Prediction of Posttraumatic Stress Symptoms in Children After Hurricane Andrew

Eric M. Vernberg
University of Kansas

Annette M. La Greca
University of Miami

Wendy K. Silverman
Florida International University

Mitchell J. Prinstein
University of Miami

The authors used an integrative conceptual model to examine the emergence of posttraumatic stress disorder (PTSD) symptoms in 568 elementary school-age children 3 months after Hurricane Andrew. The model included 4 primary factors: Exposure to Traumatic Events, Child Characteristics, Access to Social Support, and Children's Coping. Overall, 62% of the variance in children's self-reported PTSD symptoms was accounted for by the 4 primary factors, and each factor improved overall prediction of symptoms when entered in the analyses in the order specified by the conceptual model. The findings suggest that the conceptual model may be helpful to organize research and intervention efforts in the wake of natural disasters.

Hurricane Andrew struck Dade County, Florida, on August 24, 1992, in one of the worst natural disasters ever to occur in the United States. Over 175,000 residents were left homeless as 30,000 houses, 19,000 mobile homes, and 12,000 apartments were destroyed (Slevin & Filkins, 1992). Destruction was more widespread than expected, and many children were terrified during the hurricane as their homes were damaged or destroyed. In the aftermath of Hurricane Andrew, thousands of children struggled to adapt to the loss of their homes, pets, toys, and friends. Parents, school personnel, mental health professionals, and members of the media expressed widespread concern about children's psychological reactions following exposure to such a traumatic event. Concerns were also expressed about which children were at highest risk to develop negative or adverse reactions. Concerns such as these guided the present investigation.

This study sought to examine diverse factors, some of which have been previously linked with children's responses to natural disasters, within the context of an integrative conceptual model. In a recent review of the literature on children's reactions to disasters, Vogel and Vernberg (1993) concluded that a major

limitation of work in this area was the relatively unsystematic, haphazard approach to the selection of variables for investigation. Although this is understandable, given the unexpected and disruptive nature of natural disasters, the result is that the specific factors that are related to children's reactions to disasters are not clear. In this study, therefore, the selection of factors was guided by previous theory and research (Green, 1991; Korol, 1990; Pynoos & Nader, 1988; Terr, 1989), as well as our own experiences with child disaster victims.

The main types of reactions of interest in this study were those of posttraumatic stress disorder (PTSD). Symptoms of PTSD are the most common types of psychological distress observed in children following a disaster and have been the focus of most disaster-related research (e.g., Lonigan, Shannon, Finch, Daugherty, & Taylor, 1991; Lonigan, Shannon, Taylor, Finch, & Sallee, 1994; Milgram, Toubiana, Klingman, Raviv, & Goldstein, 1988; Shannon, Lonigan, Finch, & Taylor, 1994; see also Vogel & Vernberg, 1993). According to the 4th edition of the *Diagnostic and Statistical Manual of Mental Disorders* (*DSM-IV*; American Psychiatric Association, 1994), primary symptoms of PTSD include reexperiencing phenomena (e.g., recurrent thoughts or dreams of the disaster); avoidance or psychic numbing (e.g., avoidance of disaster-related activities, feelings of detachment); and hyperarousal (e.g., difficulty sleeping or concentrating). When limited in duration to 1 month, these symptoms are characteristic of Acute Stress Disorder (American Psychiatric Association, 1994). For children, associated features of these trauma-related stress disorders include physical symptoms (e.g., headaches, stomachaches), frightening dreams without recognizable content, omen formation, and guilt (American Psychiatric Association, 1994). In the present investigation, a major goal was to examine factors that were predictive of children's overall levels of these symptoms of trauma-related stress disorders.

In the subsequent sections, we present a summary of the relevant background literature that guided the selection of the four

factors included in the conceptual model (see Figure 1): Exposure to Traumatic Events, Individual Child Characteristics, Access to Social Support, and Children's Coping. The primary, global hypothesis was that each of the four factors would account uniquely for variance in PTSD symptomatology, when entered at the appropriate point in the model, because each factor is believed to make unique contributions to the development of posttraumatic stress symptoms in children following a disaster.

Exposure to Traumatic Events: Life Threat and Loss–Disruption

Exposure to Traumatic Events was selected as the first factor in the conceptual model. Exposure is considered to be the primary and most critical factor for the emergence of posttraumatic stress symptoms in most models of trauma (e.g., Eth & Pynoos, 1985; Green, 1991; Korol, 1990; Terr, 1989). Exposure is likely to influence children's access to social support and their use of coping strategies and thus must be taken into account when examining the role of these two factors in the emergence of PTSD symptoms.

Frightening, life-threatening events during the disaster and loss–disruption resulting from the disaster are two aspects of exposure that have frequently been linked to psychological distress in children (Vogel & Vernberg, 1993); however, their relative contributions to PTSD symptoms are unclear. A study of a brush fire in Australia, for example, found postdisaster disruption of family life to be a stronger predictor of symptomatology

than events during the fire itself (McFarlane, 1987), whereas studies of children's reactions to Hurricane Hugo in Charleston, South Carolina, found greater symptomatology to be associated both with more frightening experiences during the storm and with level of damage to their homes (Lonigan et al., 1991, 1994; Shannon et al., 1994). Loss, in the form of violent bereavement (as opposed to loss of property and possessions), is believed to represent an especially severe risk for PTSD symptomatology, especially if the death of a family member or friend during a disaster is directly observed (Pynoos & Nader, 1988). It is important to note that few deaths occurred during Hurricane Andrew, and the term *loss–disruption* refers in this study to loss of property or possessions and to the disruption of personal relationships and normal routines.

In addition to examining two types of exposure (life threat, loss–disruption) in relation to children's PTSD reactions, it was also of interest to delineate systematically the actual experiences that comprise children's reports of life threat and loss–disruption. To our knowledge, this is the first study of a major hurricane to report children's specific experiences in this way. This is surprising, because Exposure is a predominant and critical factor in models of reactions to trauma.

