

Childhood Posttraumatic Stress Disorder and Efforts to Cope After Hurricane Floyd

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The authors report on the level of posttraumatic stress disorder (PTSD) experienced by fourth-grade children 6 months after Hurricane Floyd and describe the children's efforts to cope with their stress. All of the children they studied were directly affected by the hurricane, secondary to the destruction of their school by floodwaters. The homes of 37% of these children were also flooded. Ninety-five percent of the children experienced at least mild symptoms of PTSD, and 71% had symptoms that were moderate to very severe. Children who reported that their homes were flooded were 3 times more likely to report symptoms than those whose homes were not flooded, and the girls were twice as likely as the boys to report symptoms. The high PTSD prevalence rates are comparable to findings from other studies involving violence in which 94% of the victims reported experiencing symptoms. For further analyses, the authors used symptom clusters of hyperarousal, numbing/avoidance, and reexperiencing symptoms.

Index Terms: coping, hyperarousal, numbing/avoidance, reexperiencing events, posttraumatic stress disorder (PTSD)

The formal study of childhood stress resulting from natural disasters is an important and growing science. Because natural disasters are unpredictable, intermittent, and multifaceted occurrences, it is difficult to conduct a systematic study of how such disasters affect victims. Moreover, the individual's age, gender, ethnicity, exposure to the trauma, methods of coping, and the social environment are mitigating factors in the development of dysfunction, such as posttraumatic stress disorder (PTSD), and recovery.

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The opportunity to study children's behaviors in response to natural disasters is a rare and daunting task. Such moments, however, provide an opening for researchers to gain insight into the effects of dire events on children. The potential exists for understanding the short-term and long-term effects of traumatic stress on children, as well as the coping mechanisms and their associated symptoms that youngsters use after a disaster. Ultimately, clinicians could use this information to predict which individuals are in greatest need and thus prevent their symptoms from emerging and treat those exhibiting primary and secondary effects. In this study, we explored individual characteristics, exposure to trauma, methods of coping, and the social environment of a cohort of fourth-grade students who lost their school and their homes to floodwaters following Hurricane Floyd.

On Wednesday, September 15, 1999, the children of eastern North Carolina public schools were dismissed early in anticipation of an approaching hurricane named *Floyd*.

Some of these children would help their families pack as they prepared to head inland as part of what has been termed the largest US evacuation in history. Others would help their families board windows, gather supplies, and wait it out. The next day, gale force winds collided with the land, causing enormous oak trees to fall on houses and crush automobiles. Roofs flew off houses, and some houses, literally, blew apart. After the winds subsided, people in the community surveyed the damage in the hope that nature had run its course.

No one anticipated the insidious disaster that lurked on the horizon. This was especially true for the children we studied, who would experience turmoil that most people are fortunate enough to avoid during their entire lives. The children's poignant comments as they recounted their experiences on return to their modular classrooms 2 weeks later vividly capture their memories of the disaster and the intensity of the traumatic reactions:

Thursday it rained all day;
 Everyone had to be evacuated;
 My whole house was under water;
 I saw the caskets float by, but my uncle stayed down;
 My dog was dead;
 I felt bad about everything. . . . I wish it never happen.

The size of Hurricane Floyd, coupled with the heavy rain delivered only weeks before by Hurricane Dennis, overwhelmed eastern North Carolina with 30 inches of rain over a 2-week period and caused unprecedented flooding that surpassed the 500-year flood plain level. All told, 51 people died, 7,000 homes were destroyed, 17,000 homes were rendered uninhabitable, 56,000 homes were damaged, and 10,000 people were housed in temporary shelters as a result of the hurricane and subsequent flooding.¹ Entire communities were destroyed in the nearly total devastation.

Hurricane Floyd was the greatest disaster that North Carolina had ever endured. The floodwaters did not recede for several weeks, resulting in many other unanticipated problems, including water contamination, unearthed caskets, and bizarre animal behavior. The elementary school that the children in this study attended was 1 of many buildings completely destroyed by the swollen Tar River. Everything was lost, including school and personal items—books, supplies, class projects, and pets. The familiar school structure that provided security and stability in these children's young lives was swept away by the floodwaters.

