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**PSYCHOLOGICAL EFFECTS OF DISASTER
ON CHILDREN AND THEIR FAMILIES:**

HURRICANE HUGO AND THE LOMA PRIETA EARTHQUAKE

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QUICK RESPONSE RESEARCH REPORT #40

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PURPOSE OF PROJECT

This study explored the relationship between resiliency and psychopathology or emotional reaction of children to natural disaster. It was also designed to discover any hitherto unknown child and family responses to disaster. A variety of assessments were used 1) to broaden the spectrum of information acquired, 2) to increase the depth of information, 3) to verify variables previously described in the literature, and 4) to discover unsuspected variables. Victims were assessed sooner than is usual after a disaster to learn about early reactions and symptoms. Burke, Borus, Burns, and Millstein (1982) and Burke, Moccia, Borus and Burns (1986) studied children 5 and 10 months after a winter storm; Gleser, Green, and Winget (1981) and Green & Gleser (1983) studied the Buffalo Creek flood victims two years after the disaster and data collection is continuing today. Six to 18 months is the typical length of time for research to begin following a disaster.

An effort was made to compensate for the lack of pre-test data. Finally, the possibility of developing a diagnostic measurement of stress was considered along with the feasibility

of using the samples in a later longitudinal study. That the earthquake study could begin two days following the completion of the hurricane study, using the same methodology and time frame, was remarkably fortuitous, and provided a comparison between disasters.

THE DISASTERS

Hurricane Hugo struck Charleston, South Carolina, on September 22, 1989, sending a 14.98 foot storm surge to the north that inundated the village of McClellanville. This Category 4 (borderline 5) storm had winds of 135 mph and gusts exceeding 150 mph. The residents had sufficient warning to evacuate or to seek refuge in the designated shelter, a local high school, but the water level was typically five and a half feet in many dwellings as well as in the high school cafeteria, causing most to fear for their life. Even those who evacuated frequently remained in the path of the storm to endure hours of falling trees and broken windows. A number of homes in the village were lost, and most of the remainder sustained extensive damage. Most personal property including food, clothes, furniture, appliances, and cars was lost. Many victims had experienced prior hurricanes of lesser intensity, and even though they had warning of Hugo, they had not expected either the intensity of wind nor the unprecedented height of the storm surge. Of the 35 hurricane-related deaths (The News & Courier/The Evening Post, 1989), none occurred in McClellanville.

The Loma Prieta Earthquake struck on October 17, 1989, caus-

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ing extensive damage between Watsonville and San Francisco, California. The magnitude 7.1 quake struck an area known to have a 30% probability of a moderate earthquake within 30 years. There had been several smaller earthquakes in the months prior to the main shock, but the population did not regard the temblors as precursors and were unprepared for the main shock. There were 68 deaths, though none occurred in the Santa Cruz Mountains where most of the data were gathered.

Both of these disasters, though moderate, had sufficient impact to expect some measurable psychological response. The American Red Cross assessed McClellanville as the most severely affected area of the Southeast.

SAMPLE SELECTION

Eleven McClellanville families were interviewed. Of these eleven, six were African-American and five were Caucasian. The socio-economic levels ranged from low to moderate. Each family had at least one child between the ages of 6-16 years. Each (with one exception) was a two-parent family, one of whom was interviewed. Many of the Caucasian families had sent their children away during the cleanup which limited the sample to those families with children still at home. The African-American families suffered the loss of homes and cars to a greater extent than the Caucasians.

There were 12 earthquake families of whom three were Hispanic. Loma Prieta family size, with the exception of the Hispanic families, tended to be smaller than in McClellanville, with

more only children, and with three single-parent families and one stepparent. Many of the families in both areas had similar levels of expendable income.

It was the authors' impression that early arrival on the disaster scene contributed to the high level of cooperation received from the victims. The latter, with one exception, had not yet reached the stage of needing to put the disaster behind them, or out of mind entirely. It was also true that parents seemed concerned about the welfare of their children and were willing to do anything that might benefit both their children and others. Only one family from each sample refused to participate, and one family failed to appear for the interview in McClellanville. As has been noted by others (Yule and Williams, 1990; McFarlane, 1987) teachers were a good source of information early in the study, but it was difficult to obtain their cooperation later.

By restricting the samples to specific geographical areas within each disaster region, the homogeneity of the sample was encouraged, and the impact of the disasters could be expected to be similar for the victims, thereby limiting variation in the impact variable. In fact, due to the choice of whether or not to evacuate from the hurricane, or that the earthquake occurred when people might have been at home, at work, or on the road, indoors or out, some variability occurred in the actual experience of each disaster. The sustained damage, however, was more uniform.

