

Pre-attack stress-load, appraisals, and coping in children's responses to the 9/11 terrorist attacks

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Background: Appraisal and coping following a disaster are important factors in children's post-traumatic stress (PTS) symptoms. However, little is known about predictors of disaster coping responses. This study examined stress-load, appraisals and coping styles measured prior to the September 11 terrorist attacks as predictors of 9/11-specific appraisals, coping and PTS. **Methods:** A community sample of children and parents ($N = 143$) participating in an ongoing study were interviewed by phone approximately 1 month following 9/11. **Results:** Pre-attack stress-load, appraisal and coping styles predicted children's 9/11-specific appraisals, coping, and PTS. 9/11-specific threat appraisals and avoidant coping predicted higher PTS and mediated the effects of pre-attack stress-load and threat appraisal. **Conclusions:** Pre-disaster stress-load, appraisal and coping styles predict disaster-specific appraisal and coping, which in turn, contribute to PTS. Coping interventions might mitigate PTS symptoms following a disaster. **Keywords:** PTS, appraisal, coping, stress-load, disaster.

The September 11, 2001 terrorist attacks were the most devastating acts of terrorism in US history. In addition to the thousands of people who directly experienced the attacks, many people witnessed them on television (Silver, Holman, McIntosh, Poulin, & Gil-Rivas, 2002). Although the impact of these events is greatest on those who experienced them directly, people across the country experienced distress following the attacks (e.g., Stein et al., 2004).

Individuals do not need to experience disasters directly to be affected by them. Knowing someone killed, injured, or involved in a disaster contributes to adjustment following disasters (Dixon, Rehling, & Sciwach, 1993; Lonigan, Shannon, Finch, & Daugherty, 1991; Pfefferbaum et al., 2000). In addition, media exposure predicts post-traumatic stress (PTS) symptoms or other stress responses (Cantor, Mares, & Oliver, 1993; Pfefferbaum et al., 2001; Terr et al., 1999). Children's perception that something bad is likely to happen to them, with or without direct exposure to the event, can result in stress symptoms (e.g., Kiser et al., 1993). Following 9/11, television exposure was related to higher levels of PTS symptoms (e.g., Fairbrother, Stuber, Galea, Fleischman, & Pfefferbaum, 2003; Galea et al., 2002; Saylor, Cowart, Lipovsky, Jackson, & Finch, 2003). In a group of elementary school children distant from the 9/11 attacks, fearing a loved one might have died was also associated with PTS (Saylor et al., 2003). A greater understanding of children's responses to indirect exposure to disasters will aid mental health professionals called upon to offer advice and services to families, schools, and communities in the aftermath of such events.

Children's appraisals are among the factors related to distress following disasters. Subjective

appraisals, including the perception of frightening or life-threatening events following a disaster, increase distress (Lonigan et al., 1991). When individuals personalize the events or view themselves as potential victims, stress symptoms are more likely to emerge (e.g., Asarnow et al., 1999; Dixon et al., 1993) whether or not the individual is directly exposed to the event (Kiser et al., 1993). Threat appraisals may be particularly relevant in the emergence of PTS symptoms (Ehlers & Clark, 2000), with children who focus on threat cues being at greater risk (Foa, Steketee, & Rothbaum, 1989). In addition, positive cognitions might reduce the likelihood of PTS symptoms (Ali, Dunmore, Clark, & Ehlers, 2002). Positive appraisals, including viewing the disasters as a challenge or believing that one has the resources to deal with the disaster, may be related to less distress following a disaster.

Children's coping following disasters also predicts post-disaster distress. Active coping includes engaged efforts to deal with stress, including positive reappraisal and problem solving. Avoidant coping includes efforts to avoid the stressor, including escape and cognitive repression (Compas, Connor-Smith, Saltzman, Thomsen, & Wadsworth, 2001). Incomplete processing of event-related information, fueled by avoidance, is a key factor in the development of PTS (Foa et al., 1989), and avoidant strategies such as thought suppression might maintain PTS (Ehlers & Clark, 2000). There is overlap between avoidant coping and the avoidant cluster symptoms of PTS, with both including similar behavioral and cognitive responses. Thus, it may be useful to examine avoidant coping styles assessed *prior* to a disaster as distinct from avoidant responses specific to a disaster. An avoidant style might predispose a child to avoidant responses following a disaster, increasing the likelihood of PTS developing. Active

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coping following a hurricane was associated with less symptomatology (Jeney-Gammon, Daugherty, Finch, Belter, & Foster, 1993), whereas avoidant coping following a large earthquake predicted greater PTS (Asarnow et al., 1999). A study of adolescents' coping following 9/11 showed that active strategies, including cognitive restructuring and positive thinking, were related to lower levels of anxiety (Wadsworth et al., 2004).

Thus, appraisal and coping play key roles in children's disaster adjustment. However, little research has examined *pre-disaster predictors* of post-disaster appraisals and coping. Understanding factors that predispose children to cope in less adaptive ways following a disaster is critical in understanding children's distress and the emergence of PTS symptoms following a disaster. Also, children with more severe acute distress responses following a disaster have a greater likelihood of persistent problems (e.g., La Greca, Silverman, Vernberg, & Prinstein, 1996), and understanding processes that contribute to acute distress can inform interventions.

Children's dispositional appraisal and coping styles may be important to consider when examining their situational or disaster-specific appraisal and coping responses (Compas et al., 2001). Dispositional appraisal and coping styles and situation-specific appraisal and coping responses are related but not redundant, with dispositional styles expected to influence situation-specific responses. Both are believed to contribute to psychological distress (Bouchard, Guillemette, & Landry-Leger, 2004).

