
Resilience Processes in Development: Four Waves of Research on Positive Adaptation in the Context of Adversity

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How do children and adolescents “make it” when their development is threatened by poverty, neglect, maltreatment, war, violence, or exposure to oppression, racism, and discrimination? What protects them when their parents are disabled by substance abuse, mental illness, or serious physical illness? How do we explain the phenomenon of resilience—children succeeding in spite of serious challenges to their development—and put this knowledge to work for the benefit of children and society? The scientific study of resilience emerged around 1970 when a group of pioneering researchers began to notice the phenomenon of positive adaptation among subgroups of children who were considered “at risk” for developing later psychopathology (Masten, 2001, 2012).

The resilience research pioneers led a revolution in thinking about the origins and treatment of psychopathology. The primary focus of earlier clinical research on children at high risk for psychopathology had been either to observe the consequences of adversity or the unfolding of risk processes accounting for the etiology of disorders. Research efforts were directed towards understanding pathology and deficits, rather than on how problems were averted, resolved, or transcended. The field of mental health at the time was dominated by psychoanalytic theory and a

disease-oriented biomedical model that located the source of illness within the individual. However, the first investigators to explore the phenomenon of resilience realized that models based primarily on predicting psychopathology were limited in scope and usefulness, providing little understanding of how good outcomes were achieved by many of the children identified as “at risk.” Such information was vital to the goal of intervening to improve the odds of good developmental outcomes among children at risk. One of the great contributions of the early investigators was their recognition and championing of the idea that understanding positive developmental pathways in the context of adversity is fundamentally important for preventing and treating problems, particularly among children at risk for psychopathology.

The study of resilience has advanced in four major waves of research. In this chapter we highlight the concepts and findings resulting from these waves to date, as they have shaped an emerging resilience framework for research and practice. The first wave of work yielded good descriptions of resilience phenomena, along with basic concepts and methodologies, and focused on the individual. The second wave yielded a more dynamic accounting of resilience, adopting a developmental systems approach to theory and research on positive adaptation in the context of adversity or risk, and focused on the transactions among individuals and the many systems in which their development is embedded. The third wave focused on creating resilience by intervention

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directed at changing developmental pathways. The fourth wave, now rising, is focused on understanding and integrating resilience across multiple levels of analysis, with growing attention to epigenetic and neurobiological processes, brain development, and the ways that systems interact to shape development.

The First Wave: Identifying Individual Resilience and Factors that Make a Difference

Initial research in this area was dominated by a strong cultural ethos in the United States that glorified rugged individualism—that Horatio Alger ability to “pick oneself up by one’s own bootstraps” and succeed solely through one’s own efforts. Early on, investigators as well as journalists referred to children who functioned well despite the odds as “invulnerable” (Anthony, 1974; Pines, 1975) and tended to focus on their personal traits and characteristics. Such children were thought to be impervious to stress because of their inner fortitude or character armor. As research extended across time and across types of trauma endured, the term of “invulnerability” was replaced by more qualified and dynamic terms such as stress-resistance and resilience. These concepts were thought to more appropriately capture the interplay of risk and protective processes occurring over time and involving individual, family, and larger sociocultural influences (Masten, Best, & Garmezy, 1990; Rutter, 1987; Werner & Smith, 1982, 1992).

Key Concepts

During the first generation of research on resilience in development, these phenomena were studied in a variety of different contexts throughout the world (Glantz & Johnson, 1999; Luthar, 2006; Masten, 2012; Masten, Best, and Garmezy, 1990). A consensus emerged on key concepts, though controversies continue to this day and there have been changes in emphasis over the years. For example, in early work, *resilience*

typically referred to a pattern of positive adaptation in the context of past or present adversity. Later definitions have become broader and more dynamic, in keeping with efforts to integrate the concept across levels of analysis and across disciplines (Masten, 2007, 2012). An example of a systems-oriented definition of resilience follows:

The capacity of a dynamic system to withstand or recover from significant challenges that threaten its stability, viability, or development (Masten, 2011).

Resilience was also recognized as an inferential concept that involved two distinct judgments (Luthar & Cicchetti, 2000; Masten & Coatsworth, 1998). First, one judges by some criteria that there has been a significant threat to the development or adaptation of the individual or system of interest. Second, one judges that, despite this threat or risk exposure, the current or eventual adaptation or adjustment of the individual or system is satisfactory, again by some selected set of criteria.

There has been considerable confusion throughout the past four decades on the precise meaning of many terms used by resilience researchers (Luthar, Cicchetti, & Becker, 2000; Masten, 2001, 2012; Rutter, 2000). Nonetheless, there is some consensus on a working vocabulary for this domain of inquiry, as presented in Table 2.1. Much of that vocabulary (e.g., adversity, life events, risks, and vulnerability) was already familiar from studies of psychopathology. Resilience studies, however, underscored some concepts that had been omitted or underemphasized in earlier work, most particularly the concepts of assets, compensatory (promotive) factors, protective factors, and competence or developmental tasks.

Resilience definitions always consider the threats to good adaptation (or perturbations in a system), conceptualized in terms like *risk*, *adversity*, and *negative life events*. As illustrated in Table 2.1, *risk* most basically signifies an *elevated probability* of a negative outcome. It is a group or population term, in that a risk factor does not identify which individual or individuals in a group considered at risk will eventually display difficulties in adaptation, but rather that the group of people with this risk factor is less

Table 2.1 Definition and illustration of key concepts

Term	Definition	Examples
Adversity	Disturbances to the function or viability of a system; experiences that threaten adaptation or development	Poverty; homelessness; child maltreatment; political conflict; disaster
Resilience	Positive adaptation in the face of risk or adversity; capacity of a dynamic system to withstand or recover from disturbance	Child from violent family does well in school, has friends, behaves well, and gets along well with the teacher; earthquake survivor recovers to normal function and development
Risk	An elevated probability of an undesirable outcome	The odds of developing schizophrenia are higher in groups of people who have a biological parent with this disorder
Risk factor	A measurable characteristic in a group of individuals or their situation that predicts a negative outcome on a specific outcome criteria	Premature birth; parental divorce; poverty; parental mental illness; child maltreatment
Cumulative risk	Increased risk due to: (a) the presence of multiple risk factors; (b) multiple occurrences of the same risk factor; or (c) the accumulating effects of ongoing adversity	Children in homeless families often have many risk factors for developmental problems, including a single parent who hasn't graduated from high school, a history of poor health care, poor schooling, inadequate nutrition, and exposure to many negative events, such as family or community violence
Vulnerability	Individual (or system) susceptibility to undesirable outcomes; the diathesis in diathesis-stressor models of psychopathology	Anxious children find school transitions more stressful; compromised immune function increases susceptibility to infectious diseases
Proximal risk	Risk factors experienced directly by the child	Witnessing violence; associating with delinquent peers
Distal risk	Risk arising from a child's ecological context but mediated through more proximal processes	High community crime rate; inaccessible health care; recession
Asset, resource, on compensatory or promotive factor	A measurable characteristic in a group of individuals or their situation that predicts a positive or desirable outcome, similarly for low and high levels of risk	Cognitive skills; competent parenting; high social class
Protective factor	A predictor of better outcomes <i>particularly</i> in situations of risk or adversity	Airbags in automobiles; 911 services; neonatal intensive care; health insurance
Cumulative protection	The presence of multiple protective factors in an individual's life	A child in a poor neighborhood has attentive parents, a safe home, supportive kin, a school tutor, and connections to prosocial peers or community organizations
Psychosocial competence	Effectiveness or capabilities in the adaptive use of personal and contextual resources to accomplish age-appropriate developmental tasks	Active engagement of intellectual ability and positive relationships with teachers results in school success
Developmental tasks	Psychosocial milestones or accomplishments expected for people of different ages in a given historical or cultural context, often serving as criteria for judging how well a person is doing in life	Walking; talking; learning to read; developing friendships; following rules; taking care of one's children

