



Resilience

Last update: November 2013

Topic Editor:

Ann S. Masten, PhD, Institute of Child Development, University of Minnesota, USA

Table of content

Synthesis	5
Resilience at an Early Age and Its Impact on Child Psychosocial Development SUNIYA S. LUTHAR, PHD, OCTOBER 2013	8
Early Resilience and Its Developmental Consequences ARNOLD SAMEROFF, PHD, OCTOBER 2013	13
Resilience at an Early Age and Its Impact on Child Development: Comments on Luthar and Sameroff TUPPETT MARIE F. YATES, PHD, OCTOBER 2013	19
Resilience in Development: The Importance of Early Childhood ANN S. MASTEN, PHD, ABIGAIL H. GEWIRTZ, PHD, JULIANNA K. SAPIENZA, BA , OCTOBER 2013	24
Early Childhood Relationships and the Roots of Resilience SABRINA M. PETERSON, BS, TUPPETT M. YATES, PHD, OCTOBER 2013	30
The Role of Physiological Reactivity in Understanding Resilience Processes in Children’s Development XIMENA A. PORTILLA, PHD, JELENA OBRADOVIĆ, PHD, OCTOBER 2013	36
Resilience after Trauma in Early Development ERIN T. REUTHER, PHD, JOY D. OSOFSKY, PHD, OCTOBER 2013	42
Protective Role of Executive Function Skills in High-Risk Environments AMANDA J. WENZEL, BA, MEGAN R. GUNNAR, PHD, APRIL 2013	50

Topic funded by:

LAWSON
FOUNDATION

Synthesis

How important is it?

When children show healthy development in spite of adversity, it is called resilience. Young children can experience many forms of adversity – sometimes mild, like not being understood by adults when trying to express their needs; sometimes severe, like being exposed to poverty, domestic violence and war. Faced with heightened adversity, some children will develop negative outcomes whereas other children will stay on a healthy course or “bounce back” and resume typical development. What would be called “competence” in children growing up in a low-risk environment becomes “resilience” in children facing adversity. Whether or not children are resilient depends on the resources available to them in their families and communities, and their own emerging personal resources. All young children need to grow up in a safe and nurturing environment and to establish stable relationships with their caregivers. In times of adversity, they need these resources even more. Resilience should thus be seen as a developmental process, drawing on strengths in families, communities and individual children. Young children cannot achieve healthy development on their own when their social support network is in disarray. The main goal of resilience research is therefore to identify the features of children’s lives that can be nurtured or changed to help them develop competence and resilience when adversity occurs. Another key question is how the individual characteristics of young children interact with their environment to promote or jeopardize resilience.

What do we know?

Ongoing studies of resilience in early childhood help us define what can be considered healthy development in context of adversity, what the effects of trauma are at a young age and what factors are associated with resilience. In resilience studies, healthy development is often defined in terms of accomplishing developmental tasks, some of which are universal, such as forming close bonds with caregivers or learning to talk, and some of which are culturally or historically specific, such as learning to weave or hunt bison. Another way of defining good development in adversity is by the absence of symptoms or problems linked to trauma, such as signs of posttraumatic stress disorder (PTSD). Manifestations of PTSD in young children are not very well documented and can differ from those of adults and older children. Children younger than age 3 who suffer from PTSD may have difficulty explaining their feelings. They may also become irritable and/or reenact the traumatic event through play.

Exposure to trauma and neglect in early childhood can affect brain development and thus have long-term consequences. The elements that foster good development in adversity and in milder circumstances are similar. Children need to be fed, protected and stimulated; just as importantly, they need to establish the early interpersonal relationships that are the foundations for cognitive, affective and neurobiological adaptation. Through relationships, young children learn to regulate their emotions, an important skill to deal with adversity, and to develop self-esteem, self-efficacy and coping abilities. As children grow, different relationships play different roles in providing resources and protection.

