

379
N81
No. 5844

THE EFFECTS OF A NATURAL DISASTER ON
ACADEMIC ABILITIES AND SOCIAL
BEHAVIOR OF SCHOOL CHILDREN

THESIS

Presented to the Graduate Council of the
North Texas State University in Partial
Fulfillment of the Requirements

For the Degree of

MASTER OF ARTS

By

Brenda Stephens Little, B.A.

Denton, Texas

December, 1981

© 1982

BRENDA STEPHENS LITTLE

All Rights Reserved

Little, Brenda Stephens, The Effects of a Natural Disaster on Academic Abilities and Social Behavior of School Children. Master of Arts (School Psychology), December, 1981, 34 pp., 17 tables, references, 21 titles.

Although most research has focused on adults, studies indicate that children also experience detrimental psychological effects as the result of natural disasters. The purpose of the present study was to determine if the tornado which struck Wichita Falls, Texas, on April 10, 1979, had any negative effects on the academic performance or social behavior of school children.

Three groups of students were studied: (a) victims of the tornado who suffered a significant loss, (b) observers of the disaster who did not suffer a significant loss, and (c) newcomers who arrived after the disaster. Achievement test scores, grades, and attendance over a 4-year period were studied. The overall results do not indicate significant differences among the three groups.

TABLE OF CONTENTS

	Page
LIST OF TABLES	iv
Thesis	
Introduction.	1
Method.	10
Subjects.	10
Procedure	13
Results	15
Discussion.	21
Appendices.	26
References.	32

LIST OF TABLES

Table	Page
1. Number of Students by Group and Sex	11
2. Student Grade Level by Sex and Group.	12
3. Adjusted Mean Reading Achievement Scores by Group	15
4. Number of Students by Group with Lower Reading Scores.	16
5. Adjusted Mean Language Arts Achievement Scores by Group	26
6. Number of Students by Group with Lower Language Arts Scores.	27
7. Adjusted Mean Math Achievement Scores by Group. .	28
8. Number of Students by Group with Lower Math Scores.	29
9. Adjusted Mean Total Battery Achievement Scores by Group.	30
10. Number of Students by Group with Lower Total Battery Scores.	31
11. Mean Overall Grades by Group.	17
12. Number of Students by Group with Lower Overall Letter Grade.	18
13. Mean Science Grades by Group.	18
14. Mean Writing Grades by Group.	19
15. Mean Citizenship Grades by Group.	19
16. Mean Absences by Group.	20
17. Mean Number of Times Tardy by Group	21

THE EFFECTS OF A NATURAL DISASTER ON
ACADEMIC ABILITIES AND SOCIAL
BEHAVIOR OF SCHOOL CHILDREN

White and Haas (1975) have noted that no broad base of knowledge has emanated from research on natural disasters nor have early research findings been updated with respect to the social and economic changes occurring after such disasters in the United States. They report that this lack of consonance in our knowledge is illustrated by the limited number of studies of the psychological effects that major disasters have upon the victims of a stricken community. Based on the small number of research reports, mental health professionals assume that any mental or emotional effects of disaster are minimal. More recent research challenges these earlier views (Benedek, 1979; Lifton & Olson, 1976; Milne, 1977a, 1977b; Newman, 1976; Parker, 1977; Penick, 1976; Rangell, 1976; Titchener & Kapp, 1976; Wallerstein & Kelly, 1980). The lack of useful information principally has been due to investigators' use of poor methodology, namely the primary use of anecdotal material and case studies, which do not lend themselves to an objective understanding of the psychological effects of disaster. Frederick (1980) believes that this lack of research can be attributed to the fact that skilled mental health professionals have

only recently been involved with investigating the occurrence of such events as the Teton Dam disaster (Huerta & Horton, 1978), the Buffalo Creek flood (Erickson, 1976; Lifton & Olson, 1976; Newman, 1976; Rangell, 1976; Stern, 1976; Titchener & Kapp, 1976), and Cyclone Tracy in Darwin, Australia (Milne, 1977a, 1977b; Parker, 1977). These studies have unequivocally underscored the presence of serious psychological disturbances among victims of major disasters.

