Perrin, & Smith, 1999).

Overall, research on the factors that put a child at risk for the development and maintenance of PTSD symptoms has not been conclusive. What one study shows to be a risk factor, another fails to support. More research with children and disasters is needed before one can truly feel confident saying that any one factor undoubtedly puts one at risk for the development of PTSD.

Summary

Of the children who survive a disaster, only a small amount will come through the experience unscathed. The majority of the children will show negative consequences, if only for a short amount of time. But for some, the effects of the disaster will continue to adversely impact their daily functioning for an extended period of time. This impact can be seen in symptoms such as increased worry or anxiety, social withdrawal, and difficulties in concentration. Further research is needed to help identify what factors contribute to long-term distress and impairment.

An array of factors has limited the generalizability of previous research. The means by which different researchers have assessed for the presence of PTSD symptoms have included interviews, projective tests, and self-report. Some studies have examined only those with full DSM-IV criteria for PTSD, while others assess levels of symptomology. As would be expected, the different assessments yield varying levels of PTSD-related distress and impairment. Using multiple informants in the assessment of PTSS is also important, since such information is generally more complete and reliable than information from any single source. Using standardized measures and structured procedures when assessing for reactions to disasters is essential if comparisons between studies wish to be made.

There has been relatively little research in the area of how children living in a disaster-prone area react to disaster. What has been done indicates that actually being exposed to a disaster may not be necessary to develop PTSD symptoms. Research that examines groups of children who live with a large threat of disaster but have not been exposed to a disaster is needed. Likewise, comparing those groups to groups of children

who live in the same area and have been exposed to a disaster will help to understand the specific effects of a disaster on PTSD symptoms. Further research into the role that attributions play in determining posttraumatic distress is also needed, specifically in the area of trauma-specific attributions. Along the same lines, factors that may place a child at-risk to develop posttraumatic distress deserve further examination.

Current Investigation

The current investigation was designed to add to the literature concerning the effects of disasters on children, the effects of living in a disaster-prone area, and what factors may contribute to those effects. This study was designed to assess and follow the presence of posttraumatic stress disorder symptomology in children exposed to a tornado and compare that to the same symptomology in demographically similar children who had not been exposed to a tornado. The roles that re-exposure to environmental cues, exposure to disaster-related media, attributions, and other factors, such as demographic variables, play in maintaining a child's level of distress, regardless of their exposure level will also be examined. The current study will longitudinally track the PTSD symptoms and attributions of children who have recently been exposed to a significant natural disaster and those who have not. The participants will complete a series of questionnaires designed to measure their PTSD symptoms and attributions at two time periods: November (approximately six months after being exposed to the tornado for the disaster group) and May (approximately one year after exposure for the disaster group).

The purpose of the current study is to collect descriptive information on the children who had either been recently exposed to a disaster or who lived in a disaster-

prone area. For both groups this will include information on levels of posttraumatic stress symptoms, behavior at school and home, and general psychological functioning. For the exposed group, this will also include information on level of exposure, both direct and indirect, to the disaster and attributions made concerning the disaster. This information will be gathered both in and out of tornado season. The use of these times allows for the examination of possible seasonal influences on posttraumatic distress for the non-exposed group and anniversary effects for the exposed group.

These data will allow the examination of several factors that could be contributing to the maintenance and development of PTSD symptoms in the exposed children. This will be done through questionnaires given to both parents and children that measure exposure to the tornado itself, exposure to disaster-related media, attributions, and demographic factors. As reviewed above, much of the research on the factors that contribute to long-term distress is inconclusive. The information collected in this study will help to provide support for which factors can be predictive of long-term distress.

The specific goals of this study are to test several hypotheses. The first hypothesis is that the exposed group will show significantly higher levels of posttraumatic distress than the non-exposed group at both data collection points. It is expected, however, that the level of symptoms in the exposed group will decrease over time. The second hypothesis is that among the exposed children, the presence and degree of PTSD symptoms will be affected by several factors. Symptom level is hypothesized to be affected by degree of exposure to the tornado, a higher level of exposure being related to higher symptom levels. A relationship between number of attributions and amount of distress, as measured by the presence and degree of PTSD symptoms is also predicted.

Specifically, those children who make more attributions for the disaster are predicted to endorse a higher level of PTSD symptoms.

CHAPTER II

METHOD

Recruitment

A number of tornadoes occurred across Oklahoma during the months of April, May, and June of 2004. Examining meteorological data from the National Weather Service (2004) assisted in identifying towns and cities in Oklahoma where a tornado had struck. Two F2 tornadoes struck near and around the town of Geary on May 29th, causing an extensive amount of property and crop damage, but no loss of human life. On June 11, 2004, an F1 tornado touched down in the town of Agra and stayed on the ground for 1.5 miles, resulting in multiple homes and properties being damaged. These two towns were chosen as the samples having recent exposures to a tornado. The town of Drumright was chosen as a control, non-exposed school due to the lack of tornadoes within a 10 mile radius of the town over the past five year period.

These three school districts (Agra, Geary, and Drumright) were contacted to determine their willingness to participate in the current study and gave their consent. Children in grades 3-6 and their parents were targeted as potential participants, due to the fact that this age range is consistent with previous research in this area (i.e., Lack, 2003, Knight, 2001). Also, self-report measures such as this study employed are considered unreliable for children younger than eight years of age.

Measures

Parent Measures

Demographic Questionnaire. Parents who allowed their child to participate in the study completed a demographic questionnaire that gathered the following information concerning themselves and their spouse/partner: age, race, relationship to child, education level, marital status, and income (see Appendix A). The child's age, race, gender, and school grade were also reported. The demographic questionnaire was administered to gather some basic descriptive information about the families.

Tornado Exposure Questionnaire – Parent Report (TEQ-P). All parents completed a brief measure designed to assess the family's degree of exposure to a tornado (see Appendix B). For the nonexposed group, this allowed for the screening and elimination of children who had been exposed to a tornado at a site other than their current hometown. The questionnaire used was a slightly modified version of a questionnaire used in previous research with tornado victims (Lack, 2003). The parents gave the following information: family's location at the time of the tornado, the subjective severity of the tornado, the presence and degree of damage to their home, injuries sustained, the family's current living situation, if the child had been separated from parents, whether the tornado resulted in parental unemployment, if assistance (medical, financial, or clean-up) were obtained, whether and what kind of psychological services were received, and questions regarding how their child felt and reacted to the tornado. Questions concerning the child and parental fear levels during and since the tornado were also asked. A total

exposure score, based on reported level of damage, injuries sustained by parent or child, severity of tornado, and length of child separation from family, was calculated based on the gathered information.

Further questions were asked concerning the television viewing habits of their child, focusing on disaster-related programming and movies. This allowed the investigation of one possible cause of the increased RI scores that have been seen in disaster-prone areas during disaster season by children who have not been exposed to a disaster. This information was acquired through the use of a multiple-choice format. The questionnaire ended with an open-ended question that asked about any recent stressful life events unrelated to the tornado, as this may have had an impact on the posttraumatic stress symptoms endorsed by the child on the Reaction Index.

Behavior Assessment System for Children – Parent Rating Scales (BASC-PRS; Reynolds & Kamphaus, 1992). The BASC-PRS measures a child's adaptive and problem behaviors in multiple areas, such as school and home. It contains 138 items and takes roughly 10-20 minutes to complete. Major scales include Attention Problems, Aggression, and Withdrawal, with composite scores measuring Internalizing and Externalizing Problems, Adaptive Skills, and a Behavioral Symptom Index. The BASC has been well standardized for use with the age range of the current study (Reynolds & Kamphaus, 2002). Reliability has been shown to be high in terms of both internal consistency (around .80 for the various scales) and stability (between .70 and .86 for the scales at a two-month retest), while good predictive validity for DSM diagnoses has been found (Reynolds & Kamphaus, 1992). All parents who participated in the study completed this measure at both time points.

Child Measures

Tornado Exposure Questionnaire – Child Report (TEQ-C). The child version of the TEQ-P assessed information pertaining to perceived life threat, life-threatening experiences, and loss-disruption experiences in an appropriate format for 3rd-6th graders (see Appendix D). First used by Knight (2001), this form is similar in structure and content to the questionnaire used by Vernberg et al. (1996) in their work with elementary-age children after Hurricane Andrew. This version of the TEQ-C added questions to mirror the majority of questions in the TEQ-P, allowing for comparisons between child and parental report. The TEQ-C was administered only at the initial assessment and used to assess the child's viewpoint on his or her degree of exposure to the tornado. Only children from the exposed group were given this questionnaire.

Frederick Reaction Index (RI; Frederick, Pynoos, & Nader, 1992). The RI is a 20-item self-report measure designed to assess PTSD symptoms in children (see Appendix E). The RI uses a likert-type scale that measures the presence and severity of PTSD symptoms on a scale of zero (none of the time) to four (most of the time). Rather than measuring diagnosable PTSD, the RI assesses the presence and degree of symptoms such as bad dreams, repetitive thoughts, emotional isolation, and somatic symptoms using age-appropriate language for children. These symptoms and their corresponding items are used to obtain a total score of posttraumatic distress. This score can range from 0 to 80, with five levels of distress: no PTSD symptoms (range 0-11), mild PTSD symptoms (range 12-24), moderate PTSD symptoms (range 25-39), severe PTSD symptoms (range 40-59), and very severe PTSD symptoms (range 60-80).

The RI is the most commonly used measure of PTSD symptoms after a disaster (Vogel & Vernberg, 1993) and allowed comparisons between the present study and existing literature in this area. Although originally developed for use in adults, this version was standardized with 750 children who had been exposed to stressful events and an interview version was found to have a correlation of .91 with established cases of PTSD (Frederick, 1985). The RI has demonstrated good 6-month test-retest reliability (e.g., .59; Shaw et al., 1996) and high internal consistency as a self-report measure (e.g., α =.89; Vernberg et al., 1996). The RI was administered at both assessments to both groups to provide a measure of children's level of distress and PTSD symptoms.

Trauma Attribution Checklist (TAC; Knight & Sullivan, 2006). In order to assess the children's attributions regarding the tornado, the TAC was used. Previously called the Natural Disaster Attribution Checklist (NDAC), this is a recently developed measure used to assess types of attributions made by children following a traumatic experience (Knight, 2001). The TAC is a 28-item self-report measure that asks questions concerning internal vs. external causes for the trauma, the importance of attributing responsibility, expectations, hypervigilance, meaning coming from the trauma or trauma-related events, omen formation, and one open-ended question concerning the cause of the trauma. With the exception of the open-ended question, the checklist items are rated on a three point likert scale from 0 (not much) to 2 (a lot). These items provided both a total score and several scales scores that can be analyzed.

While internal consistency for the TAC has been found to be very high (α = .96), test-retest reliability was only moderate, with a kappa of .50 (Lack, 2003). In terms of validity, the TAC was found to have a correlation of .79 with scores on the RI in a sample

of trauma-exposed children (Knight, 2001) and be highly predictive of long-term distress (Lack & Sullivan, 2004). The children from the exposed group were given the TAC at every assessment to provide a measure of children's number and type of attributions made about the tornado.

