2 Resilience Processes in Development: Multisystem Integration Emerging from Four Waves of Research

Ann S. Masten, Angela J. Narayan, and Margaret O'Dougherty Wright

How do children and adolescents "make it" when their development is threatened by poverty, neglect, maltreatment, wars, disasters, violence, pandemics, oppression, racism, and discrimination? What protects them when caregiving and family functioning are disrupted by separation, substance abuse, mental illness, physical illness, or death? How do we explain the manifestations of resilience—when we observe children succeed 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 (Garmezy, 1985; Rutter, 1987; Garmezy & Rutter, 1983; Werner & Smith, 1982).

The resilience research pioneers led a revolution in thinking about the origins and treatment of psychopathology (Masten & Cicchetti, 2016). The primary focus of earlier clinical research on children at high risk for psychopathology had been to observe either the consequences of adversity or the unfolding of risk processes accounting for the etiology of disorders. Research efforts were directed toward 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, didn't account for why many did not fare poorly, and provided little understanding of how good outcomes were actually achieved by those 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 resilience 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.

A. S. Masten (✉)
Institute of Child Development, University of Minnesota Twin Cities, Minneapolis, MN, USA
e-mail: amasten@umn.edu

A. J. Narayan
Department of Psychology, University of Denver, Denver, CO, USA
e-mail: angela.narayan@du.edu

M. O. Wright
Department of Psychology, Miami University, Oxford, OH, USA
e-mail: wrightmo@miamioh.edu

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The study of resilience advanced in four major waves of research (Masten & Cicchetti, 2016; Wright et al., 2013). In this chapter, we highlight the concepts and findings resulting from these waves to date, as they have shaped an emerging multisystem 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, focused on understanding the processes that could account for the manifestations of resilience observed in the first wave, adopting a developmental systems approach to theory and research on positive adaptation in the context of adversity or risk. The third wave focused on interventions aiming to foster resilience and thereby change developmental pathways in more positive directions. The fourth wave to date has focused on understanding and integrating resilience processes across multiple levels of analysis, with growing attention to epigenetic and neurobiological processes, brain development, cultural influences, and socioecological contexts, as well as the ways that systems interact to shape development. As the fourth wave of resilience science matures, there is growing attention to multisystem theory and processes, by which interacting systems shape the development of individuals and other systems over time, and a growing call for integrating knowledge across disciplines as well as levels of study.

The First Wave: Identifying Individuals Who Manifested Resilience and Factors That Appeared to 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 individual 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 traumas, the term "invulnerability" was replaced by more qualified, realistic, 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 as individuals interacted with families and larger sociocultural influences (Masten et al., 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, 2014; Masten et al., 1990; Ungar, 2008). A consensus emerged on key concepts, although 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 became broader, more dynamic, and systems-oriented, in keeping with efforts to integrate this concept across levels of analysis and across disciplines (Masten, 2018; Ungar, 2018). An example of a systems-oriented definition of resilience is as follows:

> The capacity of a dynamic system to adapt successfully to challenges that threaten the function, survival, or development of the system. (Masten, 2021, p. 1)

Early on, resilience investigators recognized that resilience was an inferential concept involving two distinct kinds of judgments (Luthar & Cicchetti, 2000; Masten & Coatsworth, 1998). First, one judges 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 by some selected set of criteria.

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

Resilience definitions require consideration of both threats or disturbances to a system and criteria of adjustment or function by which the successful adaptation of the system is judged. Threat concepts include risks or adverse experiences. As defined 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 more likely to fare poorly or less likely to do well in some regard. There is often a lack of precision regarding risk factors, related to their complex and cumulative nature (Evans et al., 2013; Obradović et al., 2012). Many broad risk indicators or "markers" encompass considerable heterogeneity in outcomes within the group. For example, children born prematurely vary in circumstances, birth weight, accompanying complications, family socioeconomic situation, access to medical care, and adequate nutrition. 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 the reason for preterm delivery or whether there were additional delivery complications may not only improve prediction about outcomes but also lead to better understanding of the actual processes producing or exacerbating the risks (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 et al., 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 became critical to examine "cumulative risk factors" in order to more accurately predict and understand developmental outcomes (Sameroff et al., 2003). Divorce, for example, has been a commonly studied stressor, but research revealed heterogeneity in outcomes for children of divorced parents. The concept of cumulative risk helps clarify this diversity in outcome. Divorce is not a single, time-limited risk factor or stressor but is often a 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, prolonged displacement, or torture, resilience often refers to good recovery after the trauma has ended (Masten & Narayan, 2012).