Most of the documented studies regarding the effects of disaster have dealt predominantly with the influence of such a trauma on the lives of adults. Most counseling and other types of intervention have been directed toward the adult and then primarily focused on the acute reactions immediately following the disaster (Bell, 1978; Huerta & Horton, 1978; Lifton & Olson, 1976; Milne, 1977a; Milne, 1977b). Although this type of crisis intervention is important and is indeed necessary, very little attention has been focused on children surviving a disaster. It would seem plausible that if adults are having difficulty coping with the stresses of disaster, one would assume that the children would also be victims of such a trauma. Children appear to experience the same grief process as adults following a disaster (Raphael, 1975). The author describes the grief process as including disbelief, protest, anger and guilt, grief and mourning, and finally acceptance. He also emphasizes the importance of children needing more time to express their feelings of grief.

Most of the 224 children who were survivors of the Buffalo Creek disaster were found to be emotionally impaired by the experience (Newman, 1976). The children showed a modified sense of reality, an increased vulnerability to future stress, an altered sense of power of self, and an early awareness of death. The author suggests that these factors, if left untreated, could lead to an "after-trauma" in later life, if the children cannot make the necessary adaptations.

Milne's (1977b) study of 649 children who survived the Darwin, Australia, cyclone disaster indicates that most of the children experienced a fear of wind, rain, and jet aircraft noise and had problems in school. Parents of these children reported somatic complaints, greater use of pain-killing drugs and sedatives, found their children to be significantly more difficult to deal with and were inclined in "take it out" on their children (Milne, 1977a). Another study documenting the results of the California earthquake of 1971 indicates that children seemed to be greatly influenced by the emotional reactions of their parents (Greeson & Mintz, 1972). Moore's (1958) study describing children's reactions to tornadoes indicates that the parents' reactions to the trauma were very influential on the child's behavior. Block, Silber, and Perry (1957) also studied children's reactions to tornadoes and similarly found a strong

association between parents who "went to pieces" and the most severely disturbed children.

A study of the Darwin disaster (Parker, 1974) suggests that there are two stress factors associated with trauma: (a) the initial stress factor associated with the experience of thinking one might be killed or injured, conceptualized as a "mortality stressor," and (b) a "relocation stressor," found 10 weeks after the disaster, which occurs when the survivors of the disaster are evacuated to an area away from their home surroundings.

A study of the Buffalo Creek disaster by Titchener and Kapp (1976) indicates that unresolved grief, survivor shame, feelings of impotent rage, and hopelessness persisted two years after the flood; these symptoms have been labeled the "Buffalo Creek Syndrome." Many survivors used first-order defenses such as projection, externalization, denial, and undoing. The authors also reported the use of psychological conservatism and dehumanization to cope with the impact of the disaster, although these factors seemed to have preserved their symptoms and caused disabling character changes. Rangell (1976) also describes a two-phase response in his study of the Buffalo Creek disaster. The first phase was that of the violent intrusion of the flood, and the second phase was the physical dislocation of the survivors with the disruption of their "ground" and "surround." During the long second phase, the trauma level kept slowly

increasing in intensity. A study of a tornado disaster by Penick (1976) found that 75% of the survivors experienced increased psychological discomfort such as anxiety, nervousness, and mild somatic complaints as long as 5 months after the disaster. Benedek (1979) lists psychosomatic symptoms, chronic anxiety, aggravation of previous psychiatric problems, and unspecified personality changes as some of the long-term reactions of children to disaster. In addition, Lifton and Olson (1976) report unfocused rage, a struggle for individual significance, and the difficulty in achieving any new sense of purpose that might reactivate imagery of integrity as some of the chronic dysfunctions of the Buffalo Creek survivors.

Recent studies indicate that adults and children who are victims of a disaster are very likely to experience serious psychological disturbances. In addition to the primary effect of the disaster, children are influenced by the emotional reactions of their parents. Also, two phases in disasters that indicate immediate effects and chronic effects have been recognized.