Further, to cope successfully, individuals rely on a limited stock of resources (Lazarus & Folkman, 1984). Greater stress-load, that is, the number of stressors with which one must cope, reduces the availability of those resources, impacting appraisal, coping and adjustment following a disaster (e.g., Jerusalem, 1993). For example, the experience of recent stressors predicted higher levels of PTS symptoms in children following a major earthquake (Laor et al., 2002). Similarly, pre-9/11 stress-load was related to greater PTS symptoms in adults (Galea et al., 2002).

In this study, we examined prospective predictors of children's acute PTS following indirect exposure to the 9/11 attacks in children in Seattle, Washington. Previous research suggests that pre-disaster adjustment and post-disaster coping are among the factors affecting children's post-disaster distress (La Greca et al., 1996). However, *pre-disaster* stress-load, appraisals and coping styles may also predict post-disaster responses, and have not been examined. We tested whether pre-attack stress-load, appraisals and coping styles predicted 9/11-specific appraisals and coping, which in turn, were expected to predict PTS symptoms.

Previous analyses with this sample showed that children in Seattle demonstrated distress and PTS

symptoms despite experiencing the events of 9/11 indirectly and from a distance (Lengua, Long, Smith, & Meltzoff, 2005). Seventy-seven percent of children reported being worried, 68% reported being upset by reminders, and 39% reported having upsetting thoughts. PTS symptom severity was somewhat lower in this sample compared to that of children who had directly experienced a major earthquake (Foa, Johnson, Feeny, & Treadwell, 2001); however, 15% of this 9/11 sample reported symptoms consistent with a diagnosis of PTSD. In addition, post-9/11 PTS symptoms predicted higher anxiety and conduct problems at a follow-up, 6 months later.

This prospective data allows a rigorous test of the processes by which pre-attack symptomatology, stress-load, appraisal and coping styles relate to children's 9/11-specific appraisal and coping and acute PTS in children indirectly experiencing a disaster. We hypothesized that higher pre-attack stress load, threat appraisal and avoidant coping style would predict more 9/11-specific threat appraisal, avoidant coping and PTS, whereas pre-attack positive appraisal and active coping style would predict more 9/11-specific positive appraisal, active coping, and lower PTS. In addition, 9/11-specific threat appraisal and avoidant coping were expected to predict higher PTS, and 9/11-specific positive appraisal and active coping were expected to predict lower PTS. Finally, 9/11-specific appraisal and coping were expected to mediate the effects of pre-attack stress-load, appraisal and coping styles.

Method

Participants

Participants were 143 children and parents who were among 214 families participating in an ongoing longitudinal study. Participants in the ongoing study were recruited through flyers sent home to families of children in Seattle, Washington public school classrooms, with emphasis on obtaining an economically and ethnically diverse sample. If there was more than one child in the target grades, one child was randomly selected. The sample of 214 children included 19% African Americans, 3% Asian Americans, 66% European Americans, 4% Latinos, 2% Native Americans, and 6% children with multiple ethnic/racial backgrounds. Eighteen percent of families reported annual income <\$30,000, 28% between \$31,000 and \$60,000, 29% between \$61,000 and \$90,000, and 25% > \$91,000. The range of children's symptomatology was consistent with rates expected in a community sample. Using a clinical cutoff of 18 and a borderline cutoff of 14 on the Child Depression Inventory (CDI), 4% and 8% of the sample met criteria for clinical and borderline levels of depression, respectively. Using the Child Behavior Checklist (CBCL) clinical and borderline cutoffs for boys and girls separately, 4% and 8% of the sample met criteria for clinical and borderline levels of externalizing problems, respectively.

By September 11, 207 of the 214 families had completed either their first or second of three annual interviews as part of the ongoing study (i.e., pre-attack interview). After 9/11, the 207 families were contacted to participate in phone interviews regarding children's responses to the 9/11 attacks. The target interview period was 2 weeks to 2 months after the attacks to assess acute stress responses. A total of 151 families completed the interviews. Thirty-two families could not be reached within the targeted interview period; 6 families declined to participate, reporting concerns about distressing their children; 18 declined for other reasons (e.g., too busy). Six parents agreed to be interviewed, but chose not to have their children participate, resulting in a sample size of 145 for child report. Variables were considered missing if 20% of item responses were missing, resulting in missing data for 2 children. Complete data were available for 143 children.

Post-attack interviews were conducted 2 to 9 weeks after 9/11 ($M = 28.94$, $SD = 11.17$, 13–62 days). Given that diagnostic criteria for PTSD require that symptoms endure for one month, it was possible that levels of symptoms would be higher for children interviewed prior to one month following 9/11 ($n = 100$) compared to those interviewed after one month ($n = 43$). However, the amount of time between 9/11 and the post-attack interview was unrelated to PTS ($r = -.03$, n.s.), and the rate of endorsing symptoms consistent with PTSD for those interviewed in the first month (15%) did not differ from the rate of PTSD for those interviewed after 30 days (14%; $\chi^2 = .03$, n.s.).