Risk terminology has been refined over the years, inspired by a series of influential articles by Kraemer et al. (1997, 2001, 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 undesirable outcome of interest. This work has not only led to a greater specificity in risk terminology but also provided a conceptual framework for research with the goal of identifying causal risk factors (see decision tree in Kraemer et al. (1997)) and testing hypothesized

Table 2.1 Definitions with child and family examples of key concepts

Term	Definition	Examples
Adversity	Disturbances to the function or viability of a system; experiences that threaten adaptation or development	Poverty; child maltreatment; death of caregiver; forced migration due to war or natural disaster; discrimination
Resilience	Positive adaptation in the face of risk or adversity; capacity of a dynamic system to adapt successfully to challenges that threaten system function, survival, or development	Child exposed to family violence 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 autism spectrum disorder (ASD) are higher in groups of people who have a biological sibling with ASD
Risk factor	A measurable characteristic in a group of individuals or their context that predicts a negative outcome on a specific outcome criterion	Premature birth; parental divorce; homelessness; parental mental illness; sexual assault
Cumulative risk	Increased overall risk due to: (a) the presence of multiple risk factors; (b) recurring risk factors; or (c) accumulating effects of ongoing adversity	Homelessness confers high cumulative risk to health and development due to a piling up of risks and adverse experiences, such as food insecurity, residential instability, unsafe neighborhoods, school mobility and dropout, poor healthcare, and unemployment
Vulnerability	Individual (or system) susceptibility to undesirable outcomes; the diathesis in diathesis-stressor models of psychopathology	A compromised immune function increases susceptibility to infectious diseases; an anxious child finds school transitions challenging; a child abused at home has difficulties negotiating conflict with peers
Proximal risk	Risk factors experienced directly by the child	Witnessing violence; associating with delinquent peers; experiencing cyberbullying
Distal risk	Risk arising from a child's ecological context but mediated through more proximal processes	High community crime rate; inaccessible healthcare; economic recession; structural racism
Asset, resource, compensatory, or promotive factor	A measurable attribute of individual, family, or broader context that predicts a positive or desirable outcome regardless of risk level	Strong cognitive abilities; competent parenting; effective schools; high socioeconomic status
Protective factor	A predictor of better outcomes *particularly* in situations of risk or adversity	Airbags in automobiles, helmets, 911 services, neonatal intensive care, health insurance, vaccines
Cumulative protection	The presence of multiple protective factors in an individual's life	A child in a poor or violent neighborhood has supportive parents, a safe home, attends a good school, volunteers as a school tutor, and has prosocial friends
Developmental tasks	Psychosocial milestones, benchmarks, or accomplishments expected of people by age in a given historical or cultural context, often serving as the criteria for judging how well a person is doing in life	Walking, talking, learning to read, developing friendships, following rules, graduating from high school, taking care of one's children
Psychosocial competence	Effectiveness in or capacity for using personal and contextual resources to accomplish age-appropriate developmental tasks	Active engagement of intellectual ability and positive relationships with teachers result in school success

mediating and moderating influences through experimental intervention designs (Kraemer et al., 2002).

Over the past two decades, a retrospective measure of cumulative risks typically reported by adults about their childhood history has surged in popularity. The Adverse Childhood Experience (ACE) scale was developed to index childhood adversities linked to adult health problems, particularly those stemming from childhood maltreatment and exposure to household dysfunction (Felitti et al., 1998). The Centers for Disease Control and many US states subsequently adopted this brief, low-burden scale to screen for the prevalence of ACEs and monitor how these exposures were related to health and well-being over the life course. Interest also has grown in documenting the intergenerational transmission of cumulative adversities indexed by the ACE scale and similar measures (Narayan et al., 2021).

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 et al., 2011). Although 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 Luthar et al. (2000) or Masten and Cicchetti (2016) 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 from internal symptoms of distress was showing resilience. There were debates about not only the "inside" versus "outside" picture on adaptation but also on "how many" domains should be considered and "when" to assess "outcome." We would argue, for example, that manifesting 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 (Wright & Masten, 2015). A person may show resilience at one point in life and not at another or in one domain and not another (e.g., work competence but not relational competence). Such debates linger in the literature (Masten & Cicchetti, 2016). 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.

In recent years, this issue has re-emerged in the form of "costs" of resilience at a biological level, reflected in allostatic load (McEwen, 2020), with respect to achieving developmental tasks when enormous effort is required to overcome very high levels of adversity, particularly in the context of structural racism and oppression or ongoing war and extreme poverty (Brody et al., 2020; Chen et al., 2021; Panter-Brick et al., 2009). The concept of "John Henryism" (James, 1994) refers to the phenomenon of internal wear and tear in the context of external success. Investigators have shown that positive ethnic/

racial identity and racial socialization by families can play important protective roles in the development of children and youth coping with marginalization and discrimination (Anderson & Stevenson, 2019; Huguley et al., 2019; Marks et al., 2020).

One of the most important domains of study that unfolded as resilience research matured 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 et al., 2006). 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 & Cicchetti, 2010). 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 the 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 risks, including high risk levels, which were often termed *assets, resources,* or *compensatory factors* (e.g., Garmezy et al., 1984) or *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 in whether the processes underlying a factor played a special role under hazardous conditions, when risk or adversity levels were high.