Although there is a paucity of research on the trauma children face in natural disasters, there is research available on the impact of divorce on children, which will serve as a possible analogy. A study of 60 families who had recently gone through divorce by Wallerstein and Kelly (1980)

found that after 5 years, "34% of the children were happy," "29% were doing reasonably well," and "37% were depressed" (p. 67). The factor which made the biggest difference for these children was not the divorce itself but psychologically healthy parents who were involved with their children in appropriate ways. Benedek (1979) drew a parallel between the effects of natural disaster on children and the more personal crisis of divorce in the lives of children by stating that the most helpful factor to children of divorce is the presence of a psychologically intact, supportive parent. This was also the primary factor that was responsible for good adjustment and satisfaction in intact families as studied by Wallerstein and Kelly (1979).

Parents often think children are too young to understand the destruction of a natural disaster and, therefore, do not attempt any meaningful discussion with their children. However, children have many questions they need answered, and they especially need to deal with the death of other children and adults. Block, Silber, and Perry (1957) noted that children are less anxious when parents are more able to deal with the disaster, to discuss it openly and frankly.

In times of disaster, the role of mental health professionals revolves around issues of direct treatment, consultation, training, and research. These areas of intervention are of crucial importance in the prevention of long-term consequences to children. Initial treatment at the site of

the disaster involves the willingness and ability to talk with parents and children about the crisis. Such discussion includes empathetic listening, a tolerance of individual reactions, acceptance of anger, guilt, depression, confusion, and all other feelings and emotions described by child victims and their parents. Adults and children tend to worry about what they should have done to avoid the disaster, and there is always the horror and guilt about the other victims crippled or killed in a natural disaster. It is important to share this kind of survivor guilt with an understanding person. It is also important that children remain with their parents or other sympathetic adults during this period. This time of trauma necessitates the use of traditional psychiatric tools and techniques including individual, group, and family therapy. The use of art, drama, and play in working through problems are important therapeutic techniques to aid young children in dealing with un verbalized fears. Food, toys, paper, and other special materials for children can be helpful. Also, giving children simple tasks, instructions, and meaningful activities can help them feel like they are part of the rescue scene (Benedek, 1979).

Throughout these studies, there seem to be three recurring themes: acute psychological trauma occurring during or immediately following the disaster (Parker, 1979; Rangell, 1976), chronic psychological effects resulting from

the catastrophe (Benedek, 1979; Lifton & Olson, 1976; Parker, 1979; Rangel, 1976; Titchener & Kapp, 1976), and the need for close contact of supportive, psychologically healthy adults in the lives of child victims of disaster (Benedek, 1979; Wallerstein & Kelly, 1980). The literature suggests how the significant adults in the child's life react and adapt to a disaster has one of the greatest impacts on children's successful transition in times of critical stress. Furthermore, if these adults, especially parents, have difficulty in resolving disaster-related stress, it almost guarantees that the children will experience some chronic psychological or somatic complaints, or both (Moore, 1958).

In summary, research on the psychological effects of a disaster predominantly places its emphasis on how adults are affected by such an event (Bell, 1978; Huerta & Horton, 1978; Lifton & Olson, 1976; Melick, 1978; Milne, 1977a). Some studies do seem to indicate, however, that children will also experience detrimental effects as the result of this kind of trauma (Milne, 1977b; Newman, 1976; Raphael, 1975). The scarcity of disaster-related information in which children are the main focus indicates a need for investigation as to how the lives of children are disturbed when a natural disaster occurs. Well-controlled research on the chronic, as well as the acute, effects of disaster on children will provide investigators the opportunity to support or

contradict previous anecdotal studies which suggest that the influences of a trauma are short-lived. Also, more knowledge about the acute and chronic effects of disaster as related to academic abilities and social behavior of children will supply prospective researchers with variables with which to evaluate any future interventions. Systematic knowledge about the impact of disasters is needed in order for families, school personnel, and mental health professionals to become more effective in providing direct and indirect service to children who are victims of a natural disaster.

The focus of attention of the present study is the effects of natural disasters on the behavior of children. Because education is compulsory for children, schools would seem to be an ideal setting for locating children who had been involved in a local disaster. In addition, students' records could provide one objective measure of the effect that disaster may have had on the performance of this area of children's lives.

