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Parent-reported behavioral and emotional responses of children to disaster and parental psychopathology

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Abstract

Child disaster mental health research has been largely limited by investigation of one disaster at a time and inconsistent methods across different studies. This study assessed 160 survivors of 3 disasters with structured diagnostic interviews, asking about the behavioral and emotional disaster reactions their 266 children of ages 3-17. Most children had 1 postdisaster behavior change or disaster-related posttraumatic stress symptom. The children's postdisaster behavioral and emotional problems were associated with parental postdisaster psychopathology. The results underscore the importance of asking disaster survivors about their children's disaster reactions and considering parental disaster experiences and reactions in addressing their children's reactions.

Keywords

disaster mental health; children; parents; psychiatric disorder; structured diagnostic interview

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Introduction

Disasters can have profound effects on children, including behavioral and emotional problems and functional impairment in a variety of settings such as home and school (Usami et al. 2014). A recent review by Cobham and colleagues (2016) has identified a number of methodological shortcomings in research on disaster mental health effects on children, including failure to examine postdisaster change in variables of interest, inability to infer causality and lack of consideration of bidirectional influences from cross-sectional studies, reliance on single informants (parent or child) in observational designs, and lack of consideration of parental distress on child outcomes.

Previous studies have examined the types of mental health problems that children may experience in relation to disaster exposure. A recent review of mental health consequences of disaster in children reported that common postdisaster psychiatric disorders in children include posttraumatic stress disorder (PTSD), acute stress disorder, depression, panic disorder, phobias, anxiety disorders specific to childhood, and adjustment disorder (Kar 2009). This review summarized the postdisaster prevalence of PTSD as ranging from 5%-43%, with higher rates in man-made disasters than in natural disasters. Reviews by Pfefferbaum and colleagues (Pfefferbaum et al. 2015b; Pfefferbaum et al. 2015a) identified lower socioeconomic status, pre-existing vulnerabilities or psychopathology, ethnic minority membership, sex (internalizing symptoms for girls and externalizing symptoms for boys), secondary adversities, high parental stress, poor parental coping, and overly restrictive parenting styles to be associated with greater distress in the children.

Recent research has highlighted the importance of examining outcomes by gender and age of the children (Usami et al. 2014). There are some indications that gender associations in emotional reactions to trauma may differ across age groups, but not enough studies including children across broad age ranges have been conducted to definitively test the possibility that gender differences may arise during important developmental stages such as puberty (Alisic et al. 2014; Usami et al. 2014).

Pfefferbaum and colleagues (2012) stressed the value of obtaining collateral information on disaster-exposed children from their parents, who are better than children themselves at reporting externalizing behaviors (Pfefferbaum et al. 2013; Pfefferbaum, Noffsinger, and Wind 2012). Assessment of parental mental health may enhance the understanding of children's disaster reactions (Cobham et al. 2016). The small amount of existing research on the context of children's disaster mental health outcomes in relation to their parents' mental health and behavior has been limited by major methodological issues (Cobham et al. 2016). Therefore, little is known about the relation of parental psychopathology to child mental health and behavior in response to disaster exposure. Research in this area is important to guide interventions to modify parents' mental health and parenting styles.

Most child disaster studies have investigated one disaster at a time, with varied methods across studies that yield inconsistent findings or even preclude comparisons among studies (Alisic et al. 2014). The use of well-established structured diagnostic interviews has been recognized for providing valid and reliable diagnoses that can be compared across studies

with confidence (Alisic et al. 2014). Opportunities to compare findings among diverse disasters studied with consistent methods and to generalize from the collective findings are rare and have been conducted only with adult survivors (North, Oliver, and Pandya 2012).

To examine a wide age range of children's disaster reactions in the context of their parents' postdisaster mental health across a wide age range and different disasters, this study analyzed a database collected from survivors of three different disasters about their children. This research addresses specific methodological shortcomings identified by Cobham et al. (2016) by examining postdisaster change in parental psychopathology and its association with child outcomes, using consistent research methods including structured diagnostic interviews of the parents and parent report of their children's behavioral and emotional disaster sequelae at home and at school. Although the original studies were broad investigation of effects of disasters on survivors and their family members, the aim of the analyses for this article was specifically to examine predictors of child postdisaster behavioral and emotional problems in relation to parental psychopathology in the context of other major predictors.