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 represent attributes or processes 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, respectively. 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 promotive factors (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 and other caregivers, who can 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 reconfirmed time and time again is that resilient adaptation depends on positive 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 et al., 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 a 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 "intelligence quotient (IQ)" scores and other assessments of general cognitive capabilities that measure general abilities for adaptive problem-solving 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 have been considerable debates 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 a more advantaged economic 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. Moreover, many of the broad indices of risk, such as poverty or homelessness or maltreatment, are marker variables for many additional risk factors and adversities that co-occur: when one is present, there usually is a history of high cumulative risk (Masten & Narayan, 2012; Sameroff et al., 2003). 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 a random accident) but has 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. However, most factors currently studied as contributors to adaptation or good versus poor development reflect continuously distributed variables that may operate in many ways at many levels (e.g., attentional skills ranging from focused to multitasking to inattention or emotionality including calm states, excitement, and extreme dysregulation).

Developmental Perspectives

Resilience studies have 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 an 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 risky. Thus, although older children are much more capable of coping in this 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 (Masten & Narayan, 2012).

The possibility of "sensitive periods" in human development, when experiences (positive or negative, present or absent) might have more influence on development, was also recognized quite early in the resilience literature, particularly with regard to the timing of adverse experiences, including nutritional deficits, caregiving deprivation, exposure to violence, or direct maltreatment (e.g., Boyce et al., 2021;

Egeland et al., 1993; Narayan et al., 2013). However, researchers also recognized the importance of intervention timing in promoting resilience (e.g., Luthar & Cicchetti, 2000; Ramey & Ramey, 1998). Developmental theories of change underpinning the strategic timing of intervention and prevention efforts often were based on one of two fundamental ideas: "windows of opportunity" when developing systems were more malleable to change and "developmental cascades" (Masten, 2015). Windows of opportunity for enduring change in the life course have been studied in relation to neural plasticity (Boyce et al., 2021; Nelson, 1999) and with respect to contextual opportunities that trigger positive changes, such as adoption, entering a high-quality early childhood program, or moving from a conflict zone to a peaceful society with more support factors for child development. Similarly, the perinatal period has been recognized as an important window of opportunity to promote resilience in pregnant women as well as the fetus, through identifying risk and intervening to prevent intergeneration transmission of stress, trauma, and psychopathology (Davis & Narayan, 2020).

The concept of developmental cascades generally refers to the spreading effects of changes in one aspect or level of functioning in dynamic systems to other domains and levels, resulting from the many interactions of biological and psychosocial systems that shape human development (Masten & Cicchetti, 2010). Preventive interventions for children in high-risk groups often aimed at promoting positive cascades, given evidence that engaging successfully in developmental tasks in one period of development sets the stage for future success in a cumulative manner. Interventions alternatively aimed at preventing or interrupting the cascading effects of negative cascades, whereby problems in adjustment were likely to grow worse over time or undermine success in the important new domains of psychosocial adjustment.

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 outcomes 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 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 (Ungar & Theron, 2020). Table 2.2 provides examples of widely observed resilience factors.

Masten (2001, 2007) has referred to these resilience factors as "the short list" and argued that these commonly observed resilience factors reflect fundamental adaptive systems supporting human development, particularly in the context of adversity. During the fourth wave, a multisystem perspective on the short list has emerged, discussed further below.

As investigators began to consider the *processes* that might account for resilience factors observed across diverse studies, the second wave of resilience work began. Although the first wave produced many ideas, constructs, methods, and findings about the 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 and Johnson (1999)).

Table 2.2 Examples of resilience factors for children in contexts of elevated risk or adversity

In the child
Sense of belonging and perceived social support
Cognitive capabilities, problem-solving skills, executive functions
Good and predictable sleep quality
Social skills and ability to form and maintain positive peer relationships
Effective emotional and behavioral regulation strategies and coping skills
Positive views of self (identity, self-confidence, self-efficacy)
Positive outlook on life (hopefulness)
Purpose, faith, a sense of meaning in life
Other attributes valued by the society and self (e.g., talents, sense of humor)
In the family
Stable and supportive home environment
Close relationship with sensitive and responsive caregiver(s)
Harmonious relationships among family members, family cohesion
Authoritative parenting (high warmth, structure, and expectations)
Supportive connections with extended family members
Positive and predictable family routines and traditions
Parental involvement in child's education
Parents who have attributes listed above in the child section
Socioeconomic advantages and resources
Family social support
Positive ethnic/racial identity and racial socialization
Spiritual or religious beliefs, affiliations, and activities
In the community
Positive neighborhood context
Safe neighborhoods with low levels of community violence and crime
Clean air and water
Affordable housing
Access to high-quality childcare
Access to green spaces, recreational centers, and libraries
Effective schools
Competent and reliable teachers
Strong and fair leadership
Positive school climate
Sense of collective community
Connections to caring adult mentors and prosocial peers
High-quality reciprocal friendships
Stable employment opportunities for adults, parents, and young people
Access to affordable and effective health-care services
Access to trustworthy emergency services (police, fire, medical)
Ethical and respected political or community leaders
In the culture or society
Protective child policies (e.g., for health, welfare, childcare, labor, education)
Healthy national economy
Peaceful political environment with national security and protection from violence
Social justice, low levels of discrimination, and perceived equity of opportunities
Nondiscriminatory laws and equal protection under the law
Traditions and celebrations that convey meaning, cohesion, belonging
Support for cultural belief systems that convey meaning and purpose