The purpose of this study was to determine if the tornado which struck Wichita Falls on April 10, 1979, had any effect on academic performances of children as measured by the yearly achievement tests and grades on report cards. The social-emotional behavior of children as measured by citizenship grades, absenteeism, and tardiness was also

measured to determine the psychological effects of the disaster.

Method

Subjects

Three groups of students in the Wichita Falls school district were studied. Group I and Group II were composed of students who were involved in the tornado disaster in April, 1979. Group I was composed of 30 students who suffered a significant loss of some kind as determined by affirmative answers on a questionnaire provided by the schools in Wichita Falls. There were 12 males and 18 females in this group. Nine males and twelve females were in fourth grade, and three males and six females were in fifth grade. Socio-economic status was determined by the fathers' occupations. All were found to belong to the working class (Rossides, 1976).

Group II involved 30 students who were in the Wichita Falls school district during the tornado but did not suffer a significant loss, as determined by the same questionnaire. Students in Group II were selected to match the sex, grade level, and socio-economic status of students in Group I. In this group there were also 12 males and 18 females, with the same grade-level breakdown as Group I: 9 males and 12 females in the fourth grade, and 3 males and 6 females in the fifth grade. The socio-economic status of this group

was again found to be classified as the working class (Rossides, 1976).

Group III contained students who moved into the Wichita Falls school district during the 1979-1980 school year. These students were identified by the school principals. In order to establish Group III, a letter was sent to the parents of each new student requesting permission for the researcher to review their child's file. Permission was obtained for 16 students. There was 1 male and 2 females in the fourth grade and 6 males and 7 females in the fifth grade. The occupation of these students' fathers also fell into the working class (Rossides, 1976). Tables 1 and 2 provide a description of the sample.

Table 1
Number of Students by Group and Sex

	<u>Male</u>		<u>Female</u>		<u>Total</u>	
	No.	%	No.	%	No.	%
Group I	12	38.7	18	40.0	30	39.5
Group II	12	38.7	18	40.0	30	39.5
Group III	7	22.6	9	20.0	16	21.0
Total	31	100.0	45	100.0	76	100.0

Table 2
Student Grade Level by Sex and Group

Grade Level	<u>Group I</u>		<u>Group II</u>		<u>Group III</u>		Overall Total									
	<u>Male</u>	<u>Female</u>	<u>Male</u>	<u>Female</u>	<u>Male</u>	<u>Female</u>										
No.	%	No.	%	No.	%	No.	%									
Fourth	9	75	12	67	21	9	75	12	21	1	14	2	22	3	45	59
Fifth	3	25	6	33	9	3	25	6	25	6	86	7	78	13	31	41
Total	12	100	18	100	30	12	100	18	100	7	100	9	100	16	76	100

*T = Total

Procedure

The previously recorded information obtained from questionnaires identified 91 students who had suffered a significant loss. These students were listed by name only. Their grade levels and the schools they attended were not identified. The researcher went to each elementary, junior high, and high school in the areas damaged by the tornado to obtain the sex, grade level, and school of each of the 91 students. The elementary schools had the largest number of students on the list, so the study was limited to the elementary grades.

Yearly achievement test scores, report card grades, citizenship grades, number of absences, and number of times tardy were recorded for each student in Group I and Group II for school years 1977-1978, 1978-1979, 1979-1980, and 1980-1981. School records for Group III were recorded for school year 1980-1981 only.

Achievement test scores were broken down into Total Reading scores, Total Language Arts scores, Total Math scores, and Total Battery scores. The test scores were presented in the form of grade equivalents. For school year 1977-1978, the Science Research Associates Achievement Series (Louis P. Thorpe, D. Welty Lefever, & Robert A. Nashund, 1978) was used for the school district. Beginning in September, 1978, the California Achievement Test (William M. Shanner, 1970) was chosen by the district as the preferred achievement test.