Behavior Assessment System for Children – Self-Report of Personality (BASC-SRP; Reynolds & Kamphaus, 1992). The BASC-SRP is designed to provide information on a child's thoughts and feelings, as well as perception of his/her home and school behavior. It contains 186 items and takes roughly 30 minutes to complete. Scales include measures of anxiety, depression, attitudes towards teachers and school, and relations with parents. Composite scores include School, Clinical, and Personal Maladjustment, as well as the Emotional Symptoms Index. As with the parent version of the BASC, the BASC-SRP has also demonstrated sound psychometric properties, including internal consistency and validity (Reynolds & Kamphaus, 1992). Children from both groups were administered the BASC-SRP at both time points.

Procedure

The study was conducted slightly differently for the two groups of children. For the exposed group, the participating schools were given packets containing the details of the study, including protocols and assessment materials, for review. After approval from school personnel, the parents of children in the 3rd through 6th grades were sent packets with an introductory letter describing the study, consent forms for participation, the demographic questionnaire, TEQ-P, and BASC-PRS. Parents were informed of the longitudinal aspect of the study and that their children would be participating in a project

that will include data collection in the spring. The parents were also be notified that, as compensation for participation, they would be entered into a drawing for fifty dollars upon completion of the packets. Parents then completed the packets if they wished and sent them back to the school with their child.

On the first day of data collection, in early November, those children had consent to participate in the study were be given information concerning the study and asked for their assent to participate. Those that agreed to participate completed the TEQ-C, RI, TAC, and BASC-SRP with the help of the experimenter and his colleagues. The experimenter read the questionnaires aloud to the children to help facilitate understanding while the children followed along and marked their answers. The experimenter's colleagues were available to answer any questions the children had during the assessment. The questionnaires took approximately 60 minutes to complete. The drawing for the fifty-dollar prize was held shortly after data collection and the money mailed to the schools to distribute to the winning families.

The second assessment was conducted in almost the exact same way. One month prior to the assessment in May (approximately five months after the initial assessment), packets were sent to the parents informing them when the next data collection would be, that they would be entered into another drawing, and containing another consent form for them to sign and return to the school and a BASC-PRS to complete. On the day of follow-up data collection, those children with consent forms (see Appendix H) were given information about the longitudinal nature of the study and asked for their assent (see Appendix I). Those that agree to participate completed the RI, TAC, and BASC-SRP with the assistance of the experimenter and his colleagues, just as before. The

questionnaires took approximately 45 minutes for the children to complete at the follow-up. As before, a drawing for the prize money was held shortly after data collection and the money mailed to the schools.

For the non-exposed school, only one difference was made in the above procedure. Non-exposed children did not complete the TAC at either assessment or the TEQ-C at the initial assessment. They were still given the TEQ-P in order to screen out children who may have been exposed to tornadoes in the past five years at another location aside from where they are currently living.

Participants

The participants in the study were children in third through sixth grade, as well as their parents. They were solicited from two elementary schools in Oklahoma that were exposed to a tornado in the spring of 2004 (Geary and Agra), as well as one school in a town that had not been exposed to a tornado in the past five years (Drumright).

Of the approximately 450 families solicited, 180 gave permission for their child to participate, resulting in a return rate of 40%, similar to the rate for other Oklahoma research disaster studies (e.g., Knight, 2001; Lack, 2003) but above the rate but above the return rate of near 30% that other studies have found (e.g. Shannon et al., 1994). Of the original 180 participants, six parents declined to participate but gave permission for their children to do so. For the first data collection, 15 children who had parental permission were absent. Those parents and children who did participate were dropped from the analyses, resulting in a final sample size of 174 parents and 165 children. Of these, 95 (57.6%) were in the exposed group and 70 (42.4%) were in the non-exposed group.

Exposed group demographics. Mothers completed the majority of the parent forms (78.2%), with fathers completing 17.8% and 8% being completed by "others," mainly grandparents. Respondents were married in 73.5% of the families, with their spouse being the child's biological parent in 77.6% of families. There was a wide age range among respondents (20-54 years, M = 34.92, SD = 7.08) and spouses (26-53 years, M = 37.01, SD = 7.03). The majority of the parent sample was Caucasian (85.1% of respondents, 88.1% of spouses), with American Indian (9.9% and 10.7%) being the second largest ethnic group. Parental education level was varied, with respondents having a mean of 13.20 (SD = 2.22) and spouses having a mean of 12.82 (SD = 1.73), each equivalent to a high school diploma and one year of college coursework. The majority of the sample reported an income level of $2001 and above each month (63.5%), with 18.3% earning between $1001-$2000 and 18.3% earning less than $1000 a month.

Participating children were in grades three through six, with an age range of 8-13 (M = 9.85, SD = 1.35). Children were split fairly evenly across sex (45.5% male, 54.5% female) and grade (28.3% in 3rd grade, 23.8% in 4th grade, 31.7% in 5th grade, 14.9% in 6th grade). Like their parents, the children were predominately Caucasian (80.2%), with 10.9% identified as American Indian. The majority of the children in the exposed group were from the Agra school district (58.9%).

Non-exposed group demographics. As mentioned above, the TEQ-P was administered to all parents at the non-exposed school to allow for the screening and elimination of children who had been exposed to a tornado at a site other than their current hometown. To illustrate the difficulty of finding a non-exposed sample in a disaster-prone area such as Oklahoma, parental screeners indicated that 30 of the 73

children in the non-exposed sample had actually been exposed to a tornado in the past five years. This resulted in a truly non-exposed sample of 43 participants.

Mothers completed the majority of the parent forms (74.4%), with fathers completing 16.3% and 9.4% being completed by "others," primarily grandmothers. Respondents were married in 62.8% of the families, with their spouse being the child's biological parent in 59.4% of families. There was a wide age range among respondents (21-64 years, M = 37.37, SD = 9.50) and spouses (25-67 years, M = 39.39, SD = 9.95). The majority of the parent sample was Caucasian (83.3% of respondents, 71.9% of spouses), with American Indian (16.7% of respondents, 18.8% of spouses) being the second largest ethnic group. Parental education level was varied, with respondents having a mean of 12.36 (SD = 2.04) and spouses having a mean of 12.13 (SD = 1.38), each equivalent to a high school diploma. Income levels were also varied, with 45.9% reporting an income level of $2001 and above each month, 32.4% earning between $1001-$2000 and 21.6% earning less than $1000 a month.

Participating children were in grades three through six, with an age range of 8-12 (M = 10.34, SD = 1.15). Approximately equivalent numbers of females and males participated in the study (56.1% vs. 43.9%). Distribution across grade was relatively evenly distributed, with the exception of a lower number of third graders (9.8% in 3rd grade, 29.3% in 4th grade, 29.3% in 5th grade, 31.7% in 6th grade). Like their parents, the children were predominately Caucasian (76.9%), with 20.5% self-identified as American Indian.

CHAPTER III

RESULTS

Time 1 – Exposed Group

Tornado Exposure Questionnaire-Parent Report (TEQ-PR)

Although the majority of participants (72.0%) reported no damage to their homes due to the tornado, 11 (11.9%) of the families in the sample reported a total loss of their home. Two families were reportedly out of their home for a week or less, one for between a week and a month, and four for longer than 6 months. Of the sample, 10 families reported currently living in a new home, apartment, or mobile home. Only two of the families also reported being unemployed as a result of the tornado, both for between 1-2 weeks.

During the tornado, children were reported to be primarily at home (48.4%), in a storm shelter (18.7%), or at a school or friend's or relative's house (both 8.8%). Parents were reported to be mainly at home (48.9%), at a storm shelter (18.5%), or at work (9.8%). The majority of the children sustained no damage at their location (56.5%), with 27.2% sustaining little damage, 9.8% sustaining moderate damage, and 6.5% sustaining major or total damage. No parents or children were reportedly injured during the tornado. A reported 10.4% of the parents thought they were going to die from the tornado. The majority of parents viewed the tornado as mild (42.4%), with the remainder either seeing

it as moderate (28.3%) or severe (15.2%) in nature. Parents' perceptions of how scared their children were during the tornado were distributed across not at all scared (19.8%), somewhat scared (29.7%), scared (22.0%), very scared (18.7%), and terrified (9.9%). In regards to how worried their children have been about tornadoes since then, 28.3% of parents reported that their children were not all worried about tornadoes now, 42.4% reported they were somewhat worried, 12.0% were worried, and 17.4% reporting their children as very or extremely worried. Ten of the parents (10.8%) reported that their child was separated from them during the tornado.

The majority of families did not receive assistance after the tornado. Of the eight (4.4%) who did report obtaining assistance, two were given financial aid, three received donations, one had help in cleaning up their property, and two reported gaining other types of services. Four families also reported receiving food and water donations after the tornado. The majority of the children did not receive any type of psychological services after the tornado (97.2%).

In addition to questions concerning the tornado, the parents were also asked about types of other, less direct exposure to disasters that their children may have had. When asked how many times over the past year that their families had to take shelter due to a tornado, only 16.7% of parents reported not taking shelter. The majority of families reported taking shelter one or two times a year (51.9%), with 18.6% reporting taking shelter three times and 12.7% reporting taking shelter four or more times. When asked how many times their children were exposed to disaster-related media or education outside the home, such as at school or an extracurricular activity, parents reported a large degree of variation, from 0-1 times (41.6%), 2-3 times (38.2%), to four or more times

(12.4%). Their child's television viewing habits as concerns disaster-related media was also queried. The majority of children were reported to watch between 1-4 hours (53.5%) or 5-6 hours (37.6%) of television on the weekdays. On weekends, the children were reported to watch between 1-6 hours (23.7%), 6-8 hours (29.9%), 9-11 hours (27.8%), or over 12 hours (20.6%). While 26 parents (26.0%) reported that their child never watched disaster movies, 58.0% of the children watched them several times a year and 13.0% watched them at least once a month. Approximately the same percentages were found for watching disaster programs and specials on television (see Table 1, Appendix F). Only 4.0% of the parents reported not changing the channel if a program is interrupted by news about bad weather, 15% reported changing it between 10-30% of the time, 14% reported changing it between 40-60% of the time, 13% reported changing it between 70-90%, and 54% reported changing the channel every time a program is interrupted.

Tornado Exposure Questionnaire-Child Report (TEQ-CR)

There was an overlap of several items between the parent and child exposure questionnaires. On the overlapping items, there was little difference between parent and child reports. The majority of children reported that during the tornado they were either at home (35.5%), at a friend or relative's house (15.1%), or in a storm shelter (15.1%). The vast majority of children also reported neither being hurt (97.9%), seeing anyone hurt (95.7%), or their pet being hurt (92.6%) during the tornado. When asked to describe their level of fear during the tornado, 34.4% reported being not at all scared, 33.3% reported being somewhat scared, 14.4% reported being scared, and 17.8% reported being very scared or terrified. In terms of damage to their home, 81.9% of the children reported no

damage to their homes, 12.8% reported a “little” damage, 1.1% reported a “medium” amount, 2.1% reported a “lot,” and 2.1% reported that their homes were “totally destroyed.” No children reported being separated from their parents as a result of the tornado and few said that their parents’ work was disrupted as a result of the tornado (7.4%). When asked how scared or upset they became when bad weather was shown on television, 59.6% reported they were not scared, 26.6% reported being somewhat scared, 5.3% said they were scared by it, and 8.5% reported being very scared or terrified. Only 4.3% of the children reported not seeing any disaster-related television shows in the past year, with most seeing 1-2 (37%), 3-4 (28.2%), or more than five (30.4%).