The average time between the pre-attack and post-attack interviews was 6.70 mos. ($SD = 3.00$, 1.61–20.34). Children's mean age at the post-attack interview was 10.94 years ($SD = 1.01$, 9.13–13.65), and 53% of children were female. Ninety-five percent of parents responding to the post-attack interviews were mothers, and 5% were fathers. There were two significant differences between families participating and not participating in the post-attack interview when compared on demographics (child age, gender, mother and father education, income) and pre-attack child symptomatology (parent- and child-report depression, anxiety, conduct problems). Fathers of families not participating had less education (technical/professional) than fathers of families who participated (college/university; $t(176) = 2.03$, $p < .05$). Also, mothers reported lower pre-attack child depression in families not participating ($M = 1.95$, $SD = 1.99$) compared to those who participated ($M = 2.73$, $SD = 2.47$; $t(204) = 2.16$, $p < .05$).

Procedures

Prior to data collection, human subjects approval was obtained for all study procedures from the University of Washington Institutional Review Board. Pre-attack data were collected using structured 2½-hour interviews conducted in families' homes. Mothers and children were interviewed by separate interviewers in different rooms to ensure privacy. Post-attack data were collected using scripted 1-hour phone interviews. Families were contacted by phone and asked to complete interviews regarding children's response to the terrorist attacks. Parental consent and child assent to participate were obtained first. Confidentiality was explained,

indicating that children's responses would not be shared with their parents unless there was concern about child safety. Usually, parents and children were interviewed sequentially during a single phone-call. Parents were asked to allow children to be in a private room during the interview. Interviewers read scripted instructions, open- and close-ended questions, and questionnaire items, and recorded responses in writing. Families received \$25.

Pre-attack measures

Symptomatology. Mothers rated children's pre-attack symptomatology using the Child Behavior Checklist (Achenbach, 1991), a valid and reliable measure of behavior problems, with one-week test-retest reliabilities of .82 to .95. The raw total problems score was used.

Stress-load. Pre-attack stress-load was assessed using children's reports on the General Life Events Schedule for Children (Sandler, Ramirez, & Reynolds, 1986), which has previously shown significant associations with child symptomatology (Lengua & Long, 2002; Sandler et al., 1986). The 29 events include moving, changing schools, serious illness/injury, parental arrest, loss of friends, death of a loved one, etc. Children rated whether an event occurred during the prior year (did not happen = 0, happened = 1).

Appraisal styles. Pre-attack threat appraisal style was measured using the 24-item 'What I Felt Scale' (Sheets et al., 1996). The scale assesses 6 aspects of threat perceptions, including negative self-evaluation, negative evaluation by others, rejection, criticism of others, harm to others, and loss, each assessed with 4 items. For this study, children were prompted to think about their three 'biggest problems' during the previous month. Then children provided a single rating of how much they thought each thought when faced with those problems (0 = not at all to 3 = most of the time). To address missing data, scores were the mean-weighted sum of the 24 items (i.e., if <20% of the items were missing, scores were the mean of the non-missing items multiplied by the total possible number of items on the scale) with $\alpha = .88$.

Pre-attack positive appraisal style was assessed using a measure of challenge and resource appraisals similar to the 'What I Felt Scale' (Lengua & Long, 2002). Seven items assessed challenge appraisals (e.g., 'You thought you would be able to figure the problem out'), and 6 items assessed resource appraisals (e.g., 'You thought about the people/things in your life that could help with the problem'). Children rated how much they thought each thought when faced with the same 'biggest problems' above (0 = not at all to 3 = most of the time). Scores were the mean-weighted sum of the 13 items with $\alpha = .85$.

Coping styles. Pre-attack coping styles were assessed using the Children's Coping Strategies Checklist (Ayers et al., 1996). Children rated how often they used each coping behavior for the same 3 'biggest problems' noted above (0 = not at all to 3 = most of the time). Two coping dimensions were assessed: active (15 items

assessing cognitive decision making, control, direct problem solving, positive cognitive restructuring, optimism, seeking understanding, $\alpha = .90$) and avoidant (12 items assessing cognitive avoidance, avoidant actions, $\alpha = .82$). Scores were the mean-weighted sum of the items on each dimension.

Post-attack measures

Indirect exposure. Indirect exposure to the events of 9/11 was assessed in two ways, knowing someone in or near the attacks and media exposure. Parents reported whether their children knew someone: (1) in New York City or Washington, DC during the attacks ($n = 32$), (2) in the World Trade Center or Pentagon during the attacks ($n = 19$), or (3) who died in the attacks ($n = 3$). Not knowing anyone in or near the attacks was coded 0 ($n = 89$). Knowing someone killed in the attacks was related to PTS (Lengua et al., 2005). However, only 3 children knew someone killed. The 0 to 3 coding was intended to capture the range of children's indirect exposure. Parents also reported on how much 'news or media coverage' about the events children viewed in the week of the attacks, responding with 'hardly at all' ($n = 18$), 'a little' ($n = 51$), 'pretty much' ($n = 39$), or 'a lot' ($n = 35$).

9/11-specific appraisal and coping. 9/11-specific appraisal and coping responses were assessed during the post-attack interview using the identical measures of appraisal and coping styles described above. However, instead of prompting children to recall their 'biggest problems,' children were prompted to think about the events of 9/11 ('When you thought about the terrorist attacks, how much did you ...'). Alphas for 9/11-specific threat and positive appraisal were .82 and .87, respectively. Alphas for 9/11-specific active and avoidant coping were .90 and .84, respectively.