Posttraumatic Stress Disorder

Posttraumatic stress disorder is a debilitating condition with a host of negative symptoms that often emerge after exposure to a traumatic event.³ These events may include

exposure to war, physical or sexual abuse, and natural disasters. Being a victim of a natural disaster produces common symptoms among humans; when these symptoms become severe and sustained, the diagnosis is PTSD.²

PTSD can be characterized as a sense of recurring fear, helplessness, and loss. Its victims avoid stimuli associated with the trauma, reexperience the events, and demonstrate persistent symptoms of increased arousal. According to the criteria set forth by the American Psychiatric Association, the disturbance must be present for more than 1 month and must cause clinically significant distress or impairment in social, occupational, or other important areas of functioning.²

Posttraumatic stress disorder was first reported in Vietnam combat veterans to describe the recurring feelings that interfered with their day-to-day functioning.³ Saigh⁴ reported similar conditions in Lebanese children exposed to war. Posttraumatic stress disorder was also reported in children after Hurricanes Andrew and Hugo.^{5,6} Researchers now believe that exposure to a traumatic event such as a natural disaster is a major factor in the development of PTSD.⁵

Published reports about posttraumatic stress and children after natural disasters is increasing,⁷⁻⁹ and symptoms in children after hurricanes and flooding, including bad dreams, poor sleep, inability to pay attention, and feelings of anger, fear, and sadness,² have been well documented.^{5,7,9,10} PTSD symptoms have a devastating effect on children's health and performance.¹¹

However, the number of investigations of the interactions among the multiple factors (eg, gender, age, ethnicity) that are thought to influence the emergence of PTSD symptoms after a natural disaster is limited. No previous studies have reported measuring PTSD in a cohort of children who were still exposed to the effects of the trauma 6 months posttrauma. Moreover, we know of no studies that explored PTSD in children exposed to multiple traumas caused by natural disasters.

Purpose

In conducting this study, we sought to determine the impact of individual and environmental factors on the development of PTSD symptoms 6 months after Hurricane Floyd. We also analyzed the relationship between students' coping choices and their PTSD symptoms. Finally, we conducted analyses of the data to explore the effect of multiple traumas on PTSD symptoms.

In an attempt to study the relationship of numerous influences on PTSD symptoms, Vernberg and colleagues⁵ proposed a conceptual model consisting of the following 4 categories of interacting variables that affect the development of PTSD: (1) characteristics of the individual child (ie, gender, age, ethnicity); (2) exposure to the traumatic event; (3) efforts

to cope with events; and (4) characteristics of the social environment. In this study, we used this model as a theoretical framework to evaluate the impact of Hurricane Floyd and the subsequent flooding on the children at 1 elementary school in North Carolina, and used data on age, gender, and ethnicity to represent individual characteristics. Although all of the children in this study lost their school, we measured exposure to the event by comparing PTSD levels of those whose homes were flooded with those whose homes were not flooded. In addition, we used data on childhood coping to explore the relationship between coping strategies and PTSD symptoms. The influence of the social environment (eg, family support on PTSD symptoms) was beyond the scope of our study, and we did not attempt to analyze it.

METHOD

We collected data from a cohort of 218 fourth-grade students. The school administration excluded students in the fifth grade, the only other grade in the elementary school, because of upcoming end-of-grade tests. We included only those children with signed child and parent/guardian informed-consent forms in the data analyses. The local Institutional Review Board reviewed and provided approval of our post hoc study. See Table 1 for a description of the demographic makeup of the student population. We included 69% ($n = 150$) of these children in our analyses, excluding only those students without informed consent forms and those with undecipherable or incomplete assessments. Fifty-seven percent of the participants were girls, and 43%

were boys, and their ages ranged from 9 to 12 years, with the largest percentages aged 9 (46%) and 10 years (45%). The reported ethnic backgrounds of the children were African American (63%), European American (33%), and Hispanic American (4%).

In March 2000, approximately 6 months after Hurricane Floyd and the flooding that followed it, the school social worker used the child version of the Post-Traumatic Stress Reaction Index (personal communication, Frederick CJ, Pynoos RS, Nader K. Reaction index to psychic trauma, form C: Child [CPTS-RI]. University of California, Los Angeles; 1992)⁷ to assess all fourth-grade students. The CPTS-RI is a Likert-type scale ranging from *none of the time* (1) through *a little of the time* (2), *some of the time* (3), *much of the time* (4), to *most of the time* (5). It establishes the existence of 17 PTSD symptoms and 3 associated symptoms in children. The CPTS-RI is reported to be the most frequently cited standardized instrument for assessing PTSD in children.¹²

In addition to identifying symptoms of PTSD, the CPTS-RI classifies symptoms into 3 clusters: numbing/avoidance, reexperiencing, and hyperarousal. Numbing/avoidance (NA) is characterized by avoidance of stimuli associated with the event and a numbing of general responsiveness. The reexperiencing cluster (RE) refers to recurrently and persistently experiencing the traumatic event; and hyperarousal (HA) involves a set of behaviors, including difficulty in falling asleep and staying asleep, concentrating, feeling irritable, or repeated outbursts of anger.² The level of internal consistency (Cronbach's alpha) for this specific study sample was .85 for the total CPTS-RI scale. The internal consistency values for the subscales were as follows: reexperiencing, .77; hyperarousal, .78; and numbing/avoidance, .48.