Frederick Reaction Index (RI)

The RI has a range of scores from 0 to 80. The average RI total score at the first assessment was 26.66 (*SD* = 14.64), which is in the moderate range, with scores ranging from 2 to 62 (see Table 2, Appendix F). According to their self-reports, 12.8% of children experienced no PTSD symptoms, 40.4% experienced mild PTSD symptoms, 25.5% experienced moderate PTSD symptoms, 18.1% experienced severe symptoms, and 3.3% experienced very severe symptoms. For this first assessment, the RI had an alpha coefficient of .827, representing high levels of internal reliability.

Trauma Attribution Checklist (TAC)

The TAC itself has a range of 0 to 48. Each scale of the TAC has its own range. For the Attribution of Responsibility scale the range is 0 to 18, while the subscales that compose it have ranges of 0 to 8 (Self-blame), 0 to 4 (Other-blame and God-blame), and

0 to 2 (No-blame). The Importance of Attributing Responsibility scale ranges from 0 to 6; both the Expectations/ Hypervigilance and Search for Meaning scales range from 0 to 10. Finally, the Omen Formation scale has a range of 0 to 4.

The average TAC score at the first assessment was 13.30 (*SD* = 8.43), with a range from 0 to 34 (see Table 3, Appendix F). The Attribution of Responsibility scale had a mean of 4.15 (*SD* = 3.17). It was divided into the subscales of Self-blame (*M* = 1.88, *SD* = 1.84), Other-blame (*M* = 0.46, *SD* = 0.86), God-blame (*M* = .82, *SD* = 0.92), and No-blame (*M* = 1.06, *SD* = 0.94). The Importance of Attributing Responsibility scale had a mean of 0.93 (*SD* = 1.25). The Expectations/ Hypervigilance scale mean score was 3.85 (*SD* = 2.67). The Search for Meaning scale had a mean of 2.91 (*SD* = 2.37), and the Omen Formation scale had a mean of 1.42 (*SD* = 1.19). For the first assessment, the TAC had an alpha coefficient of .862, representing high levels of internal reliability.

In general, as evidenced by the means of the TAC scales, the majority of children made one or more attributions, with only two children scoring a zero on the TAC total score. The means of the No-blame subscale and the Expectations/Hypervigilance scale were, relatively, the most elevated of any scale. In examining the other scales, it is notable that while many children made at least some type of attribution concerning who was responsible for the tornado, the children as a whole appear to have placed little importance on doing so, consistent with previous research (e.g., Lack, 2003).

Behavior Assessment Scale for Children – Parent Rating Scales (BASC-PRS)

Scores on the BASC-PRS are read in terms of T-scores, with a mean of 50 and a standard deviation of 10. For the clinical scales, scores above 60 are considered in the

"at-risk" range, with scores above 70 in the "clinically significant" range. For the adaptive scales, skills below 35 are considered to be clinically deficient. Both global and specific measures of internalizing, externalizing, and adaptive skills are present on the BASC-PRS. In terms of global distress, the Behavioral Symptoms Index had a mean T-score of 48.29 (*SD* = 13.37, 42nd percentile). The Externalizing Problems Index had a mean of 49.21 (*SD* = 13.39, 44th percentile), while the Internalizing Problems Index had a mean of 48.69 (*SD* = 11.92, 44th percentile). In terms of daily functioning, the Adaptive Skills Index had a mean of 48.86 (*SD* = 10.88, 46th percentile). All of the means of these global measures of distress and functioning are within normal limits, with the distribution of scores not differing from the expected, normal curve.

As would be expected based on the global measures, the means of parent report of specific types of internalizing and externalizing problems, as well as daily functioning, were all in the non-clinical range. The externalizing subscales of Hyperactivity (*M* = 47.77, *SD* = 13.43), Aggression (*M* = 48.63, *SD* = 11.77), and Conduct Problems (*M* = 50.80, *SD* = 12.65) were all in the normal range. The internalizing subscales of Anxiety (*M* = 49.13, *SD* = 11.04), Depression (*M* = 47.86, *SD* = 11.13), and Somatic Problems (*M* = 49.90, *SD* = 12.27) were also in normal limits. The other subscales of Atypicality (*M* = 49.50, *SD* = 14.96), Withdrawal (*M* = 48.78, *SD* = 9.72), and Attention Problems (*M* = 50.05, *SD* = 10.48) were also in the normal range. All the subscales of the Adaptive Skills Index, which measure the type of abilities needed to function in day-to-day living, were in the normal range. These subscales were the Adaptability (*M* = 49.23, *SD* = 10.93), Social Skills (*M* = 49.78, *SD* = 11.01), and Leadership (*M* = 48.10, *SD* = 10.24) subscales.

Behavior Assessment Scale for Children – Self-Report of Personality (BASC-SRP)

As on the parent report version of the BASC, the SRP relies on T-scores with means of 50 and standard deviations of 10. Again, scores above 60 are considered in the "at-risk" range, with scores above 70 in the "clinically significant" range on the clinical scales, while for the adaptive scales, skills below 35 are considered to be clinically deficient. In terms of global functioning, the Emotional Symptoms Index had a mean T-score of 50.81 (*SD* = 10.11, 52nd percentile). The Clinical Maladjustment Index had a mean of 49.77 (*SD* = 9.27, 49th percentile), the Personal Adjustment Index had mean of 48.38 (*SD* = 11.12, 46th percentile), and the School Maladjustment Index had a mean of 49.39 (*SD* = 9.52, 48th percentile).

Again, as with the parent report, all the means of the subscales that comprise the index scores were within normal limits. This included the school-related subscales of Attitude towards School (*M* = 50.93, *SD* = 10.88) and Attitude towards Teachers (*M* = 48.67, *SD* = 9.30), as well as the clinically related scales of Atypicality (*M* = 50.52, *SD* = 9.23), Locus of Control (*M* = 49.79, *SD* = 8.93), Social Stress (*M* = 49.89, *SD* = 9.92), Anxiety (*M* = 48.55, *SD* = 9.23), and Depression (*M* = 51.96, *SD* = 10.36). Also in the normal range were Sense of Inadequacy (*M* = 50.72, *SD* = 9.94), Relations with Parents (*M* = 48.28, *SD* = 11.40), Interpersonal Relations (*M* = 48.87, *SD* = 11.06), Self-esteem (*M* = 48.79, *SD* = 10.27), and Self-reliance (*M* = 49.41, *SD* = 10.25), all related to personal adjustment.

Time 1 – Non-exposed Group

As mentioned above, parental screeners indicated that a large number (41.1%) of the children sampled from the non-exposed school district had actually been exposed to a tornado at some point in the past five years. As with the demographic data reported above, these children have been excluded from all analyses below.

Tornado Exposure Questionnaire (TEQ)

In addition to screening out those participants who were exposed to a tornado, the primary purpose of the TEQ was to determine the level of vicarious exposure that children have received to tornadoes. The average number of times the families reported having taken shelter due to threat of tornadoes in the past year was 1.24 (*SD* = 1.59, range 0-5). The average estimate by parents for how often their child was exposed to disaster related media outside the home, such as tornado-preparedness videos at school or a Boy Scouts meeting, was 2.26 (*SD* = 2.99, range 0-10). Parents estimated their children spent 2.53 (*SD* = .96) hours watching TV on weekdays and 3.51 (*SD* = 1.60) hours on Saturday and Sunday. The majority of the sample (66.7%) reported never turning the channel if a television program is interrupted by a weather alert that shows footage of tornadoes currently happening. For specific disaster-related programming, most parents reported that their children see movies (92.6%), programs on TV (78.6%), and special reports (82.3%) at least several times a year that are related to natural or man-made disasters.

Reaction Index

The RI has a range of scores from 0 to 80. The average RI total score at the first assessment was 22.53 (*SD* = 12.14), which is in the mild range, with scores ranging from 2 to 56 (see Table 2, Appendix F). According to their self-reports, 15.0% of children experienced no PTSD symptoms, 50.0% experienced mild PTSD symptoms, 22.5% experienced moderate PTSD symptoms, 12.5% experienced severe symptoms, and no children experienced very severe symptoms. As mentioned above, the RI had an alpha coefficient of .827, representing high levels of internal reliability.

Behavior Assessment Scale for Children – Parent Rating Scales (BASC-PRS)

As above, scores on the BASC-PRS are read in terms of T-scores, with a mean of 50 and a standard deviation of 10. For the clinical scales, scores above 60 are considered in the "at-risk" range, with scores above 70 in the "clinically significant" range. For the adaptive scales, skills below 35 are considered to be clinically deficient. Both global and specific measures of internalizing, externalizing, and adaptive skills are present on the BASC-PRS. Given the means being within normal limits and the normal distribution of scores, only the global measures and the specific subscales of Depression and Anxiety will be reported. In terms of global distress, the Behavioral Symptoms Index had a mean T-score of 50.47 (*SD* = 11.48, 50th percentile). The Externalizing Problems Index had a mean of 49.40 (*SD* = 10.97, 45th percentile), while the Internalizing Problems Index had a mean of 48.93 (*SD* = 11.92, 46th percentile). In terms of daily functioning, the Adaptive Skills Index had a mean of 48.00 (*SD* = 10.82, 44th percentile). The internalizing

subscales of Anxiety (*M* = 54.14, *SD* = 10.12) and Depression (*M* = 48.70, *SD* = 11.00) were also in normal limits.

Behavior Assessment Scale for Children – Self-Report of Personality (BASC-SRP)

As with the parent report for the non-exposed sample, the means and distributions of the self-report scores were all in the normal range. In terms of global functioning, the Emotional Symptoms Index had a mean T-score of 51.03 (*SD* = 11.92, 55th percentile). The Clinical Maladjustment Index had a mean of 49.22 (*SD* = 11.20, 49th percentile), the Personal Adjustment Index had mean of 46.60 (*SD* = 11.38, 42nd percentile), and the School Maladjustment Index had a mean of 48.73 (*SD* = 11.42, 48th percentile). Self-report on both the Depression (*M* = 52.37, *SD* = 10.67) and Anxiety (*M* = 48.30, *SD* = 10.91) subscales were in the normal range.

Time 2 – Exposed Group

Frederick Reaction Index (RI)

The average RI total score at the second assessment was 24.76 (*SD* = 15.73), which is at the extreme top of the mild range, with scores ranging from 2 to 64 (see Table 2, Appendix F). According to their self-reports, 19.5% of children experienced no PTSD symptoms, 41.5% experienced mild PTSD symptoms, 21.2% experienced moderate PTSD symptoms, 15.4% experienced severe symptoms, and 2.4% experienced very severe symptoms. At this second assessment, the RI had an alpha coefficient of .846, again representing high levels of internal reliability.

Trauma Attribution Checklist (TAC)

The average TAC score at the second assessment was 13.05 (*SD* = 8.95), with a range from 0 to 31 (see Table 3, Appendix F). The Attribution of Responsibility scale had a mean of 4.02 (*SD* = 2.76). It was divided into the subscales of Self-blame (*M* = 1.70, *SD* = 1.97), Other-blame (*M* = 0.42, *SD* = 0.64), God-blame (*M* = 0.94, *SD* = 1.03), and No-blame (*M* = 1.07, *SD* = 0.96). The Importance of Attributing Responsibility scale had a mean of 0.87 (*SD* = 1.17). The Expectations/Hypervigilance scale mean score was 4.23 (*SD* = 3.28). The Search for Meaning scale had a mean of 2.75 (*SD* = 2.67), and the Omen Formation scale had a mean of 1.33 (*SD* = 1.07). At this second assessment, the TAC had an alpha coefficient of .882, again representing high internal reliability.

