

**STRESS AND COPING IN CHILDREN
FOLLOWING A NATURAL
DISASTER**

By

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Stress and Coping in Children Following a Natural Disaster

According to Cox (1978), stress is a complex transaction between the individual and the environment in which perceived demands are greater than perceived capabilities. Any situation in which an individual's cognitive appraisal determines this imbalance may have negative effects on his or her psychological and physical well-being. While this imbalance may occur in a variety of situations, fatigue, physical exertion, emotional arousal, pain, fear, and concentration are many of the most common reactions.

In order to mediate the effects of stress, individuals develop resources to increase their perceived capabilities in any given situation. When used appropriately, these coping strategies are capable of diminishing the effects of stressful events. If the perceived demands of the stressor exceed the perceived resources of the individual, however, physical and/or psychological impairment results.

There is an innate relationship between natural disasters and stress. Whether it is an earthquake, hurricane, tornado, or other climatological phenomenon, natural disasters are able to inflict extensive damage in a brief time - often with very little warning. Many survivors of the intense stress reaction of natural disasters are often left homeless, frightened, confused, or injured.

The impact of natural disasters is often very similar to other stress reactions. For research purposes, it is necessary to define the term "disaster." Belter and Shannon (1993) suggest that disasters are characterized according

to the scope and extent of "physical, social, and psychological damage caused" (p. 85). In addition, the event needs to be outside the realm of everyday experience and affect a large number of people. Lastly, the damage must be serious enough to threaten the victims' pre-existing coping abilities. The phrase "affects a large number of people" differentiates Belter and Shannon's definition of disasters from other events "outside the realm of everyday experience" that affect isolated individuals (e.g., physical or sexual assault on an individual).

It can be distressing to witness child victims of these natural disasters. Yet not all children exposed to natural disasters are negatively affected. Some children adjust with little or no difficulty. Other children may develop generalized anxiety reactions or even symptoms of post-traumatic stress disorder (PTSD). Researchers believe that the mediating effects of cognitive and behavioral coping strategies can reduce or exacerbate these stress reactions (Compas, 1987).

In spite of the potential role of child coping strategies in reducing or exacerbating the stress reactions following a natural disaster, there has been little research examining this issue. This investigation studies the impact of a natural disaster on elementary school-age children 10 months after a tornado. First, the stress and coping literature will be reviewed. A conceptual model to account for children's stress and coping in the natural disaster context will then be proposed. The research on natural disasters will then be reviewed. An investigation will be conducted to test the conceptual model. It is intended that

this investigation will elucidate the effects of natural disasters on children. The role of coping will also be explored to determine how coping may be related to children's PTSD symptoms after a natural disaster. Coping with academic stressors will also be examined to determine whether children alter their coping strategies in different contexts (e.g., tornado versus academic context).

Review of the Stress and Coping Literature

Concepts of Stress

There is an integral link between the concepts of stress and coping. When researchers discuss stress, it is necessary to consider the concept of coping. Therefore, it is critical to incorporate and adapt a theory of stress that explains coping. The measurement of this relationship is contingent on the definition of stress. Three distinctly different theories of the concept of stress have been proposed in the literature including the following: (1) the stimulus-based approach; (2) the response-based approach; and (3) the interactional approach. In this section, each of these schemes will briefly be discussed.

The stimulus-based approach views stress as a potential residing within the stimulus provided by the organism's environment. Stress is imposed by environmental conditions that are characterized by some degree of objective physical or psychological danger (Derogatis & Coons, 1993). Cox (1978) stated that stimulus theorists frequently use an engineering model to explain human behavior, assuming individuals are resilient against the environment. When the cumulative stress is greater than the individual's tolerance, there is a deterioration in functioning (i.e., stress reaction). This approach requires objective danger in his or her environment to experience stress (Cox, 1978). While this might explain the stressor of a natural disaster, it does not account for subjective danger in the environment (e.g., cognitive appraisal; Gil, 1984). This theory also does not account for stressors that are not objectively threatening

(e.g., boring tasks).

Response-based approaches emphasize the effect of the stressor on the individual. The presence of stress is defined by the individual's response (Cox, 1978), the dependent measure according to this scheme. This unidirectional approach to stress was the theoretical basis for Selye's general adaptation syndrome (Selye, 1956). This theory emphasizes physiological stress reactions in the development of disease and psychological maladjustment. It suggests that stress can accumulate, with greater stress resulting in greater distress without positing any clear mechanism for discharge of stress. Implicit in this theory is that an individual may experience stress in anticipation of an event that has not occurred (Derogatis & Coons, 1993). It does not account for why events are stressful for some individuals and not for others, however.

Interactional theories emphasize characteristics of the individual as imperative in mediating the stimulus characteristics of the environment and the responses they invoke (Cox, 1978; Laux & Vossel, 1982). Interactional theorists are critical of the stimulus- and response-based theories because of the absence of the mediating role of the individual. These theorists insist the individual constantly mediates between the perceived demands of the environment and his or her own perceived capabilities (Cox, 1978). This constant feedback loop creates a dynamic system within the individual which may include cognitive, perceptual, and physiological characteristics (Derogatis & Coons, 1993).

While each of these theories offers explanations of stress reactions, the outcomes can be quite different. The greatest weakness with the response- and stimulus-based theories of stress is the minimal role of cognitive appraisal. The stimulus-based theory suggests an objective threat automatically leads to the perception of threat in the individual and that anticipation is not sufficient to create stress. The response-based theory assumes an accumulation of distress without modulation and does not explain how some situations are perceived as stressful. The most comprehensive theory of stress to account for the trauma of a natural disaster is the interactional model of stress since it acknowledges event characteristics, response alternatives, and subject variables.

The three prominent approaches towards the study of stress were summarized in this section. On the basis of this review, the interactional model of stress appears the most comprehensive to account for the potential impact of natural disasters. In this next section, the literature on child coping will be reviewed. Based on the reviews of the literature, a model to account for coping with natural disasters will be proposed.

Concepts of Child Coping

Inherent in any discussion of stress is the concept of coping. Coping is loosely defined as a reaction by the individual to a stressor. While the ultimate goal of this reaction may be to reduce any distress caused by the stressor, this is not always the case. It is possible that coping strategies used by the individual may actually exacerbate his or her distress in some situations. In this

section, the literature regarding child coping will be briefly reviewed.

One of the most challenging aspects of studying “child coping” is the difficulty operationalizing the term. What is it and how is it measured? Child coping has many different meanings and has been assessed in different ways. Consequently, the conclusions of these investigations are partially drawn by the measures themselves.

Coping can be described as learned behavioral responses that reduce an aversive stimulus. By reducing the effects of that stimulus, organisms are negatively reinforcing their behavioral responses. Hubert, Jay, Saltoun, and Hayes (1988) developed the Behavioral Approach-Avoidance and Distress Scale to assess the coping behaviors of pediatric patients between the ages of 3 and 11 years undergoing preparation for painful medical procedures. Hubert, et al. demonstrated the importance of incorporating behavioral measures in assessing child coping. This technique is more efficacious with populations that can not be assessed with other methods (e.g., questionnaires, interviews). While this is a reliable method for assessing coping based solely on overt behavior, it is not able to assess the potential influence of other internal factors (e.g., cognitive processes).

A second conceptualization of coping classifies individuals according to their personality traits or dispositions. With knowledge of individuals' personality traits, researchers believed that coping strategies following stressful situations can be predicted. These traits or dispositions are the basic units of personality

which predispose individuals to have relatively stable patterns of coping across different contexts. In his review of the literature, Compas (1987) discussed many of these dispositional factors that influence child coping. For example, he states that the Type A behavior pattern, repression-sensitization, and monitoring-blunting are all coping strategies that rely on certain personality traits. Other researchers have used this personality conceptualization to better understand children's coping strategies. Many measures have been used to ascertain the personality traits of children, consisting primarily of questionnaires for specific coping dispositions and projective measures. Questionnaires are typically objective; however, projective tasks require children to "project" their coping strategies onto a relatively ambiguous stimulus. By interpreting the responses of the children, it is possible to determine their coping strategies. Some of the projective techniques used to assess child coping include story completion techniques. Robins (1987) used the Roberts Apperception Test for Children (RAT-C; McArthur & Roberts, 1982). Asarnow, Carlson, and Guthrie (1987) developed their own Coping Strategies Test. Other projective methods include child drawings and puppet play (Walker, 1988) and the Rorschach. Exner and Weiner (1981) identify human movement on the Rorschach as a projection of the preferred coping style of the individual.

Although these projective techniques to assess children's coping strategies have been popular in the literature, researchers question their utility for several reasons. People do not always act in accordance with their

personality traits. For example, an individual with a “monitoring” coping style may “blunt” in specific situations. This suggests that these trait and style methods of assessing coping do not necessarily estimate the variability of coping strategies in different contexts. Another drawback of personality is elucidated by Knapp, Stark, Kurkjian, and Spirito (1991). Knapp, et al. stated:

Most of the projective techniques used to assess children’s coping have been idiosyncratic measures devised for use in a single study; they were not designed to be used as standardized measures of coping. As a result, the types of coping strategies have varied widely, and information regarding the reliability and validity of these measures has been quite limited (p. 314).

In short, projective assessment techniques for measuring children’s coping strategies are limited by their reliability. Even with measures with good reliability (e.g., Exner scoring for the Rorschach), the validity of these measures to accurately measure coping strategies is suspect.

Structured and semi-structured interviewing techniques have also been used to assess children’s coping. This method has been demonstrated to be an excellent assessment technique due to the ability to gain knowledge about the child’s coping in specific domains. Also, the interviewer has some latitude in redirecting the questions to more accurately assess the individual child.

Walker (1988) used semi-structured interviews to assess coping strategies used by siblings of pediatric oncology patients. Twenty-six subjects

from 15 families were interviewed in this study attempting to identify cognitive and behavioral coping strategies. While other projective techniques were used (e.g., puppet play, drawings, and cartoon story-telling), all families were interviewed twice in their homes. After each family interview, siblings had individual unstructured interviews in their bedrooms where puppet play and drawings were utilized. Content analysis of the taped interviews revealed several cognitive coping domains including intra-psychic, interpersonal, and intellectual strategies. Behavioral coping was also identified including self-focusing, distraction, and avoiding. Due to a lack of standardized procedures and measures in this study, it is difficult to draw any conclusions about the relationship between siblings of oncology patients' behavior and their use of different coping strategies.

Curry and Russ (1985) attempted to identify coping strategies in children undergoing dental treatment. They administered the Cognitive Coping Interview (CCI) to 30 children between the ages of 8 and 10 years. During the 4-phase restorative dental procedure, children were rated by an independent observer on three behavioral coping strategies. Immediately following each phase of treatment, children were interviewed and rated on 6 coping strategies. The authors found that older children were able to use a greater number of cognitive responses to stress. The older children also focused more on positive aspects of the stressor (e.g., dental procedure) and sought less information. The authors found no significant correlation between the children's interview and behavioral

observations during the procedure. This finding suggests that behavior is not correlated with reported coping strategies.

Wertlieb, Weigel, and Feldstein (1987) developed and used a semi-structured interview to assess child coping in up to five different stressful situations. The 176 children between the ages of 6 and 9 years were interviewed in their homes and requested to discuss their coping strategies with five stressful situations. The children also completed an estimate of intellectual functioning and a measure of Type A dispositional characteristics. The children's parents completed the parent form of the Child Behavior Checklist (Achenbach & Edelbrock, 1983). Coping responses were classified according to the focus (self, environment, or other), function (problem-solving or emotion-management), and mode of the coping strategy (information, support-seeking, direct action, inhibition of action, intra-psycho). Consistent with Curry and Russ' (1985) results, Wertlieb, et al. reported that older children had increasing capacities for cognitive control as well as greater ability of emotion-management and intra-psycho strategies. The authors also reported that boys relied more on individual coping and girls were more environment-focused. An interesting finding in this study was that 37 of the 176 children claimed that "nothing helps" with coping after exposure to stress. While there were no age effects, this response was more common in boys. A limitation of this study was the reliability of their coping measure. Kappa coefficients for this study were .53 (Focus), .53 (Function), and .64 (Mode).

Band and Weisz (1988) assessed everyday stress and coping in children. They conducted semi-structured interviews with children to identify stressful situations within the last year. Their sample included 73 children that were 6, 9, or 12 years of age. Standard probes were used to gain additional information and the children's responses were transcribed verbatim for later coding. The children reported six different stressful domains including the following: separation from a friend, doctor's appointment, parent/teacher angry at child, poor peer interactions, bad grades, and accidents. Results indicated that children varied their reported coping strategies across different situations. Primary coping (i.e., direct problem-solving, problem-focused crying, problem-focused aggression, problem-focused avoidance) was most consistent in situations perceived by children as more controllable and familiar. Secondary coping (e.g., social/spiritual support, emotion-focused crying, emotion-focused aggression, cognitive avoidance) was more likely in uncontrollable and less familiar situations (doctor's appointment). Older girls believed coping was more effective than did younger girls and boys. Age differences were also prevalent, with older children using more secondary control strategies. The authors suggest this may be due to developmental limitations of younger children to describe these strategies. The authors found that problem-focused aggression was reported more frequently in the older children suggesting an increase in acting-out behavior. The authors reported good reliability of their coping measure, with pairwise kappas ranging from .84 to .94.

These investigations have demonstrated that reliance on structured and semi-structured interviewing strategies are effective in assessing children's coping. While Band and Weisz (1988) and other researchers using interviewing strategies are able to attain acceptable reliability, replication has been difficult for other researchers. In addition, each investigation seems to rely on different constructs to understand child coping. Consequently, a more standardized concept of stress and corresponding assessment measures are needed. Compas, Malcarne, and Fondacaro (1988) offer a good alternative to clinical interviews. They assessed the capacity to generate alternative solutions and strategies to cope with stressful events in a school-age population. Their sample, which consisted of 130 children between 10 and 14 years of age, completed an open-ended instrument to assess coping with self-identified recent stressful events in two domains (i.e., social and school situations). Subjects rated the degree of control over the cause of the stressor as well as a list of all possible ways they could have used to cope with the event. Kappa coefficients for these responses as either problem- or emotion-focused (Folkman & Lazarus, 1980) ranged from .87 to .88. Parents completed the Child Behavior Checklist to assess any internalizing or externalizing behavior problems. Results indicated that problem- and emotion-focused coping strategies were used in this sample. No strong gender effects were found. Coping and emotional/behavioral problems were correlated with social, but not academic, stressors.

Pencil and paper objective questionnaires have become more prevalent in the research on children's coping. Although they are not as flexible to administer when compared to semi-structured clinical interviews, questionnaires are a useful method to assess children's coping strategies. Some researchers have adapted existing adult questionnaires for adolescent populations (Halstead, Johnson, & Cunningham, 1993; Wills, 1986). These questionnaires, however, are not able to be adapted to elementary-age children. The literature on coping questionnaires oriented towards school-age children will be briefly reviewed.

Elwood (1987) developed a general coping measure for children. Her sample consisted of 85 children in fourth and seventh grade. She created separate inventories for each age and assessed stressors in the last year, stressors in the last week, coping responses, and the efficacy of these coping responses. She reported that the reliability of her measure "must be considered tentative" (p. 937) due to low occurrence of stressors on her measure. Validity was determined on the basis of agreement between coping strategies endorsed on the measure and clinical interview and was not determined on the basis of comparison with report on other psychological measures.

Brown, O'Keeffe, Sanders, and Baker (1986), using their open-ended questionnaire, found two distinct approaches used by children between 8 and 18 years in response to hypothetical stressful situations. Two of these stressful situations were selected by the researchers (i.e., dentist's visit, giving a class

report) and the third was selected by each of the 487 children. Some children actively sought to reduce the stress (e.g., "copers") while others became passive and worried about the potential impact of the stressors (e.g., "catastrophizers"). In comparing coping strategies with anxiety (STAI-C; Spielberger, Edwards, Lushene, Montouri, & Platzek, 1973), Brown, et al. found that "copers" reported less trait anxiety than children who had "catastrophic" cognitions. While efforts were made to keep the context consistent in this study, it is possible that some of the participants had never encountered either of these stressful situations. Individuals might apply very different coping strategies if responding to a hypothetical situation rather than to the memory of an event.

Dise-Lewis (1988) developed a pencil and paper questionnaire to assess child coping strategies. Like Elwood (1987), there was a stress component to her measure. Her sample, consisting of 502 junior-high students, rated the frequency of coping strategies used to manage stress. No efficacy rating was included in her investigation. To test the validity of this measure, 198 of the students also completed psychological measures assessing anxiety and depression. Their respective teachers also completed a measure assessing internalizing and externalizing behaviors. Dise-Lewis reported gender differences in coping, with girls more likely to recognize stress and exhibit "psychosomatic symptoms" compared to males. There was also a correlation between the coping strategy of distraction and indicators of distress. Anxious children were more likely to use stress-recognition (e.g., cry, get advice from

someone) and self-destructive coping strategies (e.g., get stoned on pills, do something dangerous) than non-anxious children. These results suggest that coping strategies can be predictive of psychological distress as well as be measured by objective pencil and paper questionnaires.

Spirito, Stark, and Williams (1988) developed a coping measure to assess adolescents' coping strategies. Their brief checklist was designed to assess the frequency and efficacy of many of the most salient coping strategies (e.g., distraction, social withdrawal, social support, resignation). Like many previous investigators, the authors requested the adolescents to respond in the context of a specific stressor. Six-hundred nine students and pediatric patients completed the initial series of studies to test the utility of the measure. While much of the research with this measure has emphasized pediatric populations, it has also been used to assess the coping strategies for more common stressors of adolescents (Stark, Spirito, Williams, & Guevremont, 1989) as well as suicidal adolescents (Spirito, Overholser, & Stark, 1989). A separate form for younger children was also developed (Stark, Spirito, and Stamoulis, 1988).