To assess the impact of the disaster on coping responses, we analyzed data from Kidcope,¹⁴ which we administered at the same time as the CPTS-RI. Kidcope (version for 7–12-year-old participants) was developed as a tool for the clinical researcher to use as a screening measure.¹³ Kidcope consists of 15 items designed to measure behavioral and cognitive coping strategies in multiple situations.¹⁴ The items are grouped into 10 coping strategies: distraction, social withdrawal, cognitive restructuring, self-criticism, blaming others, problem solving, emotional regulation, wishful thinking, social support, and resignation. Internal consistency or reliability for the Kidcope categories ranged from .09 to .41. These low levels may reflect the use of only 1 or 2 items to construct each category. The internal consistency of coping strategies composed of a single item could not be assessed.

The school social worker administered the CPTS-RI and Kidcope in each classroom, gave each student a copy of the

TABLE 1
Characteristics of Student Participants in a Study of PTSD After Hurricane Floyd

Variable	<i>n</i>	%
Age (y)		
9	69	46
10	68	45
11	13	8
12	2	1
Sex		
Female	85	57
Male	65	43
Ethnicity		
African American	94	63
European American	50	33
Hispanic American	6	4

Note. PTSD = posttraumatic stress disorder.

assessments, and prefaced the presentation by telling the children that the school was collecting data regarding their reactions to the hurricane and flood. Children were told that if they completed the surveys, they would be given a pencil. For the CPTS-RI, the social worker replaced the term event with *the flood* in each question and instructed the children that their reactions should pertain to “the past 6 weeks.” She gave the children an opportunity to ask questions after each item in the CPTS-RI. On reverse questions (7, 12, and 15), she asked the children to listen very carefully and to answer each question with the best choice. For Kidcope, she read each question aloud and told the children to answer by circling yes or no. We entered data from the nonrandomized sample into a computer statistics program that calculated means and standard deviations for the CPTS-RI and Kidcope. We used Pearson’s chi-square (χ^2) and the Wilcoxon-Mann-Whitney test to analyze the nonparametric data and explore relationships among individual characteristics, exposure to the trauma, and CPTS-RI scores. In addition, we used Spearman’s correlation coefficient to report on associations among the children’s coping choices and PTSD symptoms.

RESULTS

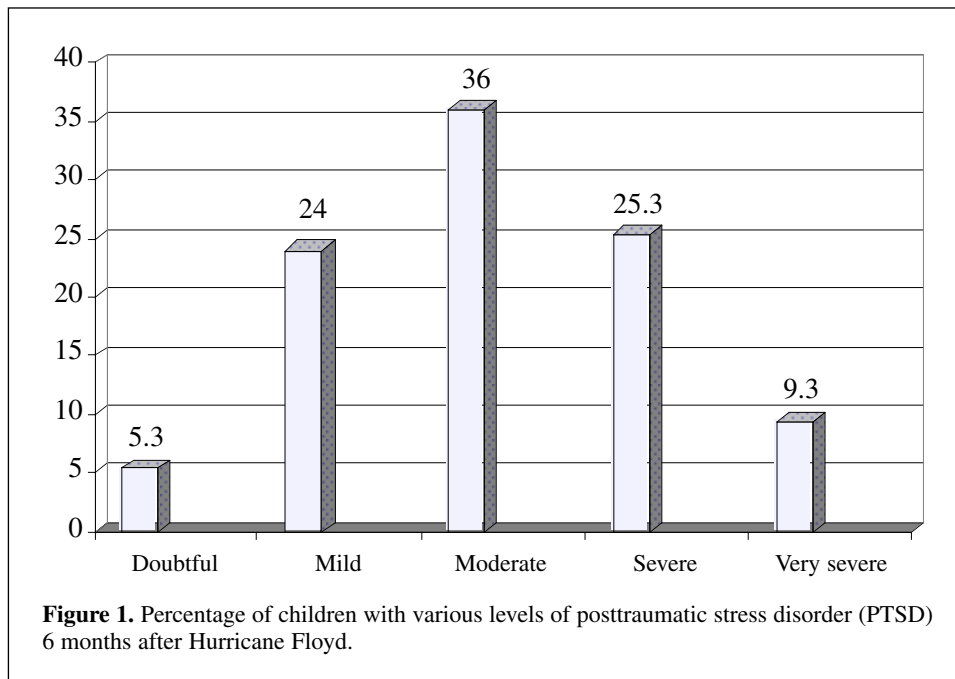
Exposure to the Event

The data shown in Figure 1 indicate that almost all (95%) of the children reported symptoms of PTSD, with 71% experiencing moderate-to-very severe symptoms. The overall mean CPTS-RI score ($n = 150$) was 34.4 ($SD = 15.6$).