Interviews were conducted between one and four weeks of the disasters.

This cannot be considered a random sample in the usual sense

of the term because every family was interviewed for which there was both time and access. Families were recruited from the shelter, walking the neighborhood, or referrals. Families were rejected only if their children were unavailable or of an inappropriate age. A research team larger than two would have enabled the use of randomization techniques, and would also have facilitated larger sample sizes, especially necessary for cross-cultural comparisons.

Self-report data was also collected from fifth and sixth grade children in their school classes.

PROCEDURE

Parent emotional state was considered an important factor bearing on the child's emotional state in several previous studies (Bloch, Silber, and Perry, 1956; Olsen, 1973; Handford et al., 1986). Parental emotional state was assessed using the SCL-90-R (Derogatis, 1977), a 90 question, 2-page form yielding 9 symptom groups. The parent was then asked to fill out a Child Behavior Checklist (Achenbach & Edlebrock, 1988) on each appropriately-aged child (6-16 years) to provide a measure of the child's emotional status.

Because it is usually impossible to gather pre-disaster data, each respondent was asked to complete these checklists twice, once as she felt before the disaster and again as she felt afterward. While this is hardly an error-free approach, as it relies on memory of an earlier state, it produced some interesting results. The respondents seemed able to make the distinction

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between pre- and post-disaster states, particularly in terms of the change in feelings or particular symptoms, if not in remembering the actual baseline value of a symptom. They knew which symptoms increased or decreased and felt able to quantify the changes. This approach has been used by Handford et al. (1986) and Ollendick and Hoffmann (1982).

The parent was then given a structured interview based on the DIS/Disaster Supplement (1983). It included some questions on resiliency factors based on Werner's (1989) work. It also contained a post-traumatic stress list based on the DIS/DS, Horowitz's Impact of Events Scale (Horowitz, Wilner, and Alvarez, 1979) and a variety of other symptoms gleaned from the literature and clinicians. The parent was also asked to describe the experience of the disaster, reactions to it, and feelings about it, for both herself and the family members in an open-ended, non-directed way. This approach obtained information a structured interview might miss. This account was recorded verbatim. Lastly, they were asked about positive outcomes from the disaster.

The family members were interviewed separately to avoid they're influencing each other's responses. Because some researchers (Garrison & Earls, 1985; Reich and Earls, 1987; Pynoos et al., 1987) are proponents of utilizing children as information sources, the children were asked to complete the Youth Self Report form (Achenbach & Edlebrock, 1988), both as they felt before and after the disaster (if nine or ten years or older). They were asked to draw a picture of their family. They

were then given a structured interview similar to, but shorter than, the parent version. It also included a post-traumatic stress checklist worded more simply for children and including a few additional questions about school and sleep patterns. They were asked to describe the disaster and their reactions to it in an unstructured way, as they drew a picture of the disaster. Finally, they were asked about good outcomes from the disaster.

This is a time-consuming battery to complete, and yet the parents neither complained about the time, nor appeared to rush through it thoughtlessly. Rather, they seemed to use the opportunity to share feelings and reactions, perhaps for the first time since the disaster. It appeared to have therapeutic value, and the respondents were sufficiently enthusiastic to offer referrals, and to volunteer for a later study.

The data were analyzed using the Statistical Package for Social Sciences (SPSS) and Mynstat computer software.

RESULTS

The two samples totaled 23 families with 48 children:

Hurricane: 11 families had 27 children;

Earthquake: 12 families had 21 children.

Nearly two thirds of the families endured substantial disaster impact, that is, they were in a flooded home or shelter or they lost their home. Most of these were hurricane victims.

Parent Emotional Status:

The parents mean overall scores on the SCL-90-R (Derogatis, 1977), a measure of emotional status, were:

<u>Before</u>	<u>%tile</u>	<u>After</u>	<u>%tile</u>
.4	70	1.03	93

A substantial symptom level is defined by Derogatis as the 89th percentile.

There were substantial increases (between pre- and post-disaster scores) in every symptom category except "Psychotic." This was shown using paired t tests ($p = .000$ to $.028$). When compared to the norms for this checklist, the parents appeared to overestimate their "before" scores in all but three symptom categories. This suggests that the parents' memory was colored by the intervening disaster and limits the usefulness of "before" data gathered by asking the victims to remember and estimate a pre-disaster emotional state. The numerical values of the pre-disaster scores should not be accepted as accurate, but the score differences may suggest symptom categories and, to a lesser extent, possible magnitude of effects.

