

Chapter 2

An Ecological-Needs-Based Perspective of Adolescent and Youth Emotional Development in the Context of Disaster: Lessons from Hurricane Katrina

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Abstract This chapter reviews studies on the impact of natural disasters on childhood and adolescent emotional development with an emphasis on studies conducted with Hurricane Katrina samples. Special consideration is given to the role of exposure to disasters on adolescent emotional development. The findings are reviewed and presented within an integrative perspective (i.e., an ecological needs-based perspective) drawn from broad contextual theories of human development. The perspective emphasizes multiple levels of influence on emotional development through the interference of multiple human needs.

Introduction

Existing research on traumatic stress and post-traumatic stress disorder (PTSD) suggests that disasters like Hurricane Katrina can have profound effects on child and adolescent emotional development (see, e.g., La Greca, Silverman, Vernberg, & Roberts, 2002; Silverman & La Greca, 2002). In addition, research on traumatic stressors other than hurricane exposure has demonstrated that youth who have experienced severe stressors are more likely to display atypical brain development (Carrión et al., 2001; De Bellis et al., 1999) such as decreases in specific brain regions involved in cognitive emotional processing (e.g., the hippocampus, see Carrión, Weems, & Reiss, 2007). Traumatic stress can clearly impact emotional, behavioral, and cognitive development. However, the extent of the Katrina disaster forces us to look beyond individual responses and try to understand the individual child within multiple contexts.

The far-reaching effects of Katrina and its aftermath challenge the applicability of many specific theoretical models in psychology to capture the complexity of youth adaptation. For example, past mental health research has tended to focus on the impact of disasters on the functioning of the individual, and most

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commonly in terms of PTSD symptoms (Norris, Friedman, & Watson, 2002). One of Katrina's lessons is that attempts to capture the entirety of the disaster's impact or the complexity of individual adaptation will require similarly complex integrative frameworks. For example, the massive scale of the Katrina disaster raised the question, "What are the social systems that are impacted and how does context play a role in shaping adaptation following catastrophe?"

To try to capture this breadth of influence, our writing and research on the Katrina disaster (Weems & Overstreet, 2008; Weems, Watts et al., 2007) has utilized broad contextual models of life span human development (e.g., Bronfenbrenner, 1977, 1979) and of risk and resilience to stress (e.g., Hobfoll, 1989; Sandler, 2001) within which to couch more specific theoretical models (such as those delineating specific predictors, moderators, and mediators of emotional disorder development following disaster, e.g., La Greca, Silverman, Vernberg, & Prinstein, 1996; Silverman & La Greca, 2002). Drawing from these theoretical models, we have termed our integrative framework an ecological needs-based perspective (Weems & Overstreet, 2008). The perspective helps show the interconnections among the diverse factors that influence youth adaptation following the experience of disasters. In the proceeding sections, we present an overview of the perspective and use it as a framework to review research on the impact of Hurricane Katrina among youth.

An Ecological Needs-Based Perspective

As noted, the perspective is based on contextual developmental theories, most directly Bronfenbrenner's ecological systems theory. This theory posits that individuals function within multiple contexts, or "ecologies", that influence each other and human development (Bronfenbrenner, 1977, 1979). These ecologies vary in their proximity to the individual (e.g., a child) and include the macrosystem, which is the most distal ecology and includes the government, culture, cultural values, and beliefs; the exosystem, which consists of processes taking place between two or more contexts, one of which does not directly involve the child, but has implications for the individual child (e.g., parent's workplace); the mesosystem, which represents the linkages between proximal ecologies (e.g., school and home, parental participation in the child's school); and the microsystem, which represents the proximal ecologies within which the child develops, including the family and school environments and peer relationships. The ontogenic level is the ecology of the individual and represents factors within the individual that influence developmental adaptation.

Our perspective also posits that disasters such as Hurricane Katrina impact emotional development by threatening basic human needs and goals (Hobfoll, 1989; Sandler, 2001). The basis of healthy emotional adaptation is the ability to meet basic needs. For example, Sandler's (2001) risk and resilience model suggests that there are four basic needs relevant to adaptation to severe stress including physical safety, self-worth, control/efficacy, and a sense of social relatedness. When these needs are met, an individual is more likely to be resilient in the face of adversity (see Sandler, 2001 for expanded discussion). Similarly, in Hobfoll's conservation of

resources model (Hobfoll, 1989), stressors such as Katrina deplete the individual's financial, material, cognitive, and emotional resources. Disasters like Hurricane Katrina threaten these basic needs and resources and so challenge healthy emotional development and mental health.