For clinical purposes, we classified the CPTS-RI raw scores to determine the level of PTSD.^{7,15} The RI cutoff points are: CPTS < 12 (doubtful level), and 12–24 (mild level). When we used this classification system, almost all (95%) of the children reported some symptoms of PTSD, and 71% of the children experienced moderate-to-very severe symptoms. Only 5.3% of the children had doubtful symptoms.

Individual Characteristics

Information on associations between study variables and PTSD symptom categories is provided in Table 2. The variables most associated with severe and very severe PTSD symptoms were being female (45%) and experiencing flooding at home (46%). We found that age and ethnicity were not significantly associated with PTSD. Percentages in the moderate PTSD category were relatively constant for all variables. The significant differences we noted for the variables gender and home flooded occurred in the categories of mild or doubtful rather than severe to very severe. The girls had 17.6% in the mild category compared with 32.3% for the boys; but 44.7% of the girls fell into the severe to very severe category, whereas only 21.5% of the boys were at that level. We noted a nearly identical association for those whose homes were flooded. Just over 12% (12.3%) of those with flooded homes showed mild PTSD, compared with a 31.2% showing of mild PTSD among those whose homes were not flooded. Yet 45.6% of those whose homes were flooded rated their PTSD as severe or very severe, compared with



28.0% of those whose homes were not flooded. We obtained a measure of association for these variables by combining the categories of doubtful and mild versus a single category of moderately severe or very severe. Collapsing the categories created a 2 × 2 table from which we computed odds ratios (ORs). The OR for gender was 2.7: the girls had 2.7 times the odds of moderate or more severe symptoms of PTSD compared with the boys. Similarly, those who were flooded had more than 3 times the odds of moderate or more severe PTSD than those not flooded.

Because the girls who were flooded reported the most symptoms ($M = 42.6, SD = 17.5$), questions about the association of being flooded and the students' gender naturally arose (see Table 2). When we controlled for the variable flooded, using stratification, the relationship of gender with the category of PTSD changed slightly but essentially persisted. The girls had a significantly greater statistical tendency toward higher PTSD symptoms than the boys did, whether flooded ($p = .031$) or not flooded ($p = .037$). The boys who were not flooded were more likely to be in the mild or doubtful categories (50% boys vs 24.5% girls). The girls who were not flooded had higher percentages in the moderate or more severe symptom category (73.5% girls vs 50% boys). When we considered those children who were flooded, we found virtually no differences between the boys and the girls for mild or doubtful PTSD (19.0% for the boys and 16.7% for the girls). However, the girls were distributed evenly over the moderate, severe, or very severe categories

(27.8%, 30.6%, and 25.0%, respectively), whereas the boys were predominately in the moderate or severe categories only (52.4% moderate, 28.6% severe, and 0.0% very severe). We conducted multivariable logistic regression with the 2 collapsed PTSD categories (doubtful or mild vs moderate) as the dependent variable with age, gender, flooded, and ethnicity and the two 2-way interactions as predictors. This logistic regression again revealed that only gender and flooded were statistically significant, with no statistically significant interactions among the variables.

Next, we used the Mann-Whitney U test to conduct an analysis on the basis of the students' raw scores. See Table 3 for the means, standard deviations, and test results. The results of these analyses are essentially identical (in terms of the associations they imply) to those reported for the categorized PTSD scores. The mean CPTS-RI score ($n = 150$) was 34.4 ± 15.6 . Age, a representation of developmental stage, was not a significant factor. The ethnic background of the children was also not significantly related to symptoms. Gender and flooded status, on the other hand, were significantly related to symptom development.

The girls who were flooded reported the most "overall" mean symptoms (42.6 ± 17.5) compared with the boys who were flooded (33.3 ± 11.4). The means and standard deviations for those not flooded were boys 29.0 ± 14.3 and girls 33.9 ± 14.7 . When we used a nonparametric analysis of variance (Kruskal-Wallis test) to assess differences of the 4 groups defined by crossing the variables flooded (yes, no)

TABLE 2
Percentages of Students in PTSD Categories, by Age, Gender, Ethnicity, and Whether Home Was Flooded

Variable	Level					χ^2 †	<i>p</i>
	Doubtful	Mild	Moderate	Severe	Very severe		
Age (y)							
9	5.8	27.5	31.9	24.6	10.1	0.8	.93
10	6.0	20.9	35.8	26.9	10.4		
Sex							
Female	3.5	17.6	34.1	31.8	12.9	10.6	.03
Male	7.7	32.3	38.5	16.9	4.6		
Ethnicity							
African American	4.4	23.1	34.1	29.7	8.8	2.2	.70
European American	8.3	22.9	35.4	20.8	12.5		
Home flooded							
Yes	5.3	12.3	36.8	29.8	15.8	10.1	.04
No	5.4	31.2	35.5	22.6	5.4		

Note. PTSD = posttraumatic stress disorder.
 †Pearson χ^2 with 4 degrees of freedom.