Still, even in similar circumstances, not all children will develop or bounce back equally well from adversity. This is partly due to their differences in regulation and executive functioning skills (the goal-directed cognitive abilities to control thought, behaviour and emotions). Children with better executive function skills are also better able to navigate in a changing environment. Children may inherit genetic variants that make them more susceptible to environmental influences; they will thrive in a positive environment but will suffer more from the consequences of adversity. Resilience is a complex phenomenon shaped by family and community resources interacting with individual characteristics. Supporting resilience in the early years implies empowering families and communities but also taking into account the differences between children that will make interventions more or less successful.

What can be done?

Children who show resilience do not have rare or special qualities; they have better protections and more resources in themselves, their families and their communities. Therefore, the first step to foster resilience in young children is to ensure that they have these protections and resources, including the material resources and stimulation they need, and a context favorable to establishing stable and positive relationships with their caregivers and later with other members of their communities. Encouraging resilience in young children primarily means supporting their families. Children considered resilient generally have parents with fewer psychological symptoms and a stronger social network.

Psychological treatment of young children exposed to traumatic events is usually based in attachment therapy and involves a parent. If they can do so supportively, caregivers could discuss the trauma with children in age-appropriate ways to help them put the event in perspective, regain confidence and move on. It is also important to re-establish a daily routine in a safe environment, even if pre-trauma conditions cannot be fully restored. Interventions targeting the environment to promote resilience in young children should aim at maintaining or reestablishing a context favorable to practicing normal activity and establishing normal relationships.

Another way of fostering resilience in young children could be to help them develop the abilities they can use to cope with adversity and take advantage of available resources. Self-regulation could be one of these skills. Individuals differ in their physiological reactivity to stress and their ability to regulate it, both developing in response to environmental input. More research is needed to examine the complex relationships between physiological reactivity, self-regulation skills and resilience. Executive function skills, like retaining information in working memory, sustaining or shifting attention, and inhibiting automatic responses to perform a goal-directed action, could also play a protective role in high-risk environment. However, exposure to adversity may harm executive function skills. Therefore, since executive function skills seem malleable to intervention, helping children exposed to adversity develop and maintain these skills could be a good way to promote resilience. Although promising, intervention programs targeting children's skills to promote resilience have yet to show that they can be effective in the long term. Moreover, such programs should take into account children's differences in their susceptibility to respond negatively to adversity and to respond positively to intervention. Finally, more research aimed directly at documenting the expression of trauma and resilience in children younger than age 5 is necessary to understand their particular needs and develop appropriate intervention programs.

Resilience at an Early Age and Its Impact on Child Psychosocial Development

Suniya S. Luthar, PhD

Columbia University, USA

October 2013, 2e éd.

Introduction

Resilience is a process or phenomenon reflecting relatively positive adaptation despite experiences of significant risk or trauma. Resilience involves judgments about people's lives. It is never directly measured, but rather is inferred, based on knowledge of two conditions: (a) that a person is doing reasonably well; and (b) that this has happened in spite of significant adversity.¹⁻⁴

It must be emphasized that resilience is not a personal trait of the individual. Children can do well despite risk because of various assets – many external to their own personalities – such as supportiveness from parents, grandparents, or well-functioning, close-knit communities. In fact, it is prudent to avoid using the term resilient as an adjective (as in “resilient children”), as this implicitly suggests an innate personal capacity to evade risk. It is preferable to use terms such as “resilient adaptation” or “resilient pattern,” which carry no suggestions about who or what might be responsible for the child's competence.

Resilience is not an all-or-nothing phenomenon, nor is it fixed in time.^{2,5} Children can show major strengths in some areas (such as school readiness) but at the same time, have difficulties in other areas (such as interacting with others). Similarly, at-risk individuals might excel at a given point in time, but with continuing adversities – or without adequate supports to deal with them – they can falter, showing considerable deterioration.