Table 2.1 provides an overview of the various ecologies and examples of the salient needs that may influence youth adaptation following a disaster. The table is not a complete delineation of influences but is illustrative of salient needs that may

Table 2.1 Ecologies and salient needs that may influence youth adaptation following a disaster

Ecology	Salient needs affected	Examples of specific factors that may influence youth adaptation
<i>Macrosystem</i>	Physical safety	Geographic location and physical geography
	Self-worth	Societal prejudices
	Social relatedness	Community climate of support versus isolation
<i>Exosystem</i>	Physical safety	Evacuation policies and government infrastructure, community resources versus disadvantage (e.g., poverty)
	Self-worth	Parental loss of job/work
	Social relatedness	Disruptions in community infrastructure (e.g., school closures, changes in health care systems) lead to different teachers, classmates, doctors, etc.
<i>Mesosystem</i>	Physical safety	Referral systems for health care disrupted
	Social relatedness	Having to attend school outside the neighborhood
	Control/efficacy	Evacuation/relocations can foster a sense of lack of control over maintaining connections among microsystems
<i>Microsystem</i>	Physical safety	Family resources (e.g., home damaged/destroyed)
	Social relatedness	School disruption, loss of friendships/friend contacts
	Control/efficacy	Parental distress/psychopathology/mental health
<i>Ontogenetic</i>	Physical safety	Experiencing personal harm
	Control/efficacy	Perceptions of control, coping ability, pre-existing risk, anxiety sensitivity, developmental level
	Self-worth	Child mental health (or emotional reactions)

influence youth within various ecologies. It is incomplete because the “example needs” in the table are not a complete list and the needs may sometimes transcend specific ecologies. Moreover, the specific examples within the various needs may also affect or be related to other needs. However, the model and table highlights that in the case of Hurricane Katrina and its aftermath, threats to basic needs and the depletion of resources emanated from multiple ecologies, increasing the risk for negative emotional outcomes at many levels. Thus, an ecological needs-based perspective can be used to integrate data and knowledge by showing how various factors within different ecologies surrounding the child act alone and/or in conjunction with other ecologies to either impede or foster the child and family’s ability to meet the child’s basic needs.

Although broad in its framework, the perspective also allows us to focus in on more specific issues related to emotional development within various developmental periods, such as adolescence. Because of developmentally related biological, emotional, and psychosocial changes, disaster exposure may be particularly salient in certain facets of emotional development and emotional health for adolescents. For example, at the microsystem level for adolescents, there is a growing importance of social issues (e.g., peer groups, peer relations, social anxiety, see Weems & Costa, 2005; Weems, 2008). Natural disasters such as Hurricane Katrina may therefore make disruptions in peer relationships more emotionally taxing for adolescents or may make disruptions in peer relations more developmentally detrimental (e.g., disruptions in normal peer contact may interfere with normative social development). At the ontogenic level, pubertal transitions may make body sensations more salient for adolescents (see Warren & Sroufe, 2004). Exposure to anxiety provoking situations common in disasters may heighten these sensations thereby exacerbating normal body sensations (Hensley & Varela, 2008). In addition, due to their increased level of cognitive sophistication during this developmental period (e.g., Piaget, 1983) adolescents are also more likely to shift their focus internally in an introspective manner leading to increased rumination on internal mood states and sensations compared to younger children. Thus, while there is evidence that younger children may be at a generally increased risk for problems (Scheeringa & Zeanah, 2008; Weems et al., 2008) adolescents may be more susceptible to certain effects of disaster exposure or more susceptible in certain psychosocial domains. This possibility is noted further below as we review each of the ecological influences.

Research on the Effects of Katrina

Macrosystem Influences

As noted, macrosystem influences include cultural values as well as regional and national norms. Hurricane Katrina ignited a national discussion of societal prejudices toward people of color and people living in poverty (Bobo, 2006; Huddy & Feldman, 2006; Lieberman, 2006). Surveys of American citizens revealed that

Whites were more likely than Blacks to place some blame on Katrina victims for their plight and were less likely to be sympathetic toward those stranded in New Orleans (Huddy & Feldman, 2006).