TABLE 3
Means and Standard Deviations of PTSD Scores, by Age, Gender, Ethnicity, and Flooded Status of Student Participants' Homes

Variable	<i>n</i>	Total	HA	RE	NA
<i>Age (y)</i>					
9	69				
<i>M</i>		33.7	10.5	11.9	13.3
<i>SD</i>		16.4	7.3	6.1	5.9
10	67				
<i>M</i>		35.1	11.2	12.0	14.5
<i>SD</i>		15.6	7.2	5.6	5.3
Mann-Whitney					
<i>U</i>		2,587	2,320	2,510	2,247
<i>p</i>		.43	.24	.51	.30
<i>Gender</i>					
Female	85				
<i>M</i>		37.5	12.1	13.3	14.9
<i>SD</i>		16.4	7.2	5.9	5.7
Male	65				
<i>M</i>		30.4	9.5	10.3	12.4
<i>SD</i>		14.4	6.7	5.2	5.0
Mann-Whitney					
<i>U</i>		2,045	2,128	2,113	1,939
<i>p</i>		.00	.07	.04	.03
<i>Ethnicity</i>					
African American	91				
<i>M</i>		35.8	11.1	12.2	14.4
<i>SD</i>		15.2	6.7	5.7	5.5
European American	48				
<i>M</i>		33.4	11.0	12.2	113.0
<i>SD</i>		17.1	7.8	6.0	5.8
Mann-Whitney					
<i>U</i>		2,015	2,971	1,925	1,618
<i>p</i>		.45	.53	.50	.15
<i>Home</i>					
Flooded	57				
<i>M</i>		39.1	12.4	13.7	15.7
<i>SD</i>		16.1	7.2	5.6	5.8
Not flooded	93				
<i>M</i>		31.6	10.1	11.0	12.6
<i>SD</i>		14.6	6.9	5.7	5.1
Mann-Whitney					
<i>U</i>		1,896	1,962	1,933	1,704
<i>p</i>		.00	.04	.01	.00

Notes: Total refers to the entire Reaction Index to Psychic Trauma, Form C: Child (CPTS-RI), raw score mean. PTSD = posttraumatic stress disorder; HA = hyperarousal; RE = reexperiencing; NA = numbing/avoidance.

with gender (male, female), the overall Kruskal-Wallis test was significant ($KW = 14.5, df = 3, p = .002$). Follow-up comparisons for this analysis showed that for those *not flooded*, the difference in the boys and the girls was significant, $p = .048$; by contrast, the comparison of boys and girls was not significant for those flooded, $p = .054$. Again, these findings mirror those for the categorized PTSD analysis.

We also used the Mann-Whitney U test to conduct a further analysis of the subscales for the CPTS-RI raw scores (reexperiencing [RE], hyperarousal [HA], and numbing and avoidance [NA]). The percentage that scored at least 1 item within a subscale is also given. The raw scores indicated that the children with flooded homes reported greater symptoms than those children whose homes were not flooded ($U = 1,896, p = .003$). Children who reported that their homes were flooded had significantly greater symptoms on all subscales of the CPTS-RI; 100% of the children with flooded homes reported symptoms of reexperiencing the event, 85% reported symptoms of hyperarousal, and 64% reported symptoms of numbing/avoidance. In addition, we used the Mann-Whitney U test to determine differences in subscale scores between the boys and the girls. The results of these analyses revealed that the girls had a significantly higher number of symptoms on 2 of the 3 CPTS-RI subscales, namely NA ($U = 1,939, p = .03$) and RE ($U = 2,113, p = .04$). HA was not significant ($U = 2,128, p = .07$).