PTS. PTS symptoms were assessed with the 17-item Child PTSD Symptom Scale (CPSS; Foa et al., 2001) which assesses DSM-IV symptoms of PTS, including re-experiencing (5 items, 'having upsetting thoughts or images about the event...'), avoidance (7 items, 'trying

not to think about, talk about ... the event'), and arousal (5 items, 'being jumpy or easily startled'). Respondents rated whether the symptom occurred not at all/1 time (0), once a week or less/once in a while (1), 2 to 4 times a week/a lot (2), or 5 or more times a week/almost always (3). The CPSS correlates with an existing PTSD measure and is internally consistent ($\alpha = .89$; Foa et al., 2001). In this study, $\alpha = .82$. In addition, a 7-item scale assesses functional impairment in relationships, schoolwork, chores, and hobbies. Foa et al. report a correlation of .42 between functional impairment and PTS symptoms. In this study, the correlation was .40 ($p < .001$). In this study, children who met criteria consistent with a diagnosis of PTSD more often endorsed at least one indicator of functional impairment (52%) compared to those who did not meet this criteria (15%). They also endorsed more indicators of functional impairment ($M = 1.33$, $SD = 1.93$) than children who did not meet criteria for PTSD ($M = .20$, $SD = .61$; $t = -5.22$, $p < .001$).

Statistical analyses

The hypotheses were tested using multiple regressions. Descriptive data are shown in Table 1. Absolute value of skew ranged from .00 to 4.13. Functional impairment demonstrated the highest level of skewness, reflecting the relatively low level of impairment in this sample. The remaining values of skewness were in the acceptable range. Moderate correlations among the variables suggest potential problems with multicollinearity (see Table 2). However, values of variance inflation factor were acceptable (1.17 to 3.88).

Results

Variable intercorrelations

Child age, time since previous interview, time since 9/11, knowing people in/near the attacks, and media exposure were each correlated with one of the predictor or outcome variables (see Table 2) and were controlled in subsequent regressions. Pre-

Table 1 Descriptive statistics

	M	SD	Min-Max	Skew
Pre-attack:				
Symptomatology	33.58	17.99	4.00-89.00	.63
Stress-load	13.24	5.96	1.00-20.00	.64
Threat appraisal style	8.85	6.84	0.00-31.00	1.05
Positive appraisal style	15.04	6.62	0.00-28.00	-.12
Active coping style	23.60	9.20	1.00-45.00	-.11
Avoidant coping style	17.62	7.05	1.00-36.00	.06
Post-attack:				
Know someone in/near attacks	.55	.80	0.00-3.00	1.24
Media exposure	2.63	.99	1.00-4.00	.00
9/11-specific threat appraisals	1.18	2.95	0.00-20.00	2.41
9/11-specific positive appraisals	20.73	8.77	1.00-39.00	-.01
9/11-specific active coping	32.73	14.98	0.00-69.00	.13
9/11-specific avoidant coping	13.43	7.73	0.00-34.00	.30
PTS symptoms	5.64	5.38	0.00-26.00	1.56
Functional impairment	.36	1.00	0.00-7.00	4.13

Table 2 Correlations among variables

Controls	Age	Time prev.	Time 9/11	Know people	Media	Symptoms	Stress-load	Threat appr.	Pos. appr.	Active cope	Avoid cope
Child age	–	–.04	–.08	–.00	.18*	.04	–.22**	–.13	–.13	–.02	–.19*
Time since previous interview		–	–.20**	.15	.12	.05	.06	.05	.03	.08	.05
Time since 9/11			–	.05	.18*	–.04	.00	–.07	–.01	–.03	–.00
Knowing someone				–	.25**	–.17*	–.07	–.13	–.00	.10	–.04
Media exposure					–	.01	.02	–.06	.01	.03	–.02
Pre-attack symptomatology						–	.15	.30**	.16	–.01	.10
Pre-attack predictors:											
Stress-load							–	.51**	.28**	.15	.33**
Threat appraisal style								–	.27**	.31**	.59**
Positive appraisal style									–	.71**	.49**
Active coping style										–	.57**
Avoidant coping style											–
Post-attack:											
9/11-specific threat appraisal	–.15	–.11	–.09	–.11	–.06	.17*	.24**	.40**	.12	.19*	.26**
9/11-specific positive appraisal	–.01	.02	.03	–.01	–.02	.03	–.06	.01	.24**	.20*	.14
9/11-specific active coping	–.13	.02	–.03	–.08	–.09	.16	–.01	.11	.28**	.20*	.23**
9/11-specific avoidant coping	–.20*	.01	–.06	–.10	–.19*	.12	.23**	.36**	.16	.03	.34**
PTS symptoms	–.22*	.04	–.03	–.03	–.16*	.15	.38**	.37**	.13	.10	.26**
Functional impairment	–.07	–.09	–.06	–.10	–.04	.27**	.17*	.15	.10	–.01	.01

* $p < .05$; ** $p < .01$.

attack symptomatology was related to higher 9/11-specific threat appraisal and functional impairment, and pre-attack stress-load was related to higher 9/11-specific threat appraisal, avoidant coping, PTS, and functional impairment. Pre-attack threat appraisal and avoidant coping style were related to higher 9/11-specific threat appraisal, avoidant coping, and PTS. Pre-attack avoidant coping style was also related to more 9/11-specific active coping. Pre-attack positive appraisal and active coping styles were related positively to 9/11-specific positive appraisal and active coping. Pre-attack active coping style was also positively related to 9/11-specific threat appraisal. These correlations suggest that pre-attack stress-load, appraisals, and coping style were plausible predictors of 9/11-specific appraisals, coping, PTS, and impairment.