The research findings using this brief coping checklist have been mixed. Spirito, et al. (1988) reported that adolescent girls were more likely to use emotional expression than boys. Adolescent boys were more likely to endorse resignation as more helpful, which is consistent with Wertlieb, et al.'s (1987) findings. Adolescents in the chronic medical condition group were more likely than a comparison sample of adolescents coping with a school-related issue to

use distraction, social withdrawal, and self-criticism. There were also no developmental differences within the sample. Gender effects were prevalent when adolescents selected their own personal problem (Stark, Spirito, Williams, & Guevremont, 1989). Stark, et al. (1989) reported that males were more likely to use wishful thinking than females, while females used social support more frequently than males. Males also endorsed the efficacy of resignation as greater than females. This finding has not been consistently reported, however. Spirito, Overholser, and Stark (1989) reported that males were more likely to use distraction than females. Interestingly, they also found that adolescents that had attempted suicide used social withdrawal, problem solving, and emotional regulation more than non-distressed controls, but not more than distressed children (i.e., subjective levels of both anxiety and depression).

The brief checklist has also been developed for younger children. The results are quite different than the adolescent findings, however. Studies of children between 9 and 13 years have found fewer gender effects than in adolescents (Spirito, Stark, Grace, & Stamoulis, 1991). This is consistent with earlier studies that have not found significant gender differences in coping in younger children (Curry & Russ, 1985).

Causey and Dubow (1992) developed the Self-Report Coping Measure (SRCM) to assess coping in elementary-school-age children. Like many of the previous measures, it is context-specific. In this investigation, the SRCM was used to assess the specific stress of social and academic situations in

elementary school children. Their sample, consisting of 481 fourth- through sixth-grade children, completed the 34-item questionnaire. The children also rated the degree of perceived control they had over the specific stressor. The authors also assessed academic achievement, anxiety, and self-esteem. While girls were more likely to use problem-solving and social support techniques than boys, boys were more likely to use distancing and externalizing strategies. The authors found no clear pattern of developmental differences. The authors reported moderate cross-situational consistency between academic and social situations. Comparing children's scores on the different factors of the SRCM with the Revised Children's Manifest Anxiety Scale (RCMAS; Reynolds & Richmond, 1985), they reported that coping strategies were related to anxiety levels. Specifically, self-reports of anxiety were related to increases in internalizing coping strategies (e.g., become so upset that I can't even talk to anyone, worry too much about it).

In summary, a wide variety of assessment techniques have been used to determine children's coping strategies. These assessments have attempted to identify children's distress with everyday stressors, academic stressors, and social interactions, as well as more objectively serious stressors (e.g., painful medical procedures, attempted suicide). While each of the assessment techniques has distinct advantages and disadvantages, the use of standard questionnaires appears the most promising for research purposes. Investigators (e.g., Causey & Dubow, 1992; Spirito, et al., 1988; Stark, et al., 1988) have cited

good reliability and replication of their measures. Their results appear to be valid, corresponding with children's self-report of distress on objective psychological measures. This suggests that the different coping strategies used by children may facilitate or exacerbate their reactions to these stressful situations. Based on this review, a conceptual model of coping is proposed in the next section to guide this investigation.

Descriptive Model of Coping

Since the interactional theory of stress incorporates the affected individual's cognitive appraisal of perceived demands and response capabilities, it is appropriate to utilize an equivalent theory of coping. The transactional theory of coping (Lazarus & Folkman, 1984) complements the interactional theory of stress by emphasizing environmental, response, and cognitive elements. Much of the coping research now relies on this framework (Compas, 1987; Knapp, Stark, Kurkjian, & Spirito, 1991). This section will review the basic tenets of this theory as well as integrate it into a broader conceptualization of coping which differentiates "positive" from "negative" coping strategies.

Gil (1984) offers a model of coping with medical procedures applicable to other contexts (e.g., natural disasters). This approach emphasizes individual differences in coping resources and situational demands. Effective coping occurs when the subjective demands of an event are matched with subjective capabilities of the individual. This effective coping may incorporate affective and recovery responses including cognitive, physiological, and behavioral

responses.

According to Gil's model, control and predictability are important factors in the coping process. There have been a number of researchers who have examined the concept of control in mediating adjustment (Averill, 1973; Miller, 1979; Thompson, 1981). The literature is organized primarily into behavioral and cognitive control. Behavioral control is the execution of a response which directly influences the objective characteristics of a threat (Gil, 1984). Actual behavioral control of the objective characteristics of the threat may or may not be possible contingent on the context. In many natural disaster contexts, it is difficult to predict the event (Baum, 1991). Despite this unpredictability, it is still possible for individuals to respond behaviorally before, during, and after the event. For instance, an individual seeing a tornado may run to the storm cellar of his home or help her neighbors clean up after the storm. While the individual does not alter the objective characteristics of the tornado, he or she is able to do specific behavioral tasks which may reduce the storm's psychological impact.

Behavioral control decreases physiological arousal, increases tolerance for aversive stimuli, and decreases anticipatory anxiety (Bowers, 1968; Geer, Davidson, & Gatchel, 1970). While these studies emphasized laboratory manipulations of pain, it is likely that these results can be generalized to many potential stressful situations. For example, children may perceive behavioral control in academic settings. While there may be some unpredictability, the ability of students to influence the objective characteristics of the situation is

much greater than following a natural disaster. Methods to increase behavioral control include soliciting feedback from the instructor or putting forth more effort in order to receive a higher grade. Even when behavioral control does not alter objective presentation (i.e., a natural disaster), it still can potentially reduce the psychological impact of the event.

Cognitive control is attained by processing information about the stressful event in order to minimize its impact. It is possible to reevaluate the threat which may lead to changes of perceived capabilities. This cognitive control allows individuals to gain preparedness for potentially stressful situations. For example, children may identify the option of getting extra credit as a means to reduce anxiety about a poor exam grade. In response to a natural disaster, this cognitive control may be manifest as watching the weather channel, researching tornadoes, or other behaviors to minimize the stress of the perceived demand.

Cognitive control reduces anticipatory anxiety and physiological arousal (Holmes & Houston, 1974), decreases the impact of the stimulus of reported pain (Chaves & Barber, 1974), and decreases post-event stress and need for analgesics or sedative (Langer, Janis, & Wolfer, 1975). While it is more difficult to gain behavioral control over natural disasters, it is possible to mediate the effects of these events with the assistance of cognitive control techniques.

Behavioral and cognitive coping strategies both appear to be important considerations in affecting the individual's reaction following exposure to a stressor. The factors of control and predictability have also been found to

reduce the impact of potentially stressful situations, influencing both psychological and physiological reactions post-exposure. The degree of effectiveness for any given coping mechanism is mediated by the individual, supporting the premise that the subjective perceived demands of the situation are weighed against the subjective perceived capabilities of the stressor.

Behavioral and cognitive coping strategies are not specific to one formulation of coping. Rather, they are incorporated into many different conceptualizations (please refer to Roth & Cohen [1986] for an excellent review of many coping formulations). Perhaps the most widely accepted conceptualization of stress and coping relies on Lazarus and Folkman's (1984) research differentiating "emotion-focused" from "problem-focused" strategies. They state that individuals relying on problem-focused strategies reduce the impact of the stressor directly and actively. For example, coping with academic problems by increasing the frequency, intensity, and duration of studying behavior is a problem-focused strategy. Emotion-focused coping is defined by reducing the impact of the stressor indirectly and passively. For example, crying after witnessing domestic violence is an emotion-focused strategy. Both problem-focused and emotion-focused coping strategies can incorporate behavioral or cognitive elements.

Lazarus and Folkman's theory can be conceptualized as an approach-avoidance formulation of coping (Roth & Cohen, 1986). Approach (or attention) strategies require the respondent to focus attention on the stressor to reduce its

impact and it is similar to the concept of problem-focused strategies. Avoidant strategies are efforts to focus attention away from the source of stress or one's reaction to the stressor. Although it incorporates attention strategies and avoidance, it is similar to emotion-focused strategies.

There is a debate over whether the approach or the avoidance coping strategy is most adaptive. While many psychologists believe that problem-focused coping strategies are more adaptive (or "positive") than emotion-focused (or "negative") strategies, Suls and Fletcher reported that both are important in adjusting to different types of stress at different times. The distinction between adaptive (i.e., positive) and maladaptive (i.e., negative) coping strategies is not clear. Consequently, the labels of "positive" and "negative" coping strategies have persisted.

In their meta-analysis of coping strategies, Suls and Fletcher (1985) contrasted "avoidant" and "non-avoidant" strategies. Studies included in their analyses were from a variety of contexts and met the following criteria: (a) explicit operationalization of stressor; (b) attention and avoidant strategy conditions that were operationalized; (c) quantifiable outcome measure; and (d) reported the length of time between occurrence of the stressor and measurement of the outcome. Their results suggested no strong overall effects favoring either positive-approach or negative-avoidance strategies. In the short-run (less than 2 weeks), negative-avoidant strategies have efficacy over positive-approach strategies. In the long-run (2 weeks to 5 years), positive-

approach strategies were more efficacious than the negative-avoidance strategies.

This section provided a description of the theoretical tenets that guided this investigation. The transactional theory of coping hypothesized coping with stress as a dynamic and complex process relying on cognitive appraisal and constant feedback loops with the environment. While researchers have conceptualized responses to stress in many ways, the most widely agreed are “approach” and “avoidant” strategies. In this context, the formulation of coping as either positive-approach or negative-avoidant was described.

Review of the Disaster Literature

Exposure to a disaster can precipitate psychological effects in the victims. Perhaps the most common psychological reaction following a disaster is anxiety. The specific symptoms, degree of impairment, and extent of this anxiety reaction may vary greatly. These anxiety reactions can be used to develop diagnostic impressions of the victims. There is a great amount of overlap between the different anxiety disorders, which are often arbitrarily delineated by the context of these reactions. Anxiety reactions and PTS symptoms are reviewed in this section. With the overlap between anxiety reactions and PTS symptoms, several investigations are mentioned in both the anxiety reaction and PTS symptom reviews:

This review will occasionally make reference to the effects of man-made disasters (e.g., ferry or bus accident, sniper attack, pedestrian walkway accident, etc.). Results of these man-made disasters are included when there is a lack of empirical evidence of specific information following natural disasters. While much of the disaster research is divided according to whether or not the cause of the disaster was a natural or man-made phenomenon, it is unclear whether the effects from man-made disasters would be different than the effects of natural disasters (Baum, 1991).

Post-Traumatic Stress Disorder Defined

Exposure to a disaster can precipitate psychological effects in the victims. One of the most extreme reactions following a trauma is post-traumatic stress

disorder (PTSD). Within the last two decades, PTSD was added as a unique mental disorder to the nosology of mental disorders when it was included in the Diagnostic and Statistical Manual of Mental Disorders - Third Edition (APA, 1980). Although the diagnosis of PTSD has much overlap with other anxiety disorders, it is qualitatively different due to several specific symptoms. The qualitative aspects of this disorder have not changed a great deal since its inception.

The DSM-IV (APA, 1994) defines the diagnosis of PTSD on the basis of several different criteria. Criterion A of the PTSD diagnosis requires that the person has been exposed to a traumatic event that involved “actual or threatened death or serious injury ... [of] self or others” as well as “intense fear, helplessness or horror.” Criterion B requires that the trauma be re-experienced as intrusive thoughts, distressing dreams, acting as if the trauma were re-occurring, intense psychological distress, and/or physiological reactivity with external or internal reminders of the trauma. Criterion C incorporates a variety of symptoms including avoidance of stimuli. While this may involve active efforts (e.g., avoiding activities associated with the trauma), it may also manifest in an inability to recall important recollections of the trauma. Other symptoms include anhedonia, social withdrawal, restricted range of affect, and a sense of foreshortened future. Criterion D includes symptoms regarding persistent physiological arousal, such as difficulty falling asleep, irritability, difficulty concentrating, hypervigilance, and an exaggerated startle response. These

symptoms also must be present for more than one month and impair social or occupational functioning (p. 427-429).

The diagnosis of PTSD includes a variety of symptoms that are consistent with mood disorders and other anxiety disorders. For example, emotional numbing, anhedonia, a restricted range of affect, and sense of foreshortened future may be present in individuals diagnosed with a depressive disorder. A variety of anxiety disorders include physiological arousal which may result in hypervigilance, difficulty falling or staying asleep, difficulty concentrating, irritability and/or anger outbursts. In contrast to these disorders, however, the victim diagnosed with PTSD must experience an event outside the range of normal or typical human experience and re-experience this traumatic event in flashbacks, dreams, or play behavior. The requirement to have these persistent symptoms for more than one month differentiates PTSD from an acute stress disorder.

A differential diagnosis needs to consider that disorganization and agitated behavior are PTSD symptoms in children. These concentration difficulties and memory impairment may contribute to poor school performance and learning. Inattention, irritability, and aggressiveness may also be present. Rather than having a learning or behavior problem, children may simply be exhibiting PTSD sequelae.

While earlier natural disaster studies assessed children's general psychopathology, recent studies are more sophisticated and emphasize specific

symptoms and disorders, relying on a PTSD framework in assessing the existence of PTS symptoms in children following a natural disaster. PTS symptoms are defined as specific cognitive and/or behavioral patterns that suggest the presence of PTSD. The presence of PTS symptoms is different than the diagnosis of PTSD, however. There is likely a positive correlation between levels of PTS symptoms and PTSD, but the diagnosis of PTSD is best not made solely on the basis of psychological questionnaires (McFarlane, 1987). Consequently, much of the more recent literature in this area emphasize the existence of these symptoms - rather than relying exclusively on diagnostic impressions.

Anxiety Reactions

Anxiety reactions are commonly reported in children following a natural disaster. There are a variety of anxiety symptoms that are exhibited in the child victims including avoidance, regressive symptoms, hyperarousal, somatic complaints, and sleeping difficulties. Investigations that have found these symptoms in children following a disaster will be reviewed in this section.

Avoidance of stimuli related to the trauma is a common reaction after a disaster. Bloch, Silber, and Perry (1956) reported avoidance symptoms in children following a tornado that struck a theater in Vicksburg, Mississippi. Forty percent of the 185 school children ranging from 2 to 15 years of age reported being afraid of returning to the movies. Based on unstructured clinical interviews, Bloch, et al. reported 56 of the children were exhibiting emotional

distress one week after the tornado. This distress was exhibited in avoidance of specific stimuli related to the disaster in addition to other effects that will be discussed later in this review. Yule, Udwin, and Murdoch (1990) used objective psychological instruments (i.e., the Fear Survey Schedule for Children - Revised; Ollendick, 1983) to assess anxiety reactions in 24 female survivors of the 'Jupiter' sinking. These 14- to 16-year-old girls developed significantly greater fears to specific stimuli relating to the traumatic event (e.g., boats). These fears did not generalize to other stimuli. Interestingly, the participants' scores on frequently used measures of anxiety, self-concept, and family functioning were not significantly different from scores of normative samples.

Not all researchers have found specific avoidance reactions to stimuli that reminds the children of the disaster. Unlike Bloch, et al.'s (1956) and Yule, et al.'s (1990) studies, other researchers have reported that generalization of the fear response may occur. Dollinger, O'Donnell, and Staley (1984) examined the effects of a lightning-strike in 29 children ranging in age from 10 to 13 years. Using objective psychological measures (i.e., Louisville Fear Survey for Children; Miller, Barrett, Hampe, & Noble, 1972) as well as projective tests, the authors reported that specific fear reactions associated with lightning likely generalized to other stimuli. This study was notable due to their effort to acquire a control group to improve the validity of their findings. They were cautious in reporting their findings because they did not include an estimate of premorbid functioning of the victims, believed to be an important predictor of post-trauma

distress.

Anxiety following a stress reaction can also be manifest as regressive behaviors. Regressive behaviors are defined as the exhibition of behaviors suggesting the loss of previously learned skills. They may be manifest as the loss of developmental milestones (e.g., urinary incontinence) or other previously learned skills (e.g., dependency, increased clinginess). Bloch, et al. (1956) reported increased dependency, clinginess, and abandonment of previously learned skills one week after the tornado. Some researchers have reported these regressive behaviors may become chronic, lasting more than two years in some cases. Dollinger (1985) reported regressive behaviors in 21% of his lightning-strike sample eight months after the natural disaster. Newman (1976), using unstructured clinical interviews and projective personality techniques, evaluated 11 children who survived a slag dam that burst during the night and killed 125 people in the village of Buffalo Creek. She found that the children, all of whom were under 12 years of age, exhibited clinginess and nocturnal enuresis two years after the disaster. She attributed the developmental level of the victims to partially explain their adjustment problems post-exposure. With a small sample size and no empirical assessment methods, Newman's results provide tentative support for chronic regressed behavior following a disaster.

Hyperarousal is another stress-reaction common in children following disasters and may be manifest as difficulty concentrating, physical agitation, or an exaggerated startle reflex. Ollendick and Hoffman (1982) used objective

psychological measures to assess 54 children (age range 2-20 years) following a flood. They reported no clinical elevations of depression, but that concentration was impaired in 11% of their sample eight months post-disaster. This extended period of impaired concentration was associated with a decline in school performance in those children. Not all researchers have found that children exhibit chronic concentration problems. Relying on objective psychological measures, Milgram, Toubiana, Klingman, Raviv, and Goldstein (1988) reported concentration difficulties in 66% of their sample of 675 Israeli seventh-graders one week after a bus accident in Israel. These difficulties, however, had largely resolved by the follow-up assessment at 9 months. Earls, Smith, Reich, and Jung (1988) assessed 32 children (ages 6-17 years) and their parents one year after a flood. Using structured interviews, they found a strong association between parental and child symptoms of hyperarousal. Of their sample, more than half of the children (i.e., 19) had pre-existing psychiatric disorders. Despite potential sampling effects, these studies provide support that hyperarousal may result following exposure to a disaster.