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

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 theories 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 et al., 1993; Yates et al., 2003; Masten, 1999, 2007). Wyman, for example, described resilience in the following manner: "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 reflected a broader transformation occurring in the sciences concerned with normative and pathological development that accompanied the emergence of *developmental psychopathology* (Cicchetti, 1990, 2006; Masten, 2006, 2007; Sroufe & Rutter, 1984). Systems thinking began to infuse general developmental theory as well as resilience theory and developmental psychopathology, yielding more dynamic models of change and paying far more attention to the interaction of multiple systems in development (Masten et al., 2021; Masten & Kalstabakken, 2018; Griffiths & Tabery, 2013). Initially, this sea change in developmental sciences led to greater emphasis on the role of relationships and systems beyond the family and attempted 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). During the fourth wave, discussed further below, dynamic multisystem models of resilience surged. As resilience science integrated systems thinking and processes, investigators turned their attention to delineating the processes that could account for the descriptive findings that characterized the first wave of studies. 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 were a necessary empirical first step before resilience research could begin to address the complexity of processes that might be involved.

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 that 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; belief systems that give life meaning and purpose; 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 adaptive 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 (Masten & Narayan, 2012).

The influence of developmental systems theory is also evident in the multicausal and dynamic models of resilience characteristic of the second wave of work. Second wave theory and research often encompass the language of developmental

systems theory (DST), with concepts such as *equifinality* and *multifinality*, developmental *pathways* and *trajectories* that capture the dynamic, interactional, reciprocal, multicausal, and multilevel models typical of DST (Bronfenbrenner, 1979; Cicchetti & Rogosch, 1996; Ford & Lerner, 1992). The focus of many second-wave studies was on the processes that may lead to resilience. Studies 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 marked a dramatic shift from a traditional focus on the individual to a broader focus encompassing family and community relational networks (Wright et al., 2013). Developmental outcomes from this perspective result from complex patterns of interaction and transaction. Second-wave research studies incorporated design and analytical techniques and strategies that allowed for detection of such multilevel influences. This dynamic approach emphasized 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 were asked about bidirectional connections between the child and his or her context. These child–context relationships and interactions become the focus of study. This approach fostered research designs that more adequately reflected individual differences in developmental pathways and contextual variation within families, communities, societies, cultures, and historical periods. Second-wave 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 et al., 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; Sroufe, 2020), and some investigators have focused on such internal processes (Compas et al., 2001; Zimmer-Gembeck & Skinner, 2016). 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 (Lieberman & Van Horn, 2009; Wright et al., 2007).

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, provided 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 outcomes, 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, Werner and Smith (1992) and Wyman (2003) found that interpersonal and affective distancing and low expectations for parental involvement were related to later resilience and not poor adjustment. Expanding upon this observation, 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 the emotional problems of their families. These results highlight the distinctive challenges faced by children who come from highly dysfunctional families and emphasize the importance of refraining from making premature conclusions about what constitutes positive coping.

The Rochester Child Resilience Project (Wyman, 2003; Wyman et al., 1993) 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 the additional characteristics of the child and the context. For example, although positive future expectations and perceptions of personal competence often appear to be protective, this positive effect was only evident among participants in their study when these perceptions were realistic. If an adolescent had an unrealistic perception of his or her competence, these positive perceptions were 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.

Stability and Change in Resilient Adaptation

As resilience research developed, more nuanced perspectives emerged. It was clear that the same child could be diagnosed as "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 lives but not in others. Second-wave research also gave more consideration to multiple levels of context interacting to produce changing adjustment over time. Complex models of resilience focused on healthy versus maladaptive *pathways* of development in the lives of children exposed to adversity over time, which could capture fluctuations in adaptive functioning over time and allow for varying patterns for different indicators of adaptive behavior. Pathway models, which have a long history in embryology and developmental psychopathology, draw attention to turning points in development and also to the holistic patterns of development and adjustment that can emerge from complex interactions of a changing person and dynamic contexts (Masten & Cicchetti, 2016; Sroufe, 2020).

