The Effectiveness of a Behavioral Medicine Intervention in Reducing Symptoms of Posttraumatic Stress in Children after a Natural Disaster

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Abstract

This article reports on the effectiveness of a behavioral medicine program in reducing symptoms of posttraumatic stress disorder (PTSD) in fourth grade children. Approximately six months after Hurricane Floyd and the subsequent flooding, students were assessed for symptoms of PTSD as well as their efforts to cope with the event. A five-week behavioral medicine program designed to address specific cognitive, emotional, social, and physical symptoms was implemented and the students were reassessed. Our results indicated an overall decrease in PTSD symptoms ($p<.001$). In addition, eight of the fifteen coping strategies significantly changed. Our results demonstrate that behavioral medicine interventions are an effective in ameliorating symptoms of PTSD symptoms in children. Similar interventions could be implemented by rapid deployment teams designed to mitigate PTSD symptoms in children after disasters and other traumatic events.

posttraumatic stress disorder, coping, behavioral medicine, re-experiencing the event, hyperarousal, numbing/avoidance, recreational therapy.

There isn't much fun in medicine but there is a lot of medicine in fun.

-William Mayo

Background

When a person is exposed to extreme stress such as sexual abuse, war, or the extended effects of a natural disaster, clinically significant symptoms often emerge.[3] The existence, frequency, intensity, and duration of these symptoms are dependent upon many factors, including, gender, age, and ethnic background of the person exposed to the stressor as well as the person's social environment and the ability to employ coping strategies.[4,5] The long term effects of chronic stress can be devastating as demonstrated by some Vietnam Veterans with posttraumatic stress disorder who have shown significant shrinkage in the hippocampus area of the brain.[6] Chronic stress is also associated with risk for depression, anxiety, alcohol or substance abuse as well as with other diseases of the cardiovascular, digestive, musculoskeletal, endocrine, respiratory, and nervous systems.[7]

Specific emotional and behavioral responses to stress have been observed and studied by mental health professionals in multiple settings, under different circumstances, over time. These symptoms have become the clinical indicators used for identifying the stress related disorder known as posttraumatic stress disorder (PTSD). Posttraumatic stress disorder has been recently defined as "the development of characteristic and persistent symptoms along with difficulty functioning after exposure to a life-threatening experience".[8(p 630)] These persistent, post trauma symptoms were the basis for the development of the original PTSD diagnosis in 1980 and with some modification still serve as the diagnostic criteria.[7] While this classification system is a useful clinical tool, it does have some limitations such as the exclusion of some less common cognitive, emotional, behavioral and physiological-somatic symptoms.[9]

The American Psychiatric Association categorizes PTSD symptoms into three main clusters: 1. A traumatic event that is persistently re-experienced; 2. There is a persistent avoidance of stimuli associated with the trauma; and 3.There is a numbing of general responsiveness and persistent symptoms of increased arousal.[3] The symptoms must last at least one month in duration and adversely affect normal functioning. Both adults and children with PTSD experience symptoms in these categories. Children however, due to developmental and other issues, experience and express their reactions to the trauma differently than adults.

PTSD and Children

Symptoms of PTSD in children are similar to those experienced by adults but differ in some important ways. According to the American Psychiatric Association "young children do not have the sense that they are reliving the past; rather, the reliving of the trauma may occur through repetitive play (e.g., a child who was involved in a serious automobile accident repeatedly reenacts car crashes with toy cars)".[3(p 466)] In addition, children may experience frightening dreams without recognizable content and in young children reenactment of the specific trauma may occur.[3] A thorough review of documented PTSD symptoms in children and adolescents is presented by Armsworth and Holaday.[9]

The prevalence of PTSD in the U.S. child population is not known. According to the American Psychiatric Association, at any given time approximately 8 % of the U.S. adult population has PTSD.[3] The existence of PTSD has been established after a number of traumatic events including exposure to violence,[10] peer victimization,[11] and war.[12] In children PTSD has also been reported after a number of natural disasters including earthquakes,[13] and hurricanes.[14,15] It is now believed that exposure to a traumatic event such as a natural disaster is a major factor in the development of PTSD.[4] We previously reported the prevalence of PTSD in the children in this study. We found 94% of the

children had at least mild symptoms and 70% had moderate to severe symptoms six months post Hurricane Floyd.[5]