Short-lived somatic complaints have also been reported in children following disasters. Blom (1986), using objective psychological measures, assessed 156 school-age children and their parents immediately, at 4-6 weeks, and 7 months following the collapse of a school pedestrian walkway. According to parental report, 9% of children exhibited somatic complaints within two weeks after the disaster. Four to six weeks later, however, only 2% of the sample

experienced somatic complaints. These somatic complaints were more common in younger children (i.e., 5- to 8-year-old children). While somatic complaints were transitory following the pedestrian collapse, investigators found that somatic complaints may persist for 6 to 8 months post-disaster (Dollinger, 1986).

Nightmares and other sleep difficulties are another common reaction to extreme stress in children. Terr (1981a) investigated the psychological impact of a seemingly random act of violence on a group of students in Chowchilla, California. She interviewed more than 20 children whose school bus was hijacked and buried. These children endorsed nightmares and sleeping difficulties both at 5 and 13 months after the incident. These sleep disturbances have also been documented following less bizarre traumatic events. Thirty-four percent of Milgram, et al.'s (1988) sample reported being unable to sleep one week following a school bus accident. In the nine month follow-up, these sleeping difficulties had resolved. Yule, Udwin, and Murdoch (1990) also found that children in their sample reported short-term sleeping problems following a boating disaster. Dollinger (1986) found that short-term sleeping difficulties were not always transient in his sample of lightning-strike victims. Perhaps the most striking illustration of the persistent nature of disasters on sleeping problems in its victims is from research following the slag burst dam at Buffalo Creek. Green, et al. (1991), relying on clinical interviews and objective psychological measures, assessed 120 adult victims of which only a minority were children at the time of the disaster. Thirty-percent of the sample continued

to have bad dreams and nightmares related to the disaster - more than 10 years post-disaster. It is important to point out that this high percentage may be related to the specific context of the trauma in which a dam burst in the middle of the night presumably while they were sleeping.

Not all researchers have identified consistent anxiety reactions following a disaster. Burke, Moccia, Borus, and Burns (1986) relied on objective psychological measures to investigate the effects of a blizzard on 81 Head Start children. They reported unusual gender effects in their sample. While the anxiety scores of boys became elevated, anxiety scores for girls actually decreased. Yule and Udwin (1991) reported that anxiety scores in their sample of 24 girls following a boat accident were not significantly different from the scores of normative samples. This lack of clinical levels of anxiety has also been reported following tornadoes. Sullivan, Romero, and Hutchinson (1993) used objective psychological measures to evaluate children following a tornado in Oologah, Oklahoma. Less than 10 percent of the 145 third- through fifth-grade children in their sample endorsed clinical levels of physiological anxiety. None of the children reported clinical levels of generalized anxiety.

In summary, anxiety reactions including specific fear responses, avoidance, regressive symptoms, hyperarousal, somatic complaints, sleeping difficulties and nightmares, are commonly reported in children following natural disasters. These effects have been identified in many different studies on different types of disasters with a variety of assessment techniques. It is unclear

if specific aspects are related to the context of the disaster. For example, Green, et al. (1991) found that prevalent sleeping difficulties were reported after the slag dam burst. Perhaps the experience of being awakened in the middle of the night to be exposed to a life-threatening situation could be directly related to these specific sleeping problems in their sample. More research needs to be conducted to determine if there is an association between the characteristics of the disaster and the development of specific anxiety reactions.

Post-Traumatic Stress Reactions

Many researchers have explored the incidence of PTSD in children who have experienced a disaster. The development of more sophisticated assessment techniques that allow researchers to measure specific symptoms and disorders has facilitated this research. The PTSD framework has been described and supported by research in children and adolescents following a variety of disasters (Lonigan, et al., 1991; McFarlane, 1987). This section will review many of the most salient findings of these investigations, most of which focus on the presence of post-traumatic stress (PTS) symptoms.

Researchers have reported a correlation between the level of child distress and proximity to the disaster. Bradburn (1991) investigated the prevalence of PTS symptoms in 22 children after the 1989 earthquake in Northern California. Relying on objective psychological measures, Bradburn reported that none of the children were exhibiting severe levels of PTS symptoms two months after the disaster. Twenty-seven percent did

acknowledge moderate levels of PTS symptoms, as measured by the Reaction Index (Frederick, 1985a). Thirty-six percent reported mild levels of PTS symptoms. Bradburn reported the most powerful predictor of PTS symptoms in children was the close proximity to the disaster area. Lonigan, et al. (1991) reached similar conclusions in their investigation three months after Hurricane Hugo struck the South Carolina coast. Their sample, which included more than 5,000 children ranging in age from 9 to 19 years, reported the degree of exposure to the hurricane affected the level of PTS symptoms. Like Bradburn, Lonigan, et al. relied on objective psychological measures to collect data from their participants. In the no, mild, moderate, and high exposure groups, the authors reported PTS symptoms in 5.06%, 10.35%, 15.54%, and 29.95% of their sample, respectively. Interestingly, the children who were excited during the hurricane did not report PTS symptoms. Rather, children who exhibited higher levels of PTS symptoms remembered being frightened or worried during the storm. Vernberg, La Greca, Silverman, and Prinstein (1996) examined PTS symptoms in 568 school-age children 3 months after Hurricane Andrew. Their conceptual model, comprised of exposure to traumatic events, child characteristics, access to social support, and children's coping, was able to account for 62% of the variance. Exposure accounted for 25% of the variance supporting much of the research finding degree of exposure to a natural disaster an important factor contributing to the endorsement of post-traumatic stress symptoms. Jones and Ribbe (1991), utilizing a comparison sample, found that

degree of exposure was also related to level of PTS symptoms 4 months after a fire in a children's dormitory. Residents of the dormitory, whose average age was 16 years, reported higher levels of PTS symptoms compared to nonresidents. Interestingly, there were no significant between-group differences on state or trait anxiety. This concordance between investigators within several months following three different types of disasters suggests that degree of exposure is an important predictor of PTS symptoms after two months.

Not all researchers have identified an association between exposure to natural disasters and PTS symptoms. Brooks, et al. (1994) investigated the long-term effects of a tornado strike in Catoosa, Oklahoma. The 13 adolescents whose community was struck were compared with a sample of 12 that had not been directly exposed to a tornado. There were no between-group differences between the exposure and comparison samples on the level of PTS symptoms. Despite the limitations of this investigation (e.g., limited sample and poor response rate), the degree of exposure did not appear to affect the level of PTS symptoms endorsed by the participants.

While researchers have identified short-term elevations of PTS symptoms in children following disasters, the long-term effects also appear to be significant. Sullivan, Romero, and Hutchison (1993) investigated tornadic effects on children twelve months after one struck Oologah, Oklahoma. Relying on objective psychological measures, they collected parent- and child-reports from 145 children in 118 families. Seventy-eight percent of the parents reported

at least moderate levels of PTS symptoms in their children, with about 30% scoring in the moderate to severe range on the RI. Ninety-four percent of the children self-reported PTS symptoms, with approximately 55% in the moderate to severe range. These findings are similar to results which reported higher levels of PTS symptoms 8 months after a disaster involving a fire (McFarlane, 1987; McFarlane, Policansky, & Irwin, 1987). Despite these PTS elevations, Sullivan, et al. did not find any elevations on generalized anxiety which is consistent other disaster investigations (Jones and Ribbe, 1991).

Sullivan, et al.'s investigation also identified a significant discrepancy between parental and child report of PTS symptoms following a natural disaster. This is consistent with other studies in this area which have been discussed previously in this review (Burke, et al., 1986; Earls, et al., 1988). The consistent finding is that children report a higher incidence and more profound degree of internalizing symptoms than do their parents in describing the child's reaction.

Longitudinal methods of tracking post-traumatic stress symptoms in children after disasters have also been conducted. McFarlane (1987, 1988) conducted a longitudinal investigation of child victims of a bush fire in Australia. These children as well as their parents and teachers completed objective psychological measures at 2, 8, and 26 months post-disaster. McFarlane reported that the bush fire had a pervasive impact on the children even after 26 months. The children endorsed fewer PTS symptoms at two months than at 8 and 26 months. Teachers reported that educational underachievement and

absenteeism increased from 8 to 26 months. Anxiety and behavioral problems at school (but not home) were also related to long-term PTS symptoms. After two years, 33% of the sample continued to have a preoccupation with bush fires.

Another longitudinal investigation of post-traumatic stress symptoms in children was conducted after Hurricane Andrew struck Florida in 1992. La Greca, Silverman, Vernberg, and Prinstein (1996) assessed 442 children in the third through fifth grade 3, 7, and 10 months post-disaster. Using the Reaction Index (RI), the authors reported that post-traumatic stress symptoms decreased over time. While the mean of the scores decreased in their sample, children continued to endorse mild levels of post-traumatic stress symptoms 10 months after the hurricane. The authors also developed a conceptual model to predict post-traumatic stress symptoms over time. Their conceptual model included the following factors: (a) exposure to traumatic events during and after the disaster; (b) demographic characteristics; (c) occurrence of major life stressors; (d) availability of social support; and (5) coping strategies to cope with disaster-related distress. Results indicated that the conceptual model accounted for 24% of the total variance in Time 3 RI scores, with exposure to the stressor accounting for most of the variance. All factors were reported as contributing to children's adjustment, however.

Intrusive thoughts are a hallmark symptom of post-traumatic stress and have been reported in the disaster literature. Green, et al. (1991) reviewed unstructured interviews from the children following the slag dam burst at Buffalo

Creek to determine the level of PTS symptoms. The diagnosis of PTSD was not part of the nosology of psychiatric disorders at the time of the disaster in the mid-1970s. On the basis of this content analysis, Green, et al. found PTS symptoms in 37% of their sample. In addition to the sleeping problems and hyperarousal already reported in this review, many of these children experienced intrusive thoughts, imagery, sounds, and smells. These findings are consistent with Bradburn (1991), who reported 45% of his predominantly African-American sample experienced intrusive imagery and sounds following the 1989 earthquake in Northern California. Not all investigators believe that intrusive smells and sounds which elicit the victim "flashing back" into the traumatic event occur. For example, Terr (1981a) reported that none of the Chowchilla children displayed true flashbacks following the hijacking of their schoolbus.

There are some characteristics that are unique to children following a traumatic event. Children are more likely to actively demonstrate memories of their trauma through play behavior. These behaviors have yet to be assessed systematically with objective measures in the research literature and are reported as anecdotal information. Through their play behavior, children are more likely to actively demonstrate memories of their trauma. For example, Terr (1981b) reported some of the child victims following the kidnapping engaged in "kidnapping" games. This behavior has also been reported in children following natural disasters. Killoran (1988) reported anecdotal information from a child

psychiatrist who observed that elements of the Mount St. Helen's volcanic eruption had been incorporated into the child games in nearby communities. Bloch, et al. (1956) also observed the presence of "tornado games" in children after a tornado in Mississippi. Most recently, this play behavior has been reported in several children following Hurricane Hugo (Saylor, Swenson, & Powell, 1992; Sullivan, Saylor, & Foster, 1991).

While PTS symptoms are prevalent following natural disasters, the presence of these symptoms is not the same as a PTSD diagnosis. McFarlane, et al. (1987) reported that the presence of PTS symptoms is not directly and consistently predictive of psychological disorder. This is consistent with Earls, et al. (1988) who found that no participants in their sample had PTSD - even though many of them had symptoms. Jones, Ribbe, and Cunningham (1994) reported that less than 10% of their adolescent sample met criteria for PTSD using the Diagnostic Interview for Children and Adolescents (DICA; Reich and Welner, 1990) six weeks after a wildfire in their community. Consequently, endorsed PTS symptoms are not sufficient to make a PTSD diagnosis.

In summary, many children appear to exhibit PTS symptoms following disasters. These PTS symptoms may actually exacerbate after more than two months and persist even after one year. The degree of exposure to the disaster appears to have an effect on the level of PTS symptoms, with children closer to the destruction exhibiting higher levels. In addition, PTS symptoms which differentiate this disorder from other anxiety disorders were addressed. Child

victims have been demonstrated to experience high levels of intrusive thoughts, although there is some discrepancy over whether children experience true flashbacks. Children also may express PTS symptoms through play behavior following the disaster.

PTSD and Coping

The disaster literature has identified much of the effects of these events on children. However, there have not been many investigations on the potential effects of coping to reduce or exacerbate psychological distress. Brooks, et al. (1994) had a very limited sample size in their study one year following a tornado that struck Catoosa, Oklahoma. These 13 adolescents were compared with 12 adolescents in a community that had not been directly struck by a tornado in more than five years. There were no between-group differences on the frequency of coping strategies used or in the efficacy of different strategies. Despite a lack of differences, there was a tendency for adolescents in the disaster group to endorse lower frequency and efficacy ratings on most coping strategies. These results merely suggest that little is understood about child coping with disasters due to the limited sample size and poor response rate of this investigation. Two more recent articles investigated more than 400 children's coping strategies after Hurricane Andrew (La Greca, et al., 1996; Vernberg, et al., 1996). Vernberg, et al. found that children who reported higher levels of coping also reported more PTSD symptomatology, which the authors attributed to processing disturbing events and dealing with ongoing life

disruption. They also reported that negative coping strategies, such as blame and anger, were strong predictors of initial PTSD symptomatology. Gender differences were minimal in their sample of third- through fifth-grade children. These results were consistent with La Greca et al.'s investigation.

Consequently, more research is needed to more fully investigate the relationship between disasters and child coping.

Problems in Previous Disaster and Coping Research

There is an extensive research literature on the effects of disasters on children. Many of the studies have used methods to increase the reliability and generalizability of their findings. Despite these attempts, much of the literature has significant limitations. These limitations include subject variables (emphasis on psychopathology, failure to consider premorbid functioning, and failure to consider developmental and gender effects) and methodological issues (assessment techniques, control samples, response rates, and context). These issues will be reviewed in this section.

Earlier studies emphasized general psychopathology of the child following a disaster. While exposure to extreme stress may result in psychiatric disorders, assessing global psychopathology ignores the more subtle and normative effects of disasters on children. McFarlane (1987) reported children may exhibit numerous PTS symptoms but not warrant a diagnosis of PTSD. By relying on psychiatric diagnoses following exposure to a trauma, it also assumes a causal link between any observed pathology and the traumatic event. This attribution

may be specious contingent on the child's premorbid functioning. Consequently, an estimate of premorbid functioning is ideal (Jones, Ribbe, & Cunningham, 1994; Parker, 1977). This is particularly salient considering the long-term effects of these disasters on individuals with premorbid psychological difficulties (Earls, et al., 1988). Ollendick and Hoffman (1982) estimated the premorbid functioning of children in their sample with an objective psychological measure. By assessing premorbid functioning, it would be possible to better understand the relationship among natural disasters, child coping, and PTS symptoms.

Gender and developmental considerations are important issues in any research on children. Unfortunately, the literature is mixed and contradictory. While some authors have not detected strong gender effects in child coping (Altshuler & Ruble, 1989; Compas, Malcarne, & Fondacaro, 1988), other researchers have reported differences (Causey & Dubow, 1992; Dise-Lewis, 1988; Wertlieb, Weigel, & Feldstein, 1987). There are a variety of researchers that have examined developmental effects in their analyses (Curry & Russ, 1985; Wertlieb, Weigel, & Feldstein, 1987), but not in the context of PTSD per se. It is unclear how development and gender might affect choice and effectiveness of coping strategies. These factors should be addressed in future research.

Assessment techniques examining child coping have varied widely (see Knapp, Stark, Kurkjian, & Spirito, 1991 for review). While some studies relied on projective drawing techniques, original story-telling techniques, or unstructured

interviews (Bloch, Silber, & Perry, 1956; Dollinger, 1985; Galante & Foa, 1986; Killoran, 1988; Newman, 1976; Sugar, 1989), others used more objective methods, such as pencil and paper questionnaires (Burke, Moccia, Borus, & Burns, 1986; Sullivan, Romero, & Hutchinson, 1993) or structured interviews (Earls, Smith, Reich, & Jung, 1988; Jones, Ribbe, & Cunningham, 1994; Steinglass & Gerrity, 1990).

The utility of any of these approaches is contingent upon the level of data assessment the researchers desire (Solomon, 1989). However, the reliance on assessment techniques without any demonstrated reliability or validity is of limited utility. Studies that rely on these strategies are useful in identifying many symptoms in children following exposure to a natural disaster; however, these unstructured and unreliable methods are not amenable to scientific rigor from independent investigators and can not be replicated. For example, story-telling strategies with no inter-rater reliability or demonstrated validity linking the responses to psychological distress are of limited benefit for research purposes.

There are several reasons to rely on objective psychological measures with demonstrated reliability and validity. A reliance on unstructured interviews or clinical impressions increases the potential for investigator bias due to difficulty maintaining neutrality to the distress of their participants. It is also not possible for the investigators to be blind to the exposure status of the individuals treated. The results of many earlier investigations, due to their reliance on clinical techniques, are often of limited validity and reliability (Yule & Williams,

1990).

Few of these investigations used control samples. This makes it difficult to attribute the observed effects to disaster exposure (Campbell & Stanley, 1963). For instance, a regional control group would provide an estimate of any ambient stress of living in a tornado-prone region. In addition, a control group increases the confidence that the results of the exposure group are more likely related to exposure to the trauma rather than pre-existing factors (e.g., any sensitization effect from living in disaster-prone region) (Campbell & Stanley, 1963).

Research attempts following natural disasters often have low response rates. Green (1982) stated concerns that disaster research might only assess specific sub-samples of the disaster victims. For instance, 54% of the questionnaires Blom (1986) sent out following the collapse of the skywalk were completed by parents. While a response rate of 50% is good in naturalistic studies generally, the threat of a response bias can not be ruled out. There is no obvious way to determine whether the responders differ in important ways from those who choose not to respond. It could be speculated that individuals whose coping was severely decreased or whose child required the most assistance following the disaster might be the least likely to respond. Alternatively, those who had the most life impact might be the most willing to respond to inquiries. Solomon (1989) emphasizes that high response rates are needed in these studies to avoid the potential bias of respondent self-selection.