Initially, the discussion of developmental pathways drew primarily from case examples and composite data obtained from longitudinal studies (e.g., Cairns & Cairns, 1994; Furstenberg et al., 1987; Hawkins et al., 2003; Masten et al., 2004, 2006; Rutter & Quinton, 1984; Sampson & Laub, 1993; Werner & Smith, 1992, 2001). Longitudinal data allowed for studies of 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 insights 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) have suggested that complex interactions of youth with parents, peers, and other adults in the home, neighborhood, schools, and workplace contributed to positive and negative trajectories across the transitions from childhood to adolescence and early adulthood. Such studies also suggested that there were 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 followed high-risk samples well into adulthood provide encouraging information about the potential for recovery from adverse experiences in childhood. Werner and Smith (1992) reported that *the majority* of their high-risk youth 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 et al. (1987) found a similar pattern of later recovery among their sample of black adolescent teenage mothers. Similarly, among antisocial youth, considerable 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 that 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, social support from extended family and friendship networks or joining a church facilitated positive changes.

Follow-up studies of children who experience severe adversity suggest a remarkable capacity for developmental recovery when normative rearing conditions are restored, including studies of institutional rearing characterized by deprivation (Van IJzendoorn et al., 2020b), rescued child soldiers (Betancourt et al., 2013), and displacement due to wars and disasters (Masten et al., 2015). These longitudinal studies often reveal turning points in the lives of those exposed to severe adversity with lasting alterations in an individual's developmental pathway often occurring in conjunction with substantial positive changes in living conditions or adjustment, brought about by adoption, migration, education, rescue, securing stable employment, successful marriage, engagement in therapy, and similar improvements. Laub et al. (1998) 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 characterized by severe deprivation, as well as from the refugee studies, continued to suffer from serious and chronic emotional, behavioral, and/or cognitive problems that appear to be the lingering effects of their experiences (Gunnar, 2001; Masten & Hubbard, 2003; Rutter & the ERA team, 1998; Wright et al., 1997; Zeanah et al., 2006). Longitudinal studies by Werner and Smith (1992) and Sampson and Laub (1993), Laub and 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, then 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 (Sroufe, 2020). Compounding or cascading problems may explain why interventions become more challenging as individuals advance further along pathways of maladaptation or problems show cascading effects, spreading across domains (Masten & Narayan, 2012).

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 "sleeper effect"). Some types of early adversity, such as living with a depressed mother and maltreatment, might impair the child's later ability to function successfully in intimate family roles. For example, survivors of child sexual abuse and other forms of complex trauma can display a wide range of later interpersonal problems, including problems with intimate partner relationships, disturbed sexual functioning, and difficulties in parenting (DiLillo, 2001; Pratchett & Yehuda, 2011; Wright et al., 2012). Experiences of child maltreatment predict elevated risk, but, nonetheless, there is considerable evidence of resilience among adult survivors of child maltreatment (Cicchetti, 2013; Ioannidis et al., 2020; Wright & Allbaugh, 2017).

Understanding resilience in terms of processes that alter children's transactions with adverse life conditions or their aftermath, mitigating negative effects of such experiences, and fostering positive adjustment also avoids the type of damaging labeling that sometimes occurs when resilience is referred to as an individual outcome. For children who experience adversity, particularly severe and long-lasting trauma, one would expect there to be short-term and long-term effects of some kind, varying in terms of differences in developmental timing, the nature of the adversity, the extent of positive early experiences and resources, historical and cultural context, and individual differences in sensitivity, resources, and resilience capacity available at any given time, resulting in ever-changing functioning over time (Masten et al., 2015; Narayan et al., 2021).

There are potentially damaging consequences of viewing resilience as an individual *trait,* as noted by many resilience scholars over the years (Luthar, 2006; Masten, 2014; Panter-Brick & Leckman, 2013; Rutter, 1987). Foremost among these is the tendency to view those children who do not adapt successfully as somehow lacking the "right stuff" and as 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 depends on other people and multiple systems of influence. 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 needed 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, lack of opportunities, inadequate medical care, or exposure to violence—also often impact and constrain the entire family. Economically impoverished families, or parents ravaged by their own struggles with alcoholism, drug addiction, 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 networks.

Cultural Influences on Resilience

Another critical component in understanding the 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 func-