There is a growing body of information about posttraumatic stress and children after natural disasters.[1,16,17] Symptoms in children are well documented after hurricanes and flooding.[1,17,4,18] These symptoms include bad dreams and poor sleep; an inability to pay attention; and feeling angry, scared, and sad.[3] PTSD symptoms, in turn, have a devastating effect on a child's health and performance.[13] These effects include mood disorders such as depression and anxiety, cognitive problems such as poor memory and attention and academic performance, social problems such as poor interpersonal relationships, behavioral problems such as conduct disorder and juvenile delinquency, and physical illness.[19,20] Remarkably, many symptoms of PTSD do not emerge until adulthood.[20] According to the American Psychiatric Association, the most important factors in the development of symptoms are the "severity, duration, and proximity of an individual's exposure to the traumatic event".[3(p 466)]

Purpose of the Study

The amount of studies addressing the effectiveness of individual and group interventions on childhood symptoms of PTSD is extremely limited.[19] Partly because of the unpredictability of disasters and numerous environmental barriers and partly because there is a natural instinct to shelter and protect those individuals affected, it is virtually impossible to do formal interventions following such disasters, never mind research their effectiveness. The few intervention studies that have been conducted have focused solely on ameliorating symptoms immediately after the traumatic event. But as the American Psychiatric Association has noted, symptoms of PTSD may not emerge until six months or more after exposure to a traumatic event.[3] In summarizing the current status of disaster research, former Assistant Surgeon General Brian Flynn stated "Good disaster research, of

any type, is rare as it is so difficult to do. The research base is expanding primarily in the areas or risk and protective factors. There is very little intervention research" (personal communication, November, 2001). Yet, there is an urgent need to determine whether individual and group interventions can mitigate symptoms after natural and other disasters in children as there is increasing evidence that lack of intervention will result in biopsychosocial problems in the short and long term.

Disasters and other traumas that produce symptoms of PTSD will not cease. It is critical therefore to develop effective interventions that can be applied after a disaster to ameliorate symptoms of PTSD. This present study asked whether a comprehensive program consisting of developmentally appropriate recreational activity, deep breathing and meditation, and cognitive behavioral strategies could decrease symptoms of PTSD and positively influence coping choices.

Subjects

Two hundred-eighteen fourth grade students participated in the intervention. Sixty nine percent (69%) of these children with signed child & parent/guardian informed consent forms were included in the data analyses. This post-hoc study was reviewed and approved by the local Institutional Review Board. Fifty-seven percent of the children were female and forty-three percent were male. Ages of the children ranged from nine to twelve years with the largest percentage being nine and ten year olds comprising 46% and 45% respectively. The ethnic backgrounds of the children were reported as African American (63%), European American (33%), and Hispanic American (4%).

The Trauma

During a two-week period in September of 1999, rain from Hurricane Dennis coupled with that of Hurricane Floyd produced flooding that exceeded the 500-year flood plain in Eastern North Carolina. The "Flood of the Century" would become the greatest

disaster the state of North Carolina had ever endured and involved the largest evacuation in United States history. Entire communities were displaced. All toll fifty-one people would die as a result of the hurricane and flooding.[21] The children of this study were at the epicenter of the disaster. Helicopters were flying in and out of their community every fifteen minutes creating an atmosphere similar to war. Officials condemned the elementary school that the children attended as it sat engulfed by floodwaters. The fourth and fifth grade children would never return to their school and were instead relocated to modular classrooms at the National Guard Armory where they did their studies, ate their lunch, and took their recess. The modular classrooms were placed at the exact location where the hundreds of helicopters took off and landed when rescuing victims. Thirty-seven percent of these children experienced flooding at home as well. Others reported loosing pets, and belongings such as clothing, toys, and games.

Methodology

Six months after Hurricane Floyd and prior to participation in the behavioral medicine intervention the Child Post Traumatic Stress-Reaction Index[2] and Kidcope[22] were administered to the children by the school social worker. Copies of the assessments were given to each student. Children were told that data was being collected regarding their reactions to the hurricane and flood. Children were told if they completed the surveys they would be given a pencil. Each question was read aloud and children were instructed to answer by circling the selected response. After each question, children were given an opportunity to ask questions. On reverse questions children were asked to listen very carefully and answer choices that were read in narrative form. The five-week behavioral medicine intervention program was then implemented. Within two weeks of completion of the intervention the children were reassessed using the same assessments and methodology.

Instruments

The Child Post Traumatic Stress-Reaction Index (CPTS-RI) is considered the most widely used instrument for diagnosing PTSD in children.[23] The CPTS-RI is a Likert type scale (1=none of the time; 2=little of the time; 3=some of the time; 4=much of the time and 5=most of the time) that establishes the existence of 17 PTSD symptoms and 3 associated symptoms in children.