Behavior Assessment Scale for Children – Parent Rating Scales (BASC-PRS)

The means and distributions of both global and specific measures of internalizing, externalizing, and adaptive skills were all within normal limits on the BASC-PRS, so only select scales will be presented. In terms of global distress, the Behavioral Symptoms Index had a mean T-score of 46.83 (*SD* = 12.71, 38th percentile). The Externalizing Problems Index had a mean of 47.27 (*SD* = 12.02, 40th percentile), while the Internalizing Problems Index had a mean of 46.78 (*SD* = 10.47, 39th percentile). In terms of daily functioning, the Adaptive Skills Index had a mean of 51.00 (*SD* = 11.46, 54th percentile). On the internalizing subscales of Anxiety (*M* = 48.80, *SD* = 10.70) and Depression (*M* = 4546, *SD* = 11.86), as well all other subscales, mean scores were in the normal range.

Behavior Assessment Scale for Children – Self-Report of Personality (BASC-SRP)

In terms of global functioning, the Emotional Symptoms Index had a mean T-score of 51.54 (*SD* = 11.44, 53rd percentile). The Clinical Maladjustment Index had a mean of 50.54 (*SD* = 11.30, 51st percentile), the Personal Adjustment Index had mean of 47.51 (*SD* = 13.02, 46th percentile), and the School Maladjustment Index had a mean of 53.98 (*SD* = 9.82, 62nd percentile). Self reports on both the Anxiety (*M* = 48.87, *SD* = 10.75) and Depression (*M* = 52.41, *SD* = 12.26) were in the normal range, as were means on all other subscales scores.

Time 2 – Non-exposed Group

Reaction Index

The average RI total score at the second assessment was 16.18 (*SD* = 6.85), which is in the mild range, with scores ranging from 6 to 37 (see Table 2, Appendix F). According to their self-reports, 18.2% of children experienced no PTSD symptoms, 68.2% experienced mild PTSD symptoms, 6.9% experienced moderate PTSD symptoms, and no children experienced severe or very severe symptoms.

Behavior Assessment Scale for Children – Parent Rating Scales (BASC-PRS)

As during the first assessment, given the lack of mean scores and distributions outside the normal range, only the global measures and the specific subscales of Depression and Anxiety will be reported for Time 2. In terms of global distress, the Behavioral Symptoms Index had a mean T-score of 50.09 (*SD* = 11.81, 50th percentile).

The Externalizing Problems Index had a mean of 48.91 (*SD* = 12.75, 46th percentile), while the Internalizing Problems Index had a mean of 49.73 (*SD* = 10.48, 49th percentile). In terms of daily functioning, the Adaptive Skills Index had a mean of 49.50 (*SD* = 7.42, 47th percentile). The internalizing subscales of Anxiety (*M* = 51.09, *SD* = 9.14) and Depression (*M* = 49.32, *SD* = 10.48) were also in normal limits.

Behavior Assessment Scale for Children – Self-Report of Personality (BASC-SRP)

As with the self-report score for Time 1, all mean scores were all in the normal range. In terms of global functioning, the Emotional Symptoms Index had a mean T-score of 48.68 (*SD* = 11.69, 51st percentile). The Clinical Maladjustment Index had a mean of 47.00 (*SD* = 9.93, 47th percentile), the Personal Adjustment Index had mean of 51.64 (*SD* = 10.34, 42nd percentile), and the School Maladjustment Index had a mean of 50.55 (*SD* = 12.99, 43rd percentile). Self-report on both the Depression (*M* = 50.82, *SD* = 11.29) and Anxiety (*M* = 45.23, *SD* = 9.91) subscales, as well as the other subscales, were in the normal range.

Differences in Distress between Exposed and Non-exposed Children

The first hypothesis to be tested was that the level of posttraumatic distress would differ for the two groups. This was tested using a 2 (exposed group vs. nonexposed group) x 2 (time) mixed design ANOVA. Group was the between-groups factor, with time being the within-subjects factor. It was predicted there would be a main effect of the between-subjects factor. This hypothesis was supported, as a significant difference between the exposed and non-exposed groups was found (F (1, 55) = 4.454, $p < .039$).

Specifically, the non-exposed group showed a lower level of posttraumatic distress, as measured by total RI score, at both Time 1 (M = 20.14, SD = 11.36 vs. M = 25.08, SD = 14.29) and Time 2 (M = 16.38, SD = 6.95 vs. M = 25.11, SD = 16.49), as seen in Figure 1. The second hypothesis, that there would be no main effect for time, was supported by the data (F (1, 55) = 1.036, p = .313). There was, however, a significant interaction effect of group by time, (F (1, 55) = 179.219, p < .001).

Analysis of Variance: Change across Time for Posttraumatic Distress and Functioning

It was predicted that the exposed group would show stability over time while the non-exposed group would demonstrate an increase in RI scores from November to May. The examination of the significant interaction effect found above was tested using a pair of one-way ANOVAs and was partially supported by the data. Results did indicate that the exposed group's total RI scores were stable across time (F (10, 37) = 1.449, p = .275). While the non-exposed group did show a significant change in distress level between November and May (F (5, 20) = 62.501, p < .001), it was in the opposite direction than predicted, decreasing between assessments (see Figure 1).

The question of how general psychological and behavioral functioning in the groups, as reported by both parents and children, changes over time was then addressed. This was examined using a 2 (exposed group vs. nonexposed group) x 2 (time) mixed design ANOVA, with group as the between-groups factor and time as the within-subjects factor. No predictions were made, since this was a research question rather than a hypothesis. First the change in parental report of general functioning was examined. Results indicated that the BASC-PRS Behavioral Symptoms Index (BSI) did not change

over time for either group, as there was not a significant main effect of time (F (1, 59) = .000, p = .992), group (F (1, 59) = .481, p = .491), or a time by group interaction effect (F (1, 59) = .198, p = .658).

The change in the child's self-report of symptoms, as measured by the BASC-SRP Emotional Symptoms Index (ESI), was then addressed using the same design as above. Results indicated the scores were relatively stable across assessments, as there was no main effect of time (F (1, 52) = .222, p = .640). There was also no statistical difference between the two groups (F (1, 52) = .247, p = .621). There was, however, a significant interaction effect between the groups across time (F (1, 52) = .4.166, p = .046), as seen in Figure 2, as the non-exposed children's ESI decreased compared to the exposed children's increasing ESI scores.

Relationship Between Posttraumatic Distress and Exposure

To test the hypothesis that the presence and degree of PTSD symptoms in the exposed group would be affected by several factors, a series of analyses were undertaken. First, a series of correlational analyses were conducted to determine the relationship between the posttraumatic distress and the level of exposure the child had to the tornado. Statistically significant relationships were found between the total RI score at Time 1 and parent report of both how scared the child was during the tornado and how worried he or she had been since the tornado (r (80) = .453, p < .001 and r (81) = .468, p < .001, respectively). The only other statistically significant relationship between an individual item on the TEQ-P and the RI total score was for the reported number of times the family had taken shelter due to threat of a tornado over the past year (r (82) = .286, p = .009). In

terms of media exposure and its relationship to distress, no significant correlations were found between any of the types of exposure (e.g., disaster movies, disaster programs, disaster programs, or overall television watching) and scores on the RI. This was true both for the combined sample, as well as the exposed and non-exposed children examined separately.

For the TEQ-C, a significant relationship was found between total RI score and the child's report of how scared he or she was during the tornado (r (84) = .443, $p < .001$) and how scared he or she is when he or she see tornadoes or storms on television (r (86) = .474, $p < .001$). RI total scores were then correlated with the total exposure scores for the TEQ-PR and TEQ-CR. While a significant relationship was found between child-reported total exposure score and total RI score (r (86) = .348, $p = .001$), the same was not found for parent-reported total exposure (r (82) = .165, $p = .139$).

Regression Analyses: Exposure, Attributions, and Prediction of Posttraumatic Distress

Stepwise multiple regression analyses were used to examine the relationship between level of exposure, attributions, and degree of posttraumatic distress as measured by the total score on the RI. Specifically, the predictive ability of level of exposure to the tornado and number of attributions employed at 6 months post-disaster for RI total score at 6 months and 12 months post-disaster was examined. Both parent and child reported total exposure scores were used as measures of the level of exposure.

For Time 1, six months post disaster, the TAC total score entered on step one and accounted for 35.7% of the variance in total RI score (see Table 4, Appendix F). Neither parent nor child report total exposures scores contributed significantly to the present

model. For Time 2, 12 months post disaster, TAC total score at Time 1 again entered on step one and this time accounted for 32.7% of the variance in RI total score. As before, neither parent nor child report total exposures scores contributed significantly to the present model.

Given the amount of variance that the TAC total score explained in both time periods' RI scores, it was decided to further examine predictive ability of the TAC. To that end, the scales of the TAC at Time 1 were entered into a stepwise multiple regression analysis predicting RI total score at Time 1 (see Table 5, Appendix F). The TAC Self-blame scale entered on the first step and accounted for 40.1% of the variance in RI score. The TAC Expectations/Hypervigilance scale entered on the second step and contributed an additional 3.5% to the model, for a total adjusted R^2 = .429. The other TAC scales were not found to contribute significantly to the predictive ability of the equation. In using the TAC scales at Time 1 to predict total RI score at Time 2, Self-blame again entered on step one and accounted for 38.7% of the variance. The TAC God-blame scale entered on step two and added an additional 8.2%, for a total adjusted R^2 = .454. The other TAC scales were not found to contribute significantly to the predictive ability of the equation.

Regression Analyses: Exposure, Attributions, Posttraumatic Distress, and Prediction of Functioning

To examine how level of exposure, number of attributions, and degree of posttraumatic distress in children exposed to a disaster predict behavioral and psychological functioning as reported by parents, a simultaneous multiple regression

analysis was conducted. Exposure, TAC total score, and RI total score at Time 1 were used predict BASC-PRS BSI scores at Time 1. No variables were found to be significantly predictive for this equation. A second simultaneous multiple regression was conducted using exposure, TAC total score, and RI total score to predict BASC-SRP ESI. Again, no significant predictors were found.

CHAPTER IV

DISCUSSION

The purpose of the current study was to collect descriptive information on the children who had either been recently exposed to a disaster or who lived in a disaster-prone area, adding to the present knowledge concerning the long-term effects of natural disasters on children and what factors play a role in maintaining those effects. There were two main goals of this study. The first goal was to test the hypothesis that level of posttraumatic distress would differ between exposed and non-exposed groups of children. This was done by collecting data from children who had recently been exposed to a tornado and those who had not been exposed at multiple time points. The second goal was to gather data on factors that could be contributing to long-term maintenance and development of posttraumatic distress in disaster-exposed children, including exposure level, and attributions.

Interpretation of Results

Previous research into the long-term reactions of children after disaster have shown various patterns of distress, with some showing a decrease in symptoms over time (e.g., Shaw, Applegate, & Schorr, 1996) and some showing a steady level of symptoms (e.g., Lack & Sullivan, 2003). A major hypothesis of the current study was that children who had been recently exposed to a disaster would show stability across time in their

level of PTSD symptoms. This hypothesis was supported by the data. The exposed children showed no significant decrease in PTSD symptoms from 6 to 12 months post disaster, with the mean level of symptoms in the Moderate range, as determined by total RI score.