tioning in the context of adversity within those cultures. Specific healing, blessing, or purification ceremonies, such as those found among Indigenous American Indian tribal cultures (Gone, 2009; LaFromboise et al., 2006a, b), as well as in many cultures and religions around the world (Crawford et al., 2006), may serve to counteract or ameliorate the impact of devastating experiences among people in a culture. Similarly, among minoritized 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). Until recently, there was 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 toward 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; Theron et al., 2015). Whereas some of the factors and processes that have been identified as fostering resilience focus on individual functioning (such as good cognitive skills, socioemotional 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. Recently, efforts have begun to index positive childhood experiences echoing the early "short list" of resilience correlates that may be efficiently tabulated to assess adults' and parents' early-life positive experiences, in addition to the positive experiences of current and future generations of children (Jefferies et al., 2019; Narayan et al., 2018). As the study of resilience continues, it will be critical to explore the extent to which factors found to promote resilience in one group are replicated across cultural groups and also how the same factor found across multiple groups may function differently in different cultural contexts (Panter-Brick, 2015). 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 et al., 1994). Intervention efforts are likely to be enhanced by deeper 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 toward *building 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. They focused their hypotheses on testing adaptive processes that were targeted in the theory or logic models of experimental interventions. 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 groups or quasi-experimental comparison groups to test 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 et al., 2000; Coie et al., 1993; Cowen & Durlak, 2000; Masten, 2007; Masten & Coatsworth, 1998; Weissberg et al., 2003; Yoshikawa, 1994). Multifaceted intervention studies designed to prevent or reduce risky behaviors, delinquency, and other problems in children (e.g., FAST Track 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 that they reduced risk for problem behaviors (Ramey & Ramey, 1998; Weissberg & Greenberg, 1998; Reynolds & Ou, 2003). As the data on assets and promotive and protective factors began to accumulate in natural resilience studies, data were also mounting in prevention science based on randomized clinical trials (RCTs). These RCTs demonstrated 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 et al., 2006; Masten & Coatsworth, 1998; Reynolds & Ou, 2003).

Resilience research had the goal of informing intervention from the outset. Moreover, with children in urgent need of help, practitioners could not wait for definitive evidence before using the best evidence available at the time to nurture resilience or recovery among children and families who were in the midst of suffering from the effects of adversity. Thus, as research models and knowledge accumulated, resilience-informed interventions emerged in parallel (Masten, 2011). Research on resilience had two major and transformative effects on interventions for children. One change was very general in the form of a profound shift away from deficit-focused models of intervention to models that included a focus on goals, strategies, and measures that assessed strengths and resources and examined promotive and protective processes. Risks and vulnerability processes remained important, but there was a new emphasis on strength-based models and strategies. Resilience-informed frameworks for practice and policy emerged in clinical psychology and psychiatry, education, school psychology and counseling, social work and child welfare reform, pediatric care, disaster preparation and response, family therapy, positive youth development, and humanitarian interventions for children, among other domains of helping professions (e.g., Ager, 2013; Galassi & Akos, 2007; Cicchetti et al., 2000; Lerner, 2017; Lundberg & Wuermli, 2012; Masten, 2021; Nation et al., 2003; Walsh, 2016). In the prevention science field, intervention models routinely delineated protective processes as targets to promote resilient development (e.g., McCLain et al., 2010; Patterson et al., 2010; Weissberg et al., 2003; Wyman, 2003; Wyman et al., 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, in and of itself, can be viewed as a protective process.

Strategic timing of intervention also holds great interest for third-wave research because evidence suggested that there are windows of opportunity for changing the course of development, when systems may be more malleable or when there is a higher likelihood of potentiating a positive cascade. 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 et al., 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 in deterring negative cascades of maladaptive behavior that could undermine adjustment (Masten et al., 2006; Masten & Cicchetti, 2010). 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). As another example, the perinatal period is a key opportunity to intervene and bolster promotive and protective factors, with lasting positive effects on maternal adjustment and well-being as well as on fetal and infant health and development (Davis & Narayan, 2020).

Experimental intervention designs, as noted above, provide powerful testing of hypotheses about resilience processes, particularly when the process of change is specified (e.g., parenting or attributional style), the intervention is tailored to specific needs and targets changes in this process, and the change processes affect subsequent change in the targeted behavior of an individual or a system. For example, executive functioning skills consistently predict better school achievement among young children experiencing homelessness (Masten et al., 2012; Obradović, 2010) and high-quality parenting appears to buffer such children against the effects of adversity (Herbers et al., 2011, 2014). These studies emphasize the need to promote competence as well as to reduce risks. Boosting fundamental skills for learning and school success and nurturing parent–child relationships are promising pathways to adaptive development for young, disadvantaged children (Diamond et al., 2007; Masten & Palmer, 2019; Zelazo, 2020).

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 the most from what aspect of treatment, mediated by which changes, thereby testing additional moderating and mediating effects. The Seattle Social Development Project provides a classic example of an experiment designed to test whether and how an intervention worked to reduce problem behaviors (see Hawkins et al. (1999, 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 changes in school bonding, which was associated with better outcomes in their secondary school years, assessed by less antisocial behaviors and better high school grades. Another excellent example is provided by Sandler et al. (2003) and Wolchik et al. (2021), who designed a preventive intervention for families going through a divorce, with the goal of moderating a key mediator in the child's life, namely, the parent's behavior. For this randomized prevention trial, 6- and 15-year follow-up data elucidated multiple cascading pathways to adaptation in adolescence and early adulthood. Early parenting effects of intervention on externalizing problems cascaded to academic and work outcomes later in adolescence and early adulthood. Moreover, intervention effects were greater for higher-risk families. Improvements in positive parenting associated with the intervention also predicted better internalizing outcomes. Such studies offer compelling evidence both for the effectiveness of a particular intervention (the manualized program for parents in this case) and for the role of parental functioning in causal processes related to child outcomes during the course of negotiating adversity. Similar findings from intervention studies have underscored the dynamic and malleable capacities afforded by close relationships to foster development and protect individuals and social groups in the face of adversity, leading numerous scholars to conclude that relationships play critical protective roles in resilience (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 (Narayan, 2015; Masten et al., 2015).