Efforts to Cope With the Event

Means and standard deviations of coping strategies reported 6 months after the traumatic flooding are reported in Table 4. The Kidcope survey comprises 15 questions designed to represent 10 coping strategies.¹⁴ The following are strategies and the numbers of the questions that represent them: distraction (1, 2), social withdrawal (3, 4), cognitive restructuring (5), self-criticism (6), blaming others (7), problem solving (8, 9), emotional regulation (10, 11), wishful thinking (12, 13), social support (14), and resignation (15). In this study, we found that the 6 most frequently cited coping strategies were wishful thinking, cognitive restructuring, social support, distraction, emotional regulation, and problem solving. The remaining 4 coping strategies (social withdrawal, resignation, blaming others, and self-criticism) were the least often used but were those most strongly associated with PTSD symptoms. The coping strategies significantly related to PTSD symptoms were social withdrawal, self-criticism, blaming others, problem solving, and emotional regulation. Interestingly, wishful thinking was the most often used coping strategy and also the strategy least associated with symptoms. Other strategies not significantly associated were distraction, social

TABLE 4
Means and Standard Deviations for Coping Strategy
Items and Their Relationship to PTSD Symptoms
(N = 150)

Kidcope category	<i>M</i> †	<i>SD</i>	<i>r</i> _s	<i>p</i> ‡
Distraction	1.1	0.7	.02	.85
Social withdrawal	0.7	0.7	.25	.00
Cognitive restructuring	0.9	0.3	.07	.45
Self-criticism	0.1	0.4	.26	.00
Blaming others	0.2	0.4	.20	.01
Problem solving	1.0	0.8	.24	.00
Emotional regulation	1.0	0.7	.40	.00
Wishful thinking	1.8	0.5	-.01	.89
Social support	0.8	0.4	.04	.60
Resignation	0.5	0.5	.12	.14

Note. PTSD = posttraumatic stress disorder. Kidcope is a screening measure.¹³
†Maximum value for the mean is 2.0, minimum value is 0.
‡Level of significance (*p*) was derived using Spearman's correlation coefficient.

support, cognitive restructuring, and resignation.

We conducted an analysis to determine whether any of the study variables (age, ethnicity, flooded, or gender) were related to the coping strategies. To take advantage of the ordinal categories, we used the linear by linear chi-square test in SPSS. Because of the large number of tests involved, we lowered the level for a claim of significance to .01 to reduce the chance of a type 1 error. None of the 10 coping strategies differed between the age groups. However, the girls were significantly more likely to use social support than the boys were, 87% vs 71%, $\chi^2(1, N = 150) = 6.6, p = .010$. Those who were flooded were significantly more likely to use emotional regulation (86%) compared with those not flooded (69%), $\chi^2(1, N = 150) = 7.5, p = .006$. The flooded children also used social support significantly more often (93%) than the children who were not flooded (72%), $\chi^2(1, N = 150) = 9.6, p = .002$. The African American youngsters were more likely to report the use of blaming others as a means of coping than were the European American children, 22% vs 6%, $\chi^2(1, N = 150) = 6.8, p = .009$.

COMMENT

Exposure to the Event

All of the children in this cohort were exposed to the trauma, and almost all were still experiencing mild-to-

very-severe PTSD symptoms 6 months after Hurricane Floyd. According to the American Psychiatric Association, PTSD prevalence is 8% in the US adult population at any given time.² Although similar statistics are not available for children, it seems reasonable to assume that they are not nearly as high as those we report in this study. Lonigan and associates⁶ studied posttraumatic stress in 5,687 children in South Carolina after Hurricane Hugo and found that 5.5% were experiencing significant symptoms. In a study similar to the one reported here, LaGreca and colleagues¹⁵ found that in 3 elementary schools “severely affected” by Hurricane Andrew, 86% of the children reported mild symptoms of PTSD and more than 55% reported moderate-to-severe symptoms. By comparison, we found that 95% of the children in this study reported at least mild symptoms of PTSD and 71% reported moderate-to-very-severe symptoms. These high prevalence rates are comparable to findings in studies involving violence that reported that 94% of the victims reported having experienced symptoms of PTSD.¹⁶

The length and severity of exposure to a natural disaster may be predictors of PTSD and warrant further investigation.¹² The extremely high levels of PTSD in this study may be directly related to all of the children’s having been exposed to the trauma and the social upheaval they experienced as a result of being displaced by the hurricane and flood. Many children in this study were forced to move in with relatives, live in hotels or recreational vehicles, or stay in other temporary housing. The finding that those children whose homes were flooded were 3 times more likely to report symptoms provides support for this theory. All of the children in this study were confined in plain white modular classrooms with pallet sidewalks in a National Guard Armory parking lot. The children ate their lunches in these classrooms and were required to use outdoor portable bathrooms. Natural disasters that have long-term effects such as these may perpetuate PTSD symptoms and be related to the duration of exposure to the event itself or to the amount of social chaos resulting from the trauma.

One factor that we did not measure in this study but that could have had an impact on the symptoms and their duration is the extremely low socioeconomic status of people in this region.¹⁷ Ranked among the poorest in the state, the region is considered distressed because it ranks lowest in the state in employment, per capita income, and population growth. Possible links between poor socioeconomic status and increased prevalence of PTSD need further investigation, with longitudinal studies to determine the impact of exposure to a chronic stressor in symptom formation and reduction. Studies investigating the relationship among

symptoms, functional deficits, and coping mechanisms are also needed. The results of these studies could greatly enhance diagnostic specificity and create a better understanding of posttraumatic stress symptoms and PTSD. Influences of parents, teachers, and other role models are very important mitigating factors^{18,19} that should also be considered in future studies.