Subject

Resilience research is highly relevant to those seeking to foster excellence in child development because (a) in today's world, many children face high-risk conditions; and (b) a substantial proportion show good social-emotional development. Understanding the antecedents of these “better than expected” trajectories is of obvious relevance for service-providers and policy-makers. In working with at-risk groups, it is far better to promote the development of resilient

functioning early in the course of development, rather than to implement treatments to repair disorders once they have already crystallized. Knowledge about resilient processes in specific at-risk circumstances can be critical in learning about the particular issues that most urgently warrant attention in the context of particular types of adversities.^{6,7}

Key Research Questions

Resilience researchers have examined diverse risk contexts, ranging from family poverty and community violence to parent mental illness and child maltreatment.⁵ Typically, the research context involves identifying a group of children facing a particular risk, identifying those with relatively positive outcomes and determining the types of factors that distinguish these youth from those who do more poorly. The key research question, therefore, is, “Why is it that some children in high-risk conditions do relatively well, whereas others falter?”

“Doing relatively well” is usually defined in terms of the degree to which children are able to do what society would normally expect of them at that developmental stage. For toddlers, for example, this would include behaviours reflecting a strong attachment to their mothers, and for five-year-olds, it would mean the capacity to interact well with age-mates and adults in the kindergarten setting. Again, with young children, it is often more appropriate to focus not only on how the children themselves are functioning, but equally if not more so, on the families’ capacities to foster and sustain their well-being. The toddler is obviously limited in her capacity to draw upon her innate strengths in coping with adversity; what is critical is the parent’s ability to shield her from major environmental pressures, and to provide the nurturance and support critical for the unfolding of effective long-term coping skills.

Key Research Results

There are many pathways to resilient adaptation, but a core theme transcending diverse risk conditions is the presence of a strong, supportive relationship with at least one adult.⁵ For children of a mentally ill parent, a close relationship with the other parent – or with a grandparent or other relative – can be extremely beneficial. Warm, supportive and consistent relationships outside the family can also be helpful, such as those with care-givers in child-care settings or teachers in schools. Of course, the salutary effects of any relationship depend on the degree of continuity and consistency that is sustained.

Children’s own strengths also, obviously, contribute to resilient adaptation. Positive trajectories are more likely among those at-risk youth with attributes such as high intelligence, easy-going temperament, charisma and social skills.⁸ What is critical to remember, though, is that many of these “personal strengths” themselves are vulnerable to assaults from the environment. To consider intelligence, for example, children growing up in interpersonally barren, neglectful conditions – such as those in Romanian orphanages – show significant impairments in intellectual development; these deficits are substantially reduced after a time of living in caring adoptive homes.⁹

Increasingly, resilience researchers are attending to the critical role of biology in resilience and vulnerability. Some children show greater physiological reactivity to stressors than others, as manifested, for example, in their levels of the stress hormone cortisol.¹⁰ Scientists have documented the critical role of emotion regulation – the ability to modulate emotions in response to stressful situations – via indices such as heart rate.¹¹ In a related vein, there is accumulating evidence on contributions of genetic factors. To illustrate, among children who had experienced maltreatment, the likelihood of developing depression later in life was lower in the presence of a genotype conferring the efficient transport of serotonin.¹²

Implications

What are the implications of these findings for interventions and policies? First and foremost, there must be concerted efforts to foster optimal care-giving among parents of young children, to begin this work as early as possible, and to continue it as long as possible. Exemplary in this regard is the work of Olds and his colleagues, in which nurses visit the homes of at-risk expectant mothers and provide support through their pregnancies as well as their children’s early years.¹³ For children in child-care settings, warmth and consistency from care-givers are essential, as is the support provided to mothers of these children.¹⁴

For children with biological vulnerabilities such as high stress-reactivity or less than average intelligence, support for their parents becomes critical. Changing a child’s temperament is, obviously, difficult. What can be done is to ensure that mothers have sufficient resources to sustain the provision of warmth and consistency in everyday schedules needed by children with less easy-going temperaments.

The resources needed for effective care-giving include not only financial resources – money to provide food, shelter, education and health care – but also psychological ones. Chronic depression or anxiety seriously impairs any mother’s abilities to take care of her child, regardless of her material resources, and we know that children of depressed mothers are at high risk for negative outcomes. If our ultimate goal is to maximize young children’s well-being, therefore, we must give high priority to attending to their mothers’ mental health and parenting needs.