Methods

Sample

Adult survivors from three disasters were interviewed about their own disaster-related mental health and their children's experience using systematic research interviews conducted an average of 3 to 6 months after the disaster. One of the three disasters was a 6.7-Richter earthquake in Northridge, CA in 1994 that produced the most severe ground motions ever recorded in a North American City at the time, resulting in 72 fatalities (McMillen, North, and Smith 2000). Another disaster was a terrorist bombing of the Murrah federal building in Oklahoma City, OK, representing the most severe act of terrorism on American sample to date, resulting in 167 fatalities (North et al. 1999). A third disaster involved severe flooding in St. Louis, MO, known as the "Great Midwestern Floods of 1993" that resulted in 25 fatalities and destroyed 5,000 homes (North et al. 2004). The rationale for combining the data from these three disasters is that they were all severe disasters with multiple fatalities and the data in all of the sites were collected using consistent methodology by one research team.

The Northridge earthquake (n=127) and St. Louis flood (n=162) studies used volunteer samples recruited through a mailing to 500 randomly selected home addresses of the residential areas that were damaged in both sites. The Oklahoma City bombing study sample (n=182) included 255 individuals randomly selected from the state health department registry of 1,092 survivors with a 71% participation rate. Only one adult survivor was interviewed per household in the Northridge earthquake and St. Louis flood samples, using a random sampling method for selection of the household member; in the Oklahoma City bombing study sample, no two participants lived in the same household. Of the combined sample of 471 survivors of these three disasters, 160 reported that they had at least one child between ages 3 and 17, constituting a total of 266 children. The final sample for the analysis of the child data represents these 266 children with data provided by their 160 parents in interviews of the parents.

The data on the children provided for this article are presented for each individual child. Because some parents provided data for more than one child, the total number of parents represented in the tables is 266 (one for each child in the sample), not 160 (the total number of parents with at least one child in this study).

Assessment tools

The Diagnostic Interview Schedule for *DSM-III-R* (DIS) (Robins et al. 1989) was used to assess the adult disaster survivors (i.e., the parents of the children who are the focus of these analyses) for predisaster and postdisaster psychiatric disorders, including PTSD, major depressive disorder, panic disorder, generalized anxiety disorder, alcohol use disorder, and drug use disorder. The Diagnostic Interview Schedule has well-established validity and reliability (Ross et al. 1995; Erdman et al. 1987; Goethe and Ahmadi 1991; Wittchen, Semler, and von Zerssen 1985; Eaton et al. 2000) and a long history of use in disaster research (Smith et al. 1986a; Robins et al. 1986a; Smith and North 1993). Parent diagnoses provided by this interview reported in this study are represented by dichotomous variables for disaster-related PTSD and for the presence/absence of any postdisaster disorder.

The Disaster Supplement to the DIS (North et al. 2001) is a structured interview administered to the parent to collect data about the survivors' disaster experience and their demographic information. This instrument has a long history of successful use in disaster studies (Smith et al. 1986b; Robins et al. 1986b; North, Oliver, and Pandya 2012). As part of the Disaster Supplement, participants were asked about their children, obtaining data about each child's age, sex, disaster-related experiences, behavior changes after the disaster (8 yes/no items) representing behavioral outcomes, disaster-related posttraumatic stress symptoms (5 yes/no items) representing emotional outcomes, and a decline in school grades after the disaster (yes/no) representing a functional outcome. Summary variables reflecting the total count of positive responses were created for child behavior changes after the disaster and child disaster-related posttraumatic stress symptoms; the Cronbach's alpha value for these items together was .79.

Data analysis

SAS version 9.4 (SAS Institute, Cary, NC) was used for statistical analysis. Results are presented with raw numbers and proportions, means, and standard deviations (SD). Dichotomous variables were compared using 2-sided χ^2 tests, and differences between dichotomous variables were established using McNemar's tests. A dichotomous variable was created from the child age variable to signify adolescents (ages 13-17) vs. younger children (ages 3-12).