Traditionally, there has been dissension among researchers regarding the influence of context on coping strategies; that is, whether an individual will consistently use a given coping strategy regardless of the situation. Lazarus and Folkman (1984) demonstrated that coping in adult samples was context-dependent. In children, the results are not as clear. While some researchers report moderate cross-situational consistency for coping in children (Causey & Dubow, 1992; Compas, et al., 1988), not all research supports this assertion. For example, Band and Weisz (1988) reported children varied their coping strategies across different situations. Future research must be sensitive to the possible influence of context on a child's choice of coping strategies.

Current Investigation and Hypotheses

The primary purpose of this investigation was to explore the long-term effects of tornadic exposure on school-age children. The children were assessed at the beginning of tornado season, 10 months after the tornado. By collecting data at this time, the likelihood of any further tornadoes was reduced. The long-term effects were assessed with reliable and valid psychological measures. A comparison sample was included to account for any potential sensitization effect as well as control for possible threats to internal validity.

A measure of trait anxiety was included in order to estimate the children's premorbid psychological functioning. It was hypothesized that trait anxiety would not be related to tornadic exposure. This hypothesis was based on the nature of trait anxiety as a relatively stable estimate of proneness to stress.

Regardless of exposure to natural disasters and other potential traumas, no between-group difference was expected on this measure.

A measure of physiological anxiety was included to estimate the children's general level of physiological arousal (e.g., hypervigilance, increased startle reflex). This physiological anxiety may increase following exposure to a traumatic event. It was hypothesized that physiological anxiety would be related to tornadic exposure. Children in the exposure group were expected to endorse higher levels of physiological anxiety than the children in the comparison group.

It was hypothesized that endorsed post-traumatic stress symptoms would be related to tornadic exposure. The children directly struck by a tornado were expected to report significantly higher levels of PTS symptoms than the children in the comparison group. It was expected that the comparison group might report some PTS symptoms due to living in a tornado-prone region of the country (i.e., sensitization effect), but that those elevations would be less than those endorsed by the children in the exposure group.

Coping strategies have been identified in the literature as reducing or exacerbating the impact of stress, such as natural disasters. These findings have been mixed, often contingent on the coping measure or the context. This investigation attempted to evaluate the role of coping following exposure to natural disasters with a reliable and valid child coping measure. Exploratory analyses evaluating between-group differences on the total number of positive-approach and negative-avoidant coping strategies endorsed in the tornado

context were conducted. It was hypothesized that children in the exposure group would endorse relying more on negative-avoidant coping strategies than the children in the comparison sample. Conversely, it was hypothesized that the children in the exposure sample would endorse relying less on positive-approach coping strategies than the children in the comparison sample. In addition to between-group differences on total positive-approach and total negative-avoidance coping strategies, these differences were also expected on the individual coping strategies.

In addition, the efficacy of different behavioral and cognitive coping strategies was also investigated. Between-group differences were expected between reported efficacy of the coping strategies in the tornado context. The children in the comparison group were expected to rate positive-approach strategies as more effective than the children in the exposure group. Conversely, the children in the exposure group were expected to rate negative-avoidant coping strategies as more effective than the children in the comparison group. These hypotheses included both positive-approach and negative-avoidance subtotal scores as well as the specific behavioral and cognitive coping strategies that comprise these scales.

Coping in an academic context was also included in this investigation to assess coping in a domain other than tornadic exposure. Since the comparison and exposure groups were both assumed to have experienced academic stressors, no between-group difference on the frequency of positive-approach or

negative-avoidant coping strategies was expected. This hypothesis included both subtotal and individual coping strategies. In addition, no between-group difference was expected on the efficacy of positive-approach or negative-avoidant coping strategies. No between-group differences in the academic context would also increase the likelihood that any differences in the tornado context were due to tornadic exposure and not other factors.

Developmental level and gender effects have been identified as important factors in the coping literature (Band & Weisz, 1988; Curry & Russ, 1985). The research in this area has been somewhat inconsistent. Exploratory analyses investigating developmental and gender effects on children's coping in the tornado and academic contexts were conducted. These gender and developmental analyses were included in this investigation to ensure potentially important differences masked by group effects were not overlooked. No a priori hypotheses were proposed.

Exploratory analyses evaluating coping strategies across different contexts were also included in this investigation. The objective characteristics of a tornado are qualitatively different than those related to academic stressors. Since a tornado is an uncontrollable and largely unpredictable event, it provides an excellent comparison for coping with stress in a more controllable event (e.g., academic stressors). Consequently, different coping strategies were likely to be reported in these two content areas. It was hypothesized that children would use different coping strategies contingent upon the situational demands. This

finding would support the hypothesis that coping is a context-dependent process.

Another finding in the coping literature is the relationship between the number of endorsed coping strategies and distress. Investigators have reported that a higher number of coping strategies endorsed is positively correlated with distress (Long & Jackson, 1993, Vernberg, et al., 1996). It was hypothesized that the total number of endorsed coping strategies would be positively correlated with increased PTS symptoms.

Lastly, exploratory analysis evaluated the “goodness of fit” for a linear regression model of PTS symptoms. It was hypothesized that the level of PTS symptoms could be predicted with the following variables: (a) endorsed trait anxiety; (b) endorsed physiological anxiety; (c) subtotal scores for the frequency and efficacy of positive-approach and negative-avoidance coping strategies reported in the tornado content domain; and (d) demographic variables (e.g., gender effects and developmental level). This model will attempt to identify factors that contribute to the presence of PTS symptoms in children, allowing identification of and intervention for at-risk children.

Method

The Event

On Sunday, May 7, 1995, at approximately 5:00 p.m., a one-mile wide, category F-4 tornado, with winds between 207 and 260 m.p.h., struck Ardmore, Oklahoma and the surrounding communities. Three people were killed and at least six were injured. Extensive damage was reported, including severe damage to the Uniroyal tire manufacturing plant. The Plainview Schools centralized campus also received substantial damage, resulting in the closure of the high school. These high school students were required to attend classes at the elementary school for the last three weeks of the school year.

Research Methods

A static-group comparison pre-experimental design was used to minimize potential threats to internal validity including the effects of history, testing, instrumentation, and regression (Campbell & Stanley, 1963). This design did not account for potential selection bias, mortality, or the interaction of selection and maturation or other external validity threats. The exposure sample consisted of children exposed to the tornado discussed above. The comparison sample consisted of children in a tornado-prone region that had not been exposed to a tornado within the last three years in order to account any ambient sensitization effect.

This investigation specifically targeted data collection on approximately March 1, the first day of "tornado season." While tornadoes may occur at any

time of the year, a vast majority occur between March 1 and September 30. Due to concerns about potential storms confounding the comparison sample, efforts were made to assessing the children prior to any severe storms that season. By collecting data on the first day of tornado season, it was expected that there may be increased attention in both samples to tornadoes compared with other times of the year (e.g., December) yet there would be little chance of recent exposure to severe storms.

Participants

The exposure group initially included 104 third- through fifth-grade children attending Plainview Elementary School in Ardmore, Oklahoma, and their parents. These children were considered to have been directly exposed to a tornado (see Table 1). If the child and parent endorsed no exposure to a tornado within the previous three years, the subject's record was excluded. This exclusionary strategy excluded 3 exposure participants resulting in a final sample of 101 children and parents, a response rate of 45%. According to parental report, 69% and 46% of these children heard and saw the tornado, respectively. Fifty-nine percent of the children in the exposure sample experienced at least some damage where they were during the tornado. Eighty-eight percent of the children were at least somewhat frightened during the tornado; 28% of the exposure sample were described as "terrified" by their parents. One-hundred percent of parents reported tornado damage within ten miles of their home; 82% of the sample were within one mile of the damage. All

children in the exposure group experienced the direct effects of the tornado since they were all enrolled at the school that sustained visible damaged.

The comparison group consisted of 35 third- through fifth-grade students and their parents from Stillwater Public Schools in Stillwater, Oklahoma. Stillwater had not been directly struck by a tornado within the previous three years. Among this comparison group, the subject's record was excluded if the child and his or her parent endorsed direct exposure to a tornado within the previous three years (i.e., a specific question on the demographics and experiences questionnaire). No parents or children were excluded in the comparison sample, resulting in a response rate of 35%. While the comparison sample did not directly experience a tornado during this time, they did receive tornado watches and tornado warnings within the past three years. In addition, they likely had friends and relatives from surrounding communities that witnessed tornadoes. Consequently, the comparison group was not a "no-exposure" group; rather, they were selected to account for any ambient stress of living in a tornado-prone region.

Procedure

The Plainview Independent School District, the district in which the schools were struck, was contacted and agreed to participate in this research project. The Stillwater Independent School District was solicited as a regional comparison due to similar characteristics, lack of tornado exposure within the previous three years, and similar risk for tornadic exposure. One school from

each the Plainview and Stillwater schools participated in this investigation.

Treatment of participants was in accordance with APA ethical standards for research. Packets containing assessment materials and research protocols were provided to school administrators for review. Endorsement was gained from the school districts. Each child in the third through fifth grades received in class a packet including a letter describing the project, a consent form and parental questionnaires to be taken home. (See Appendix A for parental cover letter and consent form, respectively). These packets were sent out approximately 10 months after the tornado, at the beginning of tornado season. If they chose to participate, parents completed questionnaires and signed consent for their children's participation. Children who received parental consent were assembled in groups at the school two weeks later and the study was described to them. Children willing to participate signed consent forms and completed questionnaires. (See Appendix B for child consent form). The children's questionnaires were read aloud to ensure comprehension. All children were given a small prize for their participation. Due to the sensitive nature of trauma, members of the research team assessed potential distress that the children might have experienced by completing the questionnaires. No child appeared upset or complained of distress while completing the questionnaires. Parent and child reports were collected independently in order to minimize the chance for bias between parent and child responses. Parental questionnaires required approximately 30 minutes to complete. Child questionnaires required

approximately 30 minutes to administer. There was no penalty for parents or children who declined to participate.

Measures

Demographic & Experiences Questionnaire. This measure was developed to assess basic demographic information (e.g., parental age, ethnicity, marital status). Parental occupations and years of formal education were assessed to determine the socioeconomic status of the family (Hollingshead, 1965). Information about the child's experiences during and after the tornado was also collected with this measure which was completed by the parents (See Appendix C).

Reaction Index. (RI; Frederick, 1985a; copyright by Frederick, Pynoos & Nader, 1992). This 20-item, self-report scale assessed post-traumatic stress disorder symptoms (e.g., recurrent thoughts of the trauma, bad dreams, somatic complaints, fear, avoidance behavior) after exposure to trauma. The children responded on a 5-point Likert scale (0 = None of the time; 4 = Most of the time). A total severity index was used to indicate the level of symptoms and whether the criteria for a diagnosis of Post Traumatic Stress Disorder (American Psychiatric Association, 1987) were met. The RI has reverse coding on a portion of the items to minimize demand characteristics. It has been empirically demonstrated to have good reliability (Applebaum & Burns, 1991) and validity (Frederick, 1985b; Pynoos, et al., 1993). This measure was completed by the children (See Appendix D).

KidCope (Spirito, Stark & Williams, 1988). This 15-item scale is a checklist designed to assess cognitive and behavioral coping strategies in children. It is divided in two parts: (1) whether or not the given coping strategy was used (i.e., yes/no format) and (2) the efficacy of that coping strategy (i.e., not helpful/somewhat helpful/very helpful). Ten coping strategies described by this measure have been statistically factored into positive-approach and negative-avoidance strategies. Positive-approach strategies include cognitive restructuring, problem-solving, social support, and emotional regulation. The negative-avoidance items include distraction, blaming others, social withdrawal, wishful thinking, and resignation. While the face validity of self-criticism appears to be a negative-avoidant strategy, this has not been supported by factor analysis on this measure.

Children endorsed the frequency (i.e., whether a strategy was used [1] or not [0]) and efficacy (i.e., not helpful [1], somewhat helpful [2], very helpful [3]) of these strategies. Sums of the frequencies for positive-approach, negative-avoidance, and total strategies were also calculated, as were the sums of the efficacy scores. The frequency and efficacy totals for the positive-approach strategies ranged from 0 - 4 and 4 -12, respectively. Since the negative-avoidance strategies included one additional coping strategy, these scores ranged from 0 - 5 and 5 - 15 for frequency and efficacy, respectively. Two different content areas, tornado exposure and academic performance, were assessed. The children in the comparison sample, who had not experienced a

tornado directly, were told to imagine that they had been through a tornado. This measure was completed by the children (See Appendices E and F, respectively).

Revised Children's Manifest Anxiety Scale (RCMAS; Reynolds & Richmond, 1985). This 37-item, true/false, self-report scale was designed to measure child trait anxiety. In addition to a total anxiety score, an estimate of trait anxiety, the RCMAS also yields subscale scores indicating physiological anxiety, worry/oversensitivity, and social concerns. The worry/oversensitivity and social concerns scales were not used in this investigation. The physiological anxiety subscale was included in subsequent analyses as a measure of sympathetic arousal. The RCMAS is a reliable and valid instrument (Reynolds & Richmond, 1985). Children completed this scale.

Data Analyses and Definition of Terms

The independent variable in this study is recent exposure to the tornado that struck Ardmore in 1995. Mean scores and standard deviations for each dependent measure were calculated. Trait anxiety is defined as a proneness towards reacting to stress and is believed to be somewhat consistent over time. This provides an estimate of premorbid functioning and is measured by the Revised Children's Manifest Anxiety Scale (RCMAS) total score. Physiological anxiety was measured from the subscale from the RCMAS. Physiological anxiety is defined as sympathetic arousal that may or may not be related to exposure to a stressor. It is generally believed to be a reaction to a perceived

threat and is not generally identified as an estimate of premorbid functioning.

Post-traumatic stress (PTS) symptoms consists of symptoms relating to exposure to a life-threatening stressor. These PTS symptoms were measured by the Reaction Index (RI) total score.

Coping strategies were also included in this investigation. The frequency (i.e., use or no use) and efficacy (i.e., no use, somewhat useful, or very helpful) for each of the ten coping strategies were used for both the tornado and academic context. Both the sums of the frequency and efficacy of positive-approach and negative-avoidance strategies were also included in this study. The total number of coping strategies endorsed in the tornado context was also calculated.

Results

Demographic Between-Group Differences

It was hypothesized that there would be no significant between-group differences for any categorical demographic variables. Chi-square analyses were conducted to detect any differences between the exposure and comparison samples on categorical demographic variables (see Table 2). Of the 101 children in the exposure group, 49% were male. Thirty-seven percent of the comparison group was male. Chi-square analysis on child gender did not indicate any significant between-group difference, $X^2(41, N = 136) = 1.36$, $p < .244$. The majority of the responding parents for the exposure and comparison groups were mothers (82% and 89%, respectively). Chi-square analysis on parent responders indicated there was no statistical between-group difference, $X^2(3, N = 136) = 1.38$, $p < .709$. Eighty-six percent of the parents from the exposure group were married compared to 69% of the comparison group. Parents' marital status was not a statistically significant between-group difference, $X^2(3, N = 136) = 6.30$, $p < .098$. The exposure sample was more ethnically heterogeneous than the predominantly white comparison sample. Chi-square analysis indicated a trend towards a between-group difference for ethnicity, $X^2(4, N = 136) = 9.42$, $p < .051$. Due to this trend, additional analyses were conducted to determine if there were any associations between ethnicity and the dependent measures. Since it was not statistically related to any dependent measure, ethnicity was likely not a confound in this study and was

not used as a covariate for subsequent analyses.

It was hypothesized that there would be no statistically significant between-group differences for non-categorical demographic variables. Between-group differences were assessed with t-tests and are presented in Table 3. Due to the difference in sample sizes between groups, t-tests throughout this investigation were calculated with separate variance estimates rather than pooled estimates. This is a more stringent estimate since pooled variances potentially bias the estimate towards the exposure sample (Norusis, 1986). In addition, all t-tests were estimated with 2-tailed analyses to account for both sides of the distribution. This decision was made due to the exploratory nature of many of these computations where directionality of the mean differences was not assumed. There were no statistically significant differences between the mean ages of the children in the two groups (exposure group 9.8 years, comparison group 9.9 years), $t(78.95) = -0.29, p < .77$. There were no statistically significant differences between the mean ages of the parent responders (exposure group 37.18 years, comparison group, 37.11), $t(52.95) = 0.05, p < .96$. The mean Hollingshead Index SES score for the exposure and comparison groups were 44.21 and 48.86, respectively, indicating the average score of the participants was in the social strata IV (i.e., medium business, minor professional, technical). The SES scores in the exposure and comparison sample ranged between 17 and 66 and 20 and 66, respectively. This indicated that both samples ranged from unskilled workers with a high

school degree to major professionals with a post-baccalaureate education. There was a significant between-group difference in socioeconomic status, with the comparison sample having a higher mean SES score, $t(66.99) = -3.25$, $p < .01$. Due to this trend in the data for a socioeconomic status difference between the samples, additional analyses were conducted to determine if there were any associations between SES and the dependent measures. Since it was not statistically related to any dependent measure, SES was likely not a confound in this study and was not used as a covariate for subsequent analyses.

None of the demographic variables, including ethnic background and SES was significantly correlated with any dependent measures. Differences between the exposure and comparison groups on outcome variables are not believed to be due to differences between-samples on demographic variables. Rather, between-group differences are believed to be related to other factors.

Trait Anxiety Between-Group Differences

It was hypothesized that there would be no between-group difference on trait anxiety, an estimate of premorbid functioning. This was expected because trait anxiety is a relatively stable “proneness” towards stress. This hypothesis was tested by comparing mean total scores from the Revised Children’s Manifest Anxiety Scale between the exposure and comparison samples. Results from these statistical analyses are presented in Table 4. The mean total score of the children in the exposure group did not differ from the mean total score of the comparison group in trait anxiety, $t(57.98) = 1.25$, $p = .218$. This hypothesis was

supported by the present investigation.