Individual Characteristics of the Child: Gender, Age, and Ethnicity

Characteristics of the individual child at the time of exposure could also influence the emergence of PTSD symptoms. In the
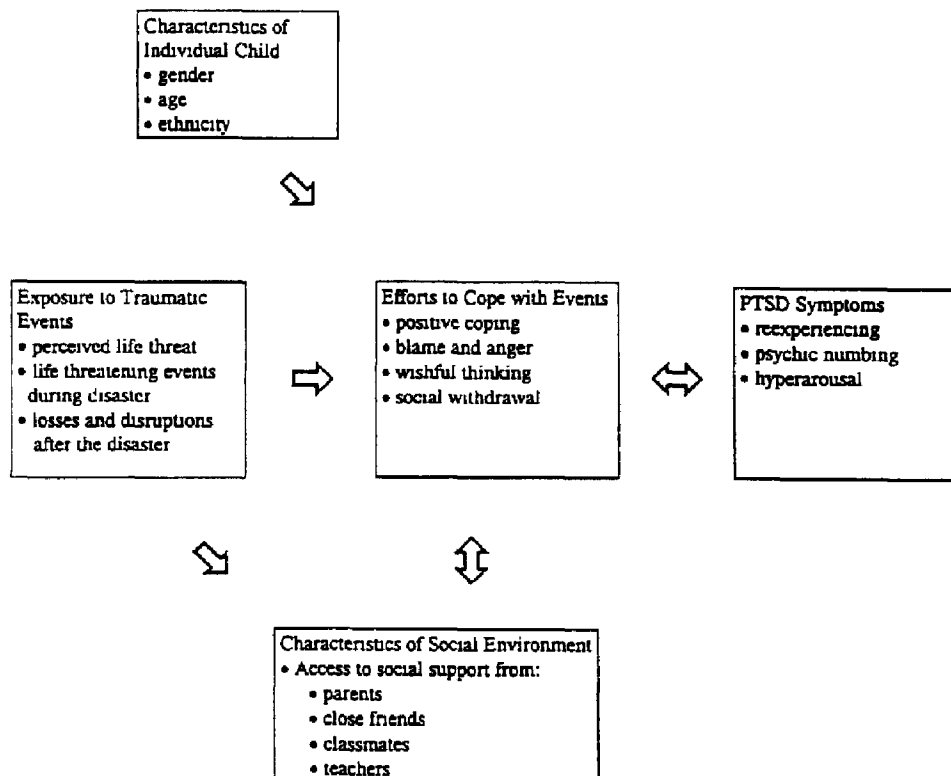

Figure 1 Conceptual model for predicting children's reactions to natural disasters. PTSD = posttraumatic stress disorder.

present investigation, child characteristics examined were gender, age, and ethnicity. These characteristics were considered second in the conceptual model because they are pre-existing factors and cannot be affected by the disaster or the subsequent factors. Considering Child Characteristics second after Exposure is important to provide statistical control for the possibility that Exposure is not distributed equally across all levels of Child Characteristics. In the case of a natural disaster, unlike for other stressors such as parental conflict, child characteristics seem unlikely to influence exposure to trauma directly. Placing these child characteristics second in the model is also appropriate because they could influence access to supportive social relationships and the use of coping strategies. (The converse is not possible.)

The rationale for possible gender differences in reactions to traumatic events is often based on variations in the acceptability of different expressions of psychological distress for boys and girls (Vogel & Vernberg, 1993). The tendency for girls to experience more internalizing symptoms than boys is well documented for several classes of stressors, including divorce and exposure to parental discord (Emery, 1988). Several studies of disasters found that girls reported more overall symptoms of PTSD than boys (Green et al., 1991; Lonigan et al., 1991; Shannon et al., 1994; Yule, 1993). However, little published research has assessed whether these gender differences occur in all three PTSD symptom clusters.

A number of age-related differences in posttraumatic stress symptomatology following disasters have been proposed on the basis of developmental differences in children's abilities to comprehend the nature of traumatic events, developmental changes in coping repertoires, and differences in involvement in extra-familial community systems (Eth & Pynoos, 1985; Terr, 1989; Vogel & Vernberg, 1993). Age-related differences in posttraumatic stress symptoms have primarily emerged in comparisons between youngsters varying markedly in age (e.g., preschool age vs. elementary school age; Green et al., 1991; Nader, Pynoos, Fairbanks, & Frederick, 1990; Schwarz & Kowalski, 1991). For the current sample (ranging from 8 to 11 years old), age-related differences in posttraumatic stress symptoms seemed unlikely but still important to consider.

Although research is sparse, there is some suggestion that ethnic differences in children's reporting of PTSD symptoms are apparent. For example, in a recent study on Hurricane Hugo, more symptoms of PTSD were reported by African American children than either Caucasian or other minority children (Shannon et al., 1994). However, African American children also were exposed to more hurricane-related traumatic experiences, which may have contributed to these ethnic differences in symptom severity. On the other hand, such differences may reflect cultural norms for responding to traumatic events (Steinglass & Gerrity, 1990). Given the paucity of research in this area, ethnic differences in children's reports of PTSD symptomatology were examined.

Characteristics of the Social Environment: Access to Social Support

Access to Social Support was chosen to represent characteristics of the social environment. This factor was considered third in the conceptual model because it is more subjective (compared to demographic variables) and also is thought to exert effects on posttraumatic stress symptoms after the initial shock of the disaster has occurred. Individuals with strong social support are generally able to cope more effectively with life stresses than those lacking such resources (S. Cohen & Wills, 1985). The usefulness of supportive relationships varies according to the stressor, the source of support, and the type of support offered (Wilcox & Vernberg, 1985). This suggests that different people in children's lives (e.g., parents, peers, teachers) offer different types of social support, and these various types of support may fill specific needs following a disaster. Access to multiple sources of support seems preferable to single sources.

Parents are frequently cited as the single most important source of social support to elementary school-age children following disasters (Pynoos & Nader, 1988; Vogel & Vernberg, 1993). Parents serve the functions of modeling coping behavior, giving comfort and nurturance, and providing a sense of physical safety (Compas & Epping, 1993; Pynoos & Nader, 1988; Vernberg & Vogel, 1993). Research on children and disasters has focused more, however, on the relationship between parents' and children's postdisaster symptomatology than on social support from parents (e.g., McFarlane, 1987; Sullivan, Saylor, & Foster, 1991).

In addition to parents, the value of peers as support agents is often asserted in the disaster literature, especially in terms of decreasing children's sense of responding oddly to the disaster, decreasing isolation, and assisting coping efforts (Gillis, 1993; Pynoos & Nader, 1988; Vernberg & Vogel, 1993). Benefits of social support from peers have been demonstrated for several stressors (La Greca et al., 1995; La Greca & Skyler, 1991; La Greca & Spetter, 1992; Vernberg, 1990), but not specifically for disasters. Because massive relocation after Hurricane Andrew disrupted peer networks of many children, it is possible that this disruption deprived some children of an important source of social support.