These findings concerning long-term distress in children following a natural disaster support multiple previous studies. Longitudinal follow-ups of other types of disasters have shown elevated levels of distress (Burke et al, 1986; McFarlane, Policansky, & Irwin, 1987; Shaw, Applegate, & Schorr, 1996), as have studies of children exposed to other types of trauma (Milgram et al., 1988; Terr, 1983). This stability also specifically supports the results of previous longitudinal research involving children who have experienced a tornado (e.g., Knight, 2001; Lack, 2003) and points to the relatively high degree of posttraumatic distress symptoms that this population experiences for extended periods after a disaster.

Another hypothesis was that exposed children would have a higher level of those symptoms than non-exposed children. This was also supported by the data. Non-exposed children displayed significantly lower amounts of tornado-related PTSD symptoms both outside and inside tornado season than exposed children. The hypothesis that the non-exposed children's RI scores would change across time, with higher scores during tornado season, was not supported. Instead, it was found that the non-exposed children's level of reported PTSD symptoms related to tornadoes decreased over time, although it remained in the Mild range as determined by RI scores. However, note that the degree of distress reported by the non-exposed children was as elevated as that found in other studies examining children who had been exposed to a different type of disaster (e.g.

McDermott, Lee, Judd, & Gibbon, 2005). The degree of distress was, however, in line with the one previous study that examined non-exposed children's level of tornado-related distress (Romero, 1997).

Why would non-exposed children's reported levels of distress being high in the fall and lower in the early spring? One possible explanation could be related to a type of primacy effect. The memories of the past tornado season's storms may be more prevalent and easily remembered during the fall immediately following tornado season (six months post tornado season) than during the following spring (12 months post tornado season). Especially if there has been little or no severe weather, as was the case during the current study's second assessment, those children not actually exposed to a tornado may not have been recently "primed" to be more worried or concerned about tornadoes.

Given both past research (e.g., McFarlane, 1987; McFarlane, Policansky, & Irwin, 1987) and the high degree of posttraumatic distress reported by both exposed and non-exposed children, it would be reasonable to expect elevations on more general measures of psychological or behavioral distress. This was not the case for the current sample. No mean elevations were found for any scales or subscales of the BASC, either by parent or child report, for either group. Even the Anxiety subscale of the BASC, which would be assumed to be related to the anxiety symptoms reported on the RI, was not significantly elevated at either time period, nor was it significantly correlated with posttraumatic distress as measured by the RI. So, while it appears that both exposed and non-exposed children have a high degree of worry and concern related to tornadoes, there seems to be little generalization of this worry to other situations or an impact of this worry on their overall levels of functioning. The one significant interaction effect found in the current

study appears to support this. Even though the children in the exposed group did increase in self-reported general functioning problems while the non-exposed decreased in symptoms, all scores were well within the normal limits, not even half a standard deviation from the mean.

If the level of tornado-specific posttraumatic stress symptoms as reported by the non-exposed group of children could be considered a normative level of distress for children in disaster-prone areas, then the seemingly dichotomous finding of high level of posttraumatic distress with no functional impairment found in this and previous studies (Lack, 2003) can be somewhat reconciled. While the long-term distress of these children may seem highly elevated based on other longitudinal disaster samples, compared to the regional "norm" it is in only slightly elevated. That is, if a normal level of tornado-related worry and stress for children in this region is in the mid- to high range of Mild PTSD symptoms, as measured by the RI, then the long-term elevation present in the exposed group (low range of Moderate PTSD symptoms) is not as high as it would appear at first glance.

Indeed, the results of the current study indicate that it may be necessary to use different cutoff score and/or categories to identify children in disaster-prone regions that are having true elevations in posttraumatic distress. For example, if one were to reset the categories of PTSD symptoms on the RI using the lowest level of tornado-related reported by the non-exposed group, which was a score of 16, as the start of the No Symptoms range and use similar breaks in category of degree of symptoms (i.e., 12-20 points per degree of symptoms), the exposed children's RI scores of 25 would not even fall into the new "Mild PTSD Symptoms" range, which would be considered between 28

and 40. Continuing by this reasoning, one could posit that, based on what may be the normative level of distress for this specific geographical and cultural area, the children who had been recently exposed to a disaster were showing no elevations in PTSD symptoms. This would then explain why there was no reported disturbance in the level of functioning in the current sample, as there was no true elevation in distress. Alternatively, solely using a measure of posttraumatic distress symptomology may not be sensitive to effectively distinguish those children who are and are not having a significant posttraumatic stress reaction to a disaster.

But what other types of measures could assist in determining if PTSD symptoms are at a problematic level? The current study would suggest two possible adjunctive measurements. First, the use of an attribution questionnaire would be indicated, given it's high level of predictive ability for distress. Those children truly experiencing normatively low levels of distress would be more likely have made a lower number of attributions for the disaster, as shown in the current study and it's precursors (Knight, 2001; Lack, 2003). Second, given that a global measure of psychological and behavioral distress was not different between exposed and non-exposed groups, the current measures of posttraumatic distress may need to be refined to include additional questions that ask about degree of impairment as a result of PTSD symptoms and/or fear when vicariously exposed to the disaster (e.g., through television). This second addition to the measure is of interest due to the difference in television viewing between exposed and non-exposed groups, specifically how often the parents reported changing the channel if news about dangerous weather comes on in exposed (almost 90% of the time) and non-exposed (never changed it almost 70% of the time).

Regardless of whether the level of distress experienced by the non-exposed children is truly normative, the fact remains that the non-exposed group scored higher during the fall, outside of tornado season, than they did in the spring, during tornado season. One possible explanation could be that the high scores in fall are due to the effects of the previous spring's less direct and vicarious exposure "carrying over" into the fall. There was a lack of major storms and tornadoes prior to the second assessment point in this study, so the children's distress level may have begun dissipating when spring came and no major storm systems had taken place yet.

A major goal of this study was to examine possible factors that may have played a role in the development and maintenance of posttraumatic distress within the exposed group of children. Specifically, the attributions made for the natural disaster and the level of exposure to the disaster were examined. The hypothesized positive relationship between level of exposure to the tornado and degree of posttraumatic distress was supported. Interestingly, only more subjective reports from both parent and child-reported level of exposure were found to be related to current level of distress. That is, child self-reported fear during and parent report of child fear during and worry since the tornado were significantly correlated with self-reported distress, where more objective measures of exposure such as damage to the house were not related to level of distress. This is in line with previous research that found that perceived threat, rather than objective exposure, to the disaster was more important in determining how severe a reaction a child had to a natural disaster (Knight, 2001; Lack, 2003; Lonigan et al., 1994). For example, believing your house would be destroyed and you would be killed could result in more long-term distress than thinking that you were relatively safe during a tornado.

In terms of non-direct exposure to tornadoes, the number of times a family had to take shelter due to tornado threat was significantly related to current level of distress in the exposed group outside of tornado season, but not during tornado season. Measures of vicarious exposure, such as number of disaster-related media seen, were not significantly related to current levels of distress at either assessment. For the non-exposed group, no measure of vicarious exposure was significantly related to tornado-related distress outside of or during tornado season. The lack of relationship between television viewing and distress was also found in the precursor to the current study (Lack, 2003), as was the high number of parents that rarely allow their child to see disaster-related media. There was, however a strong relationship between the child's self-report of fear when seeing tornadoes or natural disasters on television and current distress. Therefore, it could be hypothesized that this low level of disaster-related media exposure may be partially due to efforts by the children and their parents to actively avoid unpleasant reminders of the disaster that they experienced.

One hypothesis of that current study was that a positive relationship would exist between use of attributions and posttraumatic distress. This was supported by the data, as there were significant relationships between the different types of attributions and level of distress. This supports earlier research that has found that making any attribution is related to be more strongly predictive of emotional distress, and that the specific type of attribution made does not matter (Bulman & Wortman, 1977; Taylor, 1983). Examined statistically, the relationship between attributions and distress explained more of the variance than the relationship between exposure and distress, supportive of previous studies (e.g., Knight, 2001; Lack & Sullivan, 2004). This also points to support for the

idea of attributions as a possible mediator in the exposure-distress chain, first proposed by Dollinger (1986). In effect, it may be that the attributions a child makes are driven by his or her level of perceived exposure, and that those attributions in turn drive distress over the long-term.

Regression analyses were conducted to examine the predictive ability of exposure and attributions made for level of posttraumatic distress. For both in and out of tornado season, attributions were found to account for a significant percentage of the variance in distress (32.7% and 35.7%, respectively), while level of exposure did contribute significantly to the models. The attribution types most related to distress varied slightly between assessments. At both assessments, the TAC Self-blame scale accounted for the most variance. At six months post-disaster, the TAC Expectations/Hypervigilance scale entered on the second step for a total of 42.9% of the variance in distress explained. At 12 months post-disaster, God-blame scale entered on step two for a total of 45.4% of the variance explained. Previous studies using the TAC have found that the highest level of variance explained by the scales of Expectations/Hypervigilance (Knight, 2001) and Search for Meaning (Lack, 2003). The differences between the results of these studies are interesting and bear further research. It may be that factors outside of the disaster itself, such as community response following the tornadoes, could be the reason for why different types of attributions appear more strongly in certain groups.

In summary, the current study supported the differences in level of distress between children exposed to a tornado and non-exposed children, both during and outside of tornado season. In addition, the expected stability for the exposed group across time periods was found, supportive of this study's precursor. The expected increase in non-

exposed distress during tornado season, however, was not found, as the reported level of distress actually decreased across assessments. The level of reported distress among the non-exposed group was significantly higher than would be expected, on par with trauma-exposed samples from other studies. No general psychological or behavioral problems were observed in either group at either of the assessment periods.

The study also found the expected relationship between exposure and attributions to posttraumatic distress. While both were highly related to levels of distress, the presence of attributions for the disaster was found to be most predictive, especially self-blame for the disaster. This relationship between attributions and distress was found to be above and beyond even that of either subjective or objective exposure and distress, suggesting that exposure may drive attributions, which in turn drives distress.

Clinical Implications

The current study's results have several clinical implications. First, it provides evidence for the need for regional norms in those areas where disasters occur on a frequent basis. It would appear that using norms based on children who had a very acute, rarely occurring type of trauma (e.g., sniper attack, wildfire) would not identify those children in disaster-prone areas who are truly experiencing high levels of posttraumatic distress. Current norms may therefore over-identify those children who are actually having difficulties adjusting to posttraumatic distress.

Oddly, though the types of and the act of making attributions are highly related to the degree of distress the children display, the children themselves appear to place a low value and little emphasis on attributing the disaster to something. This was consistent

with previous research (Knight, 2001; Lack, 2003) that observed low levels of need to make attributions. Raising a child's awareness of his or her attempt to make attributions and learning what attributions, if any, a child is making for a disaster or other traumatic experience could help to predict which children would later show more distress. This would allow for earlier interventions focused on helping the child realize that those attributions that he or she may make, such as for self-blame, are erroneous. Using cognitive restructuring techniques similar to those used with depressive or anxious symptoms could perhaps do this.

Limitations and Strengths

Several limitations of this study should be noted. The sample was largely ethnically and financially homogenous, limiting the ability of the current results to generalize to other populations. The majority of the sample was Caucasian, lower middle class families, with few ethnic minorities such as Native Americans, African-Americans, and Hispanics. This limits the use of this information with those populations, who may experience posttraumatic distress symptoms differently due to cultural factors. It should also be noted that over 40% of the children had to be dropped from the non-exposed group due to the fact that they were actually exposed. Since the non-exposed sample was not homogenous in its exposure, this may have led to what could be considered a "contamination" effect, where the exposed children in the non-exposed sample had higher levels of distress that in turn led to higher levels of distress in the truly non-exposed children.