Physiological Anxiety Between-Group Differences

It was hypothesized that there would be a between-group difference on physiological anxiety, an estimate of physiological arousal. This finding was expected due to the increased physiological arousal in children following tornadic exposure. This hypothesis was tested by comparing mean subtotal physiological anxiety scores from the Revised Children's Manifest Anxiety Scale between the exposure and comparison samples. Results from this statistical analysis is presented in Table 4. On the measure of physiological anxiety, the mean factor score of children in the exposure group was 4.29 and the mean factor score in the comparison sample was 3.37. While there appeared to be a trend of the exposure sample reporting higher levels of physiological anxiety, this difference did not reach conventional levels of statistical significance, $t(54.71) = 1.82, p = .075$. This hypothesis was not supported by the present investigation.

Reaction Index Between-Group Differences

It was hypothesized that there would be a between-group difference on PTS symptoms. This finding was expected due to the potential traumatic effects of tornadic exposure on children. This hypothesis was tested by comparing total scores on the Reaction Index between the exposure and comparison samples. Between-group analysis on the Reaction Index indicated that the mean total score of the exposure group (27.73, SD = 13.89) did not differ from the mean

total score of children in the comparison group (26.77, SD = 13.08), $t(62.53) = 0.36$, $p = .716$. This hypothesis was not supported by the present investigation.

Since there was no difference on Reaction Index mean total scores, an additional analysis was conducted to determine if there was a difference in the distribution in the Reaction Index scores between the exposure and comparison samples. The distribution of RI scores in both groups is presented in Table 5. A 2 (exposure versus comparison groups) X 5 (severity of PTS symptoms) chi-square analysis was conducted to determine any between-group difference in the proportion of subjects that endorsed different classifications of PTS symptoms. The five classification levels include the following classification: (a) doubtful (0 - 11); (b) mild (12 - 24); (c) moderate (25 - 39); (d) severe (40 - 59); and (e) very severe (60 - 80). There was no statistically significant difference between the exposure and comparison groups, $X^2(4, N = 136) = 2.52$, $p < .641$. Approximately 52% of children in the exposure group reported moderate to very severe symptoms. Fifty-five percent of the comparison sample, which reported no direct exposure to a tornado within the last three years, endorsed moderate to severe levels of PTS symptoms. This hypothesis was not supported by this investigation.

KidCope Between-Group Differences – Tornado Content – Frequency

It was hypothesized that there would be between-group differences on the use of different coping strategies in the tornado context. Specifically, the exposure group was expected to rely less on positive-approach and more on

negative-avoidance coping strategies. These findings were expected because positive coping strategies were not likely to be as effective in reducing the stress of direct tornadic exposure. Since the comparison sample had not experienced the direct effects of a tornado, they were expected to believe these strategies were more useful. KidCope positive-approach and negative-avoidance coping strategies endorsed in the tornado context for both groups are presented in Table 6. Statistical analysis indicate the total number of positive-approach strategies endorsed by children was not statistically significant, $t(87.46) = -0.72$, $p < .474$. There was also no between-group difference on the total number of negative-avoidance strategies, $t(63.26) = -1.05$, $p < .296$. These hypotheses were not supported by the present investigation.

In addition to the expected between-group differences on coping strategy subtotals, it was hypothesized that the exposure and comparison samples would endorse using different individual coping strategies. The proportion of children who endorsed using individual coping strategies was compared. A series of 2 (group) x 2 (use or no use) chi-square analyses were conducted and results are presented in Table 7. Bonferroni-corrections, set at .005, were used to control for family-wise error due to the large number of analyses. There were no statistically significant differences in the children on the frequency of using any individual coping strategies. This hypothesis was not supported by the present investigation.

KidCope Between-Group Differences – Tornado Content – Efficacy

It was hypothesized that there would be between-group differences on the efficacy ratings of different coping strategies in the tornado context. Specifically, the exposure group was expected to rate positive-approach coping strategies as less effective than the comparison group. In addition, the exposure sample was expected to rate negative-avoidance coping strategies as more effective than the comparison group. KidCope positive-approach and negative-avoidance coping efficacy subtotal scores in the tornado context are presented in Table 6.

Statistical analyses indicated the total efficacy of positive-approach strategies endorsed was statistically significant, $t(64.87) = -2.11, p < .039$, with children in the exposure group endorsing these strategies as less efficacious. This finding supported one of the present study's hypotheses. While there was a trend towards children in the comparison group endorsing negative-avoidance strategies as more efficacious, this finding did not reach a conventional level of statistical significance, $t(66.19) = -1.79, p < .079$. This finding does not support the present investigation's hypotheses.

It was hypothesized that the exposure and comparison samples would rate the efficacy of individual coping strategies differently in the tornado context. The mean efficacy ratings for children in the two groups were compared. A series of t-tests were conducted and are presented in Table 8. Bonferroni-corrections, set at .005, were used to control for family-wise error due to the large number of analyses. The children in the exposure group did not differ

statistically from children in the comparison group on the efficacy of different coping strategies. While there was a trend for the comparison group to rate problem-solving ($t [63.48] = -2.73, p < .008$) and emotional regulation strategies ($t [65.06] = -2.24, p < .028$) as more efficacious, these results were not statistically significant when correcting for potential family-wise error. This hypothesis was not supported by the present investigation.

KidCope Between-Group Differences – Academic Content – Frequency

It was hypothesized that there would be no between-group differences on the use of different coping strategies in the academic context. These findings were expected based on the assumption that both samples had experienced equal exposure to academic stressors. KidCope positive-approach and negative-avoidance coping frequency subtotal scores in the academic context are presented in Table 9. The total number of positive-approach strategies endorsed was not statistically significant between the exposure and comparison group, $t (54.00) = 1.67, p < .100$. Between-group analysis indicated that children in the exposure group endorsed using a greater number of negative-avoidant coping strategies in the academic context, $t (46.33) = 2.49, p < .016$. This hypothesis was not supported by the present investigation.

It was hypothesized that there would be no differences between groups on endorsing different individual coping strategies. The proportion of children who endorsed using individual coping strategies was compared between groups in the academic context. A series of 2 (group) x 2 (use or no use) chi-square

analyses were conducted and results are presented in Table 10. Bonferroni-corrections, set at .005, were used to control for family-wise error due to the large number of analyses. There was a trend for children in the exposure group to use distraction more than children in the comparison group, but it was not statistically significant when correcting for potential family-wise error ($X^2 [1, N = 136] = 7.37, p < .007$). This hypothesis for no between-group difference in the academic context was supported by the present investigation.

KidCope Between-Group Differences – Academic Content – Efficacy

It was hypothesized that there would be no between-group differences on the efficacy ratings of different coping strategies in the academic context. These findings were expected based on the assumption that both groups had equal exposure to academic stressors. KidCope positive-approach and negative-avoidance coping efficacy scores in the academic context for both groups are presented in Table 9. There were no between-group differences with positive-approach strategies, $t(49.51) = -0.70, p < .489$, or negative-avoidance strategies, $t(50.73) = 0.23, p < .816$. This hypothesis was supported by the present investigation.

It was hypothesized that the exposure and comparison samples would rate the efficacy of individual coping strategies similarly in the academic context. The mean efficacy ratings for children in the two groups were compared. A series of t-tests were conducted and are presented in Table 11. Bonferroni-corrections, set at .005, were used to control for family-wise error due to the

large number of analyses. There were no statistically significant between-group differences on the efficacy ratings for any strategy, supporting this hypothesis.

KidCope – Exploratory Analyses – Gender and Developmental Effects

Due to the inconsistent nature of gender and developmental effects on coping (Altshuler & Ruble, 1989; Band and Weisz, 1988; Spirito, Stark, Grace, and Stamoulis, 1991), a series of exploratory analyses were conducted to identify any such effects in this data. No specific a priori hypotheses were proposed. Developmental effects were tested using child grade because of the high positive correlation between child age and grade.

Two 2 (group) x 2 (gender) x 3 (grade) ANOVAs were conducted to determine any effects on the frequency subtotal scores for the positive-approach and negative-avoidant coping strategies in the tornado context (see Table 12). The sum of positive-approach total scores in the tornado context was not statistically significant, $F(11,135) = 1.418, p < .173$. Gender and developmental effects were identified in the endorsement of positive-approach strategies, $F(2,135) = 13.164, p < .046$. Younger girls and older boys appeared to have endorsed positive-approach strategies more than older girls and younger boys. There was another gender effect on the use of positive-approach strategies, $F(1,135) = 4.177, p < .043$. Girls appeared to have endorsed positive-approach strategies more than boys. The sum of negative-avoidance strategies was not statistically significant, $F(11,135) = 0.653, p < .780$. No gender or developmental effects were identified with the use of negative-avoidance

strategies.

A series of 2 (group) x 2 (gender) x 3 (grade) chi-square analyses were conducted to determine any effects on the endorsed frequency of specific coping strategies in the tornado context. Bonferroni-corrections were set at .005 to control for family-wise error due to the large number of analyses. There were no statistically significant findings with regards to the use of different coping strategies in the tornado context.

Two 2 (group) x 2 (gender) x 3 (grade) ANOVAs were conducted to determine any effects on the efficacy subtotal scores for the positive-approach and negative-avoidant coping strategies in the tornado context (see Table 12). There was no between-group difference on the rated efficacy of positive-approach strategies, $F(11,135) = 1.595$, $p < .108$, or the negative-avoidant strategies, $F(11,135) = 1.781$, $p < .064$.

A series of 2 (group) x 2 (gender) x 3 (grade) ANOVAs were conducted to determine any effects on the rated efficacy of specific coping strategies in the tornado context. Bonferroni-corrections were set at .005 to control for family-wise error due to the large number of analyses. Children in different grades differed in the rated efficacy of wishful thinking ($F[2,135] = 7.231$, $p < .001$) and social support ($F[2,135] = 7.247$, $p < .001$). Children in the fourth-grade appeared to have higher ratings on this coping strategy. Boys and girls in different grades also differed in the rated efficacy of emotional regulation, $F(2,135) = 5.847$, $p < .004$. Older girls appeared to have endorsed this strategy

as more effective than younger girls. Conversely, older boys appeared to have endorsed this strategy as less effective than younger boys.

Two 2 (group) x 2 (gender) x 3 (grade) ANOVAs were conducted to determine any effects on the frequency subtotal scores for the positive-approach and negative-avoidance coping strategies in the academic context (see Table 13). The frequency of positive-approach strategies was examined. The sum of positive-approach total scores in the academic context was not statistically significant, $F(11,133) = 1.662, p < .090$. A gender effect was identified in the endorsement of positive-approach strategies, $F(11,133) = 9.287, p < .008$. Girls appeared to have endorsed a higher number of positive-approach strategies. The sum of negative-avoidance strategies was approaching statistical significance, $F(11,133) = 1.863, p < .051$. An effect by group was also identified on the use of negative-avoidance strategies, $F(1,133) = 5.771, p < .018$. Children in the exposure group appeared to have higher totals on the use of negative-avoidance strategies in the academic context.

A series of 2 (group) x 2 (gender) x 3 (grade) chi-square analyses were conducted to determine any effects on the endorsed frequency of specific coping strategies in the academic context. Bonferroni-corrections were set at .005 to control for family-wise error due to the large number of analyses. A group effect was identified in the use of distraction, $X^2(1, N=133) = 17.949, p < .001$. Girls in the fourth-grade exposure sample endorsed using distraction more in the academic context. No other results were statistically significant.

Two 2 (group) x 2 (gender) x 3 (grade) ANOVAs were conducted to determine any effects on the efficacy subtotal scores for the positive-approach and negative-avoidance coping strategies in the academic context (see Table 13). There was no between-group difference on the rated efficacy of positive-approach strategies, $F(11,132) = 1.591, p < .110$. A grade by group effect was identified, $F(2,133) = 3.616, p < .030$. Children in the fourth grade appeared to have higher ratings for positive-approach strategies. There was no between-group difference on the rated efficacy of negative-avoidance strategies, $F(11,133) = 1.632, p < .098$.

A series of 2 (group) x 2 (gender) x 3 (grade) ANOVAs were conducted to determine any effects on the rated efficacy of specific coping strategies in the academic context. Bonferroni-corrections were set at .005 to control for family-wise error due to the large number of analyses. Children in different grades differed in the rated efficacy of blaming others ($F[2,133] = 8.389, p < .004$). Children in the third-grade appeared to have higher ratings on this coping strategy. There was also a gender by development effect on the use of distraction, $F(2,133) = 5.829, p < .004$. Third-grade boys appeared to have higher ratings for this strategy.

KidCope – Cross-Situational Consistency

It was hypothesized that coping strategies would be context-dependent. That is, the children's coping strategies were expected to be somewhat contingent upon whether it was an academic or tornadic stressor. The McNemar

test for comparing dependent proportions compared the children's endorsed strategies between the tornadic and academic domains (Agresti & Finlay, 1997).

This test was selected to identify whether a child's endorsement of specific coping strategies in the tornado context would be similar to usage of those same coping strategies in the academic context. Both the exposure and comparison groups were combined for these analyses which are presented in Table 14.

Cross-content consistency was identified on most of the individual coping strategies, including distraction ($z = -1.76, p < .091$), social withdrawal ($z = 0.65, p < .484$), problem-solving ($z = -0.31, p < .719$), emotional regulation ($z = 1.30, p < .177$), cognitive restructuring ($z = 0.83, p < .380$), social support ($z = 0.69, p < .460$) and resignation ($z = -0.78, p < .401$). There were several differences contingent on the context, however. Results indicated that children were more likely to use wishful thinking in the tornado content domain ($z = 1.96, p < .046$). Children endorsed self-criticism ($z = 5.91, p < .001$) and blaming others ($z = 2.24, p < .022$) more frequently in the academic context. These findings provide tentative support for the hypothesis that coping may be context-dependent.

Statistical analysis attempted to determine whether rated efficacy was context-dependent. Due to the limited number of children who endorsed the use of several of the coping strategies, it was not possible to determine any difference in efficacy ratings across the two content areas.

KidCope – Number of Coping Strategies and PTS Symptoms

It was hypothesized that the number of coping strategies endorsed would be positively correlated with PTS symptoms. Since there was no between-group difference for tornadic exposure and PTS symptoms, both samples were combined for this analysis. The total score for the Reaction Index was significantly correlated with the total number of coping strategies endorsed in the tornado context, $r(136) = .3374$, $p < .001$. This positive correlation suggests that an increased number of coping strategies is related to increased PTS symptoms; therefore, supporting this hypothesis.

Predicting PTS Symptoms – A Linear Regression Model

It was hypothesized that PTS symptoms could be predicted based on demographic variables and psychological measures. While degree of exposure has been used to account for PTS symptoms in other investigations (e.g., Vernberg, et al., 1996), the lack of any between-group difference suggests this was not a strong factor in the present study. Since there was no difference in PTS symptoms, as measured by the Reaction Index, both the exposure and comparison samples were combined.

A stepwise regression was conducted to predict the level of children's total Reaction Index score, a measure of PTS symptoms (see Table 15). Physiological anxiety scores accounted for 16% of the variance. The total number of positive-approach strategies accounted for an additional 8% of the variance. No additional variance was accounted for by the sum of negative-

avoidant coping strategies. The final predictor was the child's grade level which accounted for only 4% of the variance. The resulting regression model accounted for 28% of the total variance.

Discussion

The present investigation attempted to identify the long-term results of tornadic exposure on school-age children. By including reliable and valid psychological measures as well as a comparison sample, this investigation was able to account for many potential threats to internal validity.

Since trait anxiety is a relatively stable estimate of proneness to stress, no between-group difference was expected. This hypothesis was supported by the data and was consistent with the literature that suggests trait anxiety is not significantly affected by exposure to stress.

A between-group difference was expected for physiological anxiety. The children in the exposure group were expected to endorse higher levels of physiological arousal than the children in the comparison group. There was no between-group difference on reported physiological anxiety. This finding was not expected. However, it was consistent with the lack of any between-group difference on the Reaction Index. Considering both measures included items assessing physiological arousal, it was not expected there would be a between-group difference on one measure and not the other. Neither of these hypotheses was supported by this investigation.

Despite a lack of a between-group difference on the Reaction Index, children living in a community struck by a tornado endorsed elevations of post-traumatic stress symptoms 10 months after direct exposure. The level of PTS symptoms in the exposure sample was consistent with much of the literature that

reported that these symptoms can continue for over a year (McFarlane, 1987, 1988; Steinglass & Gerrity, 1990; Sullivan, Romero, & Hutchinson, 1993). However, there was no between-group difference in post-traumatic stress symptoms between the exposure and comparison samples. This is inconsistent with the literature which suggests there is a relationship between the level of a child's distress and his or her proximity to the disaster (Bradburn, 1991; Jones & Ribbe, 1991; La Greca, et al., 1996; Lonigan, et al., 1991; Vernberg, et al., 1996). At least one prior investigation supported the present investigation's finding (Brooks, et al., 1994).

It is important to clarify that this comparison sample was not "exposure-free" but was considered "low-exposure." By living in a tornado-prone region of the country, children in both groups experienced regular tornado drills, monthly tornado siren alarms, public broadcast announcements, school visits by local meteorologists to discuss tornadoes, tornado storm chaser interviews on television, and frequent tornado watches and warnings. Both groups were exposed to tornadoes in other ways, as well. They likely knew friends or families in nearby communities that had been affected. Because of this exposure, these children were expected to be sensitized to tornadic exposure, possibly endorsing some PTS symptoms. It is possible that this sensitization effect was also enhanced by collecting this data at the beginning of tornado season. Perhaps this sensitization effect would be less at other times of the year. Regardless of any sensitization effect, however, the children in the comparison sample were

still expected to have lower levels of post-traumatic stress compared to the children whose community was directly struck by the tornado. Surprisingly, there was no significant difference between the exposure and comparison samples on this measure.

Even though there were no differences in PTS symptoms, the comparison group was not exposed to the same level of exposure as the children struck by the tornado. Almost 70% of the children were reported by their parents as hearing the tornado while nearly 50% endorsed seeing it. In addition, 88% of the children reported at least some fear during the tornado. More than 50% of the children were in locations that had at least a little damage from the tornado. Lastly, more than 82% of the exposure sample reported damage within one mile of their home. Based on parent report, the children in the exposure sample appeared to have experienced a significant level of tornadic exposure.