The CPTS-RI was standardized on 750 children and 1,350 adults with diagnosed PTSD. Concurrent validity (0.91) was established by comparing the children's scores on the CPTS-RI with diagnosed cases of PTSD.[24] A pretest internal consistency of .87 was previously reported for this study.[5] Post test values are as follows: Overall (.88); and symptom clusters: Re-experiencing (.77); Psychic-Numbing (.63); and Hyperarousal (.83).

The CPTS-RI can be further broken down into three symptom clusters: Criterion B Re-Experiencing the event (questions 1, 2, 3,4,5,13); Criterion C Numbing/Avoidance: (questions 7,8,12,13,14,15,16,18), and Criterion D Hyperarousal (questions 6,9,10,11,17, 19,20). The Re-Experiencing cluster refers to a persistent and recurrent experiencing of the traumatic event. Numbing/Avoidance symptoms are represented by an avoidance of stimuli associated with the event and a numbing of general responsiveness. Hyperarousal involves a set of behaviors that include difficulty falling or staying a sleep, difficulty concentrating, and irritability or outburst of anger.[3]

To assess the impact of the disaster on efforts to cope, Kidcope, a brief clinical coping checklist was administered at the same time as the CPTS-RI. Kidcope (7 to12 year old version) was developed as a tool for the clinical researcher to use as a screening measure.[22] Items on the Kidcope measure behavioral and cognitive coping strategies (Distraction, Social Withdrawal, Cognitive Restructuring, Self-Criticism, Blaming Others,

Problem-Solving, Emotional Regulation, Wishful Thinking, Social Support, and Resignation). The instrument was designed to be useful in multiple situations.[25]

Behavioral Medicine Intervention

For children the full impact of PTSD might not be experienced until adulthood indicating that sleeper symptoms can fester and manifest long after the trauma. These symptoms are more apt to emerge if something is not done in childhood to ameliorate the acute symptoms.[20] Thus, early interventions that address potential sleeper symptoms are critical. A combination of different strategies which include psychodynamic therapy, anxiety/stress management techniques, cognitive-behavioral therapy, and play therapy are effective in reducing the symptoms of PTSD.[19] Pfefferbaum specifically suggests the use of play to help reduce symptoms.[26]

A number of other treatment approaches have been used to treat PTSD including cognitive-behavioral interventions and psychotropic medications such as Sertraline.[27] Cognitive behavioral treatments are sometimes used alone and sometimes in conjunction with psychotropics and the combination of methods seems to work best.[28] Given the concerns of medication usage however, cognitive-behavioral treatment (CBT) is viewed as the first-line treatment of PTSD.[29]

The intervention evaluated in this study was a five-week behavioral medicine program based upon theories of psychophysiological self-regulation,[30] cognitive/behavioral therapy,[31,32] social cognitive learning strategies,[33] and the physical and emotional benefits of recreation participation.[34] Each weekly session lasted sixty minutes. The intervention involved 20 minutes of developmentally appropriate recreational activity followed by 20 minutes of content designed to help the children create an awareness of symptoms and to teach self regulatory methods such as diaphragmatic breathing and cognitive strategies. Table 1 provides an overview of the topics presented to the children.

The last 20 minutes involved a recreational activity where the focus was on integration of information learned. Recreational activities involved some form of gross motor activity played in groups such as relay races, kick ball, dancing, etc. All sessions were delivered by trained undergraduate and graduate students. When appropriate, information taught in the didactic session was practiced during the recreational activities (e.g. deep breathing). The

TABLE 1 Behavioral Medicine Intervention Topics

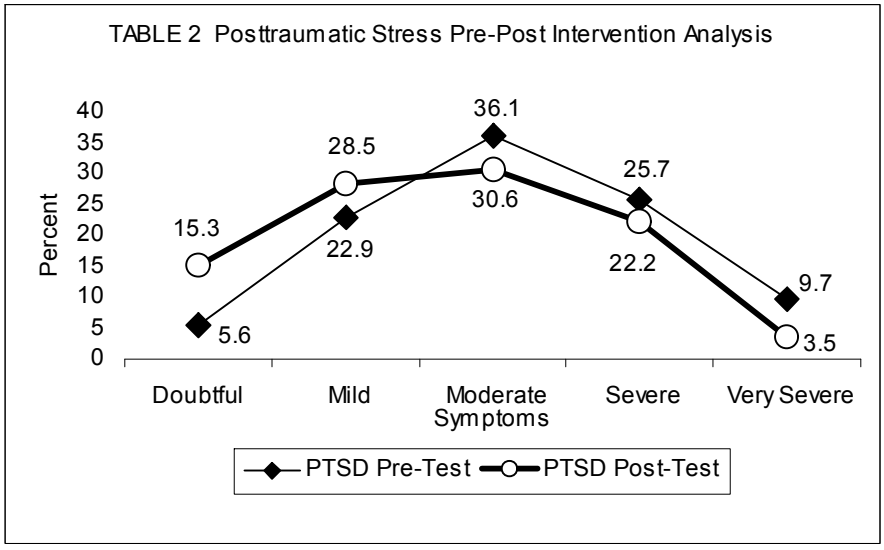
Session	Topic
Week One	Kid Stress
Week Two	Positive Thinking.
Week Three	Breathing for Health.
Week Four	Stress Busting Activities.
Week Five	Regulating Emotion