Handford et al. (1986), in their study of parent reaction to the Three Mile Island accident, used the SCL-90-R in a similar pre- and post-disaster method of data collection, and they also found elevated post-disaster scores (at two to four months after the disaster). They did not, however, compare the pre-disaster

data to the norms, and thus, lacked a basis with which to judge the numerical value of the pre-disaster scores, nor the magnitude of the pre- and post-disaster changes. The overall summary score (GSI), despite higher values for earthquake victims, did not have t-test values sufficiently large to conclude other than that there were no significant differences between hurricane and earthquake adult victims ($t(22) = 1.87, p = .07$). This may imply that the two disasters had a similar impact on their adult victims, despite the fact that six hurricane families lost their homes while only one earthquake family lost theirs. The similarity in scores may have been facilitated by the need to repair houses after both disasters, despite the effects of aftershocks and lack of warning that added to the stress levels of earthquake victims.

Children's Emotional Status:

CHILD BEHAVIOR CHECKLIST.

The parent-completed Child Behavior Checklist (CBC) (Achenbach & Edelbrock, 1988, 1983) showed scores in the abnormal range (above the 98th percentile as defined by Achenbach and Edelbrock (1983) for 17 of the 23 families, including 40.5% of the children, primarily in the Somatic and Schizoid symptom categories. The CBC authors warn that the Schizoid category is not to be taken as a diagnosis of schizoid symptoms. In fact, the responses in this category stated anxiety about hurricanes, aftershocks, daydreaming or fears of animals. Many of the South Carolina children mentioned a fear of snakes, alligators, and

dogs. A few California children also mentioned a fear of dogs. It might be well to view this category as representing worry or anxiety rather than thought disorder.

The differences in Somatic Complaint scores between hurricane victims ($n = 26$) and earthquake victims ($n = 16$) were significant ($t = -2.27, p = .028$). This suggests that the latter suffered more distress than did the children in the hurricane. This may have been due to the lack of warning of the earthquake, shaking of the initial shock, the aftershocks, or the fear of another temblor. The younger children registered more problems than the older children, particularly the younger boys. The older boys seemed to exhibit a developmental shift toward coping behavior that the younger boys were unable to manage. The latter may have been threatened not only by the crisis, but by changes in parental behavior that could be dealt with primarily by "acting out" behaviorally. They also may have been less able to absorb cognitively all that had happened, and to use rational thinking to cope with their fears. Moreover, family dynamics seem to be more important for younger children. The adolescents were observed to be less involved with family and more interested in peers, school, and in their own lives and their future. As was true of the SCL-90-R, the "before" scores were higher than the norms for these children, though significantly so in only two categories. Because the "before" scores were closer to the norms for the children than for the parents, this suggests that the tendency to overrate one's children may be occurring to a lesser extent than with oneself, and that the parents may be viewing their chil-

dren's pre-disaster behavior reasonably realistically. This lends support to this method of collecting pre-disaster data, particularly the use of numerical values for children as rated by parents.

Parent psychopathology is of interest in this study. It was among Werner's (1989) risk factors that led to lowered resiliency. At least one study (Bloch et al., 1956) mentioned the emotional health of the parents prior to a disaster as affecting the child's response to the disaster. When parents' pre-disaster scores (GSI_{bef}) were correlated with the children's CBC scores, the results were as follows:

Table 1

Children's CBC scores correlated with parent pre-disaster pathology (GSI_{bef}).

	<u>CBC_{aft}</u>				
	<u>Schiz</u>	<u>Somat</u>	<u>Aggres</u>	<u>Delinq</u>	<u>Hyper</u>
$GSI_{bef}: r =$.44	.32	.27
$p =$.002	.019	.044

The higher GSI_{bef} score (prior-problem) parents were more likely to note aggressive, delinquent, or hyperactive behaviors. These behaviors were among the more overt and intrusive of the problems. The lower-scoring parents tended to see somatic, anxious, depressive, and obsessive-compulsive symptoms. While there may have been differences in perception, it may also be true that "acting out" behaviors are more difficult for highly stressed parents to deal with, and therefore rated more negatively. There was no significant correlation between the GSI_{bef} and the children's Youth Self Report (YSR) scores.

YOUTH SELF REPORT CHECKLIST.

The child-completed Youth Self-Report form (YSR) (Achenback & Edelbrock, 1988, 1987) revealed 27 of 30 children who felt they had some problems, and 9 of those 27 who placed above the 98th percentile. They placed themselves in the Somatic ($n = 2$) and Thought Disorder categories ($n = 8$.) (Thought Disorder, like Schizoid in the CBC, reflected worries, especially about the disaster, and not psychosis.) Two of the children noted problems in themselves not noticed by their parents, whereas five of the parents noted problems in their children that were not mentioned by the children themselves. With a single exception, the parents did not check thought disorder items; they were better at seeing overt behavior problems, and they were better at it than their children. This finding is corroborated by Weissman, Orvaschel, and Padian, (1980) in their comparison of checklists and self-

report scales. These results also suggest that worried children knew they were worried and could report it, but they did not see that it affected their behavior.