Despite this direct tornadic exposure, those children in the exposure sample did not endorse higher levels of PTS symptoms than the children in the comparison sample. Several factors may account for this finding. First, the comparison group may actually have endorsed moderate levels of PTS symptoms without direct exposure (i.e., a sensitization effect). There is no question that the children in the exposure group experienced high levels of direct exposure to a tornado, but the children in the comparison sample had also been inundated with tornadic exposure. The potential of this sensitization effect was discussed earlier in this section. In short, both groups have likely been

affected by extensive tornadic exposure. La Greca, et al. (1996) reported lower levels of PTS symptoms after 10 months, however. Since previous investigations have not used a comparison sample, it is unclear whether the distress reported in other studies was unique to the exposure sample. This sensitization effect is a critical issue in the understanding of the potential effects of trauma on children and is difficult to detect without a comparison group. If this is the case, moderate levels of post-traumatic stress may be experienced by children not directly exposed to tornadic activity. It would be ideal to assess these symptoms in a region where tornadoes are less prevalent, providing a minimal exposure group. If the minimal exposure group endorsed lower levels of PTS symptoms, it is likely that an ambient level of PTS symptoms towards tornadic exposure exists in this tornado-prone region of the country.

Another explanation for the lack of a between-group difference for PTS symptoms is that the children in the exposure group experienced even higher levels of post-traumatic stress symptoms immediately following the tornado. Over the course of time, perhaps, these children's reported post-traumatic stress returned to the "ambient" level. This explanation has been supported by other studies of weather-related natural disasters where PTS symptoms decreased over time (La Greca, et al., 1996). Not all studies have found that PTS symptoms decrease over time following a natural disaster, however. McFarlane (1988) reported that PTS symptoms in children may exacerbate after 2 months and persist for more than one year.

A third explanation is that the exposure sample did not experience a significant degree of exposure. Considering the extent of damage and children's distress during the tornado, this explanation does not seem feasible. In any event, inclusion of a comparison sample is a critical factor in ascertaining a better understanding of the impact of tornadoes - or other natural disasters - on children by controlling for any sensitization effects or other potential threats to internal validity.

A fourth possible explanation for the lack of differences in PTS symptoms between the high-exposure and low-exposure groups was the reliance on the Reaction Index to assess post-traumatic stress symptoms. Numerous studies that have been previously cited have indicated the utility of this measure. It is generally believed to be a valid measure of PTS symptoms due to its sensitivity in assessing the relationship between PTS symptoms and degree of exposure (Lonigan, et al., 1991). Initially this measure was constructed to be used as a structured interview by a trained clinician. The validity and reliability of this measure were demonstrated in this format. In the self-report form, however, the relationship between endorsed levels of post-traumatic stress symptoms and the presence of the PTSD diagnosis is unclear. Based on the results of this investigation, there is concern about the ability of the Reaction Index to discriminate between endorsed PTS symptoms and actual PTS symptoms. This lack of discriminative validity calls into question the ability of this measure in the self-report form to accurately estimate children's psychological distress. Validity

of this measure needs to be conducted with an independent criterion (e.g., diagnosis of PTSD with structured clinical interview) to determine whether the Reaction Index in the self-report form is as effective as the interview form in estimating children's actual PTS symptoms. Another concern with the Reaction Index is that children of some developmental levels may not be able to accurately report personal distress. For example, this measure attempts to assess persistent avoiding or numbing of general responsiveness or dissociative effects to the trauma, a component of the PTSD diagnosis. Children may not be able to accurately report these reactions in the self-report format. This issue might be corrected by comparing item analysis in the self-report form with the interview form as well as with other means of assessment (e.g., clinical interview, other psychological instruments, and/or psychophysiological measures).

Child coping strategies were also assessed in this investigation. First, children's coping was evaluated in the tornado context. It was believed that children who had directly experienced a tornado would differ from children who had not on the frequency and efficacy of individual coping strategies. This difference was expected due to the altered perceived demands and perceived capabilities of the children in the exposure sample after the tornado strike. There were no differences on the frequency of coping strategies used. However, children in the comparison group rated a higher efficacy for positive-approach strategies. This finding supported the present investigation's

hypothesis.

There are a number of explanations for these results. First, a potential explanation of these findings is that individuals might apply different coping strategies when responding to a hypothetical situation rather than to the memory of an event (Brown, et al., 1986). Since the children in the comparison sample had not actually been through a tornado, their responses on the KidCope in the tornado context were based on an estimated reaction to a tornado. On the other hand, it was possible that children not directly exposed to the tornado were sensitized to its impact resulting in the development of coping strategies to reduce their distress. Hence, the frequency of use for different coping strategies may be consistent across the exposure and regional control groups. Only with more direct exposure do children have an opportunity to determine the efficacy of these different coping strategies. It is believed that the children in the exposure group were more aware of the limitations of the efficacy of different coping strategies, both the positive-approach and negative-avoidance ones. The children in the comparison sample likely relied on their limited exposure in rating the efficacy of these strategies, not being aware of the potential limitations of these strategies in the tornado context. As with PTS symptoms, it would be ideal to assess children's coping with a tornado in an area of the country not typically susceptible to these disasters (e.g., Oregon) to provide a minimal-exposure estimate of the frequency and efficacy of children's coping.

Strategies used by children coping with academic stressors were also assessed in this investigation. This was done to permit an estimate of children's coping strategies in which both groups had relatively equal exposure. Generally speaking, it was believed that there would be no difference between the groups. This hypothesis was only partially supported. The children in the exposure sample endorsed using a significantly greater number of negative-avoidance strategies to cope with academic stressors, particularly distraction, resignation, and social withdrawal. No difference on reported efficacy was found.

The unexpected difference in coping with academic stressors may be due to several factors. First, it is possible that the two groups were not similar in the use of coping strategies in academic contexts. Perhaps the children who had experienced the direct exposure to the tornado had altered their coping strategies in a variety of different contexts. For example, they may have increased their reliance on negative-avoidance coping strategies following the tornado. The comparison group did not change because they had not experienced a significant stressor to alter their coping. Another explanation is that the contexts of the two schools were different. Even though the content was the same across the samples (i.e., academic stressor), the context was perhaps different between the two schools. Perhaps there were different classroom characteristics or academic expectations that contributed to differential coping. This is not to suggest that the characteristics of the children in the two schools were significantly different; rather, the academic expectations in the schools may

have shaped the coping strategies of the students solely in the academic context. Such an explanation would be consistent with other coping research in which context and coping are conceptualized as a dynamic environmental system (Moos, 1984; Rutter, 1981). A third explanation involves the use of the KidCope to assess children's coping strategies in the academic context. These concerns about the use of this brief, self-report instrument will be discussed later in this section.

Gender and developmental effects were assessed in the tornado context. There were several gender differences identified in this investigation which was not consistent with much of the literature on children coping (Compas, et al., 1988; Spirito, et al. 1991; Vernberg, et al., 1996). First, girls were more likely than boys to endorse the use of positive-approach strategies. This finding is similar to research which reports that girls are more likely to use problem-solving and social support strategies than boys (Causey & Dubow, 1992). Younger girls and older boys endorsed positive-approach strategies more than older girls and younger boys. It is unclear why girls and boys differed at different developmental levels. Perhaps the younger boys were not as aware of the benefits of positive-approach strategies, preferring to rely more on negative-avoidance strategies (Wertlieb, et al., 1987), while the younger girls, in general, relied more on positive-approach strategies. The older boys were possibly aware of the potential benefits of these positive-approach strategies in other contexts, possibly assuming that they would be useful in the tornado context.

Older girls, however, were perhaps more aware of the potential limitations of positive-approach strategies following a tornado. As a result, they did not invest resources into the use of these strategies in this context. There were also developmental and gender differences on the efficacy of emotional regulation. Older girls reported more effectiveness of emotional regulation than younger girls. Conversely, older boys rated the effectiveness of emotional regulation less than younger boys. This is perhaps due to the reliance of boys on more individual coping strategies while girls rely more on environmental coping strategies (Wertlieb, et al., 1987). As girls become older, emotional regulation may become more effective in the context of a group. The effectiveness of this strategy when not in the context of a group was perhaps diminished. Children in the fourth-grade had higher ratings on the efficacy of wishful thinking. Although the older and younger children endorsed that this strategy was equally effective, it was possible that the rationale for this endorsement was quite different. For example, due to their developmental limitations, third-grade children may not have been able to use wishful thinking effectively within the tornado context. The fourth-grade children endorsed wishful thinking as more effective, but may have had a somewhat naive belief in the effectiveness of this strategy. The fifth-grade children may have believed this strategy was not as effective as the fourth-grade children due to a more comprehensive understanding of the perceived demands of the tornado. This may be due to cognitive development or perhaps one additional year of sensitization to this stressor.

There were several developmental and gender effects on child coping identified in the academic context. First, girls were more likely than boys to endorse using positive-approach strategies. This is consistent with the literature which suggests girls use more affiliative coping strategies (e.g., emotional regulation and social support) while boys tend to rely on more individual coping strategies (Wertlieb, et al., 1987). This finding was also identified in the tornado context. Despite this finding, fourth-grade girls in the comparison sample endorsed using distraction more than other groups in coping with academic stressors. Dize-Lewis (1988) reported that distraction was correlated with indicators of distress. Perhaps girls in general are more concerned with their academic achievement than boys, relying on the use of this strategy. Fourth-grade children appeared to have higher ratings for positive-approach strategies. This may be related to the specific demands of the academic stressor. For example, third-grade children possibly did not rely on these positive-approach strategies. Fourth-grade children may have had increased exposure to stressors; therefore, they realized the potential benefits of these strategies. Fifth-grade children may have experienced even higher levels of stress within the academic context due to increased academic expectations. Consequently, the children's positive-coping strategies may not be initially effective as the child goes into pre-adolescence. Third-grade children rated the effectiveness of blaming others to cope with their academic stressors higher than older children. Third-grade boys also rated the efficacy of distraction as higher. These findings

were perhaps due to older children having a better understanding of the ineffectiveness of this strategies to cope adaptively with academic stressors. This finding regarding the efficacy of distraction in boys is consistent with the literature which suggests girls tend to use affiliative coping strategies (Wertlieb, et al., 1987).

This study attempted to determine whether there were any differences in the endorsed frequency of coping strategies across types of stressor content areas. It was hypothesized that the use of strategies would be contingent on the context. The children's actual use of coping strategies was modestly cross-situational, providing tentative support for the current investigation's hypothesis. There was a pattern suggesting that several negative-avoidance strategies were context-dependent. There was no difference for the positive-approach strategies. The use of distraction, social withdrawal, problem-solving, emotional regulation, cognitive restructuring, social support, and resignation were consistent across the different contexts. Wishful thinking, self-criticism, and blaming others were used depending on the context.

It is possible that contextual effect for coping strategies is related to the perceived demands of the stressor. For example, a child may rely on wishful thinking in the tornado context because she is aware that she is not responsible for the tornado. Self-criticism and blaming others do not appear to be reasonable coping strategies in that context. In a context where there is likely more perceived control, relying on self-criticism and blaming others may be more

frequently endorsed. This match between types of coping strategies with perceived control is consistent with other studies (Causey & Dubow, 1992; Compas, et al., 1988). This finding also supports the utility of the transactional theory of coping in conceptualizing children's reactions following a natural disaster. By adjusting to the perceived demands and perceived capabilities of different stressful contexts, children develop different coping repertoires. Perceived behavioral and/or cognitive control of the stressor is an important component in the transactional theory which emphasizes a dynamic and complex feedback loop between the child and his or her environment.

It was also hypothesized that using more strategies in the tornado context would be correlated with higher levels of PTS symptoms. This finding was reported in other investigations with adults and children and was supported in this study. Long and Jackson (1993) found this effect in their retrospective investigation of childhood coping with sexual abuse. Vernberg, et al. (1996) reported that children who exhibited greater levels of distress following exposure to Hurricane Andrew also endorsed using more coping strategies. Both studies attributed this finding to the ineffectiveness of the attempted coping strategies. While other children may rely on two or three effective coping strategies, those faced with an overwhelming stressor would attempt more coping strategies to manage their distress. The children may have assumed that the perceived demands of the situation exceeded their perceived capabilities (e.g., cognitive appraisal), supporting the utility of the transactional theory of coping in better

understanding children's reactions following a natural disaster.

A consideration for all of the coping results is the reliance on the KidCope to assess these strategies. There is no "gold standard" measure for children's coping strategies. While the KidCope lists different cognitive and behavioral strategies children use to cope with stress, the brevity of the questionnaire limits its utility in research settings. With only 15 items in a yes/no format, it is difficult to get consistency among studies. This inconsistency between investigations is particularly a concern when considering the potential influence of context in affecting children's coping reactions (Spirito, 1996). While the KidCope was sensitive in this investigation, a more comprehensive coping instrument (e.g., the Self-Report Coping Measure; Causey & Dubow, 1992) has advantages. With a longer measure, it may be possible to glean more information regarding coping strategies. This measure was not used in the present investigation due to the time constraints. In future studies, however, the use of this measure would be ideal.

The present study attempted to identify factors that may be beneficial in predicting PTS symptoms in a tornado-prone region. Coping strategies, trait anxiety, and developmental factors contributed to the variance and to reported levels of PTS symptoms 10 months post-disaster. These factors accounted for slightly more variance than La Greca, et al.'s (1996) conceptual model using exposure, demographic variables, occurrence of major life stressors, social support, and coping (28% compared to 24%, respectively). La Greca, et al.'s

largest factor was degree of exposure, which accounted for 9% of the variance. Degree of exposure was not entered into the regression equation in the present study due to similar scores between the exposure and comparison groups. Physiological anxiety accounted for the most variance. Trait anxiety did not contribute to the regression model. The number of positive-approach coping strategies contributed to the model, suggesting that reported PTS symptoms are affected by coping strategies. This factor was not significant in La Greca, et al's (1996) investigation. Developmental effects were also identified in this investigation as influencing total PTS scores. Such developmental effects have been reported by other coping investigations (Band & Weisz, 1988; Curry & Russ, 1985), but not in studies specifically assessing children following natural disasters (La Greca, et al., 1996; Vernberg, 1996).

Despite the findings that physiological anxiety, coping strategies, and developmental factors contributed to PTS symptoms, this model only accounted for 28% of the variance. This is consistent with other investigations of children's adjustment following a natural disaster (La Greca, et al., 1996). Despite this consistency with La Greca et al.'s study, it is likely that this model is not a comprehensive predictor of children's PTS symptoms and adjustment to living in a tornado-prone region or to surviving a tornado.

There are several strengths of this investigation. The long-term effects of tornadic exposure on children were investigated using valid and reliable objective psychological measures permitting replication by independent

researchers. While the Reaction Index may or may not be a valid measure for assessing PTS symptoms, results from the exposure group are consistent with much of the research on natural disasters. In addition, the use of a coping measure following a natural disaster was included. When this investigation was originally proposed, there were no similar investigations in the literature. Since that time, there have been at least two studies assessing coping strategies in children following natural disasters (La Greca, et al., 1996; Vernberg, et al., 1996).

The greatest strength in this investigation was the use of a comparison sample. It is difficult to attribute the observed effects to disaster exposure in investigations that do not include a comparison sample (Campbell and Stanley, 1963). However, much of the natural disaster literature assumes post-traumatic stress symptoms observed are due to direct exposure. If a comparison sample had not been used in this investigation, the results would be consistent with the literature. By including the comparison sample, the results from the comparison group significantly affect the interpretation of the data. The potential limitations of using the comparison sample have been discussed earlier in this section (e.g., not an "exposure-free" sample). In any event, inclusion of a comparison sample is a critical factor in ascertaining a better understanding of the effects of tornadoes - or other natural disasters - on children.

There are several limitations of this study. The response rates in this study were consistent with other disaster research (35 and 45 percent in the

exposure and comparison groups, respectively) despite incentives offered to increase participation. There may be a self-selection bias for either or both samples. It is difficult to determine whether the characteristics of the respondents differed from others who did not choose to participate in this study (Campbell & Stanley, 1963). It is possible that there are both random and systematic reasons for non-participation. These potential systematic effects may have affected the outcome of this investigation in different ways. First, this study may have included the most traumatized people in the potential pool of participants from the different schools. Participants not traumatized may not have had the motivation to complete these measures. If this were the case, the findings in this investigation likely inflate the level of distress in children following tornadic exposure. Conversely, this study may have inadvertently recruited those least affected by tornadic exposure. Participants that were traumatized by their exposure to a tornado may have been too overwhelmed to complete these measures. If this was the case, the findings in this investigation likely underestimate the level of distress in children following tornadic exposure. Either of these possibilities would greatly limit the generalizability of these findings. Random reasons for non-participation would be ideal, with an equal likelihood for individuals to participate - regardless of their level of distress.

Another limitation of this investigation is that data collection in the schools limited contact the children had with the investigators to less than one hour. Relying exclusively on pencil and paper self-report measures collected in groups

was not ideal. Without more extensive information about the sample, it was unclear how consistent the children's reports of distress following tornadic exposure were with their actual behaviors. Although parents typically underestimate how much a child internalizes distress (Sullivan, et al., 1993), it would have been beneficial to have convergent measures of the children's functioning. This is consistent with McFarlane's (1987) caution that a child's endorsement of post-traumatic stress symptoms does not indicate the presence of post-traumatic stress disorder. For a diagnosis to be made, the daily functioning of the child needs to be considered. While a child may report symptoms, he or she may not exhibit them. Another possibility is that the child may not be aware he or she is exhibiting some post-traumatic stress symptoms. For example, one of the questions on the Reaction Index assessed psychic numbing following the trauma. While some children may have developed psychic numbing, they may not have been able to report it. Methods to compensate for these limitations of paper and pencil methods, such as relying on clinical interview for at least a subset of the sample, have been proposed in the literature (Spirito, 1996). Concerns regarding the validity of the Reaction Index as a self-report measure have already been addressed. It is important to reiterate that it is unclear whether or not this measure has discriminant validity and is related to actual PTSD.