intervention was designed to teach children how to deep breathe; meditate; reverse negative thought processes and increase positive ones; identify, label and appropriately process emotions as well as learn methods to improve how they viewed themselves. See Appendix A for program goals, objectives and performance measures.

Results

To begin our analyses we set our level of significance at 0.05 for the overall study and subset questions. We compared pre and post CPTS-RI scores using the Cochran-Mantel-Haenszel statistic. Results indicate that overall PTSD symptoms pre (m=34.7+/-15.7) and post (m=28.1+/-15.4) decreased significantly ($p < .001$) after the five-week intervention. While this 6.6 percent reduction in symptoms is statistically significant, it is not known whether it is also clinically significant.

To establish the existence of posttraumatic stress disorder and categorize the severity of symptoms, CPTS-RI cutoff points were established.[35,36] These cutoff points are: <12 (doubtful level), 12-24 (mild level), 25-39 (moderate level), 40-59 (severe level) and > 60 (very severe level). Using this classification system data analyses indicate that prior to the intervention 5.6% of the children had doubtful PTSD, 22.9% had mild PTSD, 36.1%



had moderate PTSD, 25.7% had severe PTSD, and 9.7% had very severe PTSD (Table 2). After the behavioral medicine intervention the rates of PTSD significantly decreased and were reported at 15.3% doubtful PTSD, 28.5% mild PTSD, 30.6% moderate PTSD, 22.2% severe PTSD and 3.5% very severe PTSD. The downward shift of symptoms after the intervention can be seen in Table 2.

In Table 3 changes in individual symptoms pre and post program intervention are listed. During the intervention period there was a significant reduction in 12 of the 20 symptoms measured in the CPTS-RI. The children reported that they were less bothered by the flood, were able to control their thoughts more, had fewer bad dreams, addressed feelings more, and felt less guilty. In addition they reported that their memory improved,

they felt less tense and afraid, had less stomach aches, were less concerned about the possibility of a reoccurrence, and were less numb than before the intervention[1].

TABLE 3 Changes in Individual Symptoms Post Intervention Using Paired Samples t Test.

	CPTS-RI-pre			CPTS-RI-post				
	M	SD	n	M	SD	n	t	p
1. Bothered by Flood	3.2	1.1	148	2.7	1.2	143	4.53	.0001***
2. Scared, Afraid, Upset	1.7	1.4	150	1.4	1.4	143	2.51	.0133*
3. Sounds/Memories	1.7	1.6	150	1.6	1.4	143	1.46	.1468
4. Uncontrollable Thoughts	1.8	1.5	150	1.3	1.3	143	3.78	.0002***
5. Good or Bad Dreams	1.6	1.4	150	1.2	1.4	143	3.48	.0007***
6. Reoccurrence of Flood	2.0	1.5	150	1.7	1.4	144	2.12	.0356*
7. Enjoy Activities	1.7	1.6	149	2.0	1.5	144	-1.61	.1100
8. Feel Alone Inside	1.6	1.5	147	1.3	1.5	143	2.23	.0277*
9. Avoid Feelings	1.7	1.6	150	1.2	1.5	143	3.83	.0002***
10. So Scared Couldn't Cry	1.3	1.5	149	1.0	1.4	143	2.11	.0362*
11. Startle Easy/Jumpy	1.6	1.5	147	1.5	1.6	143	0.62	.5390
12. Sleep Well	1.7	1.5	149	1.8	1.6	142	-1.01	.3160
13. Feel Bad/Guilty	2.0	1.6	148	1.4	1.5	140	4.29	.0001***
14. Memory Affected	1.6	1.6	150	1.0	1.3	144	4.16	.0001***
15. Easy to Concentrate	2.2	1.6	150	2.0	1.6	144	1.34	.1836
16. Avoid Reminders	1.9	1.6	149	1.7	1.6	144	0.86	.3937
17. Tense/Upset	1.6	1.5	149	1.0	1.4	144	4.17	.0001***
18. Regressive Behaviors	1.2	1.5	147	1.0	1.4	143	1.63	.7424
19. Stomach/Head Aches	1.7	1.6	149	1.4	1.6	143	2.54	.0123*
20. Harder to Behave	1.1	1.5	149	1.0	1.4	142	0.33	.7424

Note: *** p<.001 *p<. 05 On questions # 7, 12, and 15 scores are reversed.