Limitations aside, this study had several significant strengths. Perhaps the most significant strength of this study was its comparison of exposed and non-exposed children in a disaster-prone area. No studies that the researcher is aware of have performed a longitudinal assessment of this type. The longitudinal nature of the study allowed for the comparison of the exposed and non-exposed groups both in and out of tornado season. This type of assessment in the study of children's distress is unusual, where usually only one or two points are assessed. Further, each point of data collection was theoretically based rather than chosen for convenience.

A second strength of the current study was the standardized assessments at each time period. The researcher and his colleagues used standard scripts to administer the measures to the children. These scripts were identical for each school and time period, helping to ensure consistency within the study's method of data collection. Such standardization will also help allow comparisons to other studies of children's long-term distress and assist in filling in some of the gaps in the literature concerning long-term reactions to disasters.

The current study further expanded the research on children's attributions for a disaster. The assessment of attributions at more than one time period is rare in the literature concerning children's distress. Largely due to a lack of measurement technique, the long-term development and changes made in attributions for a disaster have been unstudied. By providing a comprehensive assessment of attributions, the current study was able to address the lack of long-term data for both of these constructs. This area had mainly been limited to the areas of academic achievement, social interaction, and chronic

illness in the past. The study also contributed to the development of the TAC as a useful and practical measure of those attributions, something sorely lacking in the field.

Future Directions for Research

A number of further directions for research are suggested by the results of the current study. One interesting area for comparison would be a sample that has experienced a similar disaster, but has little chance of reoccurrence, such as a town outside of Tornado Alley that was hit by a tornado. Such a comparison would control for the constant danger of living in a tornado-prone area and allow a different type of normative comparison than the sample collected for this study. Also, further studies of non-exposed children and normative levels of distress in disaster-prone areas of the country should be undertaken.

Examination of the presence of and impact of attributions in other traumatic situations with children is needed. This will allow for comparison of not only if attributions are made, but if there are differences among the types of attributions made and their contribution to the prediction of distress. Such work would also allow further exploration of the proposed link between exposure and distress, where attributions are driven by exposure and may be either mediators or moderators of distress. On a similar note, the use of the TAC across different populations will help to establish its reliability and validity of children's attributions.

Another research question raised by the current research concerns how different populations react to natural disasters. Work needs to be done with a range of populations to determine if the long-term distress noted in the current study is limited to a certain

population of if it is more generalized. Examples of possible participants include older populations, those exposed to different types of traumas, cultural groups not represented in the current study, and populations with varying economic status. Such work could also examine the role that attributions play in determining distress levels and if that differs from what is observed in the current sample.

It is hoped that this study can serve as a starting point for the types of research outlined above. By continuing to expand on the strong findings from the current study, even more contributions can be made to the literature concerning posttraumatic distress and the factors that act to deter or increase it.

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APPENDICES

APPENDIX A

DEMOGRAPHIC QUESTIONNAIRE

PLEASE FILL THIS OUT AND RETURN IT TO YOUR CHILD'S TEACHER IN THE PROVIDED MANILLA ENVELOPE

Demographic Questionnaire

Please fill in the blanks below. All responses will be kept confidential.

1. Your relationship to the child: Mother____ Father ____ Other _____
   Please describe

2. Your sex: Male_____ Female_____

3. Your age: _____

4. Your race:

   White _____ African-American _____ Hispanic/Latino_____

   Asian/Pacific Islander _____ American Indian_____
   Nation/Tribe(s)

   Biracial_____ Other_____
   Please describe Please describe

5. Your highest level of education completed (circle year):

   1 2 3 4 5 6 7 8 (Grade school)

   9 10 11 12 (High school)

   13 14 15 16 (College)

   17 and over (Graduate School)

6. Your total family income per month (check one):

   Less than $800 _____ $800-$1,000 _____ $1001-$1,500_____

   $1,501-$2,000 _____ $2,001-$2,500_____ over $2,500 _____

7. Marital Status (check one):

   Married_____ Divorced_____ Separated_____ Single_____

   Widowed_____ Living with partner_____

If married or living with a spouse or partner, please provide the following information about your spouse/partner:

8. His/her relationship to the child:

Biological parent_____ Step-parent_____ Adoptive parent_____ Other_____

9. His/her age _____

10. His/her race:

White_____ African-American_____ Hispanic/Latino_____

Asian/Pacific Islander_____ American Indian_____
Nation/Tribe(s)

Biracial_____ Other_____
Please describe Please describe

11. His/her highest level of education completed (circle year):

1 2 3 4 5 6 7 8 (Grade school)

9 10 11 12 (High school)

13 14 15 16 (College)

17 and over (Graduate school)

Please provide the following information about the child participating in this study:

12. Age_____

13. Sex: Male_____ Female_____

14. Race (check all that apply):

White_____ African-American_____ Hispanic/Latino_____

Asian/Pacific Islander_____ American Indian_____
Tribe(s)

Biracial_____ Other_____
Please describe Please describe

15. Grade in school (circle one):

3 4 5 6

APPENDIX B

TORNADO EXPOSURE QUESTIONNAIRE – PARENT REPORT

PLEASE FILL THIS OUT AND RETURN IT TO YOUR CHILD'S TEACHER IN THE PROVIDED MANILLA ENVELOPE

Tornado Exposure Questionnaire - Parent Report

1. During the past **five years**, has your child been within **five miles** of a tornado? This could have occurred at home, school, during a visit to a friend's or relative's house, or while traveling with his/her parents.

   Yes (go to question #**2**) **No** (go to question #**30**)

2. During the tornado, where was your child?

   a. At home b. At school c. At friend's or relative's house

   d. In a storm shelter at a home e. At a community storm shelter

   f. Other (please describe) _____

3. During the tornado, where were you?

   a. At home b. At work c. At friend's or relative's house

   d. In a storm shelter at a home e. At a community storm shelter

   Other_____
   Please describe

4. How much damage occurred at your child's location?

   None Little Moderate Major Total Destruction

5. Did windows or doors break in the place your child stayed during the tornado?

   Yes No

6. Did your child have to go outside during the tornado because the building you were in was badly damaged?

   Yes No

7. How much damage did the tornado cause to your home?

   0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%

8. How long were you not able to live in your home?

   Never out of home One week or less 1 week to 1 month 1-2 months

   2-4 months 4-6 months Longer than 6 months

9. What is your current living situation? Check one
   _____ Living in same home/no damage
   _____ Living in same home/damage repaired
   _____ Living in new house
   _____ Living in new apartment or mobile home
   _____ Living with relatives or friends
   Other_____

10. At any time during the tornado did you think you might die? Yes No

11. Did you get hurt during the tornado?

    Yes No

    If yes, how_____

12. Did your child get hurt during the tornado?

    Yes No

    If yes, how_____

13. Did your child see anyone else get hurt during the tornado?

    Yes No

    If yes, how_____

14. Were any of your child's clothes or toys ruined by the tornado?

    Yes No

15. Has it been hard for your child to see his/her friends since the tornado because they moved or you moved?
    Yes No

16. During the tornado, how scared was your child?

Not at all Scared	Somewhat Scared	Scared	Very Scared	Terrified

17. During the tornado, how worried were you?

Not at all Worried	Somewhat Worried	Worried	Very Worried	Terrified

18. Since the tornado, how scared or worried is your child about storms?

Not at all Scared	Somewhat Scared	Scared	Very Scared	Terrified

19. Since the tornado, how worried are you about storms?

Not at all Worried	Somewhat Worried	Worried	Very Worried	Terrified

20. In your opinion, how severe was the tornado?

Mild	Moderate	Severe	Very Severe	Catastrophic

21. During the tornado, was your child separated from his/her family?

Yes No

22. In the days following the tornado, was your child separated from his/her family?

Yes No

23. If you answered Yes to #22, how long was your child separated from his/her family?

1-2 weeks 2-4 weeks 1-3 months

3-6 months 6-12 months More than 12 months

24. Were you or your spouse unemployed or prevented from working for some period of time as a result of the tornado?

Yes No

25. If you answered Yes to #24, how long were you or your spouse unemployed or prevented from working after the tornado?

1-2 weeks 2-4 weeks 1-3 months

3-6 months 6-12 months More than 12 months

26. Did your family receive assistance after the tornado? Check all that apply

_____ Financial (FEMA loan, insurance coverage)
_____ Medical
_____ Donations (Clothing, household items, money)
_____ Clean up assistance
Other_____

27. Did your family have trouble getting enough food or water after the tornado?

Yes No

28. Did your child receive psychological or counseling services after the tornado? Check all that apply.

_____Crisis debriefing/counseling within 2 months of the tornado (from the Red Cross, FEMA, NOVA, church, school, etc)
_____Counseling in small groups provided in school
_____Counseling in small groups provided by church or community organization
_____Individual meeting with school counselor
_____Individual counseling with psychologist/psychiatrist/mental health worker
_____Other_____
Please describe

29. Did anyone else in your family receive psychological services or counseling after the tornado? Check all that apply.

_____Crisis debriefing/counseling within 2 months of the tornado (from the Red Cross, FEMA, NOVA, church, school, etc)
_____Counseling in small groups provided in school
_____Counseling in small groups provided by church or community organization
_____Individual meeting with school counselor
_____Individual counseling with psychologist/psychiatrist/mental health worker
_____Other_____
Please describe

PLEASE CONTINUE ON NEXT PAGE

30. In the past year, how many times has your family taken shelter due to the possible risk of a tornado (for example, in a storm shelter, basement, closet, or bathroom)?

    0 1 2 3 4 5 6 7 8 9 10 or more

31. How many times in the past year has your child been exposed to disaster related media (for example, during safety training) at school, church, or extracurricular activities such as Boy/Girl Scouts?

    0 1 2 3 4 5 6 7 8 9 10 or more

32. How many hours of television does your child generally watch per day from the time they get home from school until they go to bed?

    1 2 3 4 5 6 7 8 9 10 11 or more

33. How many hours of television does your child generally watch per day on the weekend?

    1 2 3 4 5 6 7 8 9 10 11 or more

34. How often does your child see disaster related movies such as Twister, The Perfect Storm, Deep Impact, Armageddon, or The Day After Tomorrow?

    Never Several times a year Once a month Once a week More than once a week

35. How often does your child watch disaster-related programs on channels such as The Weather Channel, Discovery, or the Learning Channel such as “Storm Warning!” or “Atmospheres”?

    Never Several times a year Once a month Once a week More than once a week

36. How often does your child watch special reports or news programs about disasters such as tornadoes?

    Never Several times a year Once a month Once a week More than once a week

37. If a television program is interrupted by a weather alert that shows footage of tornadoes currently happening, what percentage of the time do you allow your child to continue watching?

    0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%

38. Please describe any stressful events that have recently occurred in your family that are not directly related to a tornado.

39. Please provide any additional information related to your child's experience with tornadoes that may have had an impact on him/her.