Report card grades were recorded for each of the 4 school years. In the Wichita Falls school district, one grade for all subjects combined is given for first and second grades. In the third grade, grades are given for the following subjects: math, English, reading, spelling, social studies, science, writing, art, music, and citizenship. Beginning in the fourth grade, a grade for physical education is added. To make computations of grades possible, report card grades were coded. For first and second grades, grades were coded as follows: Above Average = 4, Average = 3, Below Average = 2, and Limited Progress = 1. For the third, fourth, and fifth grades, grades were coded as follows: A = 4, B = 3, C = 2, and D = 1. The number of absences and times tardy for each student were recorded for each school year.

A program from the Statistical Package for the Social Sciences was used for statistical analyses (Nie, Hall, Jenkins, Steinbrunner, & Bend, 1975). Analysis of variance was performed on report card grades, absences, and times tardy for each group. Analysis of covariance was computed on the achievement test scores on each group. The covariant in each case was the immediately preceding test score. An F test was used to determine if there was a significant difference between groups.

Achievement test scores were examined to determine if there were any significant differences among the three

groups with reference to the impact of the tornado. Test scores of Group I and Group II were analyzed for tests given on the following dates: April, 1978; September, 1978; September, 1979; May, 1980; and April, 1981. Test scores of all three groups were analyzed for the April, 1981, testing.

Results

The Reading achievement test scores are presented in Table 3. Results suggest no significant differences among the groups studied.

Table 3
Adjusted Mean Reading Achievement Scores by Group

Test Date	\bar{X} Score Group I	\bar{X} Score Group II	\bar{X} Score Group III	<u>F</u>	<u>p</u>
April, 1978	2.81	3.12		1.00	.322
Sept., 1978	2.37	2.94		2.942	.0916
Sept., 1979*	3.17	3.55		1.122	.293
May, 1980	4.60	5.13		1.193	.2793
April, 1981	5.32	6.34		3.151	.081
April, 1981	5.32	6.34	6.76	2.538	.086

*Year of the tornado

Although there is no significant statistical difference among groups, from September, 1978, to September, 1979, it

is interesting to note that three students from Group I obtained lower reading scores by an average of 2 months below their previous test scores, whereas three students in Group II had lower scores at an average of 1 year and 1 month below their previous test scores. The following year (September, 1979, to May, 1980), one student in Group I obtained a lower score by an average of 1 month, whereas three students from Group II had lower scores by an average of 3 months. From May, 1980, to April, 1981, an average decrease of 4 months was found for four students in Group I and an average of 4 months for five students in Group II. These data are presented in Table 4.

Table 4
Number of Students by Group with Lower Reading Scores

Test Date	Group I		Group II	
	No.	\bar{X} Decrease	No.	\bar{X} Decrease
Sept., 1979*	3	2 months	3	1 year, 1 month
May, 1980	1	1 month	3	3 months
April, 1981	4	4 months	5	4 months

*Year of the tornado

Statistical analyses yielded similar results for language arts scores, math scores, and total battery scores (See Appendix, Tables 5, 7, & 9). No significant differences

are found for any of these variables; Tables 6, 8, and 10 (see Appendix) illustrate the number of students who achieved a score lower than their previous test results.

Grades on report cards were also analyzed to determine if there were any significant differences between groups. As seen in Table 11, the overall grades for first and second grades (school years 1977-1978 and 1978-1979) do not indicate any significant variability between the groups.

Table 11
Mean Overall Grades by Group

School Year	\bar{X} Grade Group I	\bar{X} Grade Group II	F	p
1977-1978	3.03	3.10	.197	.659
1978-1979	3.00	3.00	0.000	1.000

Table 12, however, indicates four students from Group I experienced an average drop of one letter grade from the previous year.

Similar analyses were computed and tables are presented for grades in math, English, reading, spelling, social studies, art, music, and physical education. No significant statistical variability was found for any of the above school subjects. Significant differences were found, however, among groups for the subjects of science and writing.

Table 12
 Number of Students by Group with Lower
 Overall Letter Grade

School Year	Group I		Group II	
	No.	\bar{X} Decrease	No.	\bar{X} Decrease
1977-1978	4	1 letter grade	0	0
1978-1979	4	1 letter grade	0	0

A significance level beyond the .05 level was found for all three groups for school year 1980-1981 (see Table 13).