The CPTS-RI was further analyzed using the paired samples t test to discern changes in the Numbing/Avoidance, Hyperarousal, and Re-Experiencing clusters. Prior to the intervention, 100% of the children reported symptoms of Re-Experiencing, 85% reported symptoms of Hyperarousal, and 64% reported symptoms Numbing/Avoidance. The overall mean score changes for the Re-Experiencing, Numbing/Avoidance and

[1]Many readers would rather see the unadjusted p-values so that they can make an assessment of their own. A Bonferonni or Sidak approach would work to test the effects of repeated testing on unadjusted p values in this study. These are easily done, and could be performed by a reader if there is a desire to have such an adjustment. If for example a reader wants to adjust the p-values in the table (of 20 tests) using a Bonferonni approach they need only multiply each p-value by 20, and see if it still is smaller or equal to the level of significance they have chosen.

Hyperarousal subscales are reported in Table 4. There were significant reductions in Re-Experiencing and Numbing/Avoidance symptoms with Hyperarousal symptoms being less affected. Children who reported their home flooded were 3 times more likely to report more symptoms. They were 37% more likely to report symptoms of Numbing/Avoidance, 90% more likely to report symptoms of Hyperarousal than those not flooded. Females were twice as likely to report severe symptoms and had 93% greater odds of Numbing/Avoidance symptoms as well as 132% greater odds of Hyperarousal symptoms when compared with males.

TABLE 4 Overall Reduction of Symptoms by CPTS-RI Subscales

	CPTS-pre			CPTS-post				
	M	SD	n	M	SD	df	t	p
Re-Experiencing	7.2	4.5	142	5.7	4.2	141	3.99	.000***
Numbing/Avoidance	7.6	4.8	135	6.5	4.5	134	2.81	.006**
Hyperarousal	7.1	3.3	136	6.4	3.9	135	1.80	.074

Note: *** p<.001 ** p<.01

There was a significant decrease in Numbing/Avoidance and Hyperarousal symptoms in females (Table 5) but not to the degree seen in the reduction of Re-Experiencing symptoms. In males the intervention failed to reduce Numbing/Avoidance and Hyperarousal symptoms (Table 6). The intervention was effective in reducing symptoms of Re-Experiencing and Hyperarousal in African Americans but not Numbing/Avoidance (Table 7). This is the only group where the program significantly reduced the resistant symptoms of Hyperarousal. On the other hand, European Americans (Table 8) demonstrated significant decreases in Re-Experiencing and Numbing/Avoidance symptoms but, Hyperarousal symptoms were particularly resistant.

TABLE 5 Symptom Reduction in Females

	CPTS-pre			CPTS-post				
	M	SD	n	M	SD	df	t	p
Overall	37.5	16.4	85	30.3	15.8	84	4.88	.000***
Re-Experiencing	7.6	4.6	84	6.12	4.0	83	3.30	.001**
Numbing/Avoidance	8.3	5.1	80	6.9	4.6	79	2.60	.011*
Hyperarousal	7.7	3.3	81	6.7	4.0	80	2.02	.046*

Note: *** p<.001 ** p<.01 *p<. 05

TABLE 6 Symptom Reduction in Males

	CPTS-pre			CPTS-post				
	M	SD	n	M	SD	df	t	p
Overall	30.6	13.7	59	24.9	14.3	58	3.05	.003**
Re-Experiencing	6.56	4.4	58	5.1	4.4	57	2.31	.024*
Numbing/Avoidance	6.49	4.0	55	5.8	4.3	54	1.24	.218
Hyperarousal	6.14	3.2	55	5.8	3.8	54	.473	.638

Note: ** p<.01 *p<. 05

TABLE 7 Symptom Reduction in African Americans

	CPTS-pre			CPTS-post				
	M	SD	n	M	SD	df	t	p
Overall	35.8	15.2	87	29.3	15.4	86	4.72	.000***
Re-Experiencing	5.9	4.2	85	5.1	4.4	84	2.60	.011*
Numbing/Avoidance	7.6	4.9	79	7.0	4.6	79	1.13	.261
Hyperarousal	7.3	3.3	82	6.3	3.8	82	2.13	.036*