likely overall to do well in some regard. There is often a lack of precision regarding risk factors, related to their complex and cumulative nature (Obradović, Shaffer, & Masten, 2012). Many broad risk indicators or “markers” encompass great heterogeneity in outcome within the group. For example, children born prematurely vary greatly in circumstances, birth weight, accompanying complications, family socioeconomic situation, and access to medical care. A closer analysis often provides clues to the processes accounting for the overall risk of the group. In the case of prematurity, knowing details about intracranial bleeding or delivery complications may not only improve prediction about outcomes but also lead to better understanding of the actual processes producing the risk (O'Dougherty & Wright, 1990).

It soon became apparent that risk factors rarely occur in isolation. More typically, children with high risk are exposed to multiple adversities extending over time, sometimes for very long periods of their lives (Dong et al., 2004; Finkelhor, Ormrod, Turner, & Holt, 2009; Masten & Wright, 1998; Obradović et al., 2012). Outcomes generally worsen as risk factors pile up in children's lives, and concomitantly, resilience becomes less common. Thus, it has become critical to examine *cumulative risk factors* in order to more accurately predict and understand developmental outcomes (Sameroff, Gutman, & Peck, 2003). Divorce, for example, has been a commonly studied stressor but research has revealed considerable heterogeneity in outcome for children whose parents have divorced. The concept of cumulative risk helps to clarify this diversity in outcome. Divorce is not a single, time limited risk factor or stressor, but rather an often lengthy process of multiple stressors and life changes. The extent and duration of these stressors vary considerably from family to family, and can occur before, during, and after the divorce itself. Finally, some forms of adversity are so chronic and massive that no child can be expected to be resilient until a safe and more normative environment for development is restored. Thus, in cases of catastrophic trauma, such as those resulting from war or torture, resilience typically refers to good recovery after the trauma

has ended (Masten & Obradović, 2008; Wright, Masten, Northwood, & Hubbard, 1997).

Risk terminology has undergone significant refinement in recent years, inspired by a series of influential articles by Helena Kraemer and colleagues (Kraemer et al., 1997; Kraemer, Stice, Kazdin, Offord, & Kupfer, 2001; Kraemer, Wilson, Fairburn, & Agras, 2002). Their work underscored the importance of distinguishing correlates of poor outcomes from risk factors that clearly predate the onset of the problem from causal risk factors that can be shown (perhaps through experimental manipulation) to contribute to the bad outcome of interest. This work not only has led to greater specificity in risk terminology but also provided a conceptual framework for research needed to identify a causal risk factor (see decision tree in Kraemer et al., 1997) and to test hypothesized mediating and moderating influences through experimental intervention designs (Kraemer et al., 2002).

The second key aspect of judging resilience in the lives of individuals involves decisions about how well a person is doing in life or, in other words, the quality of their adaptation or development. A variety of criteria have been utilized to judge positive adaptation in the literature, including criteria focused on the absence of pathology, successes in age-salient developmental tasks, subjective well-being, or all of these (see Table 2.1 for examples). In the developmental literature, many investigators have defined good outcomes on the basis of the child's observed or reported *competence* in meeting the expectations for children of a given age and gender in their particular sociocultural and historical context. Competence is typically assessed by how well the child has met, and continues to meet, the expectations explicitly or implicitly set in the society for children as they grow up. This is often referred to as the child's track record of success in meeting *developmental tasks*, age-related standards of behavior across a variety of domains, such as physical, emotional, cognitive, moral, behavioral, and social areas of achievement or function (McCormick, Kuo, & Masten, 2011). While these may vary from culture to culture, they typically refer to broad tasks that guide the development

and socialization of children (see Table 2.1 for examples). Children judged to show resilience have typically negotiated these developmental tasks with reasonable success despite exposure to significant risks and adversities.

During the first wave of research, controversies emerged about how to define resilience and many of these debates concerned the criteria for adaptation by which resilience would be judged (see Masten & Reed, 2002 or Luthar et al., 2000 for overviews of these debates). There was debate, for example, about whether a child who was adapting well in terms of observable social behavior (academic achievement, work, relationships, etc.) but suffering internal symptoms of distress was showing resilience. There were debates about not only the “inside” vs. “outside” picture on adaptation but also on *how many* domains should be considered and *when* to assess “outcome.” We would argue, for example, that resilience does not necessarily mean that one is unaffected or untouched by the trauma one has endured nor does it mean that one always functions well. It is also possible that a child may show resilience at one point in life and not at another, or in one domain and not another. Such debates linger in the literature (see Masten, 2012). Nonetheless, it is clear that the criteria by which resilience is judged in a population and how comprehensively it is assessed across domains of functioning will impact the prevalence of resilience in high-risk groups and the nature of the processes identified as relevant to resilience.

One of the most important emerging domains of study concerns the linkage among multiple domains of adaptation, positive and negative, and what this may mean for understanding resilience and psychopathology. Internal and external symptoms are related over time, as is adaptive functioning across different domains of competence and symptoms (Masten, Burt, & Coatsworth, 2006; Masten & Curtis, 2000). Symptoms can contribute to problems negotiating developmental tasks, and failure in such tasks can lead to symptoms, with snowballing consequences that have been referred to as *developmental cascades* (Masten, 2001; Masten, Burt, et al., 2006; Masten

& Cicchetti, 2010; Masten, Obradović, & Burt, 2006). In developmental theory, good functioning in developmental tasks provides a platform on which future success is built. It is becoming more evident that promoting such competence may be crucial to preventing some kinds of problem outcomes among high-risk populations of children (see section “[The Third Wave: Intervening to Foster Resilience](#)”).