Weems, Watts, et al. (2007) examined regional differences in the psychosocial impact of Hurricane Katrina. Participants ($N = 386$) were adults and emerging adults (i.e., late adolescents) recruited in the primary areas affected by Hurricane Katrina and included residents of metropolitan New Orleans (Orleans Parish, Louisiana), Greater New Orleans (i.e., Metairie, Kenner, Gretna), and the Mississippi Gulf Coast (i.e., cities along the coast from Waveland to Ocean Springs, Mississippi). Participants were assessed for post-traumatic stress disorder (PTSD) symptoms, other psychological symptoms, perceptions of discrimination, perceptions of social support, evacuation distance, and the extent to which they experienced hurricane-related stressful events. All data were collected between October, 2005 and January, 2006. The results of our survey study suggest that the residents of the areas impacted by Hurricane Katrina were subjected to a large number of traumatic events and experienced a number of psychological symptoms in the relatively immediate aftermath of the hurricane. These findings were consistent with Centers for Disease Control and Prevention reports on Hurricane Katrina (see Weisler, Barbee, & Townsend, 2006). Results are also consistent with previous research showing that the number of hurricane disaster events a person experiences is related to psychological symptoms (e.g., La Greca, Silverman, & Wasserstein, 1998; Sattler et al., 2002). Unfortunately, but consistent with the national trends noted previously, the survey indicated that ethnic minorities perceived more discrimination than non-minorities and that regardless of ethnicity, individuals living in New Orleans perceived less social support and more discrimination than those living along the Gulf Coast of Mississippi (Weems, Watts et al., 2007).

Prejudice, discrimination, and lack of social support represent factors within the macrosystem that pose a powerful threat to one's sense of physical safety, self-worth, self-efficacy, and social relatedness. The perception of prejudice or inter-group conflict can limit support seeking from others in the post-disaster environment (Norris et al., 2002; Rabalais, Ruggiero, & Scotti, 2002) and lead to feelings of low self-worth and poor self-efficacy (Greene, Way, & Pahl, 2006; Umaña-Taylor & Updegraff, 2006), all of which have negative implications for youths' ability to cope adaptively with a disaster. However, very few studies have empirically examined the impact of perceived discrimination on youth adaptation to disasters (Norris et al., 2002). Pina et al. (2008) addressed this in a study of youth ($n = 48$, mean age = 11.4 years) impacted by Katrina through an examination of whether perceived discrimination is related to post-traumatic stress reactions among youth survivors of Katrina. The results indicated that while African-American participants perceived more discrimination than White participants, it was only modestly and not statistically significantly associated with post-traumatic stress symptoms in the study ($r = 0.22$, $p > 0.05$). Importantly, Black participants in the sample also reported high levels of extra-familial social support. Such findings suggest that future research examine whether the potentially negative contextual effects of discrimination might

be mitigated by a supportive proximal environment (see Jones et al., Chapter 4 of this volume, for a related discussion).

Returning to findings in Weems, Watts, et al. (2007) the residents of the Mississippi Gulf Coast also reported relatively more emotional symptoms, but they perceived a greater level of social support than those in metropolitan New Orleans. Such findings are consistent with the predictions we developed from theory and media coverage of the storm which depicted vast differences in the community atmosphere following the disaster. Moreover, social support was negatively related to emotional symptoms and a number of previous studies show that social support can be a protective factor (see Ozer & Weiss, 2004). Such conditions of positive social support would thus likely foster a quicker resolution of psychological problems. Although this conclusion cannot be drawn directly from the Weems, Watts et al. study alone, it is consistent with previous research on the role of social support (e.g., King, King, Fairbank, Keane, & Adams, 1998).

Developmentally, however, not all sources of social support are likely to be equally beneficial across the life span. We conducted some secondary analyses from the data in Weems, Watts et al. (2007) to examine differences in social support between late adolescents/emerging adults (Arnett, 2000) and older adults. The Family Support Scale (FSS; Dunst, Trivette, & Cross, 1986) was used to measure the helpfulness of 18 different sources of support. Descriptive analyses indicated that friends (66.5%), parents (63.6%), coworkers (37.9%), participants' own children (33.2%), and social groups (21.9%) were commonly reported as very helpful by Katrina survivors. However, chi-square analyses also suggest developmental differences consistent with our theorizing. For example, late adolescents/emerging adults (ages 18–25, $n = 159$) reported their parents as helpful (72%) more often than older adults (56%, $\chi^2 = 43.18$, $p < 0.005$), whereas older adults (ages 26–86, $n = 227$) more commonly reported their children (52%) and in-laws (37.4%) as helpful sources of support than late adolescents/emerging adults (8.7%; $\chi^2 = 117.11$, $p < 0.005$ and 25.4%; $\chi^2 = 9.81$, $p < 0.05$, respectively). Results thus point to potential developmental differences in beneficial forms of social support.