Table 13
 Mean Science Grades by Group

School Year	\bar{X} Grade Group I	\bar{X} Grade Group II	\bar{X} Grade Group III	F	p
1978-1979	3.22	3.23		.001	.979
1979-1980	3.03	3.16		.440	.510
1980-1981	2.53	3.06		4.821	.032*
1980-1981	2.53	3.06	2.37	3.270	.043*

* $p = .05$

Table 14 indicates a significant difference beyond the .05 level when all three groups are compared on writing grades.

Table 14
Mean Writing Grades by Group

School Year	\bar{X} Grade Group I	\bar{X} Grade Group II	\bar{X} Grade Group III	<u>F</u>	<u>p</u>
1978-1979	3.33	3.23		.135	.717
1979-1980	3.13	3.16		.033	.857
1980-1981	2.90	3.23		3.215	.078
1980-1981	2.90	3.23	2.62	3.606	.0321*

*p = .05

Citizenship grades were analyzed to determine if there were any significant differences among groups. Results are presented in Table 15. No significant variability is found.

Table 15
Mean Citizenship Grades by Group

School Year	\bar{X} Grade Group I	\bar{X} Grade Group II	\bar{X} Grade Group III	<u>F</u>	<u>p</u>
1978-1979	3.55	3.46		.126	.726
1979-1980	3.13	3.03		.329	.568
1980-1981	2.96	3.03		.067	.701
1980-1981	2.96	3.03	2.93	.115	.897

Number of absences were also analyzed to locate any significant differences among groups. A significant difference was determined beyond the .05 level of significance for Group I and Group II for school year 1980-1981. Results are shown in Table 16.

Table 16
Mean Absences by Group

School Year	\bar{X} Absences Group I	\bar{X} Absences Group II	\bar{X} Absences Group III	F	p
1977-1978	8.70	7.90		.201	.655
1978-1979	9.30	10.50		.212	.647
1979-1980	8.93	10.70		.531	.469
1980-1981	5.96	9.63		4.189	.045*
1980-1981	5.96	9.63	9.62	2.423	.095

*p = .05

The last variable analyzed was the number of times tardy, presented in Table 17. No significant differences are determined among groups.

Table 17
Mean Number of Times Tardy by Group

School Year	\bar{X} Tardies Group I	\bar{X} Tardies Group II	\bar{X} Tardies Group III	F	p
1977-1978	.5	1.3		1.384	.244
1978-1979	1.03	.73		.199	.657
1979-1980	1.30	.366		.792	.377
1980-1981	.90	.566		.431	.514
1980-1981	.90	.566	.6250	.272	.762

Discussion

The overall results of this study do not indicate a significant difference among Group I (victims of tornado), Group II (observers of tornado), or Group III (newcomers to school district) when analyses were performed on achievement test scores, report card grades, citizenship grades, absences, and times tardy over a 4-year period. A significant difference beyond the .05 level was found among all three groups in the 1980-1981 school year for the subjects, science and writing. Also, a significant difference beyond the .05 level was determined for Group I and Group II in the same year for the number of absences. These results could possibly be due to a delayed psychological reaction but could more likely be attributed to statistical artifact. Results indicate that students in Wichita Falls who

experienced the tornado disaster either as victims or observers did not experience any exaggerated negative effects as measured by these variables. Although academic abilities (as measured by achievement test scores and report card grades) and school-related behavior (as measured by citizenship grades, number of absences, and number of times tardy) did not differentiate the victims from the observers, an informal study was done to assess individual student decreases in test scores and grades that were not masked, because the focus of attention was on group means.

Some background information might help to explain the reasons for the apparent lack of detrimental effects of the tornado. The Wichita Falls area seemed to respond to the April, 1979, tornado disaster differently than other cities that experienced similar disasters. Forty-four persons were killed, 1,000 were injured, 20,000 were left homeless, 5,000 homes were destroyed or heavily damaged, and 2,000 residences received minor damage. In addition, 80 businesses were destroyed or heavily damaged.