The first wave of resilience studies focused on identifying the correlates or predictors of positive adaptation against a background of risk or adversity. Thus, these investigators were also interested in assessing individual or situational differences that might account for differential outcomes among children sharing similar adversities or risk factors. Two major kinds of correlates were considered: (1) positive factors associated with better adaptation at all levels of risk, including high-risk levels, which were often termed *assets* or *compensatory factors* (e.g., Garmezy, Masten, & Tellegen, 1984; see also Benson, Scales, Leffert, & Roehlkepartain, 1999), and more recently, *promotive factors* (Sameroff, 1999); and (2) factors that seemed to have particular importance for positive adaptation at high levels of risk or adversity, which were typically termed *protective factors* (e.g., Rutter, 1979). The key difference in the two types of concepts was whether the factor played a special kind of role under hazardous conditions.

When a positive predictor is designated a *protective factor*, some type of shielding from the effects of risk or adversity is implied. Thus, protective factors are assets that particularly matter or only matter when risk or adversity is high. For example, airbags in automobiles or antibodies to specific disease agents are viewed as protective factors because they operate to protect individuals from the dangers of accidents or infections. Protective factors *moderate* the impact of adversity on adaptation. The examples of airbags and antibodies are causal protective factors in that they provide demonstrable and explainable protection to a living system in the course of an unfolding experience. Similarly, a parent who jumps in front of a child to take the brunt of a physical assault clearly is protective in the sense

of shielding the child from worse harm. Yet many presumed protective factors in studies of resilience are far less easy to specify.

It has proven to be quite difficult to distinguish assets from protective factors in human development because many of the most important correlates of good adaptation are themselves complex systems or relationships that serve multiple functions. Parents, who could be viewed as “Mother Nature’s Protective Factor,” clearly comprise a protective system of immense complexity for child development. One finding that has emerged and been re-confirmed time and time again is that resilient adaptation rests on good family (or surrogate family) relationships. For very young children, early relationships with caregivers provide the foundation for developing secure attachments to others (Bowlby, 1988; Sroufe, Carlson, Levy, & Egeland, 1999). If this early infant-caregiver relationship is warm, attentive, and responsive, the child develops confidence that his or her needs will be met, learns positive ways of relating to others, becomes more able to regulate emotions, and develops feelings that the self is worthy and valued. Thus, a responsive, caring, and competent caregiver is a very powerful asset for fostering the child’s healthy growth and development in any context. In the face of significant adversity, such parents also know how to respond effectively to threat and are able to adaptively shift their responses to provide protective modes of behavior. Similarly, the human brain is capable of many functions and responds to life situations in a multitude of adaptive ways. Thus it is not surprising to learn that IQ scores, a general estimate of adaptive problem solving abilities, predict a multitude of good outcomes regardless of risk or adversity level (meeting the definition of asset) and also have been shown to function as moderators of risk or adversity, mattering even more under threatening circumstances (Masten et al., 1999).

There has been considerable debate over the years about labeling a continuous variable that correlates with adaptation as a risk factor or an asset or compensatory factor, when it could be viewed as either or both. Often these constructs are composed of bipolar opposites that exist on

the same continuum. That is, the attribute or variable in question is associated with poor adaptation at one end of the range and good adaptation at the other end. For example, when poverty is present it is identified as a risk factor for negative outcome whereas high socioeconomic status is observed to be a compensatory or promotive factor associated with positive outcomes. Eventually, we may learn “where the action is” for a particular attribute or factor, but in many cases, we may learn once again that adaptation arises from complex processes not easily labeled. Certainly, it is conceivable to think about a pure “risk factor” that has a clear negative influence on development when it occurs (e.g., foot amputated in an accident) but no influence when it does not occur. It is also conceivable to think about pure “asset” factors that have a positive influence when they occur (e.g., musical talent) but have little impact on development in their absence. But most factors currently studied as potential causal predictors of adaptation or good vs. poor development reflect continuously distributed variables that may operate in many ways at many levels (e.g., poor attentional skills vs. good attentional skills).

Developmental Perspectives

Resilience studies quickly revealed that children might have different vulnerabilities and protective systems at different times in the course of their development (Masten et al., 1990; Wright & Masten, 1997). Infants, because of their total dependence on caregivers, are highly vulnerable to the consequences of loss of their parents or mistreatment by caregivers. Yet infants are more protected from experiencing the full impact associated with war or natural disasters because they lack understanding of what is happening. As children mature, their school milieu and neighborhood can increasingly contribute to their exposure to traumatic events. Older children engage in more unsupervised activities and their involvement with peers can be protective or risk enhancing. Thus, while older children are much more capable of coping in the world on their own, their

independence from the protection of their caregivers can also contribute to their trauma exposure. Adolescents are also vulnerable to a different type of loss or betrayal, such as loss or devastation concerning friends, faith, schools, and governments. They understand what these losses mean for their future, a realization well beyond the understanding of young children.

The “Short List” of Resilience Correlates

The first wave of research on resilience included both person-focused and variable-focused approaches. Person-focused approaches identified resilient individuals in an effort to determine how they differed from other individuals facing similar adversities or risks who were not faring as well. Variable-focused approaches, in contrast, examined the linkages among characteristics of individuals and their environments that contributed to good outcome when risk or adversity was high. This method focused on variables that cut across large, heterogeneous samples, and drew heavily on multivariate statistics. Across many studies from each of these perspectives and across widely divergent methodologies, the first wave of research revealed a striking degree of consistency in findings, implicating a common set of broad correlates of better adaptation among children at risk for diverse reasons. This consistency was noted early by Garmezy (1985), and has been corroborated repeatedly over the years. Masten (2001, 2007) has referred to these correlates as “the short list” (see Table 2.2) and argued that they may reflect the fundamental adaptive systems supporting human development. As investigators began to consider the *processes* that might account for why these correlates are repeatedly found, the second wave of resilience work began. While the first wave produced many ideas, constructs, methods, and findings about correlates of resilience (as well as many controversies), it was soon evident that more sophisticated models were needed to consider the complex processes that were implicated by the initial findings (see Glantz & Johnson, 1999).