Research on interventions to create resilience gained momentum as evidence accumulated from basic research and experimental data that resilience processes could be identified and changed and that intervention methods play a vital role in

testing resilience theory (Masten, 2011). It is still the case, as noted by Weissberg et al. (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 effectively and efficiently, with strategic timing, to benefit children and society. However, the evidence base is growing and a good case can 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 not only reflect current knowledge but also explicitly focus on testing theories of change. These are ongoing tasks of third-wave resilience research. Research elucidating multifaceted processes underlying successful adaptation under adverse conditions continues to guide intervention and prevention efforts. As evidence accrues, systematic reviews of resilience-focused interventions are beginning to emerge (e.g., Dray et al., 2017; Van IJzendoorn et al., 2020a).

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 the 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 can be delayed, unexpected, or indirect, it is important to consider more complex models of change and monitor outcomes 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: Multisystem Resilience

The fourth wave in resilience research shifted the focus of resilience science to multilevel dynamics and the many processes linking genes, neurobiological adaptation, brain development, behavior, and context at multiple levels. This wave of resilience science was predicated on the idea that development arises from probabilistic epigenesis, involving many processes of interactions across multiple levels of function, with gene–environment interplay and coaction playing key roles (Gottlieb, 2007), and explicit recognition that adaptation is inherently multilevel (Masten, 2007). The fourth wave began 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 (Feder et al., 2009; Masten, 2007; Masten & Cicchetti, 2016). 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 two decades, research aimed at elucidating the biology or neuroscience of resilience has burgeoned (Feder et al., 2019; Feldman, 2020; Ioannidis et al., 2020; McEwen, 2020; McLaughlin et al., 2020; Shonkoff et al., 2021). At the same time, once independent and disparate fields of research on resilience at different levels in varying 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 pandemics (Masten, 2021; Ungar, 2021). Additionally, as the fourth wave matures, there is growing attention to issues of social justice in theory and research on resilience, bringing greater attention to structural racism, discrimination, and inequality in communities and societies that generate enormous disparities in risk and adversity exposure, resources, and protective systems that contribute to the vulnerability and differential outcomes of oppressed, marginalized, and minoritized children and their families (Anderson, 2019; Marks et al., 2020; Neblett et al., 2016; Rowhani & Hatala, 2017; Wilcox et al., 2021). There is also growing attention to understanding the intergenerational transmission of resilience across generations and to the processes accounting for individuals' abilities to harness resilience processes early in life, with positive cascading effects across generations (Narayan et al., 2021; Panter-Brick & Leckman, 2013). Some scholars have suggested that a "fifth wave" is emerging that "explicitly takes into account political and economic influences and privileges research coproduced with and alongside communities in adversity" (Hart & Gagnon, 2017).

Major Themes of the Multisystem Wave of Resilience Science

Fully describing the exciting and interdisciplinary directions comprising the multisystem wave of resilience research as it matures is beyond the scope of this chapter. However, the diverse goals and direction of developmental resilience science, as this multisystem wave matures, have been illustrated by numerous recent books and review articles (e.g., Kalisch et al., 2019; Liu et al., 2017; Masten, 2021; Masten et al., 2021; Mesman et al., 2021; Ungar, 2018, 2021; Ungar & Theron, 2020). Themes characterizing the fourth wave as it matures include the following.

- *Theoretical and empirical attention to multiple systems that influence the resilience capacity of an individual child.* Although caregiving systems always were a focus of resilience science about children, there is now more attention to socioecological contexts beyond families, including schools, communities, and culture (Dray et al., 2017; Gartland et al., 2019; Mesman et al., 2021; Panter-Brick, 2015; Ungar & Theron, 2020).
- *Calls for integrating resilience theory and science from different disciplines to tackle multisystem threats to human life and development*. There are growing calls for integrating diverse sciences concerned with human resilience in the face of growing threats to children (and adults) that span multiple systems, including large-scale disasters such as climate change, war, or the coronavirus disease 2019 (COVID-19) pandemic (Masten, 2014; Masten & Motti-Stefanidi, 2020; Sanson et al., 2019; Ungar, 2021; Walsh, 2020) as well as more specific threats and risks to children such as maltreatment (Meng et al., 2018), discrimination and structural racism (e.g., Anderson, 2019; Marks et al., 2020), or historical trauma (Hartmann et al., 2019).
- *Multilevel models and developmental cascades.* This wave of resilience science has intensified the focus on processes spanning levels of analysis and processes of change that span levels and generations over time, altering the course of development. This theme includes expanding research on the "top-down" (outside to inside the organism; outside to inside the family) effects of experiences or interventions on gene expression and neurobiological function (e.g., biological embedding of adversity), as well as the bottom-up effects of epigenetic or neurobiological changes on brain development and behavior; cascading consequences of ongoing multisystem processes over time, particularly for future health and well-being; and intergenerational transmission (e.g., Browne et al., 2021; Doty et al., 2017; Hentges & Wang, 2018; Ioannidis et al., 2020; Liu et al., 2017; Masten, 2018; Narayan et al., 2021; Toth & Manly, 2019). Multisystem developmental models of resilience highlight the importance of strategic timing and targeting of systems for change