Aside from strengthening relationships in families, it is also critical to strengthen networks in communities; this can help sustain gains derived from external interventions. In low-income communities, for example, once parents stop receiving supports from external service agencies, support from within the community can be critical in fostering continued well-being.⁶

Sometimes, particular risk processes can be relatively specific to – yet potent within – discrete settings, and concerted attention to the “context-specific” risks is also necessary. Examples include exposure to community violence in inner-city settings, and experiences of discrimination by ethnic minority youth. In addition to ensuring strong relationships with at least one care-giver, interventions must also attend to these unique risks.

In conclusion, resilience is a phenomenon representing positive adaptation despite risk. It is not a personal attribute of the child, nor is it “fixed” forever; in order to achieve and sustain resilient adaptation, children must receive supports from adults in their environments. In turn, this implies ensuring that their earliest and most primary care-givers, generally their mothers, have adequate resources to provide optimal care – not only financial resources, but psychological ones as well. From an intervention standpoint, the central tenet stemming from extant research is that resilience rests, most fundamentally, on strong relationships. The most expedient route to fostering resilient adaptation is therefore to ensure that children receive consistent care and support, as early as possible, from those who are primarily responsible for their care.

References

1. Luthar SS, Cicchetti D, Becker B. The construct of resilience: A critical evaluation and guidelines for future work. *Child Development* 2000;71(3):543-562.
2. Masten AS. Ordinary magic: Resilience processes in development. *American Psychologist* 2001;56(3):227-238.
3. Rutter M. Resilience reconsidered: Conceptual considerations, empirical findings, and policy implications. In: Shonkoff JP, Meisels SJ, eds. *Handbook of early childhood intervention*. 2nd ed. New York, NY: Cambridge University Press; 2000:651-682.
4. Werner EE. Protective factors and individual resilience. In: Shonkoff JP, Meisels SJ, eds. *Handbook of early childhood intervention*. 2nd ed. New York, NY: Cambridge University Press; 2000:115-132.

5. Luthar SS, Zelazo LB. Research on resilience: An integrative review. In: Luthar SS, ed. *Resilience and vulnerability: Adaptation in the context of childhood adversities*. New York, NY: Cambridge University Press; 2003:510-549.
6. Luthar SS, Cicchetti D. The construct of resilience: Implications for interventions and social policies. *Development and Psychopathology* 2000;12(4):857-885.
7. Masten AS, Coatsworth JD. The development of competence in favorable and unfavorable environments: Lessons from research on successful children. *American Psychologist* 1998;53(2):205-220.
8. Tolan P, Gorman-Smith D, Henry D. Supporting families in a high-risk setting: Proximal effects of the SAFE children preventive intervention. *Journal of Consulting and Clinical Psychology* 2004;72(5):855-869.
9. Rutter M. Developmental catch-up, and deficit, following adoption after severe global early privation. *Journal of Child Psychology and Psychiatry and Allied Disciplines* 1998;39(4):465-476.
10. Gunnar MR, Davis EP. Stress and emotion in early childhood. In: Lerner RM, Easterbrooks MA, Mistry J, eds. *Developmental psychology*. New York, NY: John Wiley and Sons; 2003:113-134. Weiner IB. *Handbook of psychology*; vol 6.
11. Curtis WJ, Cicchetti D. Moving research on resilience into the 21st century: Theoretical and methodological considerations in examining the biological contributors to resilience. *Development and Psychopathology* 2003;15(3):773-810.
12. Caspi A, Sugden K, Moffitt TE, Taylor A, Craig IW, Harrington H, McClay J, Mill J, Martin J, Braithwaite A, Poulton R. Influence of life stress on depression: Moderation by a polymorphism in the 5-HTT gene. *Science* 2003;301(5631):386-389.
13. Olds DL. Prenatal and infancy home visiting by nurses: From randomized trials to community replication. *Prevention Science* 2002;3(3):153-172.
14. Reynolds AJ. *Success in early intervention: The Chicago child-parent centers*. Lincoln, Neb: University of Nebraska Press; 2000.