Multivariate models were created to predict various child outcomes (dependent variable, one per model) from a list of independent covariates simultaneously entered into the model, including demographic and disaster-related variables and parent postdisaster psychiatric disorder, addressing the study's main aim. These models used the generalized linear mixed models (GLMM) procedures in SAS (PROC GLIMMIX) with a SOLUTION option for fixed effects in the model statement, which linked children within families using a family ID specifier in a RANDOM statement. Because PROC GLIMMIX does not provide model

variance explained (R^2), PROC MIXED was used to derive the sum of squared residuals from the full model (SSE) and the sum of squared deviations from the mean of the intercept-only model (SSTOT), and R^2 was calculated as $R^2=1-SSE/SSTOT$. The variable representing the specific disaster was not included in the models in part because of excessive variance inflation, but other variables associated with the specific disaster, such as presence of child at the disaster and disaster-related school absence, were included to control for effects within different disasters. Variance inflation testing using the/VIF function of PROC REG was conducted to ensure an acceptable level of multicollinearity (generally <1.8) among the independent variables included in the models. Independent covariates that were not significantly associated with the outcome in any of the models were removed from them.

The final multivariate models predicting number of postdisaster behavior changes and number of disaster-related posttraumatic stress symptoms included child age group, child sex, number of children in household, parent sex, disaster-related school absence, and parent postdisaster psychiatric disorder as independent variables. The model predicting postdisaster decline in school grades contained all the above independent covariates plus the number of child postdisaster behavior changes and number of disaster-related posttraumatic stress symptoms.

Results

Sample characteristics

The sample consisted of 266 children from 160 families. The study participants with child data were significantly more likely to be married (78% vs. 63%; $\chi^2=10.74$, $p=.001$) and younger (mean years of age=41.7, $SD=9.7$ vs. mean=51.7, $SD=15.0$; $t=8.75$, $p<.001$) compared to those without child data. Participants with vs. without child data did not differ significantly by sex, race/ethnicity, or level of education.

Table 1 presents information detailing the characteristics of the sample. The sample of children was approximately half male with a mean (SD) age of 10.5 (4.3). The mean (SD) number of children in a family was 2.1 (0.9), ranging from one to four. About half of the children were present at the disaster, and about one in five were separated from their survivor parent because of the disaster, for a median of 10 days. Approximately one-fourth of the children missed school because of the disaster, a mean (SD) of 2.1 (4.8) days and a maximum of 30 days. Parent variables in Table 1 refer to characteristics of the parent interviewed about each child, with parents with more than one child being represented repeatedly across children of the same family in the dataset. Therefore, the 160 parents providing data on children in this study are represented as 266 parents of the children in the study. Among these represented parents, mothers predominated over fathers, and the mean (SD) parent age was 41.1 (8.9). The represented parents were overwhelmingly white and predominantly married and employed, and about one-fourth were college-educated, with a mean (SD) number of years of education (counting General Equivalency Degree as 12) of 13.5 (2.2). Nearly half (45%) of the represented parents had a postdisaster disorder, significantly more among mothers than fathers (McNemar $S=35.50$, $p<.001$). PTSD was the most prevalent postdisaster disorder (31%) among the represented parents.

The children of the Northridge earthquake were younger (mean=9.2, SD=4.8 vs. mean=10.7, SD=4.2; $t=2.19$, $p=.030$) and the children of the OKC bombing were older (mean=11.2, SD=4.3 vs. mean=9.9, SD=4.2; $t=2.33$, $p=.021$) than the rest of the children. The Northridge and St. Louis disaster samples had a higher proportion of children present at the disaster compared to the rest of the sample (Northridge: 96% vs. 39%; $\chi^2=49.52$, $p<.001$; St. Louis: 79% vs. 28%; $\chi^2=64.54$, $p<.001$), and almost no children were present at the OKC bombing (1% vs. 84% of the remainder; $\chi^2=178.30$, $p<.001$). The children of the Northridge earthquake were more likely (76% vs. 20%; $\chi^2=55.99$, $p<.001$) and the children of the OKC bombing were less likely (18% vs. 39%; $\chi^2=14.31$, $p<.001$) to miss school because of the disaster. Parent disaster-related PTSD and any postdisaster disorder prevalence did not differ significantly by disaster sample.