Teachers are also potential sources of support to children following disaster (Klingman, 1987, 1993; Pynoos & Nader, 1988). For elementary school children, teachers may provide a sense of physical security that peers cannot. They also may serve the potentially important functions of providing factual information about the disaster and its consequences and reestablishing familiar roles and routines for children (Vernberg & Vogel, 1993). To our knowledge, however, specific contributions of teachers to children's postdisaster adjustment have not been studied systematically.

Children's Coping

Research on children's coping following disasters is virtually nonexistent (Compas & Epping, 1993). It should prove useful to examine children's coping after disasters, because coping responses seem likely to influence the process of adapting to highly traumatic events (Korol, 1990; Rachman, 1980; Terr, 1989). Coping was considered fourth in the conceptual model because it is typically viewed as the product of the level of trauma suffered, personal characteristics (demographic characteristics, in the present case), and situational characteristics (i.e., access to supportive others; Compas & Epping, 1993). On the basis of a process-oriented model of coping, whereby the

presence of symptoms presumably contributes to the use of coping strategies as well as being influenced by the use of these strategies, the relationship between PTSD symptoms and coping efforts was viewed as bidirectional (Compas, Worsham, & Ey, 1992)

The lack of prior research on coping with disasters made it difficult to predict how postdisaster coping responses might be categorized and how these categories might relate to PTSD symptoms. Research on children's coping with other stressful events (e.g., medical procedures, illness) seems at first glance to provide a possible source of guidance, yet fundamental differences exist between disasters and these other events. In contrast to most medical stressors that have been studied, major disasters are highly novel events that influence multiple aspects of children's lives and produce ongoing disruptions. As a consequence, patterns of coping following disasters may differ from those found in research on children's coping with familiar, discrete, time-limited events. Although research on children's coping with other stressful events (e.g., medical procedures, illness) has identified several categories of coping and relatively reliable differences in outcomes associated with the use of these categories (e.g., Peterson & Toler, 1986; Weisz, McCabe, & Dennig, 1994), it is not clear whether children use certain types of coping more than others following a major catastrophe, or at what point in the recovery process one might find differences in psychological distress associated with the use of different types of coping. Moreover, the specific coping strategies that comprise coping categories for other stressful events have often been defined inconsistently, even after a number of studies (Compas et al., 1992; Peterson, 1989). Thus, this study focused on identifying possible categories of coping following a major, catastrophic disaster and providing initial information about the relationship between these categories and PTSD symptoms.

Method

Participants

Participation was requested of all students in the third, fourth, and fifth grades (total = 1,086) of three elementary schools severely affected by Hurricane Andrew. Letters (in both English and Spanish) explaining the study's purpose and procedures were sent home with the children Parents who did not respond within 5 days received a second note requesting a reply. Of the 677 parents who responded, 589 gave permission (87%) and 88 (13%) refused. Of children with parental permission to participate, 568 completed all of the measures, and 21 were absent for part or all of the administration sessions

The sample was ethnically diverse (44% Caucasian American, 26% Hispanic American, 22% African American, 3% Asian American, and 5% of unknown ethnicity) and included slightly more girls (55%) than boys (45%). Census data for the neighborhoods in the schools' catchment areas indicate that the children's families represented a broad cross-section of occupational (38% managerial or professional, 35% technical or sales, 10% service, 5% operator–laborer) and educational levels (88% completed high school, 36% completed college, 14% completed graduate or professional degrees).

Procedures

The measures were administered at school by a research team consisting of the authors, clinical psychology graduate students, and ad-

vanced undergraduate research assistants with prior training in the study procedures. Administration was carried out in groups of 10 to 25 children in late November–early December, 1992, a period approximately 3 months after the hurricane. Two sessions of 35–50 min on separate days were required. At least one member of the research team was present for every 10 children to answer questions and ensure that the measures were completed correctly. To start each session, a member of the research team read aloud a statement explaining that each child could decide whether to participate, that there were no right or wrong answers to the questions, and that parents and school counselors would be notified about children who seemed very upset or bothered by the hurricane. After obtaining written assent, each item was read aloud while the children followed along and marked their answers. Research assistants circulated through the room and answered any questions the children had.

Measures

Symptoms of PTSD The Post-traumatic Stress Disorder Reaction Index for Children (RI) is a 20-item self-report measure of PTSD symptoms in children. Originally, it was developed as a semistructured interview on the basis of criteria outlined in the third edition and the third revised edition of *Diagnostic and Statistical Manual of Mental Disorders* (*DSM-III* and *DSM-III-R*, respectively; American Psychiatric Association, 1980, 1987) for a diagnosis of PTSD (Frederick, 1985). This widely used measure was recently revised for use in questionnaire or structured interview form (Frederick, Pynoos, & Nader, 1992). An advantage of this measure is its use of questions naming the specific traumatic event of interest (e.g., "I get scared or upset when I think about Hurricane Andrew").

To simplify presentation to the children, we reduced the 5-point response format of the structured interview to a 3-point response format consisting of the two endpoints and midpoint of the 5-point version (*none of the time, some of the time, most of the time*) In order to allow comparisons to Frederick and colleagues' (1992) categories of symptom severity, responses were scored 0, 2, 4, which are the values these responses were assigned using the 5-point response format. Children were instructed to report how often each thought, feeling, or behavior had occurred during the past few weeks.

Questionnaire items were worded as closely as possible to Frederick and colleagues' (1992) structured child interview version. For one item, a complex, two-component question was restated as two separate items (i.e., "Do you feel bad because of something you thought or did during Hurricane Andrew, or because of something you did not do" was restated as two separate items). The higher (more severe) of the child's responses to the two items was used to compute symptom severity.

The total score for all 20 items of the RI was used as an overall index of posttraumatic stress symptoms and was the primary outcome measure in this study. The total score on the RI demonstrated high internal consistency (Cronbach's α = .89). Total RI scores have been found to increase as exposure to trauma increases (Lonigan et al., 1991, 1994).