Table 2.2 Examples of promotive and protective factors

Child characteristics
Social and adaptable temperament in infancy
Good cognitive abilities, problem solving skills, and executive functions
Ability to form and maintain positive peer relationships
Effective emotional and behavioral regulation strategies
Positive view of self (self-confidence, high self-esteem, self-efficacy)
Positive outlook on life (hopefulness)
Faith and a sense of meaning in life
Characteristics valued by society and self (talents, sense of humor, attractiveness to others)
Family characteristics
Stable and supportive home environment
Harmonious interparental relationship
Close relationship to sensitive and responsive caregiver
Authoritative parenting style (high on warmth, structure/monitoring, and expectations)
Positive sibling relationships
Supportive connections with extended family members
Parents involved in child’s education
Parents have individual qualities listed above as protective for child
Socioeconomic advantages
Postsecondary education of parent
Faith and religious affiliations
Community characteristics
High neighborhood quality
Safe neighborhood
Low level of community violence
Affordable housing
Access to recreational centers
Clean air and water
Effective schools
Well-trained and well-compensated teachers
After-school programs
School recreation resources (e.g., sports, music, art)
Employment opportunities for parents and teens
Good public health care
Access to emergency services (police, fire, medical)
Connections to caring adult mentors and prosocial peers
Cultural or societal characteristics
Protective child policies (child labor, child health, and welfare)
Value and resources directed at education
Prevention of and protection from oppression or political violence
Low acceptance of physical violence

The Second Wave: Embedding Resilience in Developmental and Ecological Systems, with a Focus on Processes

Early studies delineated a number of important *factors* that were associated with later resilience, but did not provide an integrative understanding of the *processes* leading to resilience in development. As noted in a review of the first wave of work, “it is the task of future investigators to portray resilience in research questions that shift from the “what” questions of description to the “how” questions of underlying processes that influence adaptation” (Masten et al., 1990, p. 439). Subsequent research and theory has focused more specifically on understanding the complex, systemic interactions that shape both pathological and positive outcomes, emphasizing resilience as a phenomenon arising from many processes (Cicchetti, 2010; Egeland, Carlson, & Sroufe, 1993; Masten, 1999, 2007; Yates, Egeland & Sroufe, 2003). Wyman, for example, described resilience in the following way: “Resilience reflects a diverse set of processes that alter children’s transactions with adverse life conditions to reduce negative effects and promote mastery of normative developmental tasks” (Wyman, 2003, p. 308).

The second wave of resilience work reflects a broader transformation occurring in the sciences concerned with normative and pathological development that has accompanied the emergence of *developmental psychopathology* (Cicchetti, 1990, 2006; Masten, 2006, 2007; Sroufe & Rutter, 1984). Resilience research over the past decade increasingly has focused on contextual issues and more dynamic models of change, explicitly recognizing the role of developmental systems in causal explanations (Cicchetti, 2010; Cicchetti & Curtis, 2007; Masten, 2007, 2011). This has led to greater emphasis on the role of relationships and systems beyond the family, and attempts to consider and integrate biological, social, and cultural processes into models and studies of resilience (Charney, 2004; Cicchetti, 2010; Cicchetti & Curtis, 2007;

Luthar, 2006; Masten, 2001, 2007, 2011, 2012). As a result, studies of resilience are more contextualized in multiple ways, including both how the individual interacts with many other systems at many levels throughout life and greater care about generalizing conclusions about risk and protective factors from one context to another or one period of development to another. The early pioneers certainly recognized the complex, dynamic nature of naturally occurring resilience (see Masten et al., 1990 for this history), but the basic descriptive data of the initial wave of studies was a necessary empirical first step before research could begin to address the complexity of the phenomena.

The fact that many of the promotive and protective factors that were identified in the first wave appeared to facilitate development in both high and low risk conditions suggested the importance of fundamental, universal human adaptation systems; these systems keep development on course and also facilitate recovery from adversity (Masten, 2001, 2007). Examples of these adaptive systems include the development of attachment relationships; moral and ethical development; self-regulatory systems for modulating emotion, arousal, and behavior; mastery and motivational systems; and neurobehavioral and information processing systems. Other systems involve the broader cultural context and consist of extended family networks, religious organizations, and other social systems in the society that offer adaptive advantages. These systems are versatile and responsive to a wide range of challenges, both normative and non-normative. If the major threats to children’s adaptation are stressors that undermine the development of these basic protective systems, then it follows that children’s ability to recover and to be resilient will be highly dependent on these systems being restored.

The influence of developmental systems theory (DST) is also evident in the multicausal and dynamic models of resilience characteristic of the second wave of work. Second wave theory and research often encompasses the language of DST, with concepts such as *equifinality* and *multifinality*, *developmental pathways* and *trajectories* that capture the dynamic, interactional,

reciprocal, multicausal, and multiple-level models typical of DST (Bronfenbrenner, 1979; Cicchetti & Rogosch, 1996; Ford & Lerner, 1992). The focus of many second wave studies has been on the processes that may lead to resilience. Studies have attempted to explore moderating processes that would explain protective effects that seem to work only for some people under some conditions as well as mediating processes that explain how risk or protection actually works to undermine or enhance adaptation.

An ecological, transactional systems approach to understanding resilience marks a dramatic shift from a traditional focus on the individual to a broader focus encompassing family and community relational networks (Cowen, 2000; Cummings, Davies, & Campbell, 2000; Masten & Obradović, 2008; Walsh, 1998). Developmental outcome is determined by complex patterns of interaction and transaction. Wave two research studies incorporate design and analytic techniques and strategies that allow for detection of such multilevel influences. This dynamic approach emphasizes the need to formulate different research questions in order to understand the process of positive or negative adaptation following stress. Rather than asking questions about why a child is resilient, questions are asked about bidirectional connections between the child and his or her context. These child–context relationships and interactions become the focus of study. Such an approach fosters research designs that more adequately reflect individual differences in developmental pathways and contextual variation within families, communities, societies, cultures, and historical periods. Wave two research studies also provided a more complex assessment of family and environmental influences. Parents do not respond in identical ways to each of their own children, nor is the family environment experienced in an identical way by different children in the family (Plomin, Asbury, & Dunn, 2001). Even when there is significant conflict and disharmony within a family, the negativity expressed by the parents may focus more on one child than on another and the children themselves may be differentially reactive to and affected by

such conflict. A transactional model of influence captures this dynamic pattern and highlights the importance of examining reciprocal patterns of interaction that shape development over time (Sameroff, 2000).

Finally, the impact of the social context on the child is mediated in part through the child's perception and interpretation of his or her experiences (Boyce et al., 1998), and some investigators have focused on such internal processes (Compas, Connor-Smith, Saltzman, Thomsen, & Wadsworth, 2001). Although important, such assessments are inherently difficult to obtain, particularly in very young children who lack the verbal skills and conceptual framework needed to describe the impact of their traumatic experiences. There are likely to be significant changes in the meaning the child assigns to different experiences at different ages and thus the meaning and the impact of a traumatic experience can change considerably over time. For example, some victims of childhood sexual abuse are so young at the time of the initial abuse that they do not understand the full meaning of the perpetrator's actions. However, when they become older, the extent of betrayal and the shame and humiliation they experience can intensify and significantly enhance the stressfulness of the experience (Wright, Crawford, & Sebastian, 2007). While children's subjective experience and other internal cognitive and affective coping responses to traumatic experiences are still sparsely researched areas, these may be critical areas to pursue in order to fully understand individual variability in response to traumatic stress (Park & Folkman, 1997).