An additional broad influence that is important to note is the state and federal government response and the laws and policies that govern funding the mental health response. Drury, Scheeringa, and Zeanah (2008) have provided an insightful review of the federal laws governing the distribution of funds for mental services following Katrina. Drury et al. (2008) note that following the Katrina disaster, the Federal government allocated a large amount of funds (over 40 million dollars) to Louisiana for disaster-related mental health response through the Federal Emergency Management Agency (FEMA); however, the funds were not allocated to provide increased treatment services for individuals or to expand the training of clinicians in evidence-based approaches.

The Drury et al. (2008) policy analysis suggests that the reason for this was because the Stafford Disaster Relief and Emergency Assistance Act, which provides for federal assistance, describes the mental health response as “crisis counseling.” The Substance Abuse and Mental Health Services Administration (SAMHSA) manages this FEMA mental health component and interprets the Stafford Act to

mean that FEMA funds after disasters cannot be used for comprehensive mental health treatment. The SAMHSA Crisis Counseling Program is not mental health treatment in this regard; it is intended to be very short term (1–5 sessions) and is generally provided by non-licensed lay persons (Drury et al., 2008). For those who need treatment, the crisis counseling can function as a referral program; however, this is problematic if the community has few treatment providers in place or these services have been disrupted so that there is no one left to refer people to. Moreover, there is little evidence that short-term immediate crisis counseling helps people responding normally to recover more quickly or more fully and may even be detrimental for some (McNally, Bryant, & Ehlers, 2003). Resolving these and similar problematic policy issues is critical for improving future disaster response for youth (see Speier, Osofsky, & Osofsky, Chapter 12, for a related discussion).

A final potential influence worth noting at the macrosystem level is television viewing in a culture of continuous news cycles. Weems, Watts et al. (2007) found that 81–98% of the sample reported viewing some form of intense disaster-related traumatic events on TV, including death, human suffering, and violence following Katrina. Thus, in a culture of 24 h a day 7 days a week news cycles, even families who evacuated and did not experience the disaster first hand could not escape images of destruction on the TV. Comer and Kendall (2007) have recently developed a theoretical model of the potential for wide and insidious influence that events such as acts of terrorism can have on populations of youth via television viewing. While the empirical data are very limited, research aimed at clarifying the effect of horrific images repeatedly displayed on TV may be an important avenue for understanding the indirect effects of disasters on youth emotional development.

Exosystem Influences

Exosystem influences on child adaptation are indirect in nature; they originate in contexts that do not involve the child (e.g., parent's workplace, government agencies) and have their effects by creating disruptions in contexts that do involve the child (e.g., family, school). These indirect effects on the microsystems that surround the child are potentially potent risk factors for healthy youth adaptation. For example, the inadequate and inept governmental response to Katrina, in combination with the complete failure of communication systems, severely challenged the ability of families to communicate a sense of safety and control to their children (Bourque, Siegel, Kano, & Wood, 2006). In addition, the nature of the response called into question the worth of certain groups/communities and challenged feelings of social connectedness (Bourque et al., 2006; Huddy & Feldman, 2006).

Two studies on Katrina samples of youth have reported data relevant to exosystem influences on child mental health and both reveal surprising findings. First, Scheeringa and Zeanah (2008) found that workplace demands were the primary

reason for parent–child separations during the evacuation and recovery periods following Katrina in their New Orleans sample of 70 preschool children aged 3–6 years. Although previous studies have found that parent–child separations during trauma present a risk factor for child mental health (Klingman, 2002; see also Osofsky, Osofsky, & Harris, 2007), Scheeringa and Zeanah found that parent–child separation during the evacuation period was associated with relatively fewer symptoms of PTSD for both the parent and the child. Given the chaotic and deplorable conditions in New Orleans in the immediate aftermath of the storm, parent–child separation during the evacuation period may have resulted in less trauma exposure for the child and less caregiver stress for the parent, which might have served to buffer against the development of PTSD symptoms.

In a second study, Scaramella, Sohr-Preston, Callahan, and Mirabile (2008) examined financial strain in two groups of mothers with a 2-year-old child and a child enrolled in Head Start. Before Hurricane Katrina struck, 55 mother–child dyads had participated (i.e., a pre-Katrina sample); after Katrina, 47 additional mother–child dyads were recruited and participated (i.e., a post-Katrina sample). Scaramella et al. (2008) found that the factors of financial strain and neighborhood violence created disturbances in the family environment which in turn were related to increased child emotional and behavioral problems. Interestingly, the authors did not find evidence that these particular risks were worsened by the post-Katrina environment. The authors speculate that for some families the chronic stress associated with extreme poverty may already be so pervasive that the incremental impact of the disaster on child functioning is difficult to detect (see also Aber, Gershoff, Ware, & Kotler, 2004; Steptoe & Hamer, 2007). Such findings may also represent ceiling or floor effects in symptom levels for the instruments used and so point to the need to develop methodological strategies in disaster research that are sensitive to testing incremental contextual impacts.