To provide a richer clinical description, Frederick and colleagues (1992) labeled the severity of PTSD symptoms for total score on the RI. These descriptors are *doubtful* (0–11), *mild* (12–24), *moderate* (25–39), *severe* (40–59), and *very severe* (60–80). Also for solely descriptive purposes, the RI was used to assess severity on the three primary symptom clusters of PTSD specified in the *DSM* nosology (American Psychiatric Association, 1987, 1994). To calculate severity for the three primary symptom clusters of PTSD, Annette M La Greca and Wendy K. Silverman selected items from the RI that included symptoms cited specifically for each cluster in the *DSM-III-R* and *DSM-IV* criteria for PTSD (American Psychiatric Association, 1987, 1994). Reexperiencing phenomena were measured by 4 items, psychic

numbing–avoidance by 5 items, and hyperarousal by 4 items.[1] Internal consistencies for the three clusters, based on Cronbach's alpha, were .75, .64, and .57, respectively. Because different numbers of symptoms for each cluster are included in the RI, mean scores for each symptom cluster were computed to facilitate interpretation of the relative severity of symptoms for each cluster The 7 items that were not placed in a specific symptom cluster asked about symptoms that are related to PTSD in children but are not part of the *DSM–III–R* or *DSM–IV* (American Psychiatric Association, 1987, 1994) diagnostic criteria (e g , somatic complaints, guilt, foreshadowing).

Correlations between the RI total score and each of the symptom clusters were high, ranging from $r = .78$ (hyperarousal) to $r = .86$ (reexperiencing, psychic numbing–avoidance). The three symptom clusters correlated moderately with one another ($r = .68$ for reexperiencing and psychic numbing–avoidance, and .58 between hyperarousal and both reexperiencing and psychic numbing–avoidance). The high correlations between the RI total score and the symptom clusters, coupled with marginal internal consistency for two of the three clusters, raised doubt on statistical grounds about using the symptom clusters as primary outcome measures. Also, there is no clear, theory-based rationale for predicting different relationships between the symptom clusters and the other factors in the study Thus, only the RI total score was used in the tests of the conceptual model

Table 1

Endorsement Frequencies for Items of the Hurricane-Related Traumatic Experiences Questionnaire

Type of experience and item	% endorsing item
Perceived life threat	
At any time during the hurricane, did you think you might die?	60
Life-threatening experiences	
Did windows or doors break in the place you stayed during the hurricane?	59
Did you get hurt during the hurricane?	8
Did you see anyone else get hurt badly during the hurricane?	18
Did a pet you liked get hurt or die during the hurricane?	16
Did you get hit by anything falling or flying during the hurricane?	15
Did you have to go outside during the hurricane because the building you were in was badly damaged?	8
Loss–disruption experiences	
Was your home badly damaged or destroyed by the hurricane?	61
Were your clothes or toys ruined by the hurricane?	55
Has it been hard to see your friends since the hurricane because they moved or you moved?	44
Did you or your family have trouble getting enough food or water after the hurricane?	37
Did you move to new place because of the hurricane?	27
Did you have to go to a new school because of the hurricane?	26
Did you have to live away from your parents for a week or more because of the hurricane?	21
Has anyone stolen anything from your home since the hurricane?	15
Did one of your parents lose his or her job because of the hurricane?	13
Did your pet run away or have to be given away because of the hurricane?	9

Exposure to traumatic events. Hurricane-related traumatic experiences. The Hurricane-Related Traumatic Experiences questionnaire (HURTE) was developed for this study because there is no well-established measure of hurricane-related traumatic experiences. The items were developed rationally from the authors' clinical experiences with interviewing children and adults who were seriously affected by Hurricane Andrew and from inspection of a postdisaster supplement to the Diagnostic Interview Schedule (DIS; Robins & Smith, 1993).[2]

The HURTE requested self-reports of each child's exposure to life-threatening experiences during the hurricane and to disruption–loss in the weeks following the hurricane. (See Table 1 for an abbreviated listing of the items.) All items were answered "yes" or "no." The 6 items pertaining to specific, observable events during the hurricane largely reflect life-threatening experiences. The sum of these items (labeled *n of life-threatening experiences*) was used as a measure of exposure to life threat during the hurricane. One additional item that directly assessed the child's perception of threat to his or her own life ("At any time did you think you might die during the hurricane?") was included as an additional and separate evaluation of life threat. This item was taken verbatim from the DIS Disaster Supplement and is referred to as *perceived life threat* (Robins & Smith, 1993). The 10 items pertaining to the postdisaster period largely reflect disruption and loss. The sum of these items (labeled *n of loss–disruption experiences*) was used as a measure of loss and disruption resulting from the hurricane.

Characteristics of social environment. The Social Support Scale for Children and Adolescents (SSSCA) was used to assess youngsters' perceptions of social support from four sources: parents, classmates, teachers, and close friends. The SSSCA includes 6 items for each source of support. Children choose between two statements (e.g., "some kids have parents who really care about their feelings, but other kids have parents who don't seem to care much about their children's feelings") and indicate if the chosen statement is "sort of true" or "really true" for them. Items are scored 1–4, with higher scores indicating greater support. Mean scores for each source of support are reported. Extensive data support the reliability and validity of this instrument for children (Dubow & Ullman, 1989; Harter, 1985).

Children's coping. The Kidcope is a brief coping checklist developed to assess the frequency of use of 15 different coping strategies by children and adolescents (Spirito, Stark, & Williams, 1988). A specific stressor is named (in the current study, "the worst thing that happened to you because of the hurricane"), and the child is asked to indicate how frequently he or she used each of the specific coping strategies to cope with the stressor, using a 4-point scale (*not at all, sometimes, a lot, almost all the time*). Initial studies indicate adequate test–retest reliability and moderate to high correlations with other measures of coping (Spirito et al., 1988; Spirito, Stark, & Knapp, 1992)

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[1] Reexperiencing phenomena items included: *Do thoughts about the hurricane come back to you even when you do not want them to? Do you go over in your mind what happened—that is, do you see pictures in your mind or hear sounds in your mind about Hurricane Andrew? Do you have good or bad dreams about the hurricane or other bad dreams? Do things sometimes make you think it might happen again?* Psychic numbing–avoidance items included: *Do you feel as good about things you liked to do before the hurricane? Do you feel more alone inside, or more alone with your feelings? Do you feel so scared, upset, or sad that you don't really want to know how you feel? Have you felt so scared, upset, or sad that you couldn't even talk or cry? Do you want to stay away from things that make you remember what happened to you during the hurricane?* Hyperarousal items included: *Do you startle more easily or feel more jumpy or nervous than before the hurricane? Do you sleep well? Is it as easy to pay attention as before the hurricane? When something reminds you of the hurricane, do you get tense or upset?*

[2] Copies of the HURTE are available from Eric M. Vernberg.