When comparing the "before" and after scores, the increases were not significant save for the girls' Somatic scores ($t = 2.776$, $p = .017$.) This suggests that collecting "before" data in this way was less meaningful from the children than from the adults. The children have less of a sense of self than the parents, and may not be as reliable as a source of information about their emotional state either before or following a disaster. One interesting contradiction is that the older boys viewed their behavior as worsening (albeit below the level of significance), whereas their parents saw improvement. These boys may have been feeling threatened and anxious due to the recent disaster, and became more conscious of their behavior resulting in guilty feelings about misbehavior. Thus, they may have perceived their behavior as worse than it really was, and tried to compensate for it, giving their parents a favorable impression. Another discrepancy between the parent and child views appears in the older girls Aggression score. It worsens in the parents' opinion, and improves in the girls' view. Again, the behavior very well may have worsened, but the child may have needed to see improvement when to see reality may have been too threatening.

In general, the YSR does not appear to be the best source of information under these circumstances.

POST-TRAUMATIC STRESS-PARENT.

The Post-Traumatic Stress list (PTS-P) given to the parent was correlated with the parent pathology (GSI_{after}) after the disaster revealing, not unexpectedly, a significant relationship ($r = .56$, $p = .004$.) When PTS-Parent scores were compared for hurricane and earthquake victims, there was no significant difference. Apparently, adult victims from both disasters were experiencing similar levels of stress based on this measure.

There was a significant negative correlation between the parent post-disaster pathology and the Children's YSR Somatic category ($r = -.32$, $p = .05$). There was also a negative correlation between parent pathology and Thought Disorder category ($r = -.34$, $p = .04$). This suggests that as the parent emotional state worsened, the children needed to compensate in the opposite direction, perhaps to hold the family together. Similar negative correlations supporting this view appear below.

POST-TRAUMATIC STRESS-CHILD.

Unlike the adult results, the differences between PTS-Child mean scores for hurricane and earthquake child victims were significant ($t(45) = -2.83$, $p = .007$). This difference between the means suggests that the earthquake children experienced more stress than did the hurricane children. As mentioned above, there may have been differences between disasters (earthquakes might be more frightening), the lack of warning prior of an earthquake may have exacerbated the stress, and the aftershocks

may have prevent rapid recovery. It is also possible that California children were more self-revealing than South Carolina children, or that the ethnic differences between the interviewers and some of the hurricane children biased the results.

The difference in stress levels of parents and children suggests that the parents may have been focused on the damage and repairs, whereas the children, lacking a distraction such as house repair, were focusing on the disaster itself.

While the PTS-Child scores are evenly distributed over the range of possible scores, the evidence of even one symptom might be an indication of disturbance, especially if the symptom was not evident before the disaster. A child who devotes considerable energy to denying distress both to himself and to others can be expected to acknowledge few symptoms. In fact, a child with zero symptoms in a sample of children with substantial disaster impact and multiple symptoms should alert an observer to possible denial.

PTS-Parent scores were correlated with PTS-Child scores ($r = -.39$, $p = .005$). In both disasters parents with high stress scores had children with low stress scores, with the inverse also true. A 4 x 4 matrix illustrates the 16 possibilities. Nine of the possibilities are realistic in this study.

		<u>Children</u>			
		Low Stress Scores		High Stress Scores	
		true low stress	true high stress denied	true high stress	true low stress denied
<u>Parent</u>	Low Stress Scores	true low stress	possible #	*	unrealistic possibilities
		true high stress denied	possible #	*	unrealistic possibilities
	High Stress Scores	true high stress	* #	possible	unrealistic possibilities
		true low stress denied	unrealistic possibilities	unrealistic possibilities	unrealistic possibilities

* - reflect calculated correlation.

- groups of interest in determining true condition.

unrealistic possibilities.

1. It is reasonable to expect low stress score victims to be either truly low stress, or to be, in fact, highly stressed but attempting to conceal or deny their true state.

2. It is reasonable to expect high stress score victims to exhibit signs of high stress. It is not reasonable to expect high stress score victims to be, in reality, truly low stress interested in faking high stress scores except for potential gain such as time off for work, disability or insurance payments, etc. The nature of this study would not provide these incentives.