Mesosystem Influences

The mesosystem represents linkages between proximal (microsystem) ecologies (e.g., school and home, parental participation in the child's school). The immediate impact of Hurricane Katrina severed the ties (i.e., mesosystems) between the various microsystems in children's lives. Along the Gulf Coast, entire neighborhoods were swept away and in New Orleans, residents were under a forced evacuation for at least 5 weeks (DeSalvo et al., 2007). Hurricane Katrina and the failure of the levees in New Orleans displaced more than 2.5 million people throughout the United States (Larrance, Anastario, & Lawry, 2007). Children and their families were separated from peer groups, extended family networks, neighborhoods, schools, and day care centers and these separations tended to be extended. Up to 9 months after the disaster approximately 85,000 people remained housed in temporary FEMA trailer communities, resulting in continued separations from their original neighborhoods, schools, and extended family groups (Larrance et al., 2007). In the New Orleans

area, 2 years after the disaster 55% of public schools were still closed, as were two-thirds of the city's child care centers (Liu & Plyer, 2007), forcing many families to enroll their children in new schools and day care centers. In contrast, many high school students returned to the city to complete the academic year at their former school, but at the cost of returning without their parents (Nossiter, 2006), resulting in obvious challenges to maintaining close ties between the home and the school environments.

Weak or disrupted mesosystem connections may result in a lack of congruency in the belief systems, expectations, and influences of the different microsystems, limiting the ability of these systems to act in concert to foster positive child adaptation. This lack of consistency and connectedness can challenge youths' sense of interrelatedness and self-efficacy as they attempt to navigate their various developmental challenges. A research study by Salloum and Overstreet (2008) illustrates the challenges to mesosystem connections in the post-Katrina environment and the potential of school-based mental health services to increase those connections in a sample of 58 second to sixth graders who received intervention services. Most parents of the children receiving the intervention in their study found it difficult to come to the school for a meeting, so the intervention incorporated a community-based parent meeting (i.e., at the parent's home or work) scheduled at the parent's convenience. This flexibility in service provision resulted in successful parent meetings for 73% of the sample, which allowed the opportunity to strengthen connections and ensure consistency between the home and the school environments. The study also shows the potential of interventions for improving child functioning. Youth in the intervention groups had statistically significant reductions in post-traumatic stress symptoms, depression, and traumatic grief.

Similarly, Weems et al. (2009) tested the effects of a school-based test anxiety intervention on reducing post-traumatic stress symptoms. Developmentally, most ninth grade youth are just beginning high school (i.e., the transition from junior high school to high school). Making this important transition immediately post-disaster could set a large number of youth on a path of academic failure because they are hampered by their anxiety. The study used a prospective intervention design with a sample of 94 ninth graders from New Orleans exposed to Hurricane Katrina and its aftermath. Thirty youth with elevated test anxiety completed a primarily behavioral group administered, test anxiety reduction intervention. Findings suggest a statistically significant positive effect of the intervention on test anxiety levels and academic performance with evidence of positive secondary effects on post-traumatic stress symptoms (PTS). Specifically, youth who received the intervention experienced a significant reduction in PTSD symptoms, change in test anxiety predicted change in PTSD symptoms, and there appeared to be no negative effects on natural PTSD symptom decline among those who received the intervention.

In sum, school-based interventions may help reconnect the ties (i.e., mesosystems) between the various microsystems in children's lives. In addition, ethnic minorities may be less likely to seek community treatment and perceive less potential benefit from clinic-based treatment for anxiety-related problems (Chavira, Stein, Bailey, & Stein, 2003; Mojtabai & Olfson, 2006) and so school-based interventions

may be an important way to provide access to intervention and thus widen the benefit of important microsystems (like the school).