Based on this investigation, there are clinical implications for assessing children that have been directly exposed to a natural disaster. It is important to

keep in mind these findings are important for assessing long-term effects. More research needs to be conducted to determine what assessment strategies should be used immediately following a natural disaster. First, trait anxiety was not a significant factor in predicting PTS symptoms. The level of physiological anxiety was actually the largest factor. This suggests that a screener assessing physiological anxiety would be beneficial in determining those children most affected by the natural disaster. The Reaction Index is also an important measure to use. Without validity on the self-report form, this measure should be administered by a trained clinician. Coping strategies are also an important consideration. Identifying specific at-risk children on their endorsement of the frequency and efficacy of individual items is difficult. If a child endorses that no coping strategy is effective or that they are relying on resignation as the sole coping strategy, however, intervention may be warranted - particularly if the child has elevated scores on other psychological measures. The total number of coping strategies were positively correlated with PTS symptoms. This suggests that using the KidCope may be used effectively as a screening instrument.

There are a variety of considerations for future research assessing the effects of disasters on children. First, the potential sensitization effect needs to be better understood. There are several methods to gain a better estimate of the impact of this sensitization. One strategy is to use multiple geographic regions where there are higher and lower levels of exposure to different natural disasters. Considering research on tornadoes, it would be helpful to assess

children's level of PTS symptoms in high-exposure states (e.g., Oklahoma, Texas, Arkansas, or Alabama) and low-exposure states (e.g., Maine, Oregon, or Alaska). This would provide researchers with a more accurate impact of this sensitization effect. Another option would be to assess the same region at different times of the year. This investigation provided only a "snap-shot" of these children's post-traumatic stress symptoms. Since this investigation assessed the effects of tornadic exposure on the first day of tornado season, it may have inadvertently inflated reported level of distress in this study due to a possible sensitization effect. Since this study revealed no difference between the exposure and comparison groups after 10 months, an effective strategy for future research may be to monitor the adjustment of the exposure group immediately after the disaster for at least 2 years. This period of monitoring symptoms is ideal since some research suggests that post-traumatic stress symptoms may exacerbate after one year (McFarlane, 1987). This would permit tracking of improvement or worsening of psychological functioning following the disaster. By collecting data at numerous times of the year, ideally with different geographic regions, it is possible that there may be some flux in the level of post-traumatic stress symptoms endorsed by children. This is particularly likely with seasonal disasters (e.g., tornadoes or hurricanes). A third way of gaining a better understanding of sensitization effects is categorizing the exposure sample by level of exposure. This strategy has been used in other studies which have found differences regarding the level of post-traumatic stress symptoms

endorsed, with more exposure endorsing higher levels of these symptoms (Lonigan, et al., 1991).

Another consideration for future research is gaining a larger exposure and comparison sample and an improved response rate. While it is possible that the results in this investigation can be generalized to other contexts, the potential for a sampling bias can not be eliminated. With a greater response rate, the possibility of systematic factors affecting the results of the investigation is reduced.

Future studies should continue to rely on valid and reliable psychological measures that can be replicated by other investigators. The Reaction Index is likely to be an important component in future research. A series of two studies are important to determine the utility of this measure. The initial study would assess the consistency between the self-report and interview formats of this measure. The latter investigation would assess the discriminant validity of this measure with actual PTS symptoms and the diagnosis of PTSD. In addition to the Reaction Index, an estimate of trait anxiety is an important consideration. As well as estimating premorbid functioning, trait anxiety also controls for people who may have a "proneness" for difficulties adjusting with stressful situations. Despite trait anxiety not being a factor contributing to the model for PTS symptoms in this study, it should continue to be included in research following natural disasters. While this study did not use the Self Report Coping Measure (SRCM; Causey & Dubow, 1992) due to time constraints with the children, this

measure has been reported to be useful in assessing children's coping strategies and should be included in future research (Spirito, 1996). The utility of this measure would be comparing different coping strategies in different contexts - not only tornadic exposure. Identifying the context in which children are exposed is an important consideration. It is possible that different natural disasters result in different effects on the children who experience them, directly or indirectly. Since coping strategies appear to be somewhat contingent on the context, more systematic research needs to be conducted with different traumatic events.

In short, more research needs to be conducted on the effects of natural disasters on children. By better understanding the relationship between child coping, anxiety, and other important factors, it will allow identification of and intervention for these at-risk children. This identification will decrease the potential negative impact these disasters may have on children in both the short- and long-run.

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APPENDIXES

APPENDIX A

COVER LETTER AND CONSENT FORM FOR
PARENT QUESTIONNAIRE PACKET

Child Coping and Natural Disaster 112
Oklahoma State University

COLLEGE OF ARTS AND SCIENCES

Department of Psychology
215 North Murray
Stillwater, Oklahoma 74078-0250
405-744-6027

February 19, 1996

Dear Parent(s),

Tornadoes can occur with very little warning and cause a lot of damage. While they happen almost anywhere, it seems that they happen a lot more frequently in Oklahoma. Here at Oklahoma State University, we have been investigating the effects that tornadoes have on families and children. By understanding these effects, we hope to be able to help children to better deal with the consequences of tornadoes.

The tornado that struck Ardmore and the surrounding towns last April is an example of the kind of damage these storms can cause. We are interested in the effects of these storms and are requesting your help. We are asking you and your child to participate in our project.

With this letter, we have attached several forms about the tornado. These forms ask questions about your family's experiences during the tornado, as well as some general information about your family. If you choose to assist us, please complete these forms and have you child return them to school. Please make special note of the form requesting your child's participation. This will give us permission to ask your child if he/she is willing to fill out information about the tornado at school. A small prize will be given for your child's participation. If your child agrees, he/she will be asked to fill out forms very similar to these. Even if your child changes his or her mind about participating in the study, he/she will still receive the prize.

Please know that whether or not you and your child participate is completely up to you. We do hope that you will take the 15 minutes to complete these forms and provide us with this important information. If you find any question too personal, please feel free to leave the answer blank. Also, all information that you and your child provide will be confidential. Regardless of your decision to participate or not, please have your child return the envelope to his or her teacher by February 22, 1996.

Information of this nature is very important in understanding and working with children. If you have any questions about the study, please call Dr. Maureen Sullivan or Duane Runyan at (405) 744-6027. We thank you for your consideration and assistance with this project.

Sincerely,

Maureen A. Sullivan, Ph.D.

Maureen A. Sullivan, Ph.D.
Associate Professor

Duane Runyan, M.S.

Duane Runyan, M.S.
Doctoral Candidate

Information Sheet: Parents' and Children's Reactions to a Tornado ID# _____

I agree to participate in a study which is looking at the potential consequences of tornadoes on children. This information will be gathered through questionnaires which are expected to take approximately 15 minutes to complete. I understand that participation in this study is voluntary, that there is no penalty for refusal to participate, and that I am free to withdraw my consent and participation in this project at any time without penalty after notifying the project director. Also, my responses will be kept confidential.

I may contact Maureen A. Sullivan, Ph.D., Department of Psychology, Oklahoma State University at (405) 744-6027 should I wish further information about the research. I may also contact Jennifer Moore, University Research Services, 001 Life Sciences East, Oklahoma State University, Stillwater, OK 74078 at (405) 744-5700.

A second copy of this form is attached to you to keep for your records.

Please check #1 or #2:

- (1) _____ I am choosing to participate. I am returning complete forms as instructed in the packet. I am also giving consent for my child to fill out the forms.
- (2) _____ I prefer not to participate, but am giving consent for my child to fill out the forms.

Parent's Signature: _____

Parents Name (Please Print): _____

Child's Name (Please Print): _____

_____ Yes, please send me a copy of the results of the study. Send to the mailing address below. (Note: You may receive a copy of the results even if you choose not to participate).

Name: _____

Address: _____

APPENDIX B

**COVER LETTER AND CONSENT FORM FOR CHILD
QUESTIONNAIRE PACKET**

Dear Student,

As you know, tornadoes strike Oklahoma frequently. They can cause a great deal of damage. Here at Oklahoma State University we have been studying the effects that tornadoes have on people. Your parents have given us permission to ask you if you would like to help in a research project. You can help tell us how you were affected by the tornado that struck Ardmore last April. By understanding how tornadoes affect you, we hope to be able to help other children who are in tornadoes.

We are going to give you some forms with questions about what happened to you during the tornado and how you felt about it later. For helping, you will get a prize. It will take about 20-25 minutes to fill out the forms. You decide if you want to fill out the forms or not. Even if you start to fill out the forms, you can change your mind and stop at any time. You will still get the prize if you change your mind.

Once you fill out the forms, the page with your name on it will be taken off and put away separately from your answers. Only the ID number will be on your forms and not your name. That way, no one will know who filled out the forms. Your answers will be kept private from everyone.

If you would like to participate and fill out the forms about your experiences during and after the tornado, please check the "Yes" box and sign your name.

Yes, I would like to fill out the forms. I am signing my name on the line below to show that I agree, but I know that I can change my mind and stop if I want to.

Student's Signature: _____

APPENDIX C

DEMOGRAPHIC AND EXPERIENCES QUESTIONNAIRE

FORM C: PARENT FORM

Your relationship to the child: Mother ___ Father ___ Other ___

Your age: ___

Your race: White ___ Black ___ Native American ___ Hispanic ___ Asian ___
Other (please specify) _____

Highest level of education completed (circle year):
1 2 3 4 5 6 7 8 (Grade School/Junior High)
9 10 11 12 (High School)
13 14 15 16 (College)
17 and over (Graduate/Professional School)

Your occupation: _____

Your marital status: single ___ married ___ divorced ___ separated ___ widowed ___

If married, please provide the following information about your spouse:

Relationship to the child: _____

Age: _____

Race: White ___ Black ___ Native American ___ Hispanic ___ Asian ___
Other (please specify) _____

Highest level of education completed (circle year):
1 2 3 4 5 6 7 8 (Grade School/Junior High)
9 10 11 12 (High School)
13 14 15 16 (College)
17 and over (Graduate/Professional School)

Spouse's Occupation: _____

Please provide the following information about your child:

Child's date of birth: _____

Child's age: _____

Child's gender: Male ___ Female ___

Race: White ___ Black ___ Native American ___ Hispanic ___ Asian ___
Other (please specify) _____

Is your child scared or worried during severe storms?	Not at all scared	Somewhat scared	Very Scared	Terrified
Are you or your spouse scared or worried during severe storms?	Not at all scared	Somewhat scared	Very scared	Terrified
How afraid is your child of tornadoes?	Not at all scared	Somewhat scared	Very scared	Terrified
How afraid are you or your spouse of tornadoes?	Not at all scared	Somewhat scared	Very scared	Terrified

Have you discussed with your child what to do in a tornado warning? yes ___ no ___

Have you ever practiced what to do in the event of a tornado (e.g., drill)? yes ___ no ___

Has your child been in a tornado prior to 1993 (within the last 3 years)? yes ___ no ___

Please describe: _____

Has your child been through a tornado warning <u>since 1993</u> (within the last 3 years)? yes ___ no ___
How many times (approximately)? _____
Has your child ever had to take shelter from a tornado <u>since 1993</u> ? yes ___ no ___
How many times (approximately)? _____
Has a tornado gone over your community without touching down <u>since 1993</u> ? yes ___ no ___
How many times (approximately)? _____

Has your child been in a tornado since 1993? yes ___ no ___

When was the most recent tornado that your child has been through? _____

If your child has been in a tornado since 1993, please complete the remainder of the questionnaire. If not, thank you for participating in this project! Please return this packet to your child's school before February 22.

If your child has been through a tornado since 1993, please answer all remaining questions referring only to the MOST RECENT tornado.

During the tornado, where was your child? _____
How far was your child from the tornado? _____

Did your child see the tornado? yes ___ no ___
Did your child hear the tornado? yes ___ no ___

How much damage occurred at your child's location?
None Little Moderate Major Total

During the tornado, was your child separated from his/her mother? yes ___ no ___
During the tornado, was your child separated from his/her father? yes ___ no ___

During the tornado, how scared was your child?
Not at all scared Somewhat scared Very scared Terrified

Did you notice any change in your child's behavior following the tornado (e.g., difficulty sleeping, not minding, etc.)?
Please describe: _____

How long did it take before your child's behavior returned to normal? _____

<p>During the tornado, where were you? _____ If not at home, how far was your location from the tornado? _____</p> <p>Did you or your spouse see the tornado? yes ___ no ___</p> <p>Did you or your spouse hear the tornado? yes ___ no ___</p> <p>How much damage occurred at your location? None Little Moderate Major Total</p> <p>How much damage occurred at your spouse's location (if applicable)? None Little Moderate Major Total</p> <p>During the tornado, how scared were you? Not at all scared Somewhat scared Very scared Terrified</p> <p>During the tornado, how scared was your spouse (if applicable)? Not at all scared Somewhat scared Very scared Terrified</p> <p>Did you notice any change in your behavior - or your spouse's behavior - following the tornado (e.g., difficulty sleeping, etc.)? Please describe: _____ _____ _____</p>

Were any family members physically injured by the tornado? yes ___ no ___

Were any friends of the family physically injured by the tornado? yes ___ no ___

Before the tornado, had you and your family ever practiced what to do? yes ___ no ___

How long before the tornado had you last practiced? _____

Did the tornado cause damage within 10 miles of your home? yes ___ no ___

Did the tornado cause damage within 5 miles of your home? yes ___ no ___

Did the tornado cause damage within 3 miles of your home? yes ___ no ___

Did the tornado cause damage within 1 mile of your home? yes ___ no ___

Was your family without water because of the tornado? yes ___ no ___
For how long? _____

Was your family without gas because of the tornado? yes ___ no ___
For how long? _____

Was your family without telephone because of the tornado? yes ___ no ___
For how long? _____

Was your family without electricity because of the tornado? yes ___ no ___
For how long? _____

Did the tornado cause damage to your home? yes ___ no ___
How much damage did the tornado cause to your home (please circle)?
0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%

Were you unable to live in your home because of damage from the tornado? yes ___ no ___
How long were you not able to live in your home? _____

How long was it before your home was back to a normal daily routine? _____

Was your child's school damaged by the tornado? yes ___ no ___

How long was it before your child's school was back to a normal daily routine? _____

Was your workplace - or your spouse's workplace - damaged by the tornado? yes ___ no ___

How long was it before work was back to a normal daily routine? _____

Was the family's income lowered by the tornado? yes ___ no ___

How long until family finances were back to normal? _____

Did your child have any warning before the tornado hit? yes ___ no ___

Please describe: _____

Did your child help clean-up the tornado damage (e.g., home, school, community)?
yes ___ no ___

Did your child help make food baskets or volunteer his/her time in other ways to assist in the
clean-up efforts? yes ___ no ___

Please describe. _____

How long did your child have daily reminders of the tornado (e.g., downed trees, damaged
homes, etc.)? _____

Did your child watch TV news about the tornado? yes ___ no ___

Did your child read the newspapers about the tornado? yes ___ no ___

Did your child collect articles about the tornado? yes ___ no ___

How often does your child talk about the tornado?

Not at all Hardly at all Sometimes Frequently Constantly

Since the tornado, are you or your spouse scared or worried about storms?

Not at all scared Somewhat scared Very scared Terrified

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

Not at all scared Somewhat scared Very scared Terrified

Do you believe that your child has any long-term effects from the tornado? yes ___ no ___

Please describe. _____

Please provide any additional information related to your child's experience with the
tornado that may have affected him/her. _____

Thank you very much for your participation in this project! Please return this questionnaire
to your child's school before February 22.

APPENDIX D
REACTION INDEX

Below are some statements about how children and teenagers might react to the stress of a tornado. For each one, circle the number to show how much of the time it is true for you.

	None of the Time	Little of the Time	Some of the Time	Much of the Time	Most of the Time
1. I feel tornadoes are so bad they would upset most children.	1	2	3	4	5
2. I feel afraid or upset with thoughts about tornadoes.	1	2	3	4	5
3. I go over in my mind what happens with tornadoes - keep seeing pictures or hearing the sounds.	1	2	3	4	5
4. I have bad thoughts about tornadoes even though I don't want them to.	1	2	3	4	5
5. I have bad dreams about tornadoes.	1	2	3	4	5
6. Things sometimes make me think that a tornado might happen.	1	2	3	4	5
7. I feel as good about things I like to do, even though tornadoes exist.	1	2	3	4	5
8. I feel more alone inside; people don't really understand how I'm feeling.	1	2	3	4	5
9. I feel so scared or sad sometimes that I don't really want to know how I feel.	1	2	3	4	5
10. I feel so scared or sad about tornadoes I can't even talk or cry about it.	1	2	3	4	5
11. I'm more jumpy or nervous because of tornadoes (startled at loud noises).	1	2	3	4	5
12. I sleep well.	1	2	3	4	5
13. I feel bad that I can't do something to stop tornadoes from happening or to help.	1	2	3	4	5
14. I remember things well; thoughts or feelings about tornadoes do not make me forget things I learn in school.	1	2	3	4	5
15. It's easy to pay attention even though tornadoes exist.	1	2	3	4	5
16. I want to stay away from things that make me think about tornadoes.	1	2	3	4	5
17. When something makes me think about tornadoes I get tense or upset.	1	2	3	4	5
18. Things happen that warn me a tornado is coming.	1	2	3	4	5
19. Because of thinking about tornadoes, I have stomachaches, headaches, or other signs of illness.	1	2	3	4	5
20. I do not behave recklessly or take chances.	1	2	3	4	5

APPENDIX E
KIDCOPE (TORNADO CONTENT)

KIDCOPE With Tornado Content

Age: 8 9 10 11 12

Circle One:

Grade: 3 4 5 6

Girl Boy

Instructions: We are trying to find out how people deal with tornadoes and bad storms. Below is a problem that you might have had. Please read the following problem and then answer the questions below.