The destruction was so devastating that the lives of most people in the city were touched in some way by the disaster. Newspapers and magazines reported of the total uniting of the city and the immediate pulling together of friends and neighborhoods. All authority figures remained firmly in control, and there were no public displays of panic after the tornado itself had passed. There was no

civil chaos or social structure disintegration. Although state and national disaster relief services were available, they were not utilized as was expected because of the resources provided by the community. Churches and factories made large service contributions, and pronouncements of confidence rather than hopelessness were expressed by the community as a whole. Two schools were completely destroyed, and the children of these schools had to share the facilities of other schools in afternoon shifts. School personnel were made to be especially sensitive to possible behavior problems, and when children first returned to school after the tornado, teachers at these schools were instructed to minimize pursuit of academic studies and maximize discussion of their students' trauma. The school district and its personnel are to be commended for their work.

Informal interviews with principals, teachers, students, and parents indicate that many elementary children are still experiencing emotional disturbances resulting from the tornado. Principals of the elementary schools visited by the researcher report that on stormy days, many mothers of the students come to the school to take their children home. Teachers report that when the weather is bad, students ask about the weather, and radios are made available for listening to weather reports. Several principals state that it is not unusual for some children to become upset enough to leave the classroom or ask to go home. Many teachers

report that parents' presence in the classroom during bad weather increases the anxiety level of all children and that academic activity levels decrease.

Because the majority of these schools' faculty and students suffered some loss or damage to their possessions, it is possible that teachers may have been more lenient with their grading system. Also, teachers knew the extent of damage each child's family sustained. This could have made them more sympathetic and helpful toward particular students.

On two occasions, the researcher observed classes and interviewed teachers and students the day after funnel clouds had been spotted in Wichita Falls. A few teachers cried when relating how frightened they were the day before. Children wanted to talk about the bad weather and what they did when the sirens sounded. As much as an hour of some classes was devoted to listening to the children and reviewing safety procedures.

One major reason that might account for the seeming stability of these children is the fact that their families were not separated or relocated to other cities as was the case in other disasters. They were able to maintain their community roots and cope with the destruction along with thousands of others in the city.

The role of competent principal and teacher influence after the disaster should not be minimized. Most teachers

encouraged students to talk about the disaster and allowed the children to play "tornado," acting out what happened to them. Fears were discussed and many teachers expressed the opinion that the disaster had made most children more mature in their attitude toward school and life in general.

The supportive intervention of the teachers has been of great benefit in aiding the adjustment of these children. The fact that the children were able to remain with their families in the community after the disaster was also an important factor in their transition back to a normal way of life. While informal interviews revealed that some children continue to suffer emotional disturbances, the overall results of this study do not indicate any significant detrimental effects when achievement test scores, report card grades, citizenship grades, number of times tardy, and number of absences are analyzed.

Appendix A

Table 5

Adjusted Mean Language Arts Achievement Scores
by Group

Test Date	\bar{X} Score Group I	\bar{X} Score Group II	\bar{X} Score Group III	<u>F</u>	<u>p</u>
April, 1978	2.64	2.97		1.280	.263
Sept., 1978	2.30	2.85		2.918	.0929
Sept., 1979*	3.18	3.78		2.092	.1534
May, 1980	4.92	5.75		2.054	.1571
April, 1981	6.30	6.93		.349	.557
April, 1981	6.30	6.93	7.86	1.352	.265

*Year of the tornado

Appendix B

Table 6

Number of Students by Group with Lower Language
Arts Scores

Test Date	Group I		Group II	
	No.	\bar{X} Decrease	No.	\bar{X} Decrease
Sept., 1979*	2	4 months	7	7 months
May, 1980	3	5 months	1	1 month
April, 1981	5	11 months	1	5 months

*Year of the tornado

Appendix C

Table 7

Adjusted Mean Math Achievement Scores by Group

Test Date	\bar{X} Score Group I	\bar{X} Score Group II	\bar{X} Score Group III	<u>F</u>	<u>p</u>
April, 1978	2.52	2.68		.401	.529
Sept., 1978	2.26	2.48		.584	.447
Sept., 1979*	2.91	3.35		1.843	.1798
May, 1980	4.32	4.67		1.178	.2822
April, 1981	5.13	5.50		.001	.972
April, 1981	5.13	5.50	5.71	.838	.437