Because there is no prior research on children's coping following disasters, it was desirable to determine whether categories or styles of coping could be identified empirically, much as has been done for other stressful events (e g , Peterson, 1989; Weisz, McCabe, & Dennig, 1994). Zero-order correlations between the individual items ranged from .03 to .50 (r < .20 for about half of the interitem correlations), indicating that children endorsed different strategies at different levels. A principal components analysis (PCA) with varimax rotation for all 15 items of the Kidcope indicated four factors with eigenvalues greater than 1.0. Two items crossloaded on two or more factors (i.e., just tried to forget it, didn't do anything because the bad things couldn't be fixed) and were deleted from further analyses. A second PCA with the remaining 13 items indicated that each loaded cleanly on one of the four factors.[3]

The first factor included 6 items (try to see the good side of things, try to fix the bad things by thinking of answers, try to fix the bad things by doing something or talking to someone, try to calm myself down, try to feel better by spending time with others, do something like watch TV or play a game to forget it). For convenience of communication, this first factor was labeled *Positive Coping*, because all of the items involved efforts to maintain or regain a positive emotional or cognitive state without the use of hostile, passive, or isolative cognitions or behaviors. The second factor contained 3 items (blame myself for causing the bad things; blame others for causing the bad things; yell, scream, or get mad). On the basis of the content of the items, this factor was labeled *Blame and Anger*. The third and fourth factors consisted of 2 items each These factors have been labeled *Wishful Thinking* and *Social Withdrawal* in previous studies with the Kidcope (Spirito et al., 1988; Spirito et al., 1992) Internal consistency (Cronbach's alpha) for the scales formed by these four factors were .77 for Positive Coping, .53 for Blame and Anger, .67 for Wishful Thinking, and .43 for Social Withdrawal. Although Cronbach's alpha for the blame–anger and social withdrawal scales are lower than desirable, the factor loadings for the

items comprising these two scales are high (mean loading = .73). Correlations among the scales were all positive and statistically significant at a low to moderate magnitude (see Table 2).

Results

Descriptive Statistics

Posttraumatic stress symptoms Using criteria for total symptom severity on the RI described earlier (Frederick et al., 1992), only 14% of the children reported having few or no symptoms of PTSD related to the hurricane. Approximately 30% of the children reported mild, 26% moderate, 25% severe, and 5% very severe symptoms. Overall, the mean level of PTSD symptoms children reported was in the moderate range. The means and standard deviations for the RI total scores and symptom cluster scores are presented in Table 3. Inspection of the means in Table 3 suggests that children generally reported more symptoms of reexperiencing phenomena than of avoidance or hyperarousal.

Exposure to traumatic experiences. In terms of the total number of life-threatening events occurring during the hurricane, 30% reported 0 events, 56% reported 1–2 events, 12% reported 3–4 events, and 2% reported 5–6 events, yielding a mean of 1.2 events for the sample as a whole (Table 3). (The proportion of children

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[3] Each of the 13 items had a factor loading of .57 or higher on one of the four factors. None had a factor loading greater than .36 on another factor. The four factors together accounted for 56% of the variance in the Kidcope.

Table 2

Zero-Order Correlations Between PTSD Symptoms, Exposure to Traumatic Events, Perceived Life Threat, Social Support, and Coping Behavior

| Measure | PTSD symptoms Reaction Index | Exposure | | Social Support | | | | Coping | | | |
		N life-threat. exper	N loss–disrupt. exper.	Parents	Friends	Classmates	Teacher	Positive	Blame and anger	Wishful thinking	Social withdrawal
				Exposure							
Perceived life threat	.39**	.28**	.27**	−.06	−.04	−.13*	−.06	.22**	.13*	.13*	.06
No. of life-threat. exper.	.43**		.46**	−.18**	−.15*	−.18**	−.19**	.17**	.26**	.04	.09
No. of loss disrupt. exper.	.50**			−.20**	−.17**	−.23**	−.17**	.26**	.29**	.14**	09
				Social Support							
Parents	−.26**			.47**	.49**	.50**	−.01	−.26**	.01	−.14**
Close friends	−.20**				.59**	.43**	.01	−.26**	.03	−.13*
Classmates	−.31**					.38**	−.07	−.24**	−.10*	−.12*
Teachers	−.26**						−.04	−.18**	.03	−.10*
				Coping							
Positive	.46**							.33**	.45**	.31**
Blame and anger	.56**								19**	.31**
Wishful thinking	.27**									.21**
Social withdrawal	.37**									

Note. N = 568 for all analyses. PTSD = Posttraumatic stress disorder; threat. = threatening; exper. = experiences; disrupt. = disruption.
* p < .01. ** p < .001.

Table 3
Mean Scores for Boys and Girls on Primary Variables

	Observed mean					
	Boys (n = 252)		Girls (n = 316)		Total (N = 568)	
Variable (and possible score)	M	SD	M	SD	M	SD
Reaction Index total score (0–80)	27.83	17.1	31.13	17.2	29.6	17.2
PTSD symptom clusters (0–4)						
Reexperiencing symptoms	1.56	1.1	1.78	1.1	1.66	1.1
Avoidance–numbing	1.25	1.0	1.54	1.0	1.40	1.0
Hyperarousal	1.38	1.0	1.47	1.0	1.43	1.0
Exposure to traumatic experiences						
No. of life-threatening experiences (0–6)	1 35	1.3	1.14	1.1	1.2	1.2
No. of loss–disruption experiences (0–10)	3 03	1 9	3.12	1.9	3.1	1.9
Access to social support (1–4)						
Parents	3.47	0.6	3.61	0.6	3.5	0.6
Close friends	3.21	0.7	3.43	0.7	3.3	0.7
Classmates	3.02	0.7	3 17	0.7	3.1	0.7
Teachers	3.25	0.7	3.41	0.7	3.3	0 7
Coping (1–4)						
Positive coping	2.28	0.7	2.30	0 7	2.29	0.7
Blame and anger	1.45	0.6	1 39	0 6	1 42	0.6
Wishful thinking	3.05	1.0	3.02	0.9	3.03	0.9
Social withdrawal	1.78	0.8	1.83	0.7	1 81	0.7

Note   PTSD = posttraumatic stress disorder.

endorsing each item of the HURTE is shown in Table 1.) The most frequently reported life-threatening experience was windows or doors breaking during the hurricane, endorsed by more than half of the children. All the remaining life-threat items were endorsed by less than 20% of the children. Of interest, although few children (8%) reported getting hurt during the hurricane, many of them (60%) reported that they thought they might die.