Early Resilience and Its Developmental Consequences

Arnold Sameroff, PhD

University of Michigan, USA

October 2013, 2e éd.

Introduction

The ability of children to show healthy development despite facing many difficulties¹ is frequently labelled as resilience. While growing up, children encounter many challenges that must be overcome to achieve common markers of developmental success, including mental health, satisfactory social relationships and educational success. Although resilience is usually thought of as successful adaptation to extreme events such as maltreatment or poverty, it may also be involved in responses to the everyday social, physical and intellectual challenges that children face.² In the former case, it would be a characteristic that is only evident under conditions of major adversity, whereas in the latter, it would be evident in all stressful situations.

Children exposed to adversity have worse developmental outcomes. Children exposed to poverty are more likely to experience academic problems, including lower achievement test scores, more grade retentions and course failures than their more advantaged peers.³ Children raised by parents with psychiatric diagnoses have a high probability of developing mental-health problems themselves.⁴

Despite these disadvantages, most children living in very risky contexts are able to overcome these difficulties and achieve normal levels of developmental success. A growing body of research has begun to explore the lives of these so-called “resilient” children for whom successful outcomes have been reported. Rather than focusing on the deficiencies of high-risk children, these studies have placed more attention on identifying those factors that support their success. For children who succeed despite less than optimal conditions, the presence of protective or resilience factors may compensate for the risk factors in their lives.⁵

Subject

Identifying the sources of resilience in competent children is very important because efforts can then be made to increase the resilience of less competent children, especially those living in conditions of high stress. However, the identification of what constitutes resilience remains amorphous.¹ Is it something that is only identified after the fact, or can it be predicted from indices of previous developmental competence? The search for resilience began with a focus on child characteristics, but has been enlarged to include the social, economic and political environment as well. If resilience is a contextual feature, such as having emotionally supportive parents, then only those children with supportive parents would show resilience. If resilience is an individual characteristic, then resilient children should do better in all circumstances. But this leads to the question of where individual resilience originates. It could be based on some biologically based characteristic of the child, such as emotional stability, or it could be developmentally based, where a secure early relationship with parents produced the later emotional stability. Finding answers to these questions would lead to different approaches to increasing the resilience of children.

Problems

A key issue in the study of resilience is to identify its basis. The study of resilience has evolved in step with an expanding understanding of the sources of human competence. As developmental psychology and developmental psychopathology have moved to increasingly complex understandings of psychological processes, any individual characteristic is considered in relation to experience in multiple social domains – family, neighbourhood, culture, school, peer group and historical epoch. Contextual approaches view resilience as a function of the family's and other aspects of the social environment's ability to buffer the effects of adverse circumstances. Important experiences are both historical and current in the life of the child. Developmental approaches view current adaptive capacities as a function of an individual's history of successful adaptations to stressful conditions.⁶ In some views, successful coping with earlier mild stressors can serve to inoculate children against the effects of later major stressors.⁷

Research Context

Research on resilience began with the study of children living in high-risk contexts, either in terms of disordered parenting or economic deprivation. Although most children in these studies showed deficits in developmental domains of mental health and intellectual functioning, there was a group of children who seemed impervious to such stressful circumstances.⁸ Initially, research on

resilience utilized samples of children at risk to seek those who escape its effects. But increasingly, more representative samples have been used to determine if the same factors that allow children to escape the effects of adversity produce competence in more favourable circumstances. Although initially the source of resilience was judged to be a characteristic of the child, increasingly research has pointed to family and social factors as helping the child to offset environmental stress.

Key Research Questions

- Is resilience different from competence?
- Is resilience in the individual, the context or a combination of the two?
- Is resilience a general capacity, or are there specific resiliencies to specific adverse circumstances that may not generalize?

Recent Research Results

Is resilience different from competence?