Note: *** p<.001 *p<. 05

TABLE 8 Symptom Reduction in European Americans

	CPTS-pre			CPTS-post				
	M	SD	n	M	SD	df	t	p
Overall	33.4	17.1	47	24.8	15.4	46	4.00	.000***
Re-Experiencing	7.4	5.1	47	4.8	4.2	46	4.27	.000***
Numbing/Avoidance	7.3	4.6	45	5.2	4.2	44	3.53	.001**
Hyperarousal	6.9	3.7	43	6.1	4.0	42	1.06	.294

Note: *** p<.001 ** p<.01

Table 9 lists the effects of the intervention on CPTS-RI symptoms clusters in the children whose homes were flooded. As reported earlier, those children with flooded homes were three times more likely to experience symptoms than those children who did not have flooding at home.[5] Post intervention, children with flooded homes reported a significant decrease in overall symptoms as well as in the Re-Experiencing symptom cluster but not in the Numbing/Avoidance or Hyperarousal symptoms. Children who were not flooded at home (Table 10) also had significant reductions in overall PTSD and the Re-Experiencing symptom cluster, and Numbing/Avoidance. Hyperarousal symptoms were resistant in this group as well.

TABLE 9 Symptom Reduction in Children with Flooded Homes

	CPTS-pre			CPTS-post				
	M	SD	n	M	SD	df	t	p
Overall	39.5	16.3	54	32.5	15.9	53	3.60	.001**
Re-Experiencing	8.2	4.4	54	6.1	4.3	53	3.46	.001**
Numbing/Avoidance	8.3	5.2	53	7.8	4.9	52	.817	.417
Hyperarousal	7.9	3.4	50	7.4	4.0	49	.278	.470

Note: ** p<.01

TABLE 10 Children without Flooding at Home

	CPTS-pre			CPTS-post				
	M	SD	n	M	SD	df	t	p
Overall	31.8	14.7	90	25.4	14.5	89	4.38	.000**
Re-Experiencing	6.6	4.5	88	5.4	4.2	87	2.39	.019*
Numbing/Avoidance	7.1	4.6	82	5.7	4.1	81	3.53	.002**
Hyperarousal	6.6	3.7	86	5.8	3.7	85	1.72	.051

Note: ** p<.01 *p<. 05

Changes in Efforts to Cope

We analyzed results from Kidcope to determine coping preferences of the children pre and post behavioral medicine intervention. Kidcope consists of 15 questions that represent 10 categories of coping strategies. Internal consistency for these categories (pretest-posttest) were as follows: Distraction (.30), Social Withdrawal (-.08), Problem-Solving (.58), Emotional Regulation (.27), and Wishful Thinking (.50). The Cognitive Restructuring, Self-Criticism, Blaming Others, Social Support and Resignation categories, which are represented by only one question, were not analyzed due to statistical reliability issues. Because of this limitation, change scores for all items are reported. Questions are separated (Table 11) into their appropriate categories for reference purposes. The Wilcoxon Signed Ranked Test was used to determine over-all change, while the Mann-Whitney U test was employed to determine individual differences.

Results indicated (Table 11) that after the intervention children were, with respect to the hurricane and flood, less likely to try and see the good side of things; less likely to blame themselves for causing the problem; less likely to try and fix the problem by doing something or talking to someone about it; less likely to yell, scream, get mad; less likely to

wish the problem never happened or that they could do something about it; less likely to feel better spending time with others like family, grownups, or friends; and more likely to try and do something about problem.

TABLE 11 Pre Intervention and Post Intervention Kidcope Category Scores

	Kidcope-pre		Kidcope-post		
	m	sd	m	sd	p
Distraction					
I Tried to Forget	.67	.47	.69	.46	.689
I Watched TV/Played a Game	.46	.50	.55	.50	.124
Social Withdrawal					
I Stayed by Myself	.24	.43	.18	.39	.188
I Kept Quiet About the Problem	.51	.50	.45	.50	.306
Cognitive Restructuring					
I Tried to See the Good Side of Things	.87	.34	.69	.46	.000***
Self-Criticism					
I Blamed Myself for Causing the Problem	.15	.36	.07	.26	.035*
Blaming Others					
I Blamed Someone Else/Causing/Problem	.19	.39	.17	.37	.736
Problem Solving					
I Tried/Fix the Problem/Thinking of Answers	.41	.49	.35	.48	.253
I Tried/Fix the Problem/Doing Something or Talking with Someone	.61	.49	.43	.50	.001**
Emotional Regulation					
I Yelled, Screamed, got Mad	.36	.48	.26	.44	.049*
I Tried to Calm Myself Down	.64	.48	.55	.50	.111
Wishful Thinking					
I Wished the Problem had Never Happened	.93	.26	.81	.39	.005**
I Wished I Could Make Things Different	.87	.34	.74	.44	.001**
Social Support					
I Tried to Feel Better Spending Time with Others like Family, Grownups, or Friends	.80	.40	.65	.48	.001**
Resignation					
I Didn't do Anything Because the Problem Couldn't be Fixed	.48	.50	.33	.47	.005**