Individual Characteristics

The finding that more girls reported symptoms of PTSD is consistent with other studies and may be a product of the different ways that boys and girls express psychological distress.¹⁹ Symptom subscales NA and RE were also higher in the girls. Taken together, these findings tend to indicate that females experience more distress and emotional shock than males do. Interestingly, we found no significant difference between the boys and the girls in the HA symptom cluster. Perhaps these symptoms are more socially acceptable for the boys to report. A study of this issue that uses combined psychological and physiological methods over an extended period of time may shed light on this question. That most of the children’s ages were only 1 year apart and that they were at the same developmental stage may explain why we did not find significant age-related differences in the children’s symptoms.

All of the children were victimized by the loss of their school, yet those whose homes were flooded were 3 times as likely to experience symptoms of PTSD as those whose homes were not flooded. These same children reported significantly higher symptoms on all 3 subscales. These findings demonstrate that the greater the upheaval in the social environment, the greater the individuals’ symptoms of PTSD. Clinicians should note this finding and provide priority treatment services to children.

Efforts to Cope With the Event

Our findings provide a revealing look at the types of coping strategies children use in the face of disaster and how these methods are related to PTSD. Taken together, failed attempts at emotional regulation, social withdrawal, self-criticism, problem solving, and blaming others represent ineffective coping patterns strongly related to symptoms. These strategies may represent a struggle to deal with a traumatic situation that is unresolved and may have developed as a result of the trauma. If the latter is true, then early intervention is critically important. It may also be that these strategies are part of a child’s normal coping pattern and were exposed, and perhaps exacerbated, by the trauma. Intervention programs designed to increase successful problem solving and regulating emotions, and simultane-

ously decrease social withdrawal, self-criticism, and blaming others could be used to reduce symptoms.

On the other hand, wishful thinking (hope), distraction, social support, cognitive restructuring, and resignation (accepting the reality of the event) represent effective coping tactics. Programs designed to increase use of these strategies should also be conducted. Ideally, behavioral medicine programs that decrease the negative strategies and increase positive strategies should be used to reduce the symptoms of PTSD in children after natural disasters.

The finding that the girls reported more symptoms and used social support more often than the boys did seems to indicate that this strategy is not effective for everyone. Children whose homes were flooded were significantly more likely to use social support than those whose homes were not flooded. One possible explanation is that the measures of social support in Kidcope were limited. In addition, a child who seeks out others for support may not necessarily receive it. Many of the children were forced to live with relatives and friends, and the very nature of this forced relationship may have prohibited some of these children from receiving true social support.

Use of emotional regulation by the children whose homes were flooded was significantly higher than among those whose homes were not flooded. Thus, it seems that the more stress the children were under, the more they used this strategy to try to cope. Perhaps these were the children who were trying to “hold it together” and not lose control. Another interesting finding was that African American children were more likely to use blaming others as a coping strategy than the European American children were. Although we have no way of knowing the reason for this finding, perhaps the African American children felt that having to go to school and live along the riverbank in the poorest area of the county was not an individual choice but one that others had made. Hence, they felt that it was other people’s “fault” that they were flooded.

Programmatic Recommendations

Children with multiple losses and greater social environment chaos are in greater need of intervention. For example, children who lose pets and have their homes flooded, resulting in displacement, may experience more symptoms than those who lose only a few belongings. Another important factor to consider is gender. Given the findings in our study, we may be able to develop a brief clinical tool to identify those in the greatest need in the time of trauma by identifying those children who choose dysfunctional coping strategies. These children could then be placed higher on the priority list for intervention. From a clinical perspective, it

appears important to provide intervention strategies to improve emotional regulation and problem-solving techniques and to decrease social withdrawal, self-criticism, and blaming others after disasters.

Because the children who used negative coping preferences were suffering the most from PTSD, biopsychosocial interventions could be developed to assist them in changing these patterns and decreasing symptoms. At the same time, it is important to increase the use of those strategies that were found to be effective, such as wishful thinking, distraction, social support, cognitive restructuring, and resignation.