Microsystem Influences

The microsystem represents the proximal ecologies within which the child develops, including the family/home and school environments and peer relationships. Disasters also affect child adaptation by increasing risk in contexts proximal to the child, such as the family, school, and neighborhood environments. It is all too clear that disasters the scale of Hurricane Katrina create disruptions in all of the microsystems within which youth develop. However, research on the microsystems impacted by disaster has tended to focus on the family environment (Norris et al., 2002). For example, previous research has shown that marital stress, domestic violence, and parental psychopathology increase after disasters (Larrance et al., 2007; Norris et al., 2002), making it more difficult for youth to maintain their sense of safety, control, and interconnectedness (Sandler, 2001). Research by Scheeringa and Zeanah (2008) and Spell et al. (2008) speak about the importance of parental mental health for child functioning at two distinct developmental points. For preschool children, Scheeringa and Zeanah (2008) found that the onset of new mental health problems in preschool children was significantly correlated with the onset of new mental health problems in their caregivers. For school age children (8–16 years), Spell et al. (2008) obtained a similar finding among a sample of 260 displaced mother–child dyads recruited from primarily public schools within several of the main counties impacted by Katrina. Spell et al. reported that maternal psychological distress served as a significant predictor of child mental health following Hurricane Katrina. As noted by Scaramella et al. (2008), parental emotional distress and mental illness undermine parenting efficacy, resulting in increases in parental irritability and decreases in consistent discipline, both of which increase the risk for child mental health problems. In fact, Scaramella et al. found evidence for a mediating role of parenting efficacy in the relation between maternal depression and toddlers' internalizing and externalizing problems in Katrina-exposed families.

Community peer groups are another microsystem that can influence emotional development. Using the data set from Weems, Pina, et al. (2007) secondary data analyses were conducted to test the idea that natural disasters such as Katrina may make disruptions in peer relationships more emotionally taxing for adolescents. We examined the correlation between PTSD symptoms and a question which asked "Did you lose track of friends during the storm?" Correlations were examined for children aged 7–12 and adolescents aged 13–17. Both age groups reported similar rates of losing contact with friends, however, results indicated a moderate and significant association ($r = 0.46$, $p < 0.05$) in adolescents but a smaller non-significant correlation ($r = 0.20$, $p > 0.1$) in children.

Although disasters create disruptions within the microsystems surrounding the child, negative developmental outcomes are not always observed in youth exposed

to disasters (see also Vigna, Hernandez, Paasch, Gordon & Kelley, Chapter 3 of this volume). The occurrence of negative outcomes depends on the balance between protective and vulnerability factors within the different contexts surrounding the child and factors within the child. For example, increased risk created by disasters within the family's broad environment can be offset by the presence of protective factors within the specific family context or within the other microsystems surrounding the child. School-based mental health services represent a protective factor within the school microsystem that can offset the negative developmental outcomes associated with disaster exposure (Abramson & Garfield, 2006; Pynoos, Goenjian, & Steinberg, 1998). In fact, Salloum and Overstreet (2008) and Weems et al. (2009) demonstrate the effectiveness of school-based interventions for children in post-disaster environments. Similarly, Pina et al. (2008) found that as perceived helpfulness from extra-familial sources of support (e.g., teachers, friends, church members) increased, post-traumatic stress reactions in youth (i.e., PTSD, anxiety, and depression) decreased.

Ontogenic Influences

The ontogenic level is the ecology of the individual and represents factors within the individual that influence developmental adaptation. Although disasters indirectly influence child adaptation through their impact on contexts, both proximal and distal to the child, they also have a direct impact on the child. A consistent relationship has been observed in which more severe and intense traumatic experiences during a disaster are associated with the development of more severe symptoms (La Greca et al., 1998; Weems, Pina, et al., 2007). For example, as perceived life threat during the disaster increases, the development of PTSD symptoms becomes more likely (La Greca et al., 1996; see also Jones et al., Chapter 4).

Disaster experiences that involve life threat can challenge one's sense of control and self-efficacy in containing the threat, leading to emotional reactions that may be difficult to regulate (Norris et al., 2002), ultimately increasing the risk for the development of psychopathology. Researchers have linked emotional dysregulation to conduct problems and aggression (Cole & Zahn-Waxler, 1992; Frick & Morris, 2004), as well as internalizing problems such as depression and anxiety (Suveg & Zeman, 2004). However, Marsee (2008) represents one of the first attempts to empirically test emotional dysregulation as a mediator of the relation between disaster exposure and aggression in adolescents.

Marsee (2008) has pointed out that while previous research has tended to focus on internalizing reactions to disaster such as depression and PTSD symptoms, specific types of aggressive responses (particularly those that involve poorly regulated emotion such as reactive aggression) may also follow disaster exposure in youth. Marsee (2008) found evidence for an indirect association between disaster exposure and reactive aggression in a sample of 166 adolescents recruited from high schools

along the Gulf Coast of Mississippi following Katrina. Specifically, results of structural equation modeling indicated that level of hurricane exposure was related to reactive aggression via PTSD symptoms and poor emotion regulation. Results also indicated that hurricane exposure, PTSD symptoms, and poorly regulated emotion were associated with reactive aggression even after controlling for other forms of aggression (i.e., proactive aggression).