Note: *** p<.001 ** p<.01 *p<. 05: p values were calculated using the McNemar Test of Significance. Binomial distribution was used.

Discussion

There were no other significant events that occurred at this school during the five-week period when the intervention was delivered and data collected. The significant drop in PTSD symptoms coupled with the use of more appropriate coping strategies by the children is consistent with the expected outcomes of the behavioral medicine intervention program. There was no control group, however, for comparison, so a cause and effect relationship should be viewed cautiously. Additional studies are needed to determine whether our results are replicable and to measure for possible long term benefits from this type of intervention.

Changes in PTSD Symptoms

The intervention was most effective with females affecting all categories of symptoms. There was a significant decrease in Numbing/Avoidance and Hyperarousal symptoms but not to the degree seen in the reduction of Re-Experiencing symptoms. With males, the intervention failed to reduce Numbing/Avoidance and Hyperarousal symptoms but was effective in reducing symptoms of Re-Experiencing. Perhaps males were more resistant to change or it may be because boys experience and express their symptoms differently than girls. It may also be true that girls report more symptoms than boys. Given the resistance to symptom change in males alternative interventions may prove to be more effective. For instance, since the most resistant symptoms were those of Hyperarousal, interventions that focus on the reduction of psychophysiological arousal such as gross motor recreation activities, relaxation, and biofeedback may be warranted. Interestingly, the program was effective in reducing symptoms of Re-Experiencing and Hyperarousal in African Americans but not Numbing/Avoidance. African Americans were the only group where the program significantly reduced the resistant symptoms of Hyperarousal. On the

other hand, European American children demonstrated very significant decreases in Re-Experiencing and Numbing/Avoidance symptoms but not Hyperarousal symptoms.

Changes in Efforts to Cope

Kidcope was designed as an interview's tool. In this study questions were asked to a classroom of children by the school social worker. The results may be skewed as a result of this modification and some children may have misinterpreted questions. On the other hand, the questions are relatively clear and there is only a yes or no choice. Only the frequency of use of coping choices pre and post intervention was examined. Whether the children believed the coping choices were effective was not addressed. Given the goals of the intervention the results were mixed. On the one hand children reported they were less likely to try and see the good side of things; less likely to try and fix the problem by doing something or talking to someone about it and less likely to feel better spending time with others like family, grownups, or friends. On the other hand, the children were less likely to blame themselves for causing the problem; less likely to yell, scream, get mad; less likely to wish the problem never happened or that they could do something about it and more likely to try and do something about problem. We believe it is possible that the seemingly negative responses may actually reflect a general acceptance by the children of the reality of their situation. The children were instructed to do something about what they could control and to not worry about what they could not and this may also be reflected in the results. The changes in PTSD symptoms support this notion. Overall, changes in coping were consistent with the goals of the intervention.

Conclusion

Given the outcomes of this study, a range of behavioral medicine and interpersonal techniques would prove to be appropriate forms of intervention. For instance, school based stress reduction programs have demonstrated that they can have a positive impact on child

stress[37] and could be tailored for crisis intervention. Specific stress reduction techniques, based upon 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[30] and cognitive/behavioral therapy is effective in treating depression.[31,32] Other interventions designed to help the person desensitize to the disaster through counseling, increased social support, community involvement, and other social cognitive learning strategies[33] may prove effective in reducing the symptoms of numbing/avoidance. Biofeedback, a technique designed to reduce hyperarousal, may also be effective in treating PTSD symptoms post trauma, especially in males.