Given the outcomes of this study, we suggest that a range of behavioral medicine and interpersonal techniques would prove to be appropriate forms of intervention for youngsters who experience such traumatic situations.²⁰ For example, school-based stress reduction programs have demonstrated that they can have a positive impact on stress in children and could be tailored for crisis intervention.²¹ Specific stress-reduction techniques that are based on individual assessment could be designed to reduce symptoms of PTSD and to promote interpersonal growth. One technique, the relaxation response, has been shown to be effective in reducing symptoms of hyperarousal,²² and cognitive-behavioral therapy is effective in treating depression.^{23,24} Other interventions designed to help an individual desensitize herself or himself to the disaster through counseling (eg, increased social support, community involvement, and other social cognitive learning strategies) may be proved effective in reducing the symptoms of numbing/avoidance.²⁵ Future research focusing on the utility of symptom clusters in establishing the PTSD diagnosis may also provide essential information about additional treatments.

Finally, very little is known about physiological changes in children after natural disasters. Contrasting physiological and psychological data may provide a clearer picture of the effect of natural disasters on children. If researchers could assess psychophysiological reactions to disasters, they could eventually create a reaction profile that would help clinicians predict and prevent prolonged stress reactions.

Summary

The findings from this study clearly demonstrate the devastating effect natural disasters have on children and offer insights into how children attempt to cope with such experiences. We had no control group data, however, and applications of our findings are limited. As is true of all instruments, the CPTS-RI scale we used to measure symptoms has some limitations—the scale does not call for reporting all symptoms of PTSD, and the sensitivity of the instrument is still being investigated. Longitudinal studies exploring

changes in a cohort over time should help further address the sensitivity question. We administered Kidcope to children in groups, although the questionnaire was originally developed for an interview. The change in approach could have influenced the validity of our findings. We took precautions to ensure that the children understood the questions and grasped how to mark their answers, yet an ever-present possibility is that cultural and educational factors may have affected their responses.

It appears that the social environment is a critical factor in symptom development and maintenance. For the children of this study, the destruction and chaos of the social environment must be considered. This is especially true of those children whose homes were flooded. Additional research on the role of the social environment in developing PTSD symptoms and recovery is called for and may provide insights into methods of interventions that may mitigate the effects of loss related to the social environment.

Community studies that focus on the prevalence of PTSD in economically distressed areas compared with more affluent communities would shed light on how socioeconomic factors influence development and maintenance of PTSD. Coping strategies are very important in mitigating the symptoms of PTSD and require further study. In addition, intervention programs that are designed to decrease symptoms by increasing positive coping strategies and decrease negative strategies must be developed, implemented, and evaluated.

NOTE

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Changes in the *Behavioral Medicine* Editorial Board

Stanislav V. Kasl, PhD, professor of epidemiology at the Yale University School of Medicine, has retired as an executive editor of *Behavioral Medicine* after years of devoted service to the journal. He joined the editorial board of *Behavioral Medicine's* predecessor, the *Journal of Human Stress*, in 1976 with Vol. 1, No. 3, and has been involved as a consulting and executive editor ever since.

Dr Kasl, winner of the distinguished mentorship award in 2001 from the Behavioral and Social Science Section of the Gerontological Society of America, has been a respected leader in the field of behavioral medicine since before it had that name. He has taught decades of students at Yale University, and his teaching and editing have been a force for improving the methodology in psychosomatic and behavioral research since the 1970s. He will continue his research and writing at Yale in the broad field of psychosocial epidemiology, that is, the psychological and social influences on health and well-being, with a special emphasis on the elderly.

The editors and authors who have known and worked with him on *Behavioral Medicine* have benefited from his insightful reviews and will miss Dr Kasl greatly. We hope to call upon him from time to time in the future for his editorial expertise.



Kristina Orth-Gomer, MD, of the Karolinska Institute in Stockholm, Sweden, a respected researcher, author, and lecturer in the field of psychosomatic medicine, has joined the editorial board as executive editor of *Behavioral Medicine*.

Dr Orth-Gomer served for 15 years as professor of behavioral medicine at the Swedish National Institute for Psychosocial Factors and Health. She received her MD from the Karolinska in 1972, where she specialized in internal medicine and social medicine. In addition to serving on the boards of various Swedish research institutions, she was a cofounder of the Swedish Society of Behavioral Medicine in 1986 and of the International Society of Behavioral Medicine in 1990. President of the Swedish Society of Behavioral Medicine from 1986 to 1990 and president-elect and president of the International Society of Behavioral Medicine from 1990 to 1994, Dr Orth-Gomer is currently serving on the boards of the American Psychosomatic Society and the Academy for Behavioral Medicine Research.

Dr Orth-Gomer is conducting research on psychosocial risks and stress related to chronic disease. Her interests include the roles of social networks and support as buffers against stress and disease, and the role of isolation that leads to depression, exhaustion, and burnout. In focusing on cardiovascular disease, a major threat to women's health, she has found that marital stress—long-time problems with husband and/or children—have a stronger adverse affect on women's heart disease than work-related stress.