*Year of the tornado

Appendix D

Table 8

Number of Students by Group with Lower Math Scores

Test Date	Group I		Group II	
	No.	\bar{X} Decrease	No.	\bar{X} Decrease
Sept., 1979*	4	2 months	3	4 months
May, 1980	0	0	0	0
April, 1981	3	4 months	2	5 months

*Year of the tornado

Appendix E

Table 9

Adjusted Mean Total Battery Achievement Scores
by Group

Test Date	\bar{X} Score Group I	\bar{X} Score Group II	\bar{X} Score Group III	<u>F</u>	<u>p</u>
April, 1978	2.65	2.92		1.102	.298
Sept., 1978	2.18	2.67		3.682	.0699
Sept., 1979*	3.00	3.43		2.133	.149
May, 1980	4.46	5.03		1.116	.1511
April, 1981	5.26	5.82		.009	.925
April, 1981	5.26	5.82	6.18	1.601	.209

*Year of the tornado

Appendix F

Table 10

Number of Students by Group with Lower
Total Battery Scores

Test Date	Group I		Group II	
	No.	\bar{X} Decrease	No.	\bar{X} Decrease
Sept., 1979*	1	5 months	3	1 month
May, 1980	1	2 months	0	0
April, 1981	1	5 months	2	2 months

*Year of the tornado

References

- Bell, B. D. Disaster impact and responses: Overcoming the thousand natural shocks. Gerontologist, 1978, 18, 531-540.
- Block, D., Silber, E., & Perry, S. Some factors in the emotional reactions of children to disaster. American Journal of Psychiatry, 1957, 133, 55-69.
- Erickson, K. T. Loss of community at Buffalo Creek. American Journal of Psychiatry, 1976, 133, 302-305.
- Frederick, C. J. Effects of natural vs. human-induced violence upon victims. Evaluation and Change, special issue, 1980, 71-75.
- Greeson, R. R., & Mintz, T. California earthquake, 1971: Some psychoanalytic observations. International Journal of Psychoanalytic Psychotherapy, 1972, 1, 7-23.
- Huerta, F., & Horton, R. Coping behavior of elderly flood victims. Gerontologist, 1978, 18, 541-546.
- Lifton, R. J., & Olson, E. The human meanings of total disaster. Psychiatry, 1976, 3, 1-18.
- Milne, G. Cyclone Tracy I: The effects on Darwin adults. Australian Psychologist, 1977, 12, 39-52(a).
- Milne, G. Cyclone Tracy II: The effects on Darwin children. Australian Psychologist, 1977, 12, 55-62(b).

- Moore, H. Some emotional concomitants of disaster. Mental Hygiene, 1958, 12, 45-50.
- Newman, C. J. Children of disaster: Clinical observations at Buffalo Creek. American Journal of Psychiatry, 1976, 133, 306-312.
- Nie, N. H., Hull, C. H., Jenkins, J. G., Steinbrenner, K., & Bent, D. Statistical package for the social sciences. New York: McGraw-Hill, 1975.
- Parker, G. Cyclone Tracy and Darwin evacuees: On the restoration of the species. British Journal of Psychiatry, 1977, 130, 548-555.
- Penick, E. C. Mental health problems and natural disaster. Journal of Community Psychology, 1976, 4, 64-67.
- Raphael, B. Crisis and loss: Counseling following a disaster. Mental Health in Australia, 1975, 1, 118-122.
- Rangell, L. A discussion of the Buffalo Creek disaster: The course of psychic trauma. American Journal of Psychiatry, 1976, 113, 313-316.
- Rossides, D. W. The American class system. Boston: Houghton Mifflin, 1976.
- Stern, G. M. From chaos to responsibility. American Journal of Psychiatry, 1976, 133, 300-301.
- Titchener, J. L., & Kapp, F. T. Family and character changes at Buffalo Creek. American Journal of Psychiatry, 1976, 133, 295-299.

Wallerstein, J. S., & Kelly, J. B. California's children of divorce. Psychology Today, 1980, 13, 66-76.

White, J. F., & Haas, J. E. Assessment of research on natural hazards. Cambridge, Mass.: MIT Press, 1975.