APPENDIX C

TORNADO EXPOSURE QUESTIONNAIRE – CHILD REPORT

Tornado Exposure Questionnaire-Child Report

Circle the response that best describes your experience during and after the tornado

1. During the tornado, where were you? *Circle one*

   a. At home b. At school c. At friend's or relative's house

   d. In a storm shelter at a home e. At a community storm shelter

   Other_____
   Please describe

2. Did windows or doors break in the place you stayed during the tornado?

   Yes No

3. Did you get hit by anything falling or flying during the tornado?

   Yes No

4. Did you get hurt during the tornado?

   Yes No

5. Did you see anyone else get hurt during the tornado?

   Yes No

6. How scared were you during the tornado? *Circle one*

   Not at all Scared Somewhat Scared Very Scared Terrified

7. Did a pet you liked get hurt or die during the tornado?

   Yes No

8. Did you have to go outside during the tornado because the building you were in was badly damaged?

   Yes No

9. Was your home badly damaged or destroyed by the tornado?

   Yes No

10. How much damage did the tornado cause to your home? *Circle one*

    None A little A medium amount A lot Totally destroyed

11. Were your clothes or toys ruined by the tornado?

    Yes No

12. Has it been hard to see your friends since the tornado because they or you moved?

    Yes No

13. Did you or your family have trouble getting enough food or water after the tornado?

    Yes No

14. Did you move to a new place after the tornado?

    Yes No

15. Did you have to go to a new school because of the tornado?

    Yes No

16. Did you have to live away from your parents for a week or more because of the tornado?

    Yes No

17. Did one of you parents have to stop working because of the tornado?

    Yes No

18. Did your pet run away or have to be given away because of the tornado?

    Yes No

19. When you see shows on TV about tornadoes, like news reports or movies, how much do they scare you?

    Not at all scared A little scared Scared Very scared Terrified

20. How many times in the past year did you see something on TV about tornadoes at school, church, or something like Boy/Girl Scouts?

    1 2 3 4 5 6 7 or more

APPENDIX D

CONSENT FORMS – PARENT

PLEASE SIGN THIS COPY AND RETURN IT TO YOUR CHILD'S TEACHER

Informed Consent Statement

Project Title: A Comparison of Posttraumatic Distress Related to Seasonal Natural Disasters in Exposed and Non-exposed Children

Investigators: Caleb W. Lack, M.S., & Maureen A. Sullivan, Ph.D.

A. Purpose: This study will assess the effects of experiencing a tornado on children. Information on children's distress, attributions made about tornado-related events, and general functioning will be gathered in the late fall and in the spring to compare to the children who have not experienced a tornado.

B. Procedures: I understand that I will be asked to complete the following measures:

1. Demographic Questionnaire. This questionnaire will ask for demographic information about yourself and your spouse or partner such as age, race, and relationship to child, education level completed, marital status, and income.

2. Behavior Assessment System for Children (parent form). This questionnaire will ask for information on your child's behavior at home, school, and in the community.

3. Tornado Exposure Questionnaire (parent form). This questionnaire will ask for information about your experience during the tornado, including your family's location and whether your child was separated from you, how severe you thought the tornado was, the amount of damage to your home, any injuries suffered by your family, your family's current living situation, whether you were prevented from working because of the tornado, and whether you received assistance after the tornado.

I understand that my child will be asked to complete the following measures:

1. Tornado Exposure Questionnaire (child form). This questionnaire will ask your child about his/her experience during the tornado, how severe he/she thought the tornado was, any injuries sustained or witnessed, loss of property, and disruption in routine as a result of the tornado.

2. Frederick's Reaction Index. This questionnaire will ask your child about feelings and thoughts he/she has had about the tornado. Topics include bad dreams, repetitive thoughts, worries, loneliness, and physical complaints like headaches or stomachaches that may have been present after the tornado.

3. Trauma Attribution Checklist. This questionnaire will ask your child about explanations he/she may have for the occurrence of the tornado or bad things that happened during the tornado. Your child will be asked questions about reasons that he/she may have for tornado-related events.

4. Behavior Assessment System for Children (self-report form). This questionnaire will ask your child about their everyday thoughts, feelings, and behavior, both at home and in school.

C. Duration of Participation. Your participation and your child's participation are completely voluntary and may be ended at any point. It is expected to take approximately 30-40 minutes to complete the parent questionnaires. The child questionnaires are expected to take 60 minutes to complete and will be administered at your child's school during school hours in November. The follow-up to this study will occur in May and take approximately 45 mintues. Your signature on this form gives consent for you and your child to participate in the follow up sessions. In April, you will receive another form asking for your consent to participate in the follow-up study.

D. Confidentiality. All information about you and your child will be kept confidential and will not be released. Questionnaires will have subject numbers, rather than names on them. All information will be kept in a secure place that is open only to the researchers and their assistants. This information will be saved as long as it is scientifically useful; typically, such information is kept for 5 years after publication of the results. Results from this study may be presented at professional meetings or in publications, but you and your child will not be identified individually; we will be looking at the group as a whole.

E. Benefits of participation. Your family will be entered into a $50.00 drawing after the parent questionnaires are received and the child questionnaires are collected in November. Your family will be entered into another drawing in May after follow-up questionnaires are collected.

F. Risks of participation. The risks to you and your child are minimal. It is possible that some children may become upset when asked to think about tornadoes. If this happens, we will talk with your child about his/her concerns and let you know about his/her concerns. If your child becomes uncomfortable or upset, your child will be given the opportunity to stop participation at that point with no penalty. You will be offered several names and phone numbers of agencies that work with parents and children if any of these events take place.

I have been fully informed about the procedures listed here. I am aware of what my child and I will be asked to do and of the benefits of my participation. I also understand the following statement:

I affirm that I am 18 years of age or older.

I understand that I may contact any of the researchers at the following addresses and phone numbers, should I desire to discuss my or my child's participation in the study and/or request information about the results of the study: Maureen Sullivan, Ph.D., 215 North Murray Hall, Dept. of Psychology, Oklahoma State University, Stillwater, OK 74078-0250, (405) 744-6027. I may also contact Carol Olsen, Institutional Review Board, 415 Whitehurst, OSU, (405) 744-1676. I have read and fully understand this consent form. I sign it freely and voluntarily. A copy of this form will be given to me.

Please read the following statements and place a check next to the statement that indicates your level of participation.

_____ I agree to participate and I give my permission for my child to participate if he/she wishes to.

_____ I agree to participate, but I do not give my permission for my child to participate.

_____ I do not wish to participate, but I give my permission for my child to participate if he/she wishes to.

_____ _____

Parent's Name (please print) Date

_____

Signature of Parent

_____

Child's Name (please print)

APPENDIX E

ASSENT FORMS – CHILD

Dear Student,

The tornado that hit your town last spring is an example of the kind of damage that tornadoes can cause. We are interested in the effects of tornadoes, and we are requesting your help. We are asking you to participate in our study.

To participate in our study, you will have to fill out four forms. These forms ask questions about your family's experiences during the tornadoes, your feelings about the tornadoes, thoughts you have had about the tornadoes, and how you act everyday.

Please know that whether or not you participate is completely up to you. We do hope that you will take the time to complete these forms and provide us with this important information. If you any question bothers you, please feel free to leave the answer blank.

If you are willing to complete these forms for us, please check off the blank and sign your name on the line. If you do not want to participate, just put the forms back in the envelope, give us the envelope, and you can return to class. The pencil is yours to keep.

_____I agree to participate in this study.

_____

Please print name

APPENDIX F

TABLES

Table 1

Exposed Children's Viewing of Types of Disaster-Related Television per Parent Report

How often	% Disaster Movies	% Disaster Programs	% Disaster Specials
Never	26.0	32.7	15.8
Several times a year	58.0	45.5	64.4
Once a month	13.0	13.2	6.9
Once a week	2.0	5.0	7.9
> Once a week	1.0	3.0	5.0

Table 2

Degree of PTSD Symptoms as Measured by the Reaction Index

Degree of Symptoms	Exposed Group Time 1	Exposed Group Time 2	Non-Exposed Group Time 1	Non-Exposed Group Time 2
	%	%	%	%
No PTSD Symptoms (Range 0-11)	12.8 (*n* =12)	19.5 (*n* = 8)	15.0 (*n* = 6)	18.2 (*n* = 4)
Mild PTSD Symptoms (Range 12-24)	40.4 (*n* = 38)	41.5 (*n* = 17)	50.0 (*n* = 20)	68.2 (*n* = 15)
Moderate PTSD Symptoms (Range 25-39)	25.5 (*n* = 24)	21.2 (*n* = 9)	22.5 (*n* = 9)	6.9 (*n* = 3)
Severe PTSD Symptoms (Range 40-59)	18.1 (*n* = 17)	15.4 (*n* = 6)	12.5 (*n* = 5)	0.0 (*n* = 0)
Very Severe PTSD Symptoms (Range 60-80)	3.3 (*n* = 3)	2.4 (*n* = 1)	0.0 (*n* = 0)	0.0 (*n* = 0)
Total RI Score				
Mean	26.66	24.76	22.53	16.18
SD	(14.64)	(15.73)	(12.14)	(6.85)

Table 3

Means and Standard Deviations of Exposed Children's Attributions as Measured by the TAC

TAC Scale/Subscale	Time 1	Time 2
Attribution of Responsibility (Range 0-18)	4.15 (3.17)	4.02 (2.78)
Self-blame (Range 0-8)	1.88 (1.84)	1.70 (1.97)
Other-blame (Range 0-4)	0.46 (0.86)	0.42 (0.64)
God-blame (Range 0-4)	0.82 (0.92)	0.95 (0.92)
No-blame (Range 0-2)	1.06 (0.94)	1.06 (0.94)
Importance of Attributing Responsibility (Range 0-6)	0.93 (1.25)	0.87 (1.17)
Expectations/Hypervigilance (Range 0-10)	3.85 (2.67)	4.23 (3.38)
Search for Meaning (Range 0-10)	2.91 (2.37)	2.75 (2.68)
Omen Formation (Range 0-4)	1.42 (1.19)	1.32 (1.07)
TAC Total Score (Range 0-48)	13.30 (8.46)	13.05 (8.95)

Table 4

Summary of Stepwise Regression Analyses for Overall Exposure and Number of Exposed Children's Attributions Predicting Posttraumatic Distress at Times 1 and 2

Time 1
(N = 90)

Variable	Multiple R	R^2	Adjusted R^2	F	Significance
Step 1 TAC Total Score	.603	.364	.357	50.343	< .001

Note: Parent and child-reported total exposure scores were excluded from the equation.

Time 2
(N = 37)

Variable	Multiple R	R^2	Adjusted R^2	F	Significance of F
Step 1 TAC Total Score	.588	.346	.327	18.524	< .001

Note: Parent and child-reported total exposure scores were excluded from the equation.

Table 5

Summary of Stepwise Regression Analyses for Specific Attribution Types Predicting Exposed Children's Posttraumatic Distress at Times 1 and 2

Time 1
(*N* = 78)

Variable	Multiple *R*	R^2	Adjusted R^2	*F* change	Significance of *F*
Step 1 TAC Self-blame	.640	.409	.401	52.644	< .001
Step 2 TAC Self-blame TAC Expectations/Hypervigilance	.666	.444	.429	29.939	< .001

Note: All other TAC scales were excluded from the equation.

Time 2
(*N* = 31)

Variable	Multiple *R*	R^2	Adjusted R^2	*F* change	Significance of *F*
Step 1 TAC Self-blame	.639	.408	.401	19.964	< .001
Step 2 TAC Self-blame TAC God-blame	.700	.490	.454	13.458	< .001

Note: All other TAC scales were excluded from the equation.

APPENDIX G

FIGURES

Figure Caption

Figure 1. Total RI score means across time periods.