In terms of the total number of loss–disruption events occurring after the hurricane, 9% reported 0 events, 30% reported 1–2 events, 33% reported 3–4 events, and 24% reported five or more events, yielding a mean of 3.1 loss–disruption events (Table 3). More than half the children reported experiencing severe damage to their homes and possessions (clothes, toys; Table 1). Disruption in friendships was also reported by a high proportion of the children (44%).

Social support.   Inspection of Table 3 indicates that children reported the highest levels of social support from their parents. Levels of social support by teachers and close friends were similar to each other but lower than for parents. Classmates were reported to provide the lowest levels of social support. Girls reported higher levels of support than boys for all four sources.

Coping   Children reported using wishful thinking coping most frequently, followed by positive coping, social withdrawal, and blame–anger, respectively (Table 3). The mean score for wishful thinking fell at the *a lot* point on the 4-point response scale, and the mean for positive coping fell between *sometimes* and *a lot* In contrast, mean scores for social withdrawal and blame–anger variables fell below the *sometimes* response point. Gender differences were minimal.

Prediction of PTSD Symptomatology

Analyses using total RI score as the dependent variable were conducted through analysis of partial variance (APV). This

statistical approach uses hierarchical regression, with the order of entry of variables based on a conceptual model and the statistical significance of each successive step of the analysis judged by explaining variance remaining after partialing out variance accounted for by prior steps (J. Cohen & Cohen, 1983). Contributions of all four of the primary factors specified in the conceptual model (exposure to trauma, child demographic characteristics, social support, coping) to total PTSD symptomatology were tested using this approach.

When there were two or more variables comprising a primary factor (e.g., exposure to trauma was represented by perceived life threat, number of life-threatening experiences, number of loss–disruption experiences), the variables were entered as a set, then followed up with analyses of unique effects among these variables. This "set approach" to APV allows for a test of effects of both shared and unique variance among variables entered as a set and avoids misleading conclusions arising from multicollinearity among independent variables (J. Cohen & Cohen, 1983).

Zero-order correlations among the variables used in the APV are shown in Table 2 to aid in interpretation. All of the variables correlated with total PTSD symptom scores at a statistically significant level.

Using all four factors in the conceptual model, we explained more than 62% of the variance in total PTSD symptomatology (as measured by RI scores). The exposure variables, entered as a set on the first step of the APV, accounted for 35% of the variance in PTSD total symptom scores. Greater exposure to hurricane-related traumatic experiences was associated with more PTSD symptoms. About half of this variance was explained by variance shared by the three exposure variables. (See Table 4.) Each of the three exposure variables that comprised the set also accounted uniquely for significant variance in PTSD symptom-

Table 4

Analysis of Partial Variance of PTSD Symptoms on Exposure to Traumatic Events, Gender, Social Support, and Coping

	Set statistics			Decomposition of set effect		
Step: Predictors	$r^2\Delta$	Sig. of $r^2\Delta$	r^2 total	β	Unique $r^2\Delta$	Sig. of unique $r^2\Delta$
1: Exposure to traumatic experiences	.35	.001	.35			
Perceived life threat				.26	059	.001
No. of life threatening experiences				.19	.028	.001
No. of loss–disruption experiences				.34	.09	.001
2 Child demographic characteristics	.006	ns	.36			
Gender				.07	.006	.03
Ethnicity				NA	>.001	ns
Age				−.01	>.001	ns
3: Social support	.054	.001	.41			
Teacher				−.13	.01	.01
Classmates				−.16	.014	.001
Close friend				.05	>.001	ns
Parent				−.05	002	ns
4: Coping	.21	.001	.62			
Positive				.19	.019	.001
Blame and anger				.32	.076	.001
Wishful thinking				.03	>.001	ns
Social withdrawal				.15	.019	.001

Note N = 568. PTSD = posttraumatic stress disorder; sig = significance; NA = not applicable.

atology (6% for perceived life threat, 3% for number of life-threatening experiences, and 9% for number of loss–disruption experiences). For each variable, greater exposure to hurricane-related traumatic experiences was associated with more PTSD symptoms.

Next, the child demographic variables (gender, age, ethnicity) were entered as a set on the second step of the APV. This set did not account for statistically significant amounts of variance in overall PTSD symptoms when entered after the exposure variables. Follow-up testing indicated a small but statistically significant unique effect for gender, with girls reporting slightly more overall PTSD symptoms than boys. (See Table 4.)

Children's access to social support was entered as a set on the third step of the APV, accounting for 5% of the additional variance in PTSD total symptom scores. (See Table 4.) However, in examining the variance that remained after considering the variables entered previously, the social support variables accounted for 8% of the remaining variance. Of this, 5% was shared among the support variables; support from teachers and classmates each accounted uniquely for small but statistically significant amounts (about 1% each). Lower levels of social support were related to greater PTSD symptomatology.

Children's coping (positive coping, blame-anger, wishful thinking, social withdrawal) was entered as a set on the final step of the APV, accounting for 21% of the additional variance in PTSD total symptom scores. (See Table 4.) However, the remaining variance explained by this set was 35%. Slightly less than half of this was shared variance (16%). The blame and anger variable accounted uniquely for 13%, and positive coping and social withdrawal accounted for about 3% each. Higher levels of each of the coping variables were associated with more PTSD symptoms.

Discussion

To our knowledge, this is the first study to examine an integrative conceptual model for the emergence of PTSD symptoms in children following a major hurricane. More than 60% of the variance in children's self-reported PTSD symptoms 3 months after Hurricane Andrew was accounted for by the four primary factors in this model (Exposure to Traumatic Events, Child Characteristics, Access to Social Support, and Coping). Each of the four primary factors improved overall prediction of PTSD symptoms when entered in the analyses as guided by the conceptual model, suggesting that the model is acceptably parsimonious. All statistically significant effects were in the predicted direction.