Prescribed recreation activity is an effective modality (recreational therapy) that can be utilized to facilitate the delivery of behavioral medicine interventions when treating symptoms of PTSD. There are many advantages associated with this unique approach. According to the American Psychiatric Association reenactment of the traumatic event through play is a symptom of PTSD.[3] Perhaps reenactment through play is also a sign of healthy coping and the absence of reenactment play a symptom? When a child's environment is destroyed by a disaster the ability to play becomes restricted. When children loose their toys (potential implements for coping?) their ability to cope (heal themselves) may be impaired. An informal analysis of narratives written by children about the effects of this hurricane and flood suggested a consistent theme about the loss of toys and places to play as being significant events. Disaster relief teams should assist in the restoration of play environments and help children replace lost toys to facilitate coping. There are numerous other physical, social, emotional, and cognitive advantages associated with recreation participation. Some of the benefits of prescribed recreation have been reviewed by Russoniello.[34,38] but the real meaning of Dr. Mayo's quote remains obscured and under researched. Future research focusing on the utility of PTSD symptom clusters in establishing specificity in the PTSD diagnosis

could provide important insights. Further analyses of these symptom clusters may also provide essential information about how the disorder is experienced and provide additional information for choosing treatment approaches. At present treatment specificity is limited and, as a result, children with contraindications such as co-morbid psychiatric conditions, chemical dependency, poor compliance, or difficulty using imagery are treated the same as others without these problems. At a minimum this could affect the overall success of the interventions. More importantly, the treatment may inadvertently cause more harm than good.[39] Proper training of those delivering these types of programs is essential for these and other reasons. Programs that provide opportunities for play therapy and recreational activities for those that are traumatized could prove very effective in ameliorating acute and long-term symptoms of PTSD after traumatic events. Further investigation into this treatment potential is indicated.

Finally, the use of trained college students to deliver the behavioral medicine program proved to be highly effective both for the elementary school children who received the services, and for the university students who learned their craft (recreational therapy). There was an immediate emotional bond between the children and the college students. Perhaps this was because the children could relate due to the closeness of age or maybe they could envision their own success when working with these college students. Given the shortage of trained responders to address mental health issues after disasters, it seems prudent to further study this potential therapeutic relationship and its inherent benefits. The availability of training modules for use by universities during times of disaster, are needed to facilitate similar interventions. The behavioral medicine intervention utilized in this study (Appendix A) was effective in reducing symptoms of PTSD, as well as increasing positive coping strategies while decreasing negative ones. Thus, the intervention is recommended as a starting point for future interventions.

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Appendix A Goals and Objectives of Behavioral Medicine Intervention

Week One: What is Stress?

Goals

1. To introduce the children to the idea of stress
2. To define some of the terms used to refer to stress
3. To assist the children in developing an awareness of the symptoms of stress

Objective

1. Teach children ways to assess individual stress
2. To assist the children in developing an awareness stress and its impact on their life

Performance Measures

1. Each child will write/verbalize at least 2 symptoms of stress
2. Each child will verbalize/write at least 2 stressors currently affecting them.

Week Two: The Power of Positive Thinking

Goal

1. To teach children how to use positive thinking to reverse the symptoms of stress.

Objectives

1. To teach children common cognitive distortions (negative thought patterns).
2. To teach children ways to overcome negative thought patterns and increase positive ones.

Performance Measures

1. Children will verbalize, write two negative thoughts or patterns of thought
2. Children will identify 2 ways to say negative thoughts more positively
3. Children will write 3 positive things about themselves.

Week Three: Breathing for Health

Goal

1. To help the children to improve the quality of their breathing.

Objectives

1. Teach the children proper abdominal breathing techniques.
2. Discuss the health benefits of proper breathing and the disadvantages of dysfunctional breathing.

Performance Measures

1. Children will demonstrate appropriate abdominal breathing technique.
2. Children will write\verbalize at least two advantages of proper breathing and at least two problems associated with dysfunctional breathing.

Week Four: Stress Busting Activities

Goals

1. To assist children in the identification of coping activities.
2. To help children increase positive coping activities.

Objectives

1. To illustrate the importance of coping in health and stress reduction.
2. To expose the children to various coping activities and their relationship to stress reduction.

Performance Measures

1. Children will write/verbalize two current and two new coping activities.
2. Children will write/verbalize one negative consequence of not using coping activities.
3. Children will write/verbalize two positive results from participating in appropriate coping activities.

Week Five: Expressing Emotions

Goals

1. Children will be able to identify and deal with emotions such as anger and sadness.

Objectives

1. To teach the children ways to identify emotions.
2. To provide an opportunity for children to practice expressing emotions in an appropriate manner.

Performance Objectives

1. Children will verbalize/write down at least 2 things that makes them angry.
2. Children will verbalize/write at least 2 mental methods e.g. count from four backward using deep breathing to reduce anger.
3. Children will verbalize/write at least 2 inappropriate ways to express anger.
4. Children will verbalize/write at least 2 appropriate ways to express anger.
5. Children will identify at least one person they can use as a confidant.