Child outcomes

As shown in Table 2, nearly three-fourths of the children in the sample had at least one postdisaster behavior change as reported by their parent. Nearly half of the children were described as more clingy to adults and more fearful, and more than one-fourth had increased aggression, more trouble sleeping, and complaints of stomachaches or headaches. At least one disaster-related posttraumatic stress symptom was reported in more than three-fourths of the children. The children's posttraumatic stress symptoms included talking about the disaster in half and being upset or worried by disaster reminders in nearly half, as well as disaster-related game playing or picture drawing, disaster-related dreams or nightmares, and avoidance of thinking about the disaster in more than one-fourth. The number of postdisaster behavior changes was strongly correlated with the number of disaster-related posttraumatic stress symptoms ($r=.50$, $p<.001$). Most (88%, 233/266) of the children had at least one postdisaster behavior change or disaster-related posttraumatic stress symptom and the mean (SD) of these items was 3.9 (3.0). Few children were reported to have a postdisaster drop in school grades.

Predictors of child outcomes

Table 3 addresses the study's main aim to examine predictors of child postdisaster behavioral and emotional problems in relation to parental psychopathology in the context of other major predictors by presenting results of three multivariate models separately predicting child postdisaster behavior changes, disaster-related posttraumatic stress symptoms, and postdisaster drop in grades respectively (one dependent variable per model). Race/ethnicity, marital status, sex, and college education of the parent; child disaster trauma exposure; and child separation from the parent because of the disaster were not associated with the dependent variables in any of these models and were thus not included in the final models. Only the independent variables that were significantly associated with the dependent variable in the models are included in the table. In the first model, number of postdisaster behavior changes was significantly associated with younger children and fewer children in the household, and positively associated with disaster-related school absence and a postdisaster psychiatric disorder in the mother. In the second model, number of disaster-related posttraumatic stress symptoms was significantly associated with younger children and positively associated with female sex of the parent, disaster-related school absence, and a postdisaster psychiatric disorder in the father. In the third model, postdisaster drop in

grades was significantly associated with male sex of the child and a postdisaster psychiatric disorder in the mother. A separate model (not shown) substituting child age for the dichotomous older child variable also showed that postdisaster drop in grades was associated with older age of the child ($t=2.90$, $p=.005$).

Discussion

These results augment the extant literature with information from parent survivors three disasters using consistent methods. All parents and about half of the children in this study were directly exposed to disaster, with nearly half of the parents developing a postdisaster psychiatric disorder and many children experiencing behavioral and emotional effects.

In multivariate models, neither the child's disaster trauma exposure nor separation from the parent in the disaster were associated with child postdisaster behavioral and emotional problems, indicating that the children's adjustment was directly related to other variables. In this study, multivariate analysis clarified that associations of the children's reactions to trauma exposure were overshadowed by other variables, especially parental postdisaster psychopathology in all three multivariate models. A child disaster mental health review (Aptekar and Boore 1990) concluded that children separated from their families in disaster were more symptomatic than other children. In contrast, the non-association of parent/child separation with outcomes in this study may reflect relatively brief parent/child separation that lacked the uncertainty of duration of such separation in other studies such as refugee children. Disaster-related school absence was associated with both postdisaster behavior changes and disaster-related posttraumatic stress symptoms. It may be that parental observation was greater in the children with school absences, prompting parents to notice and report these behaviors and symptoms; that children who missed school developed more behavioral and emotional symptoms in the absence of the structure that school provides; or that the children with the worst disaster trauma exposure and/or more reactions missed more school.

A postdisaster drop in school grades was relatively uncommon despite high rates of disaster-related behavioral and emotional problems, and were not associated with disaster-related school absence or with child disaster-related posttraumatic stress symptoms. Even though postdisaster behavioral and emotional changes were identified in the majority of the children, they were not associated with a postdisaster drop in grades. These encouraging results speak to the resilience of children in the face of disaster. Aptekar and Boore (1990) similarly noted that some studies have found that postdisaster psychopathology in children was not reflected by a decline in their school performance.