Research from additional Katrina-exposed samples of youth similarly suggests that disaster exposure may influence the development of many different forms of maladaptation. For example, Spell et al. (2008) reported that 13% of their school-aged sample of youth demonstrated clinically significant externalizing symptoms. Scheeringa and Zeanah (2008) found that PTSD in their preschool sample was comorbid with at least one of four other disorders in 88.6% of the sample. Hensley and Varela (2008) have further shown that disaster exposure may also have implications for physical adaptation. Their study moves the research on disaster reactions to new areas through their finding that hurricane exposure was also associated with somatic complaints such as headaches, gastrointestinal distress, and pain symptoms.

Individual youth characteristics are also important in shaping the developmental adaptation to disasters (La Greca et al., 2002; Norris et al., 2002). In support of this, research has consistently indicated that pre-existing characteristics of the child can determine the impact of disaster exposure on adaptation. For example, research has documented that pre-hurricane levels of trait anxiety predict PTSD symptoms above and beyond exposure to the trauma (La Greca et al., 1998; Weems, Pina, et al., 2007). For example, La Greca and colleagues examined stress reactions in a sample of children (fourth–sixth grade) assessed 3- ($n = 92$) and 7-months ($n = 74$) post-disaster (pre-trauma data were collected 15 months prior to Hurricane Andrew's landfall in South Florida) and found that trait anxiety was the strongest and most consistent predictor of youth's PTS reactions (e.g., trait anxiety predicted PTS symptoms even when controlling for level of exposure and demographic characteristics). These findings have also been replicated and extended in Katrina-exposed youth. Specifically, Weems, Pina, et al. (2007) found that both pre-disaster negative affect and trait anxiety predicted post-disaster PTS symptoms even when controlling for pre-disaster PTSD symptoms, level of exposure, and demographic characteristics. Theoretically, pre-existing trait anxiety is thought to impact the way children are able to cope with and process the traumatic event (La Greca et al., 1996; Vernberg, La Greca, Silverman, & Prinstein, 1996). Those with elevated trait anxiety are theorized to be less able to positively cope and are more likely to have elevated PTS symptoms even with relatively low exposure experiences (La Greca et al., 1998).

Hensley and Varela (2008) have extended this work on trait anxiety in a Hurricane Katrina sample by providing evidence that anxiety sensitivity moderated the relationship between trait anxiety and PTSD in a sample of sixth and seventh grade students exposed to Katrina. Anxiety sensitivity involves the expectancy that anxiety-related symptoms invariably lead to extremely negative consequences and is

distinguished from trait anxiety, which is the propensity to experience anxiety sensations (i.e., anxiety sensitivity is a cognitive expectancy about anxiety sensations; trait anxiety is a propensity to experience anxiety sensations). Specifically, Hensley and Varela (2008) found that high trait anxiety coupled with high anxiety sensitivity is associated with the relatively highest PTSD symptoms. Their model suggests that anxiety sensitivity creates a cycle of anxiety amplification, resulting in extremely high levels of net anxiety that renders children less likely to adequately process and cope with the traumatic experience that is more than would occur with just high trait anxiety alone.

Another pre-existing factor that can shape adaptation to disaster exposure is developmental level (Salmon & Bryant, 2002). Although it is generally believed that children tend to be more severely affected by disasters than adults, no consensus has emerged regarding developmental differences in mental health problems prior to adulthood (Norris et al., 2002). Historically, researchers believed that preschool children were not highly affected by trauma exposure and our knowledge of how very young children respond to life-threatening traumatic events has lagged behind that of other age groups (Scheeringa & Zeanah, 2008; see also Buchanan, Casbergue, & Baumgartner, Chapter 1). Assessment of PTSD in preschool-aged children requires a developmentally sensitive approach. For example, Sprung (2008) demonstrated that young children's knowledge about the mind and its operations underlies their ability to monitor and report unwanted intrusive thoughts. Findings from the study by Sprung are consistent with the argument that certain symptoms of post-traumatic stress disorder (e.g., intrusive thinking, emotional numbing, and avoidance) can easily be overlooked in preschool children (Scheeringa, Zeanah, Myers, & Putnam, 2003). In fact, Scheeringa et al. (2003) have empirically validated alternative, developmentally sensitive diagnostic criteria for PTSD in young children. In their study of Katrina-exposed children, Scheeringa and Zeanah (2008) found that 50% of the children in their sample aged 3–6 years met criteria for PTSD following Katrina using the alternative criteria.