These results provide initial support for the utility of the model for understanding children's reactions to disasters. Because previous research in this area has tended to be unsystematic and haphazard, this model has the potential to provide a useful framework to organize researchers' and clinicians' thinking about children's reactions and the factors that influence them. The conceptual model can also guide future research efforts in this area.

In addition to providing overall support for the utility of the conceptual model, the findings extend, support, and clarify several important issues identified in prior research on children and disasters. Basic questions were raised at the outset about the effects of a major hurricane on children's psychological adjustment and children's risk to develop disaster-related symptomatology. Clearly, the vast majority of the children (86%) reported at least mild disaster-related psychological symptoms falling within the PTSD spectrum at 3 months post-hurricane. More than 55% reported moderate to very severe levels of these symptoms, suggesting that the majority of children were still

struggling to process the events brought about by the storm. These findings are consistent with studies of Hurricane Hugo in suggesting that marked PTSD symptoms are common among children in hard-hit areas in the first few months after a major hurricane (Lonigan et al., 1994; Shannon et al., 1994).

Although the current study focused on overall PTSD symptomatology, note that reexperiencing symptoms, such as intrusive, repetitive thoughts and bad dreams about the hurricane, were most pronounced of the three primary symptom clusters of PTSD, although psychic numbing–avoidance and hyperarousal symptoms were also reported frequently. Reexperiencing symptoms and hyperarousal were present at similar levels for children under 13 years of age in the Hurricane Hugo sample, with psychic numbing–avoidance symptoms somewhat less frequent (Shannon et al., 1994). Although there is no clear rationale for predicting differences in severity of these three primary symptom clusters in children exposed to severe natural disasters, it is possible that children find it more difficult to notice and report psychic numbing–avoidance symptoms, or that these variations result from differences in experiences or personal characteristics (Lonigan et al., 1994) Investigation of potential variation of the severity of different symptoms of PTSD may prove worthwhile in future research.

Consistent with previous research (e.g., Eth & Pynoos, 1985; Green et al., 1991; Lonigan et al., 1994), level of exposure to traumatic events was a strong predictor for the severity of PTSD symptoms. About half of the variance in overall posttraumatic stress symptoms explained by the exposure variable was attributed to variance shared by the three variables comprising this factor (perceived life threat, number of life threatening experiences, and the number of loss–disruption experiences). Each of these variables also explained uniquely 3% to 9% of the variance in total PTSD symptoms, suggesting that each contributed to the emergence of symptoms. It thus seems important to inquire about the occurrence of specific life-threatening events, perceived life threat, and events reflecting loss–disruption in assessing risk for disaster-related symptomatology (see Pynoos & Nader, 1989).

Finding both life threat and loss–disruption to be significantly related to PTSD symptoms may help clarify some of the seemingly contradictory conclusions of prior studies and reviews (e.g., Lonigan et al., 1991, 1994; McFarlane, 1987; Pynoos & Nader, 1988; Shannon et al., 1994). In a disaster such as Hurricane Andrew, which produced high levels of life threat and loss–disruption, both of these aspects of exposure appear to contribute to PTSD. However, not all disasters involve high levels of exposure to both forms of trauma. Moreover, loss–disruption after Hurricane Andrew primarily involved loss of possessions and housing and disruption of familiar roles and routines. In other disasters, such as the sniper shootings and hostage taking described by Pynoos and Nader (1988), loss–disruption involved violent bereavement rather than property destruction. Clearer descriptions of the nature of exposure to traumatic experiences in various disasters should yield more consistent findings in future research.

Also examined in this study were the specific types of exposure experiences that children encountered during and after this major natural disaster. It was interesting to observe that many children reported thinking that they might die, even though few reported witnessing or experiencing physical injury first hand. Most children also reported experiencing considerable loss of personal possessions and life disruption. This is one of the few studies to examine in a systematic way the specific types of exposure experiences that children encounter during a severe hurricane. Documenting such information contributes, therefore, to the growing body of literature in this area. It would be important in future studies to similarly delineate these experiences in other types of disasters—both natural and human. Efforts might then be undertaken to understand more clearly how these different specific experiences may be important in the emergence of PTSD symptoms.

Of the child characteristics measured, only gender accounted systematically for differences in symptomatology, and this effect was relatively minor in comparison to the other factors in the model. As predicted, girls reported greater levels of symptoms when differences were found. Finding this difference after controlling for level of exposure extends the gender differences in postdisaster PTSD symptomatology recently reported by Shannon and colleagues (1994) in their study of children affected by Hurricane Hugo.

The ethnic differences in children's posttraumatic stress symptoms reported by Shannon and colleagues (1994) were not replicated here when level of exposure was taken into account. The lack of cultural differences (as represented by ethnicity) in the development of symptoms of PTSD suggests that children of the three major ethnic groups in the study (African American, Caucasian American, Hispanic American) reacted similarly to life threat and loss–disruption. It seems possible that cultural differences in reactions to disasters could be greater among adults than children, owing to adults' longer length of time being socialized to meet specific cultural norms. It is also possible that differences in reactions to disasters appear between geographically distant communities (e.g., Steinglass & Gerrity, 1990), but not as much between ethnic groups in the same community.

Developmental level (represented by grade in school) was not a significant factor in children's PTSD symptoms, but it is crucial to recall that the age range was relatively narrow (third to fifth grades). This study adds further confidence to other evidence that children of the ages sampled here respond similarly to disasters in terms of self-reported posttraumatic stress symptoms (Green et al., 1991; Nader et al., 1990).

Access to supportive social relationships emerged as a significant predictor of children's PTSD symptoms. Unique effects were found for support from teachers and classmates, but not parents or close friends (although shared variance among the support measures also accounted for significant variance). These findings lend credence to the position that socially supportive relationships within the classroom, both from the teachers and classmates, are important for children's psychological well-being after a major disaster. Furthermore, this supports the idea of implementing interventions that target these dimensions of the school environment (Klingman, 1987, 1993; La Greca, Vernberg, Silverman, Vogel, & Prinstein, 1994). This is noteworthy given the dearth of evaluation research on classroom-level interventions after disasters, which often attempt to strengthen social support from peers and teachers (Vernberg & Vogel, 1993). The findings also provide further evidence for the

importance of multiple sources of social support and suggests that different sources fulfill different support needs (Compas & Epping, 1993; Wilcox & Vernberg, 1985).