The study's findings addressing the main aims underscored the importance of the context of children's disaster outcomes in association with their parents. Parental postdisaster psychopathology was significantly associated with the children's postdisaster behavioral and emotional problems. Consistent with the limited research on this issue, maternal and paternal postdisaster psychopathology may be differentially associated with postdisaster problems in their children (Pfefferbaum et al. 2015b; Kilic, Kilic, and Aydin 2011). Maternal postdisaster psychopathology was associated with the children's postdisaster decline in

school grades, and paternal postdisaster psychopathology was associated with the children's disaster-related posttraumatic stress symptoms. Mothers reported more child disaster-related posttraumatic stress symptoms than did fathers, indicating that parent report of children's disaster reactions also may vary by sex of the parent. It is possible that the association of parental psychopathology with child behavioral and emotional problems in this study could represent a spillover effect of parental problems onto child behavior and conversely from child behavior to parental distress, but it is not possible to draw conclusions about directional causality from these data. Alternatively, the association of parental psychopathology with child behavioral and emotional problems could represent greater sensitivity of these parents to the psychopathology of their children, as suggested by Aptekar and Boore (1990).

Although boys were more likely than girls to evidence a postdisaster drop in school grades, boys and girls did not differ in number of disaster-related behavioral and emotional problems. Relative to younger children, those of roughly prepubertal age and above were reported to have more behavioral and emotional problems but not a postdisaster drop in school grades. However, greater age of the child was significantly associated with a postdisaster drop in school grades, suggesting that school grades are incrementally affected with each successive year of a child's age rather than a post-pubertal phenomenon. It is unclear how the use of parent rather than child self-report may have influenced sex and age findings.

In the current study, fewer postdisaster behavior changes were reported in association with the presence of more children in the family. It is possible that additional support provided by siblings may have stabilized postdisaster behaviors of other children in the family, but it also possible that parents are less able to observe each child's behaviors as closely when there are many children in the household.

This study had a number of strengths. First, data from three disaster studies could be included in one analysis because of the use of consistent methods across studies, providing a relatively large sample of child/parent dyads across a wide range of child ages. The parents were highly exposed to severe disasters, and the children varied from no to high exposure.

Limitations to this study included exclusive reliance on parent report and a lack of diagnostic information on the children. Because the identification of child internalizing disorders (depressive and anxiety disorders) is about twice as frequent using a parent informant than by direct assessment of the child, and externalizing disorders (conduct and oppositional disorders) are about twice as frequent by direct assessment of the child than using a parent informant (Kashani et al. 1985), the child psychopathology in this study could be biased toward internalizing and against externalizing symptoms. This bias may be even greater for older children (Achenbach, McConaughy, and Howell 1987). There is potential confounding of parent report of the child's reactions with the parent's own psychopathology. Only one parent provided child data, and thus maternal and paternal reports could not be compared on the same child. Also, the non-interviewed parent may have psychopathology not measured in this study that may have an important bearing on their children's behavioral and emotional responses to disaster. Because all of the parents were exposed to the disaster

trauma, this variable could not be examined for effects on children. No data were obtained from teachers, who would have been in the best position to report on the children's school behaviors and functioning. There were also no data describing daycare or preschool attendance outcomes for preschool children. Future studies need to interview both parents to provide complete data on the relation of parent and child psychopathology after disaster.

The results of this study underscore the importance of asking survivors about their children's disaster reactions and considering parental disaster experiences and reactions in addressing their children's reactions. Survivors face a number of challenges as they address the consequences of disasters and their own reactions. Concern about their children may create additional burdens for survivors who provide the primary support for their children in general as well as following disasters. The quality of the parent-child relationship influences children's disaster reactions and recovery (Pfefferbaum et al. 2015b). Thus, attention to the reactions and needs of the children of survivors is essential to the care and recovery of both survivors and their children. Disaster survivors should be queried about the exposure, experiences, reactions, and recovery of their family members—especially their children. Specifically, associations of maternal psychopathology with new child behavioral problems and decline in school grades after disaster and also associations of paternal psychopathology with child disaster-related posttraumatic stress symptoms suggest need for inclusion of both parents in interventions for their children if possible, which may benefit the parents as well as the children. Services should include the capacity to assess and intervene with family members or to refer family members for assessment and services as indicated.