The astericks assume that the parent's stress determines that of the child, though the reverse might be true to a lesser degree. A child in a highly stressed state could lower the parent's threshold for showing stress symptoms. It is the authors' impression, however, that the children watched and waited for parental examples of behaviors, expectations, and feelings, and then drew conclusions about how to think, feel and react. The parameters of this process in children raise potentially interesting research questions.

For the children it is the True High Stress Denied group (#) that is of greatest interest, because they are the group most likely to escape detection and attention given their low stress scores and fewer stress symptoms.

The negative correlation between parent and child stress scores may indicate that children of high-stress parents feel they need to stay calm to hold the family together or to keep it running, and in so doing must assume a low stress role. It should also raise the question of whether their condition is truly low stress or one of 'true high stress denied,' and should further screening, therapy, or other intervention be utilized? Is their reaction to be considered a successful coping style, or an indicator of future problems?

This negative correlation suggests interesting possibilities. It may be feasible, with a refinement of these checklists, to develop a reasonable predictor of child disaster stress. If low-stress parents have high-stress children, and if it is fairly

easy to elicit good responses and cooperation from the parent, as it seems to be, and if it is fairly difficult to elicit responses from children as appears to be the case, then a short, 15 to 20-item checklist answered by a cooperative parent about himself may be a fair predictor for his children.

It is the our impression that the low scoring parents were also among the most controlled. They were outwardly organized, careful, calm, and undemonstrative, but they seemed to have an underlying level of tension that their children may pick up and act out. Smith (1983), in referring to the victims of the San Fernando earthquake, stated the situation concisely: "Parental fears that are unrecognized or denied heighten a child's fears..." The tension was most apparent when these in-control parents were contrasted with those victims who put everything in their God's hands, thereby allowing themselves to relax, to accept what had happened and what was to come. In the latter victims, their words were congruent with both their bearing and their unconscious actions. The tense parents, in contrast, were not congruent. They might say they had everything under control, but the tone of voice, the manner of speaking, the ways in which they held their stiff body or darted their eyes, all of these uncontrolled signs betrayed their underlying tension.

Variables that have been significant in other studies did not, for a variety of reasons, appear to be so in this one. For example, the variables Separation from Parent, Prior Emotional Problems, Prior Disasters, Sex of Victim, and Impact of Disaster were not significant in these disasters. Birth Order, on the

other hand, may have been important. The oldest child in each of 13 families had the lowest PTS-Child score of the siblings. Their ages ranged from 9 to 16 years. The middle child of only four families had scores lower than his older siblings. Their ages ranged from 9 to 14 years. Thus, while the ages of both groups span the same range, the first-born, regardless of age, had lower stress scores than later born children. This suggests that birth order may be more important than age. It may also suggest that the role of "distressed victim" is not perceived as an option to the first born, but it is available to the younger children as was found by Bloch et al. (1956).

Post-Traumatic Stress scores of the children (PTS-C) were correlated with the Youth Self Report (YSR) scores in the six groups common to both sexes:

Table 2

Correlation of PTS-C with YSR_{af} problem groups

PTS-C:	<u>YSR_{af}</u>					
	<u>Depres.</u>	<u>Unpop.</u>	<u>Somat.</u>	<u>Th. Dis.</u>	<u>Del.</u>	<u>Aggr</u>
r =	.56	.41	.38	.59	.40	.36
p =	.001	.016	.026	.001	.019	.033

This suggests that the children are consistent in recording their stress and their other problems; their stress is reflected in both measures. The YSR, however, was not able to discriminate between earthquake and hurricane children as was the PTS-Child.

Interestingly, many of the highest correlations of the PTS-Child were with YSR groups that rarely figure significantly in any of the other analyses. Depression, for example, was a cause of concern because it was expected, and yet, with one exception (CBC, younger boys), it never registered at significant levels.

RESILIENCY VARIABLES.

The research hypotheses stated that those children high in resiliency factors were less likely to develop emotional reactions or overt pathology or suffer stress; and those children low in resiliency factors were more likely to develop negative emotional reactions, pathology and stress symptoms. The results tended support these hypotheses (see Table 3).

To simplify the analysis, many of the interview questions dealing with resiliency factors were grouped into variables, four of which are described below:

1. Family Instability -- the sum of nine items including marital status, unemployment, trouble with some aspect of the society, answered by the parent;
2. Family Discord -- the mean of 11 items reflecting how well parents get along with their children and each other, answered by the parent;
3. Child Instability -- the sum of 16 items dealing with friends, family discord, substance abuse, and problem-solving,

answered by the child;

4. Child's Temperament -- the sum of 10 items revealing eating, sleeping, or irritability problems during the 1st year of life, answered by the parent.