Contextual Specificity of Protective Processes

With closer attention to processes that might account for resilience, second wave investigators also began to note that protective processes could be contextually specific. This research highlighted the importance of paying careful attention to the ways in which specific groups exposed to diverse stressors differentially adapt, and also to

exploring which factors were protective for which individuals in these contexts. Cicchetti and Rogosch (1997), in their follow-up study of maltreated children, provide intriguing evidence in this regard. Whereas many studies of high-risk children have found that close interpersonal relationships and social support predict better long-term outcome, Cicchetti and Rogosch found that the maltreated children in their study who displayed positive long-term adjustment actually drew on *fewer* relational resources and displayed more restrictive emotional self-regulation styles than did comparison controls who were not maltreated. In a similar vein, both Werner and Smith (1992) and Wyman (2003) found that interpersonal and affective distancing and low expectations for parental involvement were related to later resilience, not poor adjustment. Expanding upon this, Werner and Smith reported that later in life many of their resilient adults detached themselves from parents and siblings, perhaps to prevent being overwhelmed by their families' emotional problems. These results highlight the distinctive challenges faced by children who come from highly dysfunctional families and emphasize the importance of avoiding premature conclusions about what constitutes positive coping.

The Rochester Child Resilience Project (Wyman, 2003; Wyman, Cowen, Work, & Kerley, 1993) has shed additional light on the issues of context-specific adaptation and the processes underlying resilience. In their follow-up study of urban children growing up in the context of adversity (high rates of poverty, violence, family discord, and substance use problems), factors considered to be "protective" differed in their effect, depending on additional characteristics of the child and the context. For example, although positive future expectations and perceptions of personal competence have often been found to be protective, this positive effect was only evident among participants in their study when these perceptions were realistic. If the adolescent had an unrealistic perception of his or her competence, this was associated with an elevated risk of serious conduct problems. Furthermore, in their sample, positive future expectations were actually

associated with academic disengagement among those participants who also displayed conduct problems. Overall, these findings suggest that individual child characteristics such as high self-esteem or positive future expectations may be associated with resilience for some children but not for others. It may be quite important to pay attention to whether the child's beliefs and expectations are congruent with his or her ability to reach the goals set.

Stability and Change in Resilient Adaptation

As resilience research developed, more nuanced perspectives emerged. It was clear that the same child could be diagnosed "resilient" at one point in development but not another, that a child might be adaptive in one context but not another at the same point in development, and that children were often adaptive in some aspects of their life but not others. Moreover, wave two research gave far more consideration to multiple levels of context interacting to produce resilience. Consequently, the most complex models of resilience focus on healthy vs. maladaptive *pathways* of development in the lives of children exposed to adversity over time. These models provide an opportunity to attend specifically to turning points in individual's lives, and to consider the complex, holistic interactions of a changing person and context (Masten, 2012; Masten & Reed, 2002; Rutter, 2000).

To date, much of the discussion of developmental pathways has been drawn from case examples and composite data obtained in longitudinal studies (e.g., Cairns, & Cairns, 1994; Furstenberg, Brooks-Gunn, & Morgan, 1987; Hawkins et al., 2003; Masten et al., 2004; Masten, Obradović, & Burt, 2006; Rutter & Quinton, 1984; Sampson & Laub, 1993; Werner & Smith, 1992, 2001). This longitudinal data allows us to examine changes within-individuals over time rather than focusing on between-individual analyses. Such data speak to the enduring capacity for change that exists throughout development, and also provide valuable insight into the possible

processes that may operate to produce either stability or change in functioning. For example, studies identifying and attempting to account for desistance trajectories in delinquency and criminal behavior based on longitudinal data (e.g., Hawkins et al., 2003; Mulvey et al., 2010; Sampson & Laub, 1993) suggest that complex interactions of youth with parents, peers, and other adults in the home, neighborhood, schools, and workplace contribute to positive and negative trajectories across the transitions from childhood to adolescence and early adulthood. Such studies also suggest that there are critical turning points in response to specific developmental challenges (such as entering school or the transition to adolescence) that may shape the nature and course of future adaptation.

Three studies that have followed a high-risk sample well into adulthood provide some very encouraging information about the potential for recovery. Werner and Smith (1992) report that *the majority* of their high-risk youths with serious coping problems in adolescence had recovered by the time they reached their 30s, and this was particularly true for the women in their sample. Only one in six troubled high-risk teens became a troubled adult. Furstenberg and colleagues (1987) found a similar pattern of later recovery among their sample of black adolescent teenage mothers. Also, among antisocial youth, large scale desistance is reported over time, so that by mid-life, the majority of antisocial youth have desisted (Sampson & Laub, 1993). Across all three studies, strong ties to work and to one's spouse were associated with eventual positive adaptation and strongly implicated in "turn around" cases. Activities which facilitated these ends, such as developing personal resources, obtaining further education, marrying an accepting and supportive spouse, joining the armed forces to gain vocational skills, and subsequent fertility control and family planning, were critical components promoting positive within-individual changes over time. For other high-risk individuals, supportive extended family and friendship networks or becoming a member of a church facilitated positive change. Follow-up studies of children adopted away from institutional rearing

characterized by extreme deprivation (Rutter & the English and Romanian Adoptees (ERA) study team, 1998), child soldiers (e.g., Betancourt et al., 2010) and refugees exposed to massive war trauma (Wright et al., 1997) also suggest a remarkable capacity for developmental recovery when normative rearing conditions are restored. All of these studies reveal the critical importance of turning points in the lives of those exposed to severe adversity. These turning points, often occurring in conjunction with substantial changes in status or context (e.g., adoption, immigration, postsecondary education, rescue, securing stable employment, successful marriage), may indicate lasting alterations in an individual's developmental pathway. Laub, Nagin, and Sampson (1998) have described these phenomena in terms of "knifing off" in the long-term follow-up of the Glueck and Glueck cohort of antisocial youth, and there are many anecdotal accounts of such dramatic turns in the life course.