While there have been few longitudinal studies on the extended effects of Katrina that have appeared in the published literature to date, the first author (Weems et al., 2008) recently completed screening of a sample of over 200 New Orleans school children (grades 4 through 9) using the PTSD Reaction Index (Frederick, Pynoos, & Nadar, 1992) at two time points (Fall 2007 2 years post and Spring 2008 two-and-a-half years post). These youth were exposed to a number of Katrina-related traumatic experiences including losing contact with family and friends, having clothes and toys damaged, and temporary relocation to another city. In addition, as many as 68% had a home damaged or destroyed and 25% thought they might die at some point. In terms of PTSD symptoms, children were classified by severity of symptoms using the system developed by Frederick et al. (1992): Doubtful (score of 0–11), Mild (12–24), Moderate (25–39), Severe (40–59), and Very Severe (60–80). At time 1 sample reports indicated: "Doubtful" 26%, "Mild" 32%, "Moderate" 23%, "Severe" 16%, and "Very Severe" 5%. At time 2 the rates were highly similar: "Doubtful" 25%, "Mild" 36%, "Moderate" 23%, "Severe" 13%, and "Very Severe" 3%. Chi-square analyses indicated that youth were likely to retain their severity classification

over time [$X^2(16) = 68.3, p < 0.001$]. Such findings point to the pervasive and chronic impact of Katrina given that the typical course of symptoms is usually one of remitting symptoms over time (La Greca et al., 2002). Moreover, the rates of at least "Severe" PTSD (i.e., a score of 40 or greater on the PTSD-RI) observed among samples of school-aged children exposed to Katrina and assessed much earlier were 12.6% (5–8 months following Hurricane Katrina; Hensley & Varela, 2008) and 11% (3–7 months following Hurricane Katrina; Spell et al., 2008).

Youth coping behaviors represent another potential moderator of psychological outcomes following natural disasters. For example, avoidant coping such as withdrawal is associated with greater PTSD symptoms (e.g., La Greca et al., 1996; Vernberg et al., 1996), while active coping such as problem-focused coping is associated with lower depression symptoms in youth hurricane survivors (e.g., Jeney-Gammon, Daugherty, Finch, Belter, & Foster, 1993). Pina et al. (2008) found that avoidant coping behaviors (i.e., repression, avoidant actions) predicted post-Katrina PTSD and anxiety symptoms, which is consistent with other research (Norris et al., 2002). However, they did not find evidence that active coping strategies (i.e., positive cognitive restructuring, problem focus coping) buffer youths' post-traumatic stress reactions. Terranova, Boxer, and Morris (in press) examined predictors of PTSD symptoms in a sample of 152 sixth grade school children from southeast Louisiana (neighboring Orleans parish) assessed at 1.5 months (time 1) and 8 months (time 2) after Katrina and found that negative coping (a combination of internalizing, externalizing and avoidant coping) was associated with PTSD at 1.5 months. Peer victimization (i.e., being bullied) was predictive of change in PTSD (PTSD symptoms at time 2 controlling for symptoms at time 1) and results further indicated that negative coping interacted with level of hurricane exposure to predict change in PTSD, such that high negative coping and high exposure were associated with the highest PTSD symptoms at time 2.

Conclusions

Research on Katrina-exposed samples of youth have added to the child and adolescent mental health knowledge at each level of influence posited by an ecological needs-based perspective. While research in this area still tends to focus on the individual child, the research to date does show that the impact of the Katrina disaster was felt at societal, community, family, and individual levels. Thus, one of the main lessons learned from the Katrina experience is that we must consider these multiple levels of impact when designing and implementing future research and prevention efforts. A very positive lesson is that interventions can be effective even in the wake of a disaster like Hurricane Katrina. The positive upshot of the ecological needs-based model is that while the model points to all the many potential negative influences on youth emotional development it also helps to show that there are just as many areas for intervention. Applying the extant empirical knowledge within the

model we presented to the realm of policy suggests that efforts to prevent and minimize suffering in the wake of disaster will benefit from addressing each of these multiple levels of impact with interventions aimed at each of the ecologies (e.g., making sure government funding [macrosystem] is aimed at effective interventions [microsystem or ontogenic levels]). The perspective we have delineated and the data published to date on Katrina suggest that future researchers will benefit from considering in greater depth the contextual as well as individual influences on youth exposed to disaster.

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