The resiliency variables were correlated with the Parent's GSI and PTS-P scores, and with the children's PTS-C, CBC and the YSR scores. The results are shown in Table 3.

Table 3

Correlation of protocols and resiliency variables

	1	2	3	4
	Family Instab(P)	Discord(P)	Instab.(C)	Temperam.
<u>GSI_{af}</u> :	$r = .42$ $p = .002$.70 .000	.56 .000	.31 .021
<u>PTS-P</u> :	$r = .38$ $p = .044$		-.45 .000	
<u>PTS-Child</u> :			$r = -.228$ $p = .062$	
<u>CBC_{af}</u> :				
Schiz:	$r = .34$ $p = .013$.31 .025	
Somat:		$r = .30$ $p = .002$.40 .005	
Agress:		$r = .44$ $p = .002$.31 .028
Delinq:		$r = .65$ $p = .000$		
Hyper:		$r = .29$ $p = .037$		

	1	2	3	4
	Family Instab(P)	Discord(P)	Instab.(C)	Temperam.

YSR_{af}:

Unpop:	$r = .44$
	$p = .015$
Somatic:	$r = -.40$
	$p = .021$
Delinq:	$r = .42$
	$p = .016$
Aggress:	$r = .33$
	$p = .058$

Only significant data were presented in this table, with the exception of the PTS-Child correlation.

The negative correlation of the child's Post-Traumatic Stress (PTS-C) score with the child's view of family instability supports the negative PTS correlations mentioned above, and the theory that low-stress score parents tend to have high-stress score children who perceive the underlying tension in the family and reflect it in the Family Instability variable. The YSR Somatic scores are also negatively correlated with parent's view of family instability, and the negative correlation between the parent's Post-Traumatic Stress (PTS-P) score and the child's view of family instability also seem to support the theory. Increases in the parent's pathology score (GSI) lead to increases in the

Family Instability variable, suggesting that stressful family circumstances leave the parent less able to cope with the disaster stress. The high correlation between the Family Discord variable and the parent's post-disaster pathology score suggests that the entire family is or has been under stress which worsens as the parent's condition worsens.

This study generated a considerable amount of additional data that awaits further analysis and follow-up.

DISCUSSION

There were five main findings arising from this study:

- 1) The research hypotheses, that children high in resiliency factors would withstand disaster stress better than those low in resilience factors, tended to be verified. A factor analysis (to be done) will reveal which factors are most influential. Birth order, effects of the disaster, and prior problems show some potential for further exploration. Other variables tested -- sex, previous disasters, and separation -- were not significant in these disasters. The separation variable notwithstanding, family dynamics appear to play a major role in the child's reaction and adjustment to major calamities as suggested by birth order, prior problems, and the Effects variable (that included several factors dealing with separation from parents and siblings). Separation usually did not occur to the hurricane victims due to forewarning, and may have played a role in the earthquake aftermath that was beyond simple measurement. As the impact of disaster is further explored, a focus on family dynamics should

receive high priority.

2) The inverse correlation between parent stress scores and child stress scores is interesting and worthy of further exploration. A factor analysis of the post-traumatic stress symptoms might be revealing, especially as related to parent pathology, family dynamics, and resilience and other variables. The explanation of this negative correlation may be that some children tend to minimize or deny their own distress, particularly in the presence of adverse parental reaction. This supports the role theory of Bloch et al. (1956) and Silber, Perry, and Bloch (1958), that states that only one member of a family at a time may take on the role of impaired victim. The child must compensate or at least not become any more dysfunctional as the parent emotional state worsens. This is an indication of the importance of family dynamics to child response (in the face of an extreme stressor). Several other measures support this dynamic:

- a) the negative correlation between PTS-Child and the Instability variable (child's view of family instability);
- b) the strong positive correlation between this same Instability variable and the PTS-Parent;
- c) the negative correlations between the GSI (parent pathology) and the YSR (child) Somatic and Thought Disorder groups;
- d) and possibly the decline in the CBC scores for the older boys (none of which, however, reached the $p = .05$ level of significance).

This dynamic (as pathology increases, child resilience seems to increase with decreasing stress) tends to confound the rela-

tionship between resilience and pathology (as pathology increases, resilience should decrease), and a more complex model is needed.

3) The ability of the PTS-Child measure to separate hurricane from earthquake victims when most other measures were insensitive to the difference suggests some promise for this instrument. The only other access to the child's emotional state was the information on the Effects variable gathered from the Child Interview and the art work. When asked directly about symptoms and effects, the children appeared to respond readily and in a way that made earthquake victims quantifiably distinguishable from hurricane victims.