The findings on children's coping are among the first reported in the disaster literature and suggest a strong positive relationship between greater psychological distress and greater use of coping efforts, even after controlling for exposure to trauma, child demographic characteristics, and social support. This is consistent with a process-oriented model of coping, which postulates a bidirectional relation between emotional distress and coping (Compas et al., 1992).

The finding that all four coping variables (positive coping, blame-anger, wishful thinking, social withdrawal) were positively correlated with overall PTSD symptoms suggests that high levels of distress following a novel, intense, ongoing stressor (resulting from a major natural disaster) may initially elicit a variety of coping strategies, both positive and negative. As the information on exposure to traumatic experiences indicates, for most of the children in this study, Hurricane Andrew represented a unique, intense stressor that elicited concerns of a life-threatening nature and led to significant and multiple disruptions in the children's everyday lives. In this context, it is likely that the children were still engaged in the process of learning how best to deal with this stressor when these data were collected 3 months after the hurricane.

Other research has also found that individuals typically use several types of coping strategies to cope with a specific stressful event (Compas, Forsythe, & Wagner, 1988), and this seems particularly likely to occur with a novel, frightening, and disruptive event (Compas & Epping, 1993). At the same time, certain ways of coping seem likely to be more salutary over time than others. In this regard, the results suggest that the frequent use of blame and anger as a way of coping may potentially have the strongest negative ramifications for children's levels of distress following disasters. Indeed, blame and anger uniquely accounted for 36% of the total effects for the set of coping variables. Although children reported blame and anger to be the least frequently used type of coping strategy, it was the type of coping that was linked with the highest level of PTSD symptomatology. Also of interest was the absence of unique effects for wishful thinking, suggesting that this most frequently used type of coping is at least benign following a major hurricane. Although these findings are interesting and provocative, it is conceivable that clearer differences in psychological outcomes for these different types of coping emerge later in the course of adapting to traumatic experiences. These notions await further investigation.

The findings regarding the categorization of children's coping responses following a major disaster are in some ways similar to those reported for other stressful events. Indeed, two of the four categories (wishful thinking, social withdrawal) are identical to those reported by the author of the coping measure, and another is a combination of two previously described categories (blame and anger; Spirito et al., 1988). However, the most robust category, positive coping, combines several previously described categories of the Kidcope and does not appear to fit neatly into formulations derived from other research on coping. Aside from consisting of coping strategies that generally seem positive and socially acceptable, the individual items appear to include strat-

egies that may be considered incompatible in some schemas for categorizing coping. For example, several items appear to represent problem-focused coping (e.g., try to fix the bad things by doing something or talking to someone, try to fix the bad things by thinking of answers), whereas others seem more emotion focused (e.g., try to calm myself down, try to see the good side of things). Perhaps the common thread is that all of the strategies involve intentionally taking nonhostile, nondestructive action, either physically or psychologically, in response to feelings of distress. This formulation has similarities to Peterson's (1989) conceptualization of active coping in the context of stressful medical procedures, which developed a rationale for considering psychologically active coping strategies as a type of problem-focused coping in the face of unavoidable stressful events.

Despite the important contributions of this study, several caveats should be noted. One is the study's sole reliance on children's self-reports. However, there are two points worth considering. First, there is general consensus (Loeber, Green, & Lahey, 1990) that children are more reliable informants of their internalizing states than other sources (e.g., Edelbrock, Costello, Dulcan, Kalas, & Conover, 1985; Silverman & Eisen, 1992). This might be particularly true in the case of child PTSD symptoms following a natural disaster because parents and teachers, who are typically the other informants in research, may be preoccupied and under severe stress themselves. Under the circumstances, parents and teachers may not be as attuned to children's inner emotional states. In fact, during the administration of our measures a number of children remarked that they did not share their distress with their parents because they did not want to "bother" them or further upset them (see Yule & Williams, 1990).

A second, related point has to do with what is feasible and realistic to expect in the wake of a disaster as devastating as Hurricane Andrew. Parents and teachers were in the process of recovery. Requesting their participation in a school-based study may have placed undue burden on them. Still, parents and teachers typically report considerably fewer postdisaster distress symptoms for children compared to children's self-reports (e.g., Earls, Smith, Reich, & Jung, 1988; Hanford et al., 1986), and it is necessary to bear in mind that a study based on children's self-reports is likely to find higher levels of child distress than one based on other informants. Note also that reliance on children's self-reports raises concerns that some of the relationships found here may be due in part to shared method variance. Despite the difficulties of conducting research with children after such a catastrophic disaster, it will be important to include measures from other sources, such as parents, teachers, or direct observation, to evaluate more completely the conceptual model used here.

Another issue worth considering in interpreting the results is that the children's reports were obtained 3 months following the disaster. This limits the generalizability of the study's findings to this time frame. It will be important to examine children's reactions to disasters over a more extended period of time using longitudinal designs. Also, the children's reports may have been partially influenced by their telling and retelling of their disaster experiences, which commonly occurs among disaster victims.

Finally, further investigation of children's coping actions fol-

lowing major disasters is needed to clarify the most important distinctions among various forms of coping and to investigate possible connections between various coping strategies and PTSD symptoms. It seems important in future research to include more items that may tap blame–anger, social withdrawal, and wishful thinking coping. These forms of coping were measured by two or three items each, raising concerns about the reliability of these categories. The limited number of items on the Kidcope also raises the possibility that some forms of coping used by children after disasters were not well-represented. Nonetheless, self-reported coping and PTSD symptoms clearly were strongly associated, and the results suggest that this association is stronger for some types of coping than others Greater insight into the nature of this association seems likely to provide useful information regarding risk and resilience among children exposed to major disasters, and the use of additional methods to assess children's coping after disasters appears warranted.

Despite these limitations, support for the utility of the conceptual model for the emergence of posttraumatic stress symptoms following widespread natural disasters strengthens confidence in focusing on life threat, loss–disruption, social support, and coping efforts to assess the risk of psychological distress in children after disasters. Targeting social support processes and coping efforts for further research seems particularly important, especially with the goal of developing research-based postdisaster interventions that foster the provision of social support and the use of effective coping efforts. Although many current postdisaster interventions with children are consistent with the present results, many school-based interventions are offered only for the first few weeks after disasters strike (e.g., Klingman, 1987). These findings suggest that the task of processing disturbing events is far from over for large numbers of elementary school-age children 3 months after a disaster of the magnitude of Hurricane Andrew.

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