Correlations and mean differences across pre-attack appraisal and coping styles and 9/11-specific appraisal and coping were examined to determine the extent of overlap across dispositional (pre-attack) vs. situational (9/11-specific) appraisal and coping. The correlations between pre-attack and 9/11-specific appraisal and coping were modest to moderate (Table 2). There were significant differences across the measures. Pre-attack threat appraisal style ($M = 8.85$, $SD = 6.84$) was significantly higher than 9/11-specific threat appraisal ($M = 1.18$, $SD = 2.95$; $t = 14.60$, $p < .001$). Pre-attack positive appraisal style ($M = 15.04$, $SD = 6.62$) was significantly lower than 9/11-specific positive appraisal ($M = 20.73$, $SD = 8.77$; $t = -7.06$, $p < .001$). Children reported using more active coping following 9/11 ($M = 32.73$, $SD = 14.98$) than with pre-attack stressors ($M = 23.59$, $SD = 9.20$; $t = -6.84$, $p < .001$). Children also reported using less avoidant coping following 9/11 ($M = 13.43$, $SD = 7.73$) than with pre-attack stressors

($M = 17.62$, $SD = 7.05$; $t = 5.90$, $p < .001$). Moderate correlations and significant differences between pre-attack and 9/11-specific appraisal and coping suggested that the 9/11-specific appraisal and coping responses were differentiated from pre-attack appraisal and coping styles.

Pre-attack predictors of 9/11-specific appraisal and coping

Pre-attack stress load, threat appraisal and avoidant coping style were expected to predict higher levels of 9/11-specific threat appraisal and avoidant coping. Pre-attack positive appraisal and active coping style were expected to predict higher levels of 9/11-specific positive appraisal and active coping. These hypotheses were tested using multiple regressions (see Table 3). Child age, gender, time since the pre-attack interview, time between 9/11 and the post-attack interview, and pre-attack symptomatology were entered in the first step. Time since the pre-attack interview and time since 9/11 were included to control for variability in the timing of interviews. Older children reported lower 9/11-specific threat appraisals and avoidant coping. Gender, time since the pre-attack interview and time since 9/11 were unrelated to 9/11-specific appraisal and coping. Pre-attack symptomatology was related to greater threat appraisal. Measures of indirect exposure were entered in the second step. More media exposure was related to less avoidant coping.

Pre-attack stress-load was entered in the third step and significantly predicted higher 9/11-specific threat appraisals and avoidant coping. Pre-attack appraisal and coping styles were entered in the fourth step. Pre-attack threat appraisal style predicted greater 9/11-specific threat

Table 3 Pre-attack stress-load, appraisal and coping predicting 9/11-specific appraisals and coping

Predictors	9/11-specific							
	Threat appraisal		Positive appraisal		Active coping		Avoidant coping	
	β	ΔR^2	β	ΔR^2	β	ΔR^2	β	ΔR^2
Step 1: Controls		.09*		.02		.05		.08*
Age	-.19*		.01		-.12		-.22**	
Gender ¹	.06		-.11		-.06		.10	
Time since previous interview	-.15		.01		-.03		-.02	
Time since 9/11	-.12		.01		-.05		-.09	
Pre-attack Symptomatology	.18*		.05		.17		.12	
Step 2: Indirect exposure		.00		.00		.01		.04*
Knowing someone	-.05		.03		-.01		-.03	
Media exposure	.02		-.06		-.10		-.19*	
Step 3: Pre-attack stress-load	.19*	.03*	-.01	.00	-.01	.00	.20*	.03*
Step 4: Pre-attack appraisal and coping		.10**		.10**		.11*		.12**
Threat appraisal style	.30*		-.12		-.08		.19	
Positive appraisal style	-.17		.24*		.22		.14	
Active coping style	.21		.04		.01		-.29*	
Avoidant coping style	-.00		.15		.20		.32**	

¹Girl = 1, boy = 2. * $p < .05$; ** $p < .01$.

appraisal. Pre-attack positive appraisal style predicted greater 9/11-specific positive appraisal. Pre-attack active and avoidant coping styles predicted less and more use of 9/11-specific avoidant coping, respectively.

Pre-attack and 9/11-specific predictors of PTS and impairment

Pre-attack stress load, threat appraisal and avoidant coping style were expected to predict higher PTS, whereas pre-attack positive appraisal and active

coping style were expected to predict lower PTS. Also, 9/11-specific threat appraisal and avoidant coping were expected to predict higher PTS, and 9/11-specific positive appraisal and active coping were expected to predict lower PTS. Tests of these hypotheses are presented in Table 4.

Child age, gender, time since the pre-attack interview, time since 9/11, and pre-attack symptomatology were entered in the first step. Older children reported fewer PTS symptoms. Pre-attack symptomatology was related to higher PTS and greater functional impairment. Measures of indirect

Table 4 Pre-attack stress-load, appraisal and coping, and 9/11-specific appraisal and coping predicting PTS symptoms and impairment

Predictors	PTS symptoms			Functional impairment		
	β at entry	ΔR^2	β last step	β at entry	ΔR^2	β last step
	Step 1: Control variables		.08			.10*
Age	-.23**		-.02	-.09		-.00
Gender ¹	-.05		-.14	.02		-.04
Time since previous interview	.02		.07	-.12		-.06
Time since 9/11	-.05		.04	-.08		-.04
Pre-attack symptomatology	.18*		.02	.27**		.18*
Step 2: Indirect exposure		.01			.00	
Knowing someone	.02		.07	-.04		-.01
Media exposure	-.12		-.09	.01		-.00
Step 3: Pre-attack stress-load	.35**	.11**	.21*	.15	.02	.10
Step 4: Pre-attack appraisal/coping		.03			.01	
Threat appraisal style	.21*		.04	.09		-.04
Positive appraisal style	-.03		-.00	.10		.17
Active coping style	-.05		-.03	-.05		-.12
Avoidant coping style	.08		-.01	-.15		-.16
Step 5: 9/11-specific appraisal/coping		.17**			.12**	
Threat appraisal	.34**		-	.39**		-
Positive appraisal	-.11		-	.03		-
Active coping	.07		-	-.04		-
Avoidant coping	.29**		-	.05		-

¹Girl = 1, boy = 2. * $p < .05$; ** $p < .01$.

exposure were entered in the second step and were unrelated to PTS or impairment.