The results of the PTS-Child measure also suggest that the children may be more focused on the disaster experience than on the repairs for which they have little or no responsibility, and which they see as their parents' concern. It is also possible that earthquakes may be more frightening than hurricanes; perhaps the lack of warning is more unnerving; perhaps the continual aftershocks raise the individual and/or the ambient stress level. There is always the possibility of cultural differences accounting for differences in responses. Unfortunately, the sample of each ethnic group for each disaster was too small to determine the effect of cultural differences.

There may also be regional differences. It is conceivable that children in the Southeast, when compared with west coast children, have different perceptions of hurricanes (based on prior experience with them) than the perceptions of earthquakes

held by California children. Moreover, South Carolina children may be expected by their elders to respond to questions about hurricanes or questions posed by adults in a particular way. Clearly, the attitude of respect for adults, as seen in South Carolina children and their manners, is different from the attitude held by California children; behind the attitude may lie a different basis for response to a hurricane or to a checklist presented by an adult. There may also be customary limits on the degree of openness and candor, admission of fear or problems that vary between regions. A study of an earthquake in South Carolina might remove this regional variable.

4) The parent emotional state appears to have worsened dramatically, and was easily measured using the SCL-90-R and PTS-P. The inability of the SCL-90-R and the PTS-Parent to distinguish between adult hurricane and earthquake victims may indicate similar levels of stress. The parents may be focused on similar degrees of damage and repair, and not on the disaster experience itself. Even the aftershocks that made parents uneasy were not sufficient to generate a difference between the two disaster groups. The Impact variable also suggests that their experiences were similar.

From another point of view, how is it possible that those hurricane victims who endured hours standing in the cold and rising water with their children on their shoulders, convinced of the imminence of death, did not register substantially higher levels of stress than earthquake victims for whom the temblor lasted only 15 seconds? Were they in a state of denial when in-

interviewed a week later? Will they begin to experience flashbacks, nightmares, or other symptoms of post-traumatic stress six months or a year after the disaster? Will they be less able to work or more difficult to live with? Ziv and Israeli (1979) invoke Schachter's (1959) theory of affiliation to explain low anxiety among kibbutzim children who experienced frequent bombardment. "In his investigations of fear- and anxiety-producing situations, Schachter showed that when an individual remains within a group during a fear-producing situation his anxiety decreases; this explains why people prefer to be in the company of those experiencing similar frightening experiences." Half of the hurricane victims were together in the flooded shelter and later shared a safe shelter. Most of the other half weathered the storm with relatives. Perhaps this explains their low scores in the face of a potentially fatal experience. The value of a study to follow these victims over a long period of time, and the need for better methods of assessment, is evident.

5) The parents seemed to be a better source of information about their children than the children themselves following a disaster of the magnitudes of this hurricane and earthquake. The Child Behavior Checklist (CBC) seems better able to elicit a picture of the child's emotional state than does the Youth Self Report (YSR), though the list of stress symptoms (PTS-Child) seems to have produced good data.

The older boys seem to have improved, in their parent's view, though none of the improvements were large enough to be significant, and the boys saw themselves as worsening. They may hope to

be helpful in a demanding situation; or they may be afraid to rock the family boat by acting out for fear of losing even more parental love from an already distracted parent; or they may be following cultural expectations to take over and solve problems by manipulating the external environment--helping with repairs.

The girls show dysfunctional increases in most behavior groups, though the changes are significant only in the Somatic group. They picking up and reflecting parental dysfunction. The girls' Somatic symptoms increased substantially, especially for the earthquake victims. Somatic symptoms may be more acceptable for girls to express, and easier for parents to notice.

The lack of correlation between the CBC and the PTS-Child suggests a parental inability to detect specific disaster stress. Perhaps the PTS-Child symptoms are the sort that a parent would need to inquire about directly, and that level of communication is not taking place between victims and their children. In this country it may be uncommon for that level of communication to occur between parents and children under the best of circumstances. Somatic symptoms may be more easily discussed than fears, especially given that it may be culturally unacceptable to admit to fear.

Only nine children revealed through the YSR that they felt they had problems, suggesting that the children are not necessarily the best source of information, at least about these behavior groups. Denial may be operating in the children, or the YSR may be less appropriate for disaster use than an instrument such as the PTS-Child. The YSR was not able to discriminate between hur-

ricane and earthquake victims as were the CBC and PTS-Child, though the correlations were higher than were the CBC with the PTS-Child.

An important reaction was the impact brought on by the sight of the damage wrought by the disaster. It was one thing to survive the initial onslaught of the disaster, and quite a different experience to view the damage, review it day after day, and suffer the emotional consequences of repeated exposure to devastation. Parents and their children, in both the hurricane and the earthquake, described this second impact repeatedly and in emotional terms. Whether it worsened the effects of the disaster, or ultimately enabled the victims to come to terms with the trauma, or both successively, is unclear, but it is worthy of further study.