There has been a tornado in your town that caused a lot of damage. For example, your school may have been damaged so that classes had to be canceled. Now you are wondering what is going to happen after the tornado.

1. Have you ever had a problem like this? Yes No

2. Would this situation make your nervous?
 Not at all A little Somewhat Pretty Much Very Much

3. Would this situation make you sad?
 Not at all A little Somewhat Pretty Much Very Much

4. Would this situation make you mad?
 Not at all A little Somewhat Pretty Much Very Much

Now **imagine** this just happened to you – even if it did not. Please turn to the next page and circle whether you would use any of the following ways to help deal with this problem.

	Did you do this?		How much did it help?		
	yes	no	Not at all	A little	A lot
1. I just tried to forget it.	yes	no	Not at all	A little	A lot
2. I did something like watch TV or played a game to forget it.	yes	no	Not at all	A little	A lot
3. I stayed by myself.	yes	no	Not at all	A little	A lot
4. I kept quiet about the problem.	yes	no	Not at all	A little	A lot
5. I tried to see the good side of things.	yes	no	Not at all	A little	A lot
6. I blamed myself for causing the problem.	yes	no	Not at all	A little	A lot
7. I blamed someone else for causing the problem.	yes	no	Not at all	A little	A lot
8. I tried to fix the problem by thinking of answers.	yes	no	Not at all	A little	A lot
9. I tried to fix the problem by doing something or talking to someone.	yes	no	Not at all	A little	A lot
10. I yelled, screamed, or got mad.	yes	no	Not at all	A little	A lot
11. I tried to calm myself down.	yes	no	Not at all	A little	A lot
12. I wished the problem had never happened.	yes	no	Not at all	A little	A lot
13. I wished I could make everything different.	yes	no	Not at all	A little	A lot
14. I tried to feel better by spending time with others like family, friends, and grown-ups.	yes	no	Not at all	A little	A lot
15. I didn't do anything because the problem couldn't be fixed.	yes	no	Not at all	A little	A lot

APPENDIX F
KIDCOPE (SCHOOL CONTENT)

KIDCOPE With School Content

Age: 8 9 10 11 12

Circle One:

Grade: 3 4 5 6

Girl Boy

Instructions: We are trying to find out how people deal with problems at school. Below is a problem that you might have had in school. Please read the following problem and then answer the questions below.

You have been trying to do better in school. You have been doing your homework, studying for tests, and paying attention in class. Even so, you sometimes don't get grades as good as you expected. Now you are wondering what your parents would say.

1. Have you ever had a problem like this? Yes No

2. Would this situation make your nervous?
 Not at all A little Somewhat Pretty Much Very Much

3. Would this situation make you sad?
 Not at all A little Somewhat Pretty Much Very Much

4. Would this situation make you mad?
 Not at all A little Somewhat Pretty Much Very Much

Now imagine this just happened to you – even if it did not. Please turn to the next page and circle whether you would use any of the following ways to help deal with this problem.

	Did you do this?		How much did it help?		
	yes	no	Not at all	A little	A lot
1. I just tried to forget it.	yes	no	Not at all	A little	A lot
2. I did something like watch TV or played a game to forget it.	yes	no	Not at all	A little	A lot
3. I stayed by myself.	yes	no	Not at all	A little	A lot
4. I kept quiet about the problem.	yes	no	Not at all	A little	A lot
5. I tried to see the good side of things.	yes	no	Not at all	A little	A lot
6. I blamed myself for causing the problem.	yes	no	Not at all	A little	A lot
7. I blamed someone else for causing the problem.	yes	no	Not at all	A little	A lot
8. I tried to fix the problem by thinking of answers.	yes	no	Not at all	A little	A lot
9. I tried to fix the problem by doing something or talking to someone.	yes	no	Not at all	A little	A lot
10. I yelled, screamed, or got mad.	yes	no	Not at all	A little	A lot
11. I tried to calm myself down.	yes	no	Not at all	A little	A lot
12. I wished the problem had never happened.	yes	no	Not at all	A little	A lot
13. I wished I could make everything different.	yes	no	Not at all	A little	A lot
14. I tried to feel better by spending time with others like family, friends, and grown-ups.	yes	no	Not at all	A little	A lot
15. I didn't do anything because the problem couldn't be fixed.	yes	no	Not at all	A little	A lot

APPENDIX G

INSTITUTIONAL REVIEW BOARD

HUMAN SUBJECTS REVIEW APPROVAL

OKLAHOMA STATE UNIVERSITY
INSTITUTIONAL REVIEW BOARD
HUMAN SUBJECTS REVIEW

Date: 01-18-95

IRB#: AS-95-032

Proposal Title: STRESS AND COPING IN CHILDREN FOLLOWING A NATURAL DISASTER

Principal Investigator(s): Maureen Sullivan, Duane Runyan

Reviewed and Processed as: Expedited

Approval Status Recommended by Reviewer(s): Approved

ALL APPROVALS MAY BE SUBJECT TO REVIEW BY FULL INSTITUTIONAL REVIEW BOARD AT NEXT MEETING.

APPROVAL STATUS PERIOD VALID FOR ONE CALENDAR YEAR AFTER WHICH A CONTINUATION OR RENEWAL REQUEST IS REQUIRED TO BE SUBMITTED FOR BOARD APPROVAL.

ANY MODIFICATIONS TO APPROVED PROJECT MUST ALSO BE SUBMITTED FOR APPROVAL.

Comments, Modifications/Conditions for Approval or Reasons for Deferral or Disapproval are as follows:

Provisions received and approved.

Signature:



Chair of Institutional Review Board

Date: April 11, 1996

TABLES

Table 1

Descriptive Information on the Degree of Exposure to the Tornado in the Exposure Sample (Parent Report)

Child Heard Tornado	69% Yes 31% No
Child Saw Tornado	46% Yes 54% No
Damage at Child's Location	41% None 30% Little 12% Moderate 14% Major 02% Total
Child Level of Fear During Tornado	12% Not at all 39% Somewhat 21% Very Scared 28% Terrified
Damage within 10 Miles of Home	100% Yes 00% No
Damage within 3 Miles of Home	93% Yes 07% No
Damage within 1 Mile of Home	82% Yes 18% No

Table 2

Between-Group Differences on Categorical Demographic Characteristics

	<u>Exposure</u>	<u>Comparison</u>	<u>X²</u>	<u>df</u>	<u>p</u>
Gender	50 males 51 females	13 males 22 females	1.36	41	.244
Parental Report	82% mothers 18% other	89% mothers 11% other	1.38	3	.709
Marital Status	86% married 14% other	69% married 31% other	6.30	3	.098
Ethnic Background	78% white 22% other	91% white 9% other	9.42	4	.051

Table 3

Between-Group Differences on Non-Categorical Demographic Characteristics

	<u>Exposure</u> M (SD)	<u>Comparison</u> M (SD)	<u>t</u> _{value}	<u>df</u>	<u>p</u>
Child Age	9.8 years (1.00)	9.9 years (0.87)	-0.29	78.95	.77
Parent Age	37.2 years (5.97)	37.1 years (6.89)	0.05	78.95	.96
SES	44.21 (10.69)	48.86 (10.10)	66.99	-3.25	.01 **

** p < .01

Table 4

Between-Group Differences – Revised Children’s Manifest Anxiety Scale

	<u>Exposure</u> <u>M (SD)</u>	<u>Comparison</u> <u>M (SD)</u>	<u>t</u> _{value}	<u>df</u>	<u>p</u>
Total Anxiety Score	12.12 (6.00)	10.63 (6.14)	1.25	57.98	.218
Physiological Anxiety	04.29 (2.42)	03.37 (3.37)	1.82	54.71	.075

Table 5

Reaction Index Scores By Groups Classified By Post Traumatic Stress Symptoms

<u>Score</u>	<u>Degree of PTS</u>	<u>Exposure</u>		<u>Comparison</u>	
		<u>n</u>	<u>%</u>	<u>n</u>	<u>%</u>
0-11	Doubtful	13	12.9	04	11.4
12-24	Mild	35	34.7	12	34.3
25-39	Moderate	29	28.7	14	40.0
40-59	Severe	22	21.8	05	14.3
60-80	Very Severe	02	02.0	00	00.0
Totals		101	100.0	35	100.0

Table 6

Between-Group Differences – KidCope Subtotal Scores – Tornado Content

<u>Coping Style</u>	<u>Exposure M (SD)</u>	<u>Comparison M (SD)</u>	<u>t_{value}</u>	<u>df</u>	<u>p</u>
Positive-Approach					
# of Strategies	2.36 (1.09)	2.48 (0.74)	-0.72	87.46	.474
Efficacy	7.64 (2.12)	8.46 (1.92)	-2.11	64.87	.039 *
Negative-Avoidant					
# of Strategies	2.80 (1.01)	3.00 (0.94)	-1.05	63.26	.296
Efficacy	9.69 (1.32)	10.50 (2.27)	-1.79	66.19	.079

* p < .05

Table 7

Between-Group Differences – KidCope Scores – Frequency of Use – Tornado Content

<u>Coping Style</u>	<u>Exposure % Use</u>	<u>Comparison % Use</u>	<u>X²</u>	<u>df</u>	<u>p</u>
Distraction	77.2	88.6	1.450	1	.229
Social Withdrawal	58.4	42.9	1.948	1	.163
Wishful Thinking	81.2	85.7	0.121	1	.728
Self-Criticism	07.9	05.7	0.003	1	.956
Blaming Others	07.9	02.9	0.415	1	.519
Problem-Solving	70.3	82.9	1.511	1	.219
Emotional Regulation	67.3	80.0	1.447	1	.229
Cognitive Restructuring	91.1	94.2	0.057	1	.812
Social Support	65.3	68.6	0.029	1	.888
Resignation	43.6	34.3	0.581	1	.446

Note: Bonferroni-corrected alpha ($p < .005$)

Table 8

Between-Group Differences – KidCope Scores – Efficacy of Use – Tornado

Content

<u>Coping Style</u>	<u>Exposure M (SD)</u>	<u>Comparison M (SD)</u>	<u>t_{value}</u>	<u>df</u>	<u>p</u>
Distraction	2.26 (0.65)	2.45 (0.57)	-1.55	63.06	.126
Social Withdrawal	2.12 (0.75)	2.00 (0.66)	0.61	24.10	.548
Wishful Thinking	2.29 (0.64)	2.30 (0.65)	-0.05	50.70	.958
Self-Criticism	1.63 (0.74)	1.00 (0.00)	N/A	N/A	N/A
Blaming Others	2.25 (0.89)	1.00 (0.00)	N/A	N/A	N/A
Problem-Solving	2.16 (0.62)	2.48 (0.51)	-2.73	63.48	.008
Emotional Regulation	2.19 (0.70)	2.48 (0.51)	-2.24	65.06	.028
Cognitive Restructuring	2.35 (0.82)	2.36 (0.55)	-0.09	85.16	.926
Social Support	2.30 (0.68)	2.50 (0.59)	-1.34	46.66	.185
Resignation	1.98 (0.79)	2.00 (0.85)	-0.08	16.55	.935

Note: Bonferroni-corrected alpha ($p < .005$)

Table 9

Between-Group Differences – KidCope Subtotal Scores – Academic Content

<u>Coping Style</u>	<u>Exposure M (SD)</u>	<u>Comparison M (SD)</u>	<u>t_{value}</u>	<u>df</u>	<u>p</u>
Positive-Approach					
# of Strategies	2.51 (1.12)	2.11 (1.20)	1.67	54.00	.100
Efficacy	7.52 (2.13)	7.85 (2.41)	-0.70	49.51	.489
Negative-Avoidant					
# of Strategies	2.90 (0.98)	2.38 (1.30)	2.49	46.33	.016 *
Efficacy	9.58 (2.67)	9.44 (3.10)	0.23	50.73	.816

* p < .05

Table 10

Between-Group Differences – KidCope Scores – Frequency of Use – Academic

Content

<u>Coping Style</u>	<u>Exposure % Use</u>	<u>Comparison % Use</u>	<u>X²</u>	<u>df</u>	<u>p</u>
Distraction	79.0	52.9	7.365	1	.007
Social Withdrawal	62.0	47.1	1.755	1	.185
Wishful Thinking	76.0	73.5	0.003	1	.953
Self-Criticism	42.0	32.4	0.625	1	.429
Blaming Others	16.0	08.8	0.565	1	.452
Problem-Solving	74.0	67.6	0.244	1	.621
Emotional Regulation	75.0	73.5	0.000	1	1.00
Cognitive Restructuring	96.0	85.3	3.090	1	.079
Social Support	66.0	58.8	0.299	1	.584
Resignation	43.0	23.5	3.296	1	.069

Bonferroni-corrected alpha ($p < .005$)

Table 11

Between-Group Differences – KidCope Scores – Efficacy of Use – Academic

Content

<u>Coping Style</u>	<u>Exposure M (SD)</u>	<u>Comparison M (SD)</u>	<u>t_{value}</u>	<u>df</u>	<u>p</u>
Distraction	2.14 (0.78)	2.22 (0.65)	-0.47	29.43	.641
Social Withdrawal	2.19 (0.72)	1.88 (0.62)	1.77	26.52	.088
Wishful Thinking	2.24 (0.61)	2.36 (0.57)	-0.92	43.49	.361
Self-Criticism	1.52 (0.67)	1.64 (0.81)	-0.42	13.82	.678
Blaming Others	2.13 (0.96)	1.67 (1.16)	0.65	2.54	.571
Problem-Solving	2.20 (0.64)	2.26 (0.62)	-0.39	37.81	.699
Emotional Regulation	2.12 (0.72)	2.28 (0.74)	-0.95	40.17	.349
Cognitive Restructuring	2.28 (0.78)	2.21 (0.73)	0.48	49.02	.637
Social Support	2.26 (0.62)	2.60 (0.50)	-2.53	37.90	.016
Resignation	1.95 (0.75)	1.75 (0.71)	0.74	10.20	.476

Note: Bonferroni-corrected alpha ($p < .005$)

Table 12

Between-Group Differences (Group x Gender x Grade ANOVAs) – KidCope Subtotal Scores – Tornado Content

<u>Coping Style</u>	<u>Exposure M (SD)</u>	<u>Comparison M (SD)</u>	<u>F_{value}</u>	<u>df</u>	<u>p</u>
Positive-Approach					
# of Strategies	2.36 (1.09)	2.48 (0.74)	1.418	11,135	.173
Efficacy	7.64 (2.12)	8.46 (1.92)	1.595	11,135	.108
Negative-Avoidant					
# of Strategies	2.80 (1.01)	3.00 (0.94)	0.653	11,135	.780
Efficacy	9.69 (1.32)	10.50 (2.27)	1.781	11,135	.064

Table 13

Between-Group Differences (Group x Gender x Grade ANOVAs) – KidCope Subtotal Scores – Academic Content

<u>Coping Style</u>	<u>Exposure M (SD)</u>	<u>Comparison M (SD)</u>	<u>F_{value}</u>	<u>df</u>	<u>p</u>
Positive-Approach					
# of Strategies	2.51 (1.12)	2.11 (1.20)	1.662	11,133	.090
Efficacy	7.52 (2.13)	7.85 (2.41)	1.591	11,132	.110
Negative-Avoidant					
# of Strategies	2.90 (0.98)	2.38 (1.30)	1.863	11,133	.051
Efficacy	9.58 (2.67)	9.44 (3.10)	1.632	11,133	.098

* p < .05

Table 14

KidCope Scores Between Content Domains – Frequency of Use

<u>Coping Style</u>	<u>% Agree</u> ¹	<u>% Disagree</u> ²	<u>X²</u>	<u>df</u>	<u>p</u>
Distraction	70.9	29.1	4.458	1	.0348
Social Withdrawal	71.6	28.4	22.362	1	.0001 *
Wishful Thinking	80.6	19.4	22.076	1	.0001 *
Self-Criticism	60.4	39.6	0.134	1	.7142
Blaming Others	85.1	14.9	4.841	1	.0278
Problem-Solving	68.7	31.3	4.525	1	.0334
Emotional Regulation	78.4	21.6	27.160	1	.0001 *
Cognitive Restructuring	90.3	09.7	10.603	1	.0011 *
Social Support	74.6	25.4	23.886	1	.0001 *
Resignation	69.4	30.6	16.285	1	.0005 *

Bonferroni-corrected alpha ($p < .005$)

- 1: % Agree = Percent of cross-content consistency (i.e., either endorse using the given coping strategy in both domains or neither domain)
- 2: % Disagree = Percent of cross-content inconsistency (i.e., using the given coping strategy in one context, but not the other one)

Table 15

Summary of Regression Analysis for Variables Predicting PTS Symptoms (N=136)

Steps and Variables in model	Beta	df	F for model	R ²	R-change
PTS Symptoms					
1. Physiological Anxiety	.4073	1,123	24.47	.165	
2. # of Positive Coping Strategies	.2740	2,122	19.20	.240	.075
3. Child Grade	-.2022	3,121	15.71	.280	.040

2

VITA

Richard Duane Runyan, Jr.

Candidate for the Degree of

Doctor of Philosophy

Thesis: STRESS AND COPING IN CHILDREN FOLLOWING
A NATURAL DISASTER

Major Field: PSYCHOLOGY

Biographical:

Education: Graduated from James Robinson High School, Fairfax, Virginia in May, 1984; received Bachelor of Science degree in Political Science from Texas A&M University, College Station, Texas in May, 1988; received Bachelor of Science degree in Psychology and Master of Arts degree in Political Science from Texas A&M University, College Station, Texas in December, 1991; and received a Master of Science degree in Psychology from Oklahoma State University, Stillwater, Oklahoma in December, 1992. Completed the requirements for the Doctor of Philosophy degree with a major in Psychology: Clinical at Oklahoma State University in May, 1997.

Experience: Employed by Oklahoma State University, Department of Psychology as a graduate research assistant and teaching assistant. Completed psychology predoctoral internship at the Baylor College of Medicine, Houston, Texas.

Professional Memberships: American Psychological Association, Association for the Advancement of Behavior Therapy.