The impressive recovery patterns observed in many individuals later in life, however, do not mean that all children will recover. A significant percentage of the children from the Romanian orphanages as well as from the refugee studies have serious and chronic emotional, behavioral, and/or cognitive problems that appear to be lasting effects of their experiences (Gunnar, 2001; Masten & Hubbard, 2003; Rutter & the ERA team, 1998; Wright et al., 1997; Zeanah, Smyke, & Settles, 2006). Both Werner and Smith's (1992) and Sampson and Laub's (1993) longitudinal studies (Laub & Sampson, 2002) revealed that if there were several problem areas at an early age, such as school failure, serious mental health problems, and repeated problems with delinquency, the pattern of maladjustment and deviant behavior was more stable. This finding sheds light on a pattern replicated by other longitudinal studies that there is stronger support for developmental continuity of poor adaptation when multiple areas of competence have been compromised. Compounding or cascading problems may explain why intervention becomes more challenging as individuals advance further along pathways of maladaptation, or problems show cascading effects, spreading across domains

(Masten & Cicchetti, 2010; Masten & Powell, 2003; Yates et al., 2003).

Another important consideration is the possibility that the effects of early adversity might not be evident immediately, but might emerge much later in development (a kind of “sleeping effect”). Some types of early adversity, such as living with a depressed mother (Goodman, 2007) or experiencing neglect or abuse (DiLillo & Damashek, 2003), might impair the child’s later ability to function successfully in intimate family roles. For example, female survivors of child sexual abuse can display a wide range of later interpersonal problems, including problems with intimate partner relationships, disturbed sexual functioning, and difficulties in parenting (DiLillo, 2001). Longitudinal data on interpersonal functioning over time is particularly needed to understand the influence of early traumatic relationship experiences on later attachments and to explore the timing and types of subsequent interpersonal experiences that can counteract adverse effects (Egeland, Weinfield, Bosquet, & Cheng, 2000).

Understanding resilience in terms of processes that alter children’s transactions with adverse life conditions, enabling them to reduce the negative effects of such experiences, and fostering mastery also avoids the type of damaging labeling that sometimes occurs when resilience is referred to as an individual outcome. Children who experience adversity, particularly severe and long lasting trauma, should be expected to have distress symptoms of some sort. For this reason it is particularly helpful to think of a “continuum of resilience” as well as a “continuum of vulnerability” across multiple domains (physical, psychological, interpersonal, and occupational) and to be alert to the ever changing dynamic of the child’s functioning over time.

There are potentially damaging consequences of viewing resilience as an individual *trait* (Masten, 2012). Foremost among these is the tendency to view those children who do not adapt successfully as somehow lacking the “right stuff” and somehow personally to blame for not being able to surmount the obstacles they have faced. This focus minimizes the overwhelming social stressors and chronic adversities that many children face and

also underplays the extensive role of context in individual resilience. Because adaptation is embedded within a context of multiple systems of interactions, including the family, school, neighborhood, community, and culture, a child’s resilience is very dependent upon other people and other systems of influence (Masten & Obradović, 2008; Riley & Masten, 2005). The processes that foster resilience or vulnerability need to be understood within this holistic context. Children who do not “make it” often lack the basic support, protection, and respect they need for successful development, whereas children who succeed typically have sufficient external support to continue forward. The same forces that may constrain the child’s development—poverty, discrimination, inadequate medical care, or exposure to community violence—also often impact and constrain the entire family. Economically impoverished families, or parents ravaged by their own struggles with alcoholism or mental illness, are often poorly equipped to provide the necessary resources and basic protections their children need. All individuals need the support and assistance of the society in which they live. The degree of success one has in surmounting these obstacles is a complex combination of personal strengths and vulnerabilities, as well as ongoing transactions with one’s family and community network (Cowen, 2000; Riley & Masten, 2005; Walsh, 1998).

Cultural Influences on Resilience

Another critical component in understanding processes in resilience is the role of culture. Just as biological evolution has equipped human individuals with many adaptive systems, cultural evolution has produced a host of protective systems. Protective factors are often rooted in culture. Cultural traditions, religious rituals and ceremonies, and community support services undoubtedly provide a wide variety of protective functions, though these have not been studied as extensively in resilience research. Moreover, there may well be culturally specific traditions, beliefs, or support systems that function to protect individuals,

families, and community functioning in the context of adversity within those cultures. Specific healing, blessing, or purification ceremonies, such as those found among American Indian tribal cultures (Gone, 2009; LaFromboise, Oliver & Hoyt, 2006a, 2006b), as well as in many cultures and religions around the world (Crawford, Wright, & Masten, 2006), may serve to counteract or ameliorate the impact of devastating experiences among people in a culture. Similarly, among minority groups in society, factors such as strength of ethnic identity, competence and comfort in relating to members of different groups, and racial socialization are particularly important in dealing with challenges that arise due to experiences of oppression and discrimination within the context in which they live (Szalacha et al., 2003; Wright & Littleford, 2002). To date there has been surprisingly limited systematic investigation of culturally based protective processes (Luthar, 2006, Masten & Wright, 2010). The movement away from an individually based conceptualization of resilience and towards a contextually situated framework has been a welcome one from the perspective of many cross-cultural researchers (Aponte, 1994; Boyd-Franklin & Bry, 2000; Hill, 1999). Whereas some of the factors and processes that have been identified as fostering resilience focus on individual functioning (such as good cognitive skills, socio-emotional sensitivity, ability to self-regulate), the shape and function of these processes may be culturally influenced or may interact with cultural demands and expectations in ways that are poorly understood. Moreover, many other factors have been identified within the collective network of the family and the community. As the study of resilience continues, it will be critical to explore the extent to which factors found to promote resilience in one group will also be replicated across cultural groups and also how the same factor found across multiple groups may function differently in different cultural contexts. For example, for various cultural/ethnic groups there can be a great deal of difference in the relative importance placed on individualism, collectivism, and familism, and

these dimensions might mediate resilience in different ways for different groups (Gaines et al., 1997; Kim, Triandis, Kagitcibasi, Choi, & Yoon, 1994). Our intervention efforts might be significantly enhanced by consideration of these and of other cultural dimensions.

The Third Wave: Intervening to Foster Resilience

From inception, a compelling rationale for the systematic study of naturally occurring resilience was to inform practice, prevention, and policy efforts directed towards *creating resilience* when it was not likely to occur naturally. The second wave focused on a better understanding of mediating and moderating processes that might explain the links between adversity and developmental competence, as an intermediate step toward the ultimate goal of intervening to promote resilience and positive development. Research on such processes continues to be important. However, using lessons from the first two waves, investigators of the third wave began to translate the basic science of resilience that was emerging into actions intended to promote resilience. These investigators recognized that experiments to promote positive adaptation and prevent problems among individuals at high risk for developing problems represented a powerful strategy for testing resilience theory and hypothesized adaptive processes that were targeted in the theory or logic model of the experimental intervention. Initially, this work took the form of theory-driven intervention designs and subsequently, with growing frequency, third-wave research has taken the form of experiments with randomized control or comparison groups with explicit models of change. Such experiments represent the “gold standard” of evidence about change processes.