Pre-attack stress-load was entered in the third step and predicted higher PTS but not functional impairment. Pre-attack appraisal and coping styles were entered in the fourth step. Pre-attack threat appraisal style predicted higher PTS. Pre-attack positive appraisal, active and avoidant coping styles were unrelated to PTS. Pre-attack appraisal and coping styles did not predict functional impairment.

9/11-specific appraisal and coping were entered in the fifth step. 9/11-specific threat appraisal predicted higher PTS and functional impairment. 9/11-specific avoidant coping predicted higher PTS.

Indirect effects of pre-attack predictors through 9/11-specific appraisal and coping

Finally, 9/11-specific appraisal and coping were expected to mediate the effects of pre-attack stress-load, appraisal and coping styles on PTS. Using the distribution of products ($Z_\alpha Z_\beta$; McKinnon, Lockwood, Hoffman, West, & Sheets, 2002), tests of indirect or mediated effects were conducted when a pre-attack variable predicted PTS and also 9/11-specific appraisal or coping. Pre-attack stress-load was related to higher PTS and also predicted 9/11-specific threat appraisal and avoidant coping. The association between pre-attack stress-load and PTS symptoms was reduced, although still significant, when 9/11-specific threat and avoidant coping were taken into account (Table 4). There were significant indirect effects of pre-attack stress-load on PTS through 9/11-specific threat appraisal ($Z_\alpha Z_\beta = 8.40$, $p < .01$) and avoidant coping ($Z_\alpha Z_\beta = 5.22$, $p < .05$). Pre-attack threat appraisal style was related to higher PTS and also predicted 9/11-specific threat appraisal. The association between pre-attack threat appraisal style and PTS was reduced and became non-significant when 9/11-specific threat appraisal was taken into account. There was a significant indirect effect of pre-attack threat appraisal style on PTS through 9/11-specific threat appraisal ($Z_\alpha Z_\beta = 9.67$, $p < .01$). Although pre-attack active and avoidant coping style were related to 9/11-specific avoidant coping, they were not significantly related to PTS, so tests of mediation were not applicable.

Discussion

Understanding pre-disaster predictors of disaster responses is critical for understanding the etiology of PTS symptoms and for developing interventions for children who experience distress following a disaster. This study demonstrated that pre-attack stress-load, appraisal and coping styles predicted 9/11-specific appraisal and coping, which in turn, predicted PTS. Prospective longitudinal data allowed us to examine pre- and post-disaster predictors of children's PTS

and to distinguish between dispositional and situational appraisal and coping responses. There were several important findings. First, appraisals and coping predicted children's PTS above prior levels of symptomatology, providing robust evidence that they contribute uniquely to PTS. Second, both dispositional pre-attack appraisal and coping styles and situational 9/11-specific appraisal and coping contributed to PTS. Third, 9/11-specific appraisal and coping mediated the effects of pre-attack stress-load and threat appraisal style, highlighting a potential mechanism in the emergence of PTS.

It is useful to note that dispositional and situation-specific measures of appraisal and coping were distinct. Children reported less threat and avoidance and more positive appraisal and active coping specific to 9/11. These seemingly more adaptive responses likely reflected the fact that children experienced the disaster indirectly. If children had experienced the disaster directly, more threat appraisals and avoidance might have been reported. Also, the measures of appraisal and coping were not disaster-specific. Therefore, some of the items were not directly relevant to the experience of a disaster (e.g., 'You thought that someone you like didn't want to spend time with you'). However, it was important to use the same measure pre- and post-disaster to adequately compare dispositional and situation-specific coping and examine their relative contribution. Consistent with previous findings, both dispositional and situation-specific coping played a role in children's symptoms (e.g., Bouchard et al., 2004).

Pre-attack appraisals and coping styles predicted 9/11-specific appraisal, coping, and PTS. Children who tended to perceive threat from stressors prior to 9/11 were more likely to perceive threat from the 9/11 attacks and experienced more PTS symptoms. Children who tended to perceive stressors as challenges and themselves as having resources for dealing with stressors were more likely to positively appraise the 9/11 attacks. In addition, the tendency to use active or avoidant coping prior to 9/11 was related to a reduced or increased likelihood, respectively, to use avoidant coping in response to the attacks. However, once 9/11-specific appraisal and coping were taken into account, pre-attack appraisal and coping style were no longer related to PTS. Pre-attack threat appraisal and avoidant coping styles were indirectly related to PTS through 9/11-specific appraisal and coping. These findings suggest that maladaptive appraisal and coping styles may lead to stable patterns of problematic stress responses (Compas et al., 2001), increasing the likelihood that a child will poorly manage the stress associated with a disaster when it occurs.

Similarly, pre-attack stress-load predicted 9/11-specific threat appraisal, avoidant coping, and PTS. Experiencing more stressors in the previous year increased the likelihood of maladaptive appraisal and coping responses to the 9/11 attack, which in

turn, predicted higher PTS. Children may feel embattled by previous stressors and attempt to set aside the added distress from the disaster, rendering them more susceptible to PTS. Taken together, pre-disaster stress-load, appraisal, and coping styles are important predictors of adaptive or maladaptive responses to a disaster.