as well as multilevel/multisystem approaches to intervention and policy to mobilize enduring change (Gee, 2021; Masten et al., 2021; Mesman et al., 2021; Ungar & Theron, 2020).

- *Measuring multisystem resilience.* Another salient feature of the multisystem resilience wave is more effort to measure resilience spanning multiple system levels. There are innovative strategies for modeling multisystem resilience in complex adaptive systems (e.g., Ioannidis et al., 2020) and the interconnections of protective factors across levels of analysis, for example, by dynamic network analysis (Kalisch et al., 2019). Various measures of childhood resilience encompassing multisystem resilience factors continue to be developed and refined (e.g., Jefferies et al., 2019; Morris et al., 2021; Narayan et al., 2018). Moreover, there are growing efforts to document the psychometric properties of widely utilized measures, such as the Child and Youth Resilience Measure, particularly with respect to structural invariance and multicultural validity (e.g., Renbarger et al., 2020).
- *Deeper examination of tradeoffs and sensitive periods in the study of resilience.* There is growing attention to issues of tradeoffs in resilience processes, notably with respect to timing or levels of analysis (Ellis et al., 2022; Hostinar & Miller, 2019; Ungar, 2018). Research on allostatic load, "wear and tear" on the body associated with successful adjustment in children or youth at high risk due to structural racism or poverty, or John Henryism, as described above, illustrate this theme. The possibility of temporal tradeoffs in adaptation to adversity, whereby short-term survival may compromise long-term health, is also receiving more attention. Both these trends reflect a more nuanced, multidimensional, and multisystem approach to understanding how adversity, resilience, and adjustment are interrelated over the course of development.

Conclusion

In conclusion, the past half century of research on resilience has yielded striking progress in theory, methods, findings, and intervention approaches while also identifying key promotive and protective factors that represent fundamental adaptive systems and processes supporting human adaptation and development in the context of adverse experiences. Findings suggest that resilience is dynamic, shaped by complex multisystem interactions that shape pathways toward positive and negative adjustment in relation to life challenges. Resilience science has shifted toward complexity, with growing attention to theory and methods that accommodate dynamic and developmental systems approaches to understanding and building resilience in children and the systems on which they depend. Resilience capacity develops in children through many processes at many levels of interaction from molecular to socioecological as children grow up and encounter challenges in ordinary or extraordinary circumstances. There is certainly progress, but much work remains, particularly to fill in the details about the intersystem processes that nurture and support resilience in different circumstances and cultures, both common and unique, during different periods of development. It will take time to unravel and understand these multiple levels of influence and build stronger bridges between science and practice.

It is essential for resilience scholars to remember the original goals of this work—to understand the variability of the pathways manifested by children who encounter developmental hazards and adversities well enough to make a difference; to prevent and mitigate risks and disparities in trauma exposure; to boost access to vital resources; to nurture, mobilize, or restore the systems that help children weather the storms of life; and to guide policy and practice toward a society of opportunity for nurturing and supporting resilience. Clinical interventions and pri-

mary preventions with promising efficacy for resilience exist, but these strategies need to be tailored to individual and contextual differences and evaluated for efficacy in more diverse community settings. Collaborative work across diverse contexts is urgently needed to refine resilience-based models of intervention and change and to inform the design of prevention and social policy programs. Decades of past work on resilience have focused productively on psychological and interpersonal processes. More recently, serious attention to biological and cultural levels of analysis is emerging, with an explicit focus on context and transactional as well as multidirectional 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 integrate multisystem processes in models of change and intervention.

The multisystem wave of resilience science is maturing as humanity faces profound global challenges related to climate change, pandemics, political conflicts and violence, record levels of migration and displacement, and reckoning with centuries of colonialism and oppression. Resilience science offers hope and guidance, but at the same time, there remain many gaps in the knowledge base needed to confront the existential threats of the present and future. It is essential that we invest in research, training for young scholars, translational applications of knowledge, and a transdisciplinary workforce to continue advancing resilience science and its practical applications on behalf of the future resilience of children, families, communities, and societies.

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