Historically, the third wave represented a confluence of goals, models, and methods from prevention science and studies of naturally occurring resilience (Cicchetti, Rappaport, Sandler, & Weissberg, 2000; Coie et al., 1993; Cowen & Durlak, 2000; Masten, 2007; Masten & Coatsworth, 1998; Weissberg & Kumpfer, 2003;

Yoshikawa, 1994). Multifaceted intervention studies designed to prevent or reduce risky behaviors, delinquency, and other problems in children (e.g., FASTTrack or the Seattle Social Development Project) and also early childhood interventions developed to improve the odds of children growing up in poverty or disadvantage (e.g., Abecedarian, Head Start, Perry Preschool Project, Chicago Longitudinal Study) encompassed multiple strategies designed to promote success in developmental tasks at the same time they reduced risk for problem behaviors (Ramey & Ramey, 1998; Reynolds & Ou, 2003; Weissberg & Greenberg, 1998). As the data on assets, promotive, and protective factors began to accumulate in natural resilience studies, data was mounting in prevention science based on randomized clinical trials that promoting competence was a key element of programs that worked and the mediators and moderators of change bore a striking resemblance to the processes implicated by the "short list" in resilience research (Cicchetti et al., 2000; Luthar & Cicchetti, 2000; Masten, 2001, 2007; Masten, Burt, et al., 2006; Masten & Coatsworth, 1998; Masten, Obradović, et al., 2006; Reynolds & Ou, 2003).

Over the past decade, there has been a profound change in the models for intervention, particularly in prevention models, that likely reflects the growing influence of resilience theory and research (Masten, 2011). Numerous strength-based models and resilience frameworks for practice and policy have been articulated (e.g., Cicchetti et al., 2000; Galassi & Akos, 2007; Luthar & Cicchetti, 2000; Masten, 2001, 2006, 2011; Nation et al., 2003). In the prevention science field, intervention models are routinely described in terms of protective processes to promote resilient development (McLain et al., 2010; Patterson, Forgatch, & DeGarmo, 2010; Toth, Pianta, & Erickson, 2011; Weissberg, Kumpfer, & Seligman, 2003; Wyman, 2003; Wyman, Sandler, Wolchik, & Nelson, 2000). Intervening to alter the life course of a child potentially at risk for psychopathology or other problems, whether by reducing risk or adversity exposure, boosting resources, nurturing relationships, or mobilizing other protective systems, can be viewed as a protective process.

Strategic timing of intervention also holds great interest for third wave research because evidence suggests that there are windows of opportunity for changing the course of development, when systems may be more malleable or there is a higher likelihood of potentiating a positive cascade (Cicchetti, 2010; Masten & Cicchetti, 2010; Masten, Burt, et al., 2006; Masten, Obradović, et al., 2006; Masten, Long, Kuo, McCormick, & Desjardins, 2009; Steinberg, Dahl, Keating, Kupfer, Masten, & Pine, 2006). Timing an intervention well may lead to more lasting effects, broader effects, and/or higher returns on investment (Heckman, 2006; Masten et al., 2009; Masten & Cicchetti, 2010; Reynolds & Temple, 2006; Shonkoff, Boyce, & McEwen, 2009). For example, during a developmental transition or turning point, targeted interventions can be critically important in activating developmental cascades (i.e., progressive effects) that enhance multiple domains of functioning or deterring negative cascades of maladaptive behavior that could undermine adjustment (Masten, Burt, et al., 2006; Masten & Cicchetti, 2010; Masten, Obradović, et al., 2006). For example, the long-term effects of the Parent-Management Training-Oregon (PMTO) model to promote parents' positive involvement and deter coercive aggression included cascading pathways of adaptive development for both parents and children. A follow-up study revealed a higher standard of living and healthier social interactions 9 years after the intervention (Patterson et al., 2010).

Experimental intervention designs can provide a powerful test of hypotheses about how resilience occurs, particularly when the process of change is specified (e.g., parenting or attributional style), the intervention is tailored for specific needs and targets changes in this process, and the change processes affect subsequent change in the targeted behavior of an individual or system. For example, possessing the executive functioning capacity of strong inhibitory skills was demonstrated to be centrally important for school achievement in homeless children (Obradović, 2010). Also important was high quality parenting to buffer these children from further adversity and to

serve as a mediator of risk and achievement (Herbers et al., 2011). These studies emphasize the need to promote competence as well as to reduce risk. Boosting fundamental skills for learning and school success and nurturing parent–child relationships are also promising pathways to adaptive development for young, disadvantaged children (Diamond, Barnett, Thomas, & Munro 2007; Masten & Gewirtz, 2006).

Kraemer et al. (2002) provided an illustration of how experimental intervention designs can test such mediating and moderating effects, with the intervention serving as the hoped-for moderator of the hypothesized mediating process. Experimental designs are also particularly well suited for identifying who benefits most from what aspect of treatment, mediated by which changes, thereby testing additional moderating and mediating effects. The Seattle Social Development Project provides an excellent example of an experiment designed to test whether and how an intervention worked to reduce problem behaviors (see Hawkins, Catalano, Kosterman, Abbott, & Hill, 1999; Hawkins et al., 2003). For example, a comprehensive intervention package (delivered to a group of children in schools serving high crime neighborhoods when they were in elementary school) produced demonstrable change in school bonding which was associated with better outcomes in the secondary school years, assessed by less antisocial behavior and better high school grades. Another excellent example is provided by Sandler, Wolchik, Davis, Haine, and Ayers (2003), who designed a preventive intervention for families going through a divorce, with the goal of moderating a key mediator in the child's life, the parent's behavior. Six-year follow-up data for this randomized prevention trial elucidated multiple cascading pathways to adaptation in adolescence. Mothers' more positive relationships with children and use of effective discipline activated positive trajectories of less internalizing problems leading to higher self-esteem, and less externalizing problems and substance use leading to higher academic achievement (McLain et al., 2010). Such studies offer compelling evidence both for the effectiveness of a particular intervention (the manualized program for

mothers in this case) and for the role of parental functioning in causal processes related to child outcomes during the course of negotiating adversity. The dynamic capacities afforded by close relationships to foster development and protect individuals and social groups in the face of adversity has led many to conclude that relationships are the most critical protective factor for young people at risk (e.g., Luthar, 2006). The children of parents who already function well during adversity or parents who mobilize what is needed to protect their children as a result of personal change, enlisting help, or other adaptive processes fare better during and following adversity in many situations studied around the globe.