PTS symptoms were related to greater functional impairment. However, only pre-attack symptomatology and 9/11-specific threat appraisals predicted functional impairment. It seems apparent that children who have more pre-existing symptomatology will report more social, academic, and family impairments. However, above that, children appraising the events of 9/11 as threatening were also more impaired. This is consistent with previous research indicating that perceptions of threat from a disaster relate to greater distress (Kiser et al., 1993).

The findings that 9/11-specific appraisal and coping predicted PTS are consistent with past research on appraisals and coping following disasters (e.g., Jeney-Gammon et al., 1993; La Greca et al., 1996; Silver et al., 2002). In particular, the perception of threat (e.g., Kiser et al., 1993; Saylor et al., 2003) and avoidant coping predict more severe distress (e.g., Asarnow et al., 1999; Silver et al., 2002). Clearly, there is overlap between avoidant coping and the avoidant cluster symptoms of PTS. Nonetheless, these findings suggest that a dispositional avoidant coping style contributes to event-specific avoidant responses, whether they are conceptualized as coping or PTS symptoms. The findings of this study are unique in showing that dispositional pre-attack threat appraisal and avoidant coping style contribute to disaster-specific threat and avoidance. In addition, the findings that threat appraisals together with avoidance predicted PTS support models for the emergence of PTS, indicating that PTS symptoms arise from a combination of attention to threat cues and incomplete cognitive processing (Foa et al., 1989). Thus, coping interventions might aim to reduce threat appraisals and promote active coping with event-related threats.

There were several limitations in this study. Most measures were completed by children, making shared method variance a problem. However, the constructs assessed require that children report on their own experiences and coping efforts. In addition, PTS symptoms were assessed two to nine weeks following 9/11, reflecting acute responses. PTS was not assessed subsequently. Therefore, the role of appraisal and coping in persistent PTS symptoms cannot be examined. Caution should be used in generalizing the findings to children directly affected by a disaster, because appraisal and coping might differ under conditions of greater distress and disruption. However, mental health professionals should be aware of the effects of disasters on those experiencing them *indirectly*, given this represents a vast majority of children's experiences of these

events. Finally, our measures of indirect exposure were limited. Assessment of media exposure was limited by the response scale, which was a Likert rating rather than a quantitative assessment of hours and type of exposure. Also, knowing someone in or near the attacks was not as relevant as knowing someone killed in the attacks. However, only three children knew someone who died. These limitations probably account for the lack of association between indirect exposure and PTS that previously has been demonstrated. Nonetheless, the examination of pre-attack stress-load, appraisal, and coping styles, along with 9/11-specific appraisal and coping, provides robust evidence of the roles of stress-load, appraisal and coping in predicting PTS.

Results of this study support models of the development of PTS, highlighting the roles of negative cognitions and avoidance. In addition, the findings point to targets of intervention, indicating that facilitation of positive re-appraisals and active processing of threats might mitigate PTS and functional impairment in distressed children following a disaster.

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References

- Achenbach, T.M. (1991). *Manual for the Child Behavior Checklist and Revised Child Behavior Profile*. Burlington, VT: University of Vermont, Department of Psychiatry.
- Ali, T., Dunmore, E., Clark, D., & Ehlers, A. (2002). The role of negative beliefs in posttraumatic stress disorder: A comparison of assault victims and non victims. *Behavioral and Cognitive Psychotherapy*, 30, 249–257.
- Asarnow, J., Glynn, S., Pynoos, R.S., Nahum, J., Guthrie, D., Cantwell, D.P., & Franklin, B. (1999). When the earth stops shaking: Earthquake sequelae among children diagnosed for pre-earthquake psychopathy. *Journal of the American Academy of Child and Adolescent Psychiatry*, 38, 1016–1023.