The mitigating influence of aid in various forms such as food, clothing, money, volunteer labor, housing, and insurance seems to have had a substantial effect on the parents' morale and behavior. The children, in turn, may have absorbed parental attitudes and either stored them in an internal, relatively unnoticeable way, or displayed them in overt reaction. That some, perhaps many, of these forms of aid reached the lower socioeconomic classes later, if at all, cannot help registering on families. Volunteer labor, in both the hurricane and the earthquake, was particularly important to the victims of those disasters, and when unavailable, morale declined and was replaced by anger, bitterness, despondency, and a sense of racially-motivated injustice. High-spirited volunteer labor, when present, appeared

to lift victims out of their helplessness and depression, and motivate them to help not only themselves, but others as well. The problems with government and private relief agencies were noted and may also have had a significant impact on parents and, consequently, on their children. Inevitably, as parental morale ebbed and flowed, the children may have reflected or absorbed these attitudes and behaviors.

Another set of research questions needing exploration arose when the following phenomenon was observed. Approximately three or four weeks after the disaster there began to emerge a desire among some victims to forget the experience and all its sequelae. Is this common to most victims; does it represent a necessary phase of recovery; does it facilitate recovery, and only under certain conditions or precursors? How should this be dealt with therapeutically? What is the operating dynamic underlying this phenomenon, what does it reveal about coping mechanisms and personality structure? These are questions needing further exploration.

Limitations

Intervention bias

Research in the field, unlike laboratory conditions, is subject to many unanticipated, uncontrolled and uncontrollable factors, and this study was no exception. For example, it was found that the disaster population in the Red Cross Shelter in Georgetown, South Carolina, had already been visited during the first week following the disaster by several people functioning as men-

tal health workers. These included a school psychologist who drew pictures with the children on three occasions, a teacher who used sand trays and a water trough for games on two mornings, and a county mental health worker who made at least one visit. The shelter manager herself happened to be a psychiatric social worker capable of doing therapy if the need arose. There were also daily visits by the minister of the church in which the shelter was housed, as well as by the ministers serving the town of McClellanville. In the course of gathering data the field team, too, undoubtedly served as therapeutic agents in that we encouraged people to talk and asked the children to draw pictures.

The schools in both South Carolina and California had already begun therapeutic activities such as group discussions, art, and story-writing, or had informational lectures on the causes of the disaster, all of which could be beneficial to the children leading to successful coping, adaptation and recovery, and cause them to modify their responses to the assessment. Even Red Cross and National Guard personnel were supportive and helpful, and were noted by many victims as greatly appreciated. This, no doubt, had a substantial therapeutic effect. These two agencies were mentioned frequently as sources of emotional relief from stress that were the most helpful of any sources. They provided necessities such as food, water and showers, they were sources of upbeat companionship, and they also frequently surprised victims with luxuries such as special foods, parties, and even a bunny to replace a lost pet for a child.

Ideally, none of these interventions would have occurred before the assessments, but some of them clearly made a huge difference in the lives of the victims, and it is significant that the society was willing and able to respond as it did.

Response bias

Problems of response bias, which occur when the respondent answers questions or checklists inaccurately, occur for many reasons and are not limited to disaster research. One study (Reich and Earls, 1987) noticed that the children who answered all the questions with "no" did so out of boredom and had found a way to end the test quickly. That did not seem to be a significant problem in this study, with only one known doubtful occurrence. A more likely problem was the inability of the respondent to concentrate on the tests due to stress. When a respondent is stressed, one must question the accuracy of the responses. Those respondents who were determined to deny the effects of the disaster may have tended to underreport their reactions compared with those who were very aware of their feelings and reactions. The problem of differentiating between those who were underresponding to the questions and those who were minimally affected was sometimes clarified in the interview notes, but remained unquantifiable. There is also the problem of the respondent who wishes to answer in a way that pleases the examiner, or who wishes to appear in a good light. These respondents appeared to answer to the best of their abilities, and this must be taken as represen-

tative of their perceptions and state at the time of the interview.

It is important, and yet usually impossible, to obtain pre- and post-disaster data, hence the attempt to collect both kinds of data at one time. While the respondents seemed able to make the distinction between their pre- and post-disaster states, reliance on memory is subject to error, and there is no check on this error other than the inferences to be made by comparison with norms, also subject to error. Given that the pre-disaster states were higher than the norms, the post-disaster change was probably greater than the results indicate.

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