Research on interventions to create resilience is gaining momentum as evidence builds from basic research and experimental data that resilience processes can be identified and changed, and that intervention methods are vital for testing resilience theory (Masten, 2011). It is still the case, as noted by Weissberg and Kumpfer (2003) some time ago, that much work remains to be done to understand resilience processes (e.g., mediating, moderating, promoting, compensating, and cascading processes) well enough to manipulate them most effectively and efficiently to benefit children and society. However, the evidence base is growing and a good case can also be made that progress would be accelerated by concerted efforts to span the translational divide through collaborative translational research that engages basic researchers and community partners in intervention trials that reflect current knowledge but also explicitly focus on testing theories of change (see Masten, 2011; Toth et al., 2011). These are ongoing tasks of third wave resilience research. Only by identifying the multifaceted processes underlying successful adaptation under adverse conditions will we find ways to intervene successfully in the lives of those who remain vulnerable.

Analyses of current preventive programs that work for children underscore the importance of theory-driven approaches that embrace a developmental, ecological systems approach and capitalize on windows of opportunity in development. Salient features of successful prevention programs

include many of the factors that have been described in this chapter. These include a focus on strategically timed, culturally relevant, comprehensive programs across multiple settings, programs that are of sufficient length and depth to address the magnitude of the problem, and strive to maximize positive resources and the benefit-to-cost ratio of implementation. Additionally, because the effects of interventions might be delayed, unexpected, or indirect, it is important to consider more complex models of change and monitor outcome appropriately, over time, in multiple domains and possibly at multiple-system levels. Such comprehensive prevention approaches acknowledge the multiplicity of risks and the cumulative trauma that many children face and emphasize the importance of promoting competence and building protection across multiple domains in order to achieve a positive outcome.

The Fourth Wave: Resilience Research on Multiple-Systems Levels, Epigenetic Processes, and Neurobiological Processes

The fourth wave in resilience research is focused on multilevel dynamics and the many processes linking genes, neurobiological adaptation, brain development, behavior, and context at multiple levels. It is predicated on the idea that development arises from probabilistic epigenesis, involving many processes of interaction across multiple levels of function, with gene–environment interplay and co-action playing key roles (Gottlieb, 2007) and explicit recognition that adaptation is inherently multilevel (Masten, 2007). This wave began to rise as new methods for research became more widely available to study these processes, including the assessment of genes, gene expression, brain structure and function, social interaction, and statistics for modeling growth, change, and interactions in complex systems (Charney, 2004; Cicchetti, 2010; Cicchetti & Curtis, 2006, 2007; Feder, Nestler, & Charney, 2009; Masten et al., 2004; Masten, 2007, 2012; Masten & Obradović, 2008). There had been many calls for greater attention

to resilience at other levels of analysis (e.g., Curtis & Cicchetti, 2003), but earlier waves of resilience research were dominated by psychosocial studies emphasizing individual behavior and development, with some attention to other levels, such as relationships, families, peers, and schools or other community systems (Cicchetti, 2010; Luthar, 2006; Masten, 2007).

Over the past decade, research aiming to elucidate the biology or neuroscience of resilience has burgeoned (Cicchetti, 2010; Feder et al., 2009). At the same time, once independent and disparate fields of research on resilience at different levels in different disciplines (e.g., ecology, engineering, public health, management, emergency services) are coming together in response to urgent national and global threats that require integrative solutions, such as natural disasters, terrorism, global warming, and flu pandemic (Masten & Obradović, 2008; Masten & Osofsky, 2010; Norris, Steven, Pfefferbaum, Wyche, & Pfefferbaum, 2008).

Fully describing the exciting and interdisciplinary directions in the fourth wave of resilience research is beyond the scope of this chapter. However, as examples, there is considerable activity and interest in the following research areas:

- Gene X environment moderating effects including intervention moderating effects (for illustration see Kim-Cohen & Gold, 2009; Brody, Beach, Chen, & Murry, 2009).
- Programming, biological sensitivity to context, differential susceptibility, bidirectional influences, and calibration of adaptive systems crucial for adaptive response to adversity (see Boyce & Ellis, 2005; Del Giudice, Ellis, & Shirtcliff, 2011; Meaney, 2010).
- Reprogramming and interventions to normalize poorly regulated adaptive systems in the organism, such as stress or immune function, executive function skills, and emotion regulation (see Dozier, Peloso, Lewis, Laurenceau, & Levine, 2008; Fisher, Van Ryzin, & Gunnar, 2011; Meaney, 2010; Yehuda, Flory, Southwick, & Charney, 2006).
- Assessment of biomarkers, gene expression, or neural function in intervention studies to tailor the intervention or assess its effectiveness

(see Blair, 2010; Brody et al., 2009; Cicchetti, 2010).

- Integrating models and research on resilience in ecosystems, social systems, and individual biology or neural systems (see Longstaff, 2009; Masten & Obradović, 2008; Norris et al., 2008).

This wave of resilience research is just beginning but it promises to transform the science and the application of resilience.

Conclusion

In conclusion, the past 40 years of research on resilience have shed much light on the fundamental adaptive systems supporting human development and on identifying complex, multisystemic interactions that might shape both positive and pathological outcomes following adversity. A strong knowledge base has accrued on the processes implicated in resilience, particularly on factors that increase vulnerability and those that afford protection. However, much remains to be done, and as evident in the rising fourth wave of research, there is much uncharted territory. It will take time to unravel and understand these multiple levels of influence and build a stronger bridge between science and practice. It is essential at this juncture not to lose sight of the goals for this work—to enhance understanding of key mechanisms leading to risk reduction, to determine the key ingredients of successful interventions, and to apply what we are learning in prevention and intervention efforts to foster resilience among vulnerable children and their families. Clinical interventions and primary preventions with known effectiveness currently exist and need to be made accessible in more diverse community settings and evaluated. This will allow for critical exploration of factors that promote or interfere with resilient processes in different cultural contexts. Collaborative work across diverse contexts is urgently needed to refine resilience-based models of intervention and change, and also to inform the design of primary prevention and social policy programs. Past work in this

area has focused very productively on the psychological and interpersonal arenas, but efforts to include biological and cultural levels of analysis are just beginning. The thrust of future research needs to attend more directly and explicitly to context and transactional, bidirectional analyses over time, clarifying the conditions under which interventions may and may not work, identifying the most strategic and cost-effective targets and timing for interventions, and exploring natural reparative processes. Although there is clear evidence that resilience in young people is highly dependent on other people and multiple systems of influence, there is limited knowledge of how these multiple levels of influence operate synergistically and how best to incorporate the biological, psychological, interpersonal, and cultural levels of analysis into our research and models for clinical intervention. Integrative approaches, spanning levels and disciplines, are needed to apply the expanding knowledge based on resilience in human development with efficiency and effectiveness to foster positive adaptation among the most vulnerable children, youth, and families in our communities.

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