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Table 1

Characteristics of the sample

	Variable value	% (n/N)
Child variables		
Male sex		55 (142/266)
# children ages 3-17 in household	1	31 (82/266)
	2	43 (114/266)
	3	16 (42/266)
	4	11 (28/266)
Child birth order	1	60 (160/266)
	2	29 (78/266)
	3	8 (21/266)
	4	3 (7/266)
Disaster-related variables	Child present at disaster	49 (129/266)
	Disaster separated child from parent	21 (57/266)
	Disaster-related school absence	26 (68/266)
Parent variables		
Male sex		41 (108/266)
Race/ethnicity	White	91 (242/266)
	Black	7 (19/266)
	Hispanic	2 (5/266)
Married status		79 (211/266)
College graduate		26 (70/266)
Currently employed		80 (213/266)
Postdisaster psychiatric disorders	Fathers	10 (27/266)
	Mothers	35 (92/266)

Table 2

Child disaster-related findings

	% (n/N)	Mean (SD), range
Postdisaster behavior changes		
More fearful	44 (118/266)	
More clingy to adults	46 (122/266)	
More socially withdrawn	12 (32/266)	
More aggressive	27 (71/266)	
Trouble sleeping	31 (82/266)	
Frequent nightmares	18 (49/266)	
Complaints of stomachaches or headaches	27 (70/266)	
Regressed behavior (i.e., thumbsucking, bedwetting)	12 (33/266)	
<i>Any of the above</i>	72 (192/266)	2.2 (2.1), 0-8
Disaster-related posttraumatic stress symptoms		
Dreams or nightmares about the disaster	26 (66/258)	
Played games or drawn pictures about the disaster	31 (82/265)	
Becomes upset or worried by reminders about the disaster	44 (116/265)	
Spontaneously talks about the disaster	50 (133/266)	
Avoids thinking about or feeling upset about the disaster	26 (67/256)	
<i>Any of the above</i>	77 (205/266)	1.7 (1.4), 0-5
Postdisaster drop in school grades	15 (39/266)	

Three multivariate models predicting child postdisaster behavior changes, disaster-related posttraumatic stress symptoms, and postdisaster drop in school grades respectively (one dependent variable for each model) from selected demographic and disaster-related variables and parent postdisaster psychiatric disorder (independent covariates entered simultaneously into each model), including also the dependent variables from the first two models in the independent variable list for the last model. (Only variables significantly associated with the dependent variable are listed.)

Table 3

	Num df	Den df	Estimate	SE	Confidence limits	t	p
<i>Model 1. # postdisaster behavior changes (model R²=.20)</i>							
Child age >12	1	94	-.11	.23	-1.58, .65	-4.75	<.001
# children in household	1	94	-.56	.16	-.88, -.24	-3.54	<.001
Disaster-related school absence	1	94	1.05	.28	.49, 1.60	3.72	<.001
Maternal postdisaster psychiatric disorder	1	94	1.24	.34	.58, 1.91	3.70	<.001
<i>Model 2. # disaster-related posttraumatic stress symptoms (model R²=.22)</i>							
Child age >12	1	94	-.67	.15	-.96, -.38	-4.59	<.001
Parent male sex	1	94	-.74	.23	-1.20, -.27	-3.14	.002
Disaster-related school absence	1	94	.48	.19	.10, .86	2.49	.015
Paternal postdisaster psychiatric disorder	1	94	.80	.31	.18, 1.42	2.55	.013
<i>Model 3. Postdisaster drop in school grades (model R²=.11)</i>							
Male child	1	92	.09	.04	.00, .17	2.09	.040
Maternal postdisaster psychiatric disorder	1	92	.12	.06	.00, .24	2.04	.044