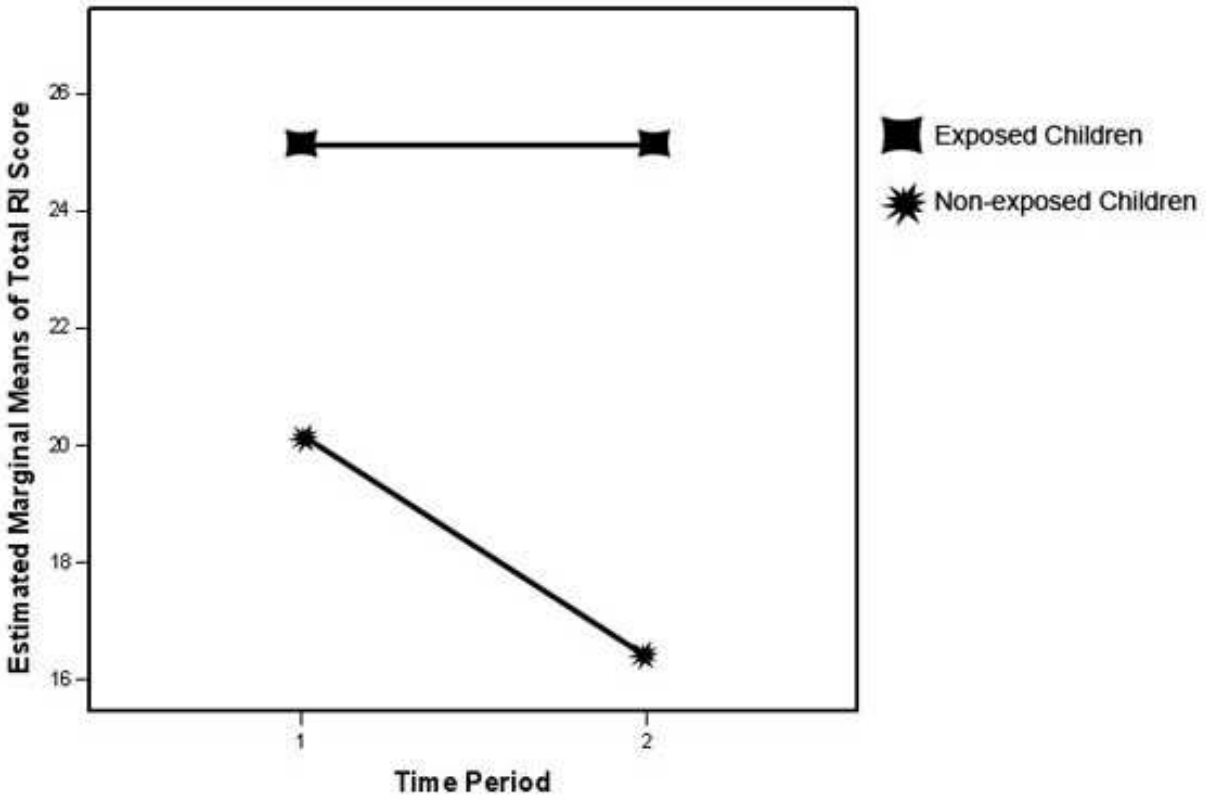
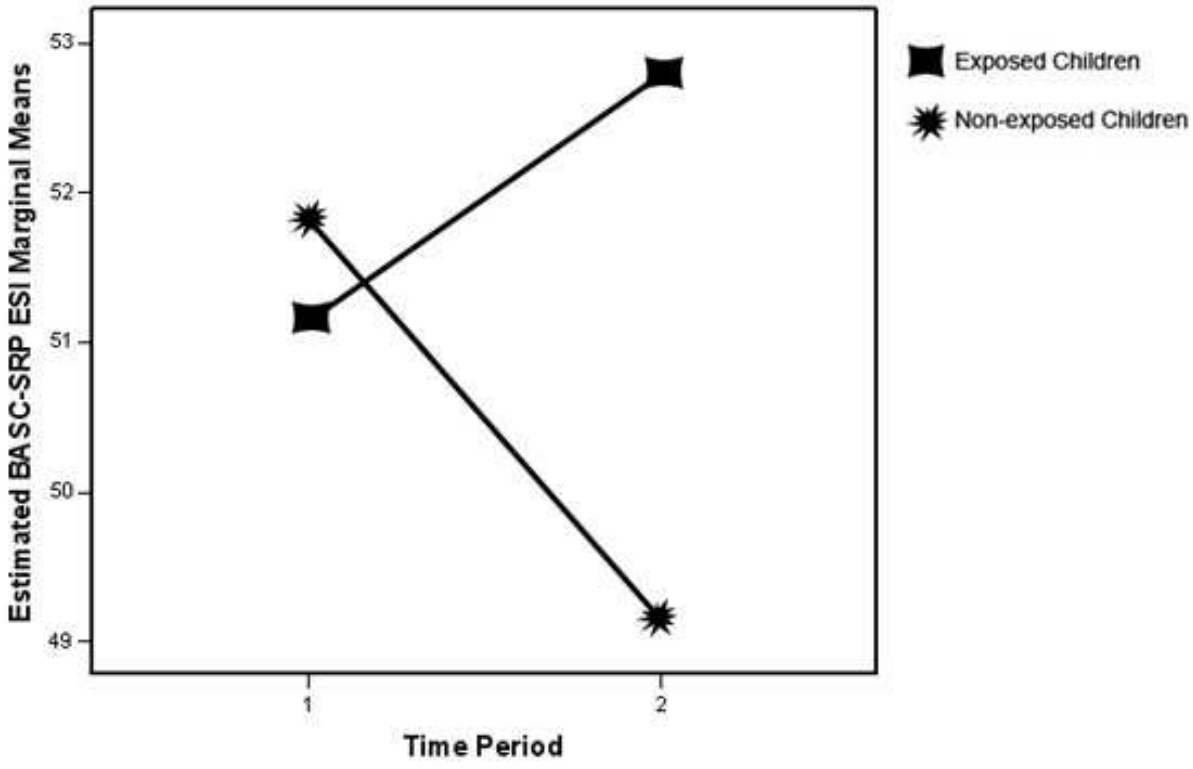

Estimated Marginal Means of Total RI Score
26
24
22
20
18
16
1
2
Time Period
Exposed Children
Non-exposed Children

Figure 2. Total BASC-SRP ESI score means across time periods.


Estimated BASC-SRP ESI Marginal Means
53
52
51
50
49
1
2
Time Period
Exposed Children
Non-exposed Children

APPENDIX H

IRB

Oklahoma State University
Institutional Review Board

Protocol Expires: 11/10/2003

Date: Monday, November 11, 2002 IRB Application No AS0329

Proposal Title: EFFECTS OF SEASONAL NATURAL DISASTERS ON POSTTRAUMATIC STRESS SYMPTOMS, COPING STRATEGIES, AND ATTRIBUTIONS

Principal Investigator(s):

Caleb Lack
311 N Murray
Stillwater, OK 74078

Reviewed and Processed as: Expedited (Spec Pop)

Approval Status Recommended by Reviewer(s): Approved *

Dear PI :

Your IRB application referenced above has been approved for one calendar year. Please make note of the expiration date indicated above. It is the judgment of the reviewers that the rights and welfare of individuals who may be asked to participate in this study will be respected, and that the research will be conducted in a manner consistent with the IRB requirements as outlined in section 45 CFR 46.

As Principal Investigator, it is your responsibility to do the following:

1. Conduct this study exactly as it has been approved. Any modifications to the research protocol must be submitted with the appropriate signatures for IRB approval.
2. Submit a request for continuation if the study extends beyond the approval period of one calendar year. This continuation must receive IRB review and approval before the research can continue.
3. Report any adverse events to the IRB Chair promptly. Adverse events are those which are unanticipated and impact the subjects during the course of this research; and
4. Notify the IRB office in writing when your research project is complete.

Please note that approved projects are subject to monitoring by the IRB. If you have questions about the IRB procedures or need any assistance from the Board, please contact Sharon Bacher, the Executive Secretary to the IRB, in 415 Whitehurst (phone: 405-744-5700, sbacher@okstate.edu).

Sincerely,

Carol Olson

Carol Olson, Chair
Institutional Review Board

*NOTE: The investigator is reminded that if any child experiences distress greater than that expected in ordinary life and as delineated in the revision statement, the investigator must report this as an adverse event to the IRB Chair within 24 hours.

VITA

Caleb Wayne Lack

Candidate for the Degree of

Doctor of Philosophy

Dissertation: A COMPARISON OF POSTTRAUMATIC DISTRESS RELATED TO SEASONAL NATURAL DISASTERS IN EXPOSED AND NON-EXPOSED CHILDREN

Major Field: Psychology

Biographical:

Personal Data: Born in Mountain View, Oklahoma, on September 23, 1978, the son of Johnny and Patty Lack.

Education: Graduated from Mountain View-Gotebo High School, Mountain View, Oklahoma, in May 1997; received Bachelor of Arts degree in Psychology from Oklahoma State University, Stillwater, Oklahoma in May 2001; received Master of Science degree in Psychology at Oklahoma State University in December, 2003. Completed pre-doctoral internship at the University of Florida in the Departments of Psychiatry and Clinical and Health Psychology on June 30, 2006. Completed the requirements for the Doctor of Philosophy degree in Psychology at Oklahoma State University in June 2006.

Professional Memberships: Psi Chi, American Psychological Society, Association for Behavioral and Cognitive Therapies

Name: Caleb W. Lack Date of Degree: July, 2006

Institution: Oklahoma State University Location: Stillwater, OK

Title of Study: A COMPARISON OF POSTTRAUMATIC DISTRESS RELATED TO SEASONAL NATURAL DISASTERS IN EXPOSED AND NON-EXPOSED CHILDREN

Pages in Study: 113 Candidate for the Degree of Doctor of Philosophy

Major Field: Psychology

Scope and Method of Study: This study was designed to assess and follow the presence of posttraumatic stress disorder symptomology in children exposed to a tornado and compare that to the same symptomology in demographically similar children who had not been exposed to a tornado. This was done to examine the differences between these groups, both of whom live in a disaster-prevalent area, inside and outside of tornado season. The study also examined the roles that re-exposure to environmental cues, exposure to disaster-related media, attributions, and other factors play in maintaining a child's level of distress, as well as the children's general behavioral and emotional functioning. Participants in the study were 95 exposed children and 70 non-exposed children ages 8-12. The exposed children had at least one tornado strike their hometown in late May or early June 2004, while the non-exposed children's hometown had not had a tornado within 10 miles of it in the past five years. Each participant and their parent completed a series of questionnaires designed to measure the above variables in November 2004 (6 months post tornado and outside tornado season) and May 2005 (12 months post tornado and inside tornado season).

Findings and Conclusions: The current study supported the proposed stability of posttraumatic distress symptoms in tornado-exposed children, showing no decrease from six to 12 months post tornado. Also supported was the difference in posttraumatic distress symptom level between exposed and non-exposed children, with non-exposed children displaying significantly lower amounts of tornado-related PTSD symptoms both outside and inside tornado season than exposed children. The degree of difference between these two groups, while statistically significant, was not as large as expected, as the non-exposed children did show mild levels of posttraumatic distress. In contrast to expectations, results showed that tornado-specific distress was not related to more global behavioral or emotional functioning. The current study also supported the relationship between the factors of exposure, attributions, and distress .

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