- Ayers, T.S., Sandler, I.N., West, S.G., & Roosa, M.W. (1996). A dispositional and situational assessment of children's coping: Testing alternative models of coping. *Journal of Personality, 64*, 923-958.
- Bouchard, G., Guillemette, A., & Landry-Leger, N. (2004). Situational and dispositional coping: An examination of their relation to personality, cognitive appraisals, and psychological distress. *European Journal of Personality, 18*, 221-238.
- Cantor, J., Mares, M.L., & Oliver, M.B. (1993). Parents' and children's emotional reactions to TV coverage of the Gulf War. In B.S. Greenberg, & W. Gantz (Eds.), *Desert Storm and the mass media* (pp. 325-340). Cresskill, NJ: Hampton Press.
- Compas, B.E., Connor-Smith, J.K., Saltzman, H., Thomsen, A.H., & Wadsworth, M.E. (2001). Coping with stress during childhood and adolescence: Problems, progress, and potential in theory and research. *Psychological Bulletin, 127*, 87-127.
- Dixon, P., Rehling, G., & Sciwach, R. (1993). Peripheral victims of the Herald of Free Enterprise disaster. *British Journal of Medical Psychology, 66*, 193-202.
- Ehlers, A., & Clark, D.M. (2000). A cognitive model of posttraumatic stress disorder. *Behavior Research and Therapy, 38*, 319-345.
- Fairbrother, G., Stuber, J., Galea, S., Fleischman, A.R., & Pfefferbaum, B. (2003). Posttraumatic stress reactions in New York City children after the September 11, 2001, terrorist attacks. *Ambulatory Pediatrics, 3*, 304-311.
- Foa, E.B., Johnson, K.M., Feeny, N.C., & Treadwell, K.R.H. (2001). The Child PTSD Symptom Scale (CPSS): A preliminary examination of its psychometric properties. *Journal of Community Psychology, 30*, 376-384.
- Foa, E.B., Steketee, G., & Rothbaum, B.O. (1989). Behavioral/cognitive conceptualization of PTSD. *Behavior Therapy, 20*, 155-176.
- Galea, S., Ahern, J., Resnick, H., Kilpatrick, D., Bucuvalas, M., Gold, J., & Vlahov, D. (2002). Psychological sequelae of the September 11 terrorist attacks in New York City. *New England Journal of Medicine, 346*, 982-987.
- Jeney-Gammon, P., Daugherty, T.K., Finch, A.J., Belter, R.W., & Foster, K.Y. (1993). Children's coping styles and report of depressive symptoms following a natural disaster. *Journal of Genetic Psychology, 154*, 259-267.
- Jerusalem, M. (1993). Personal resources, environmental constraints, and adaptational processes: The predictive power of a theoretical stress model. *Personality and Individual Differences, 14*, 15-24.
- Kiser, L., Heston, J., Hickerson, S., Millsap, P., Nunn, W., & Pruitt, D. (1993). Anticipatory stress in children and adolescents. *American Journal of Psychiatry, 150*, 87-92.
- La Greca, A.M., Silverman, W.K., Vernberg, E.M., & Prinstein, M.J. (1996). Symptoms of posttraumatic stress in children after Hurricane Andrew: A prospective study. *Journal of Consulting and Clinical Psychology, 64*, 712-723.
- Laor, N., Wolmer, L., Kora, M., Yucel, D., Spirman, S., & Yazgan, Y. (2002). Posttraumatic, dissociative and grief symptoms in Turkish children exposed to the 1999 earthquakes. *Journal of Nervous and Mental Disorders, 190*, 824-832.
- Lazarus, R., & Folkman, S. (1984). *Stress, appraisal, and coping*. New York: Springer.
- Lengua, L.J., & Long, A.C. (2002). The role of emotionality and self-regulation in the appraisal-coping process: Tests of direct and moderating effects. *Journal of Applied Developmental Psychology, 23*, 471-493.
- Lengua, L.J., Long, A.C., Smith, K.I., & Meltzoff, A.N. (2005). Pre-attack symptomatology and temperament as predictors of children's responses to the September 11, 2001 terrorist attacks. *Journal of Child Psychology and Psychiatry, 46*, 631-645.
- Lonigan, C.J., Shannon, M.P., Finch, A.J., & Daugherty, T.K. (1991). Children's reactions to a natural disaster: Symptom severity and degree of exposure. *Advances in Behavior Research and Therapy, 13*, 135-154.
- McKinnon, D.P., Lockwood, C.M., Hoffman, J.M., West, S.G., & Sheets, V. (2002). A comparison of methods to test mediation and other intervening variable effects. *Psychological Methods, 7*, 83-104.
- Pfefferbaum, B., Gurwitsch, R.H., McDonald, N.B., Leftwich, M.J., Sconzo, G.M., Messenbaugh, A.K., & Schultz, R.A. (2000). Posttraumatic stress among young children after the death of a friend or acquaintance in a terrorist bombing. *Psychiatric Services, 51*, 386-388.
- Pfefferbaum, B., Nixon, S.J., Tivis, R.D., Daugherty, D.E., Pynoos, R.S., Gurwitsch, R.H., & Foy, D.W. (2001). Television exposure in children after a terrorist incident. *Psychiatry, 64*, 202-211.
- Sandler, I.N., Ramirez, R., & Reynolds, K.D. (1986, August). *Life stress for children of divorce, bereaved, and asthmatic children*. Paper presented at the annual meeting of the American Psychological Association, Washington, DC.
- Saylor, C.F., Cowart, B.L., Lipovsky, J.A., Jackson, C., & Finch, A.J. (2003). Media exposure to September 11: Elementary school students' experiences and posttraumatic symptoms. *American Behavioral Scientist, 46*, 1622-1642.
- Sheets, V., Sandler, I.N., & West, S.G. (1996). Appraisals of negative events in preadolescent children of divorce. *Child Development, 67*, 2166-2182.
- Silver, R.C., Holman, E.A., McIntosh, D.N., Poulin, M., & Gil-Rivas, V. (2002). Nationwide longitudinal study of psychological responses to September 11. *Journal of the American Medical Association, 288*, 1235-1244.
- Stein, B.D., Jaycox, L.H., Elliott, M.N., Collins, R., Berry, S., Marshall, G.N., Klein, D.J., & Schuster, M.A. (2004). The emotional and behavioral impact of terrorism on children: Results from a national survey. *Applied Developmental Science, 8*, 184-194.
- Terr, L.C., Bloch, D.A., Michel, B.A., Shi, H., Reinhardt, J.A., & Metayer, S. (1999). Children's symptoms in the wake of the Challenger: A field study of distant-traumatic effects and an outline of related conditions. *American Journal of Psychiatry, 156*, 1536-1544.
- Wadsworth, M.E., Gundmundsen, G.R., Raviv, T., Ahlqvist, J.A., McIntosh, D.N., Kline, G.H., Rea, J., & Burwell, R.A. (2004). Coping with terrorism: Age and gender differences in effortful and involuntary responses to September 11th. *Applied Developmental Science, 8*, 143-157.