Resilience researchers who are most concerned with understanding how individuals overcome adversity emphasize the definitional difference between resilience and competence.⁹ But others describe competence and resilience as closely related sub-constructs within the broader construct of adaptation.² The study of competence and resilience are inextricably linked, with resilience focused more sharply on adaptation under extenuating circumstances of deprivation, trauma, disaster or other acute and chronic adversities.

Is resilience in the individual, the context or a combination of the two?

Children with higher levels of competence have better developmental outcomes under conditions of high stress, but also under lower levels of challenge.¹⁰ However, contextual factors play an equally large role in producing positive outcomes. Supportive families,⁶ accepting peer groups,¹¹ competent schools¹² and neighbourhood collective efficacy,¹³ not to mention more financial resources,¹⁴ all contribute to children's positive developmental outcomes. The case for individual resourcefulness is further weakened when high- and low-competent children being raised in high- and low-risk environments are compared. High-competent children raised in high-risk environments do worse than low-competent children raised in low-risk environments.¹⁵

Is resilience a general capacity, or are there specific resiliencies to specific adverse circumstances that may not generalize?

Resilience has come to be seen as a multidimensional construct.¹ Because it is usually studied with a specific at-risk population, for example maltreated children, children raised by psychotic parents or children raised in poverty, different processes have been found to lead to positive outcomes. Moreover, when children show resilience in one area of development, it may be at the cost of more problems in other areas. As an example, Luthar¹⁶ found that children who showed successful adaptation struggled with emotional problems such as depression.

Conclusions

Rather than focusing on improving a still unidentified construct of resilience in individuals, more energy should be devoted to studying social contexts that foster positive outcomes. Improving individual competence is an important strategy where social circumstance cannot be altered, but a greater proportion of competent outcomes would be achieved if efforts were made to change contextual factors rather than individual factors.

Studies of the effects of multiple environmental risks across a wide range of conditions have found the accumulation of social risks across the family, peer group, school and neighbourhood to have a consistent negative effect. The more risks, the worse the outcomes.

Single variables, such as income level and marital status on the family side, and gender, race, efficacy, mental health and achievement on the personal side, taken alone may have statistically significant effects on children's behaviour, but their effects are small in comparison with the accumulation of multiple negative influences that characterize high-risk groups. The overlap in children's outcomes is substantial for low-income vs. high-income families, families with one or two parents, boys vs. girls, blacks vs. whites, and high-resourceful and low-resourceful youth. But the overlap is far less in comparisons between groups of children reared in conditions of high vs. low levels of multiple risks, where the effects of gender, race, resourcefulness, income and number of parents in the home are accumulated.

It must be noted that resilience is not the same as positive behaviour. In stressful circumstances with limited resources, one individual's gain must be at the expense of someone else's loss, a zero-sum game. In such situations, resilience may take the form of antisocial behaviour, such as resources gained by criminality in inner city environments.

It is unlikely that there is a universal protective factor for all children. The positive factors that promote competence may vary according to the specific age of the child and the developmental outcome being targeted. To truly appreciate the determinants of resilience requires paying attention to the broad constellation of ecological factors in which individuals and families are embedded.

Implications for the Policy and Services Perspectives

Understanding the origins of resilience is an important precursor of any successful intervention. Where resilience arises from family, school, peer group or community factors, interventions should take place in those settings. Unfortunately, most interventions in single domains have not produced major resistance to problematic outcomes. Children typically experience multiple risks in multiple social contexts and consequently, it is unlikely that a “magic bullet” for prevention or intervention will be found.¹⁷ Prevention and intervention efforts emerging from this realization utilize combinations of efforts to target multiple rather than single sources of resilience.¹⁸ The Fast Track Project to reduce conduct problems is one such multifaceted intervention.¹⁹ Increasingly, appreciation must be given to the multiple social subsystems that play important roles in producing or reducing social and academic competence.

References

1. Luthar SS, Cicchetti D, Becker B. The construct of resilience: A critical evaluation and guidelines for future work. *Child Development* 2000;71(3):543-562.
2. Masten AS. Ordinary magic: Resilience processes in development. *American Psychologist* 2001;56(3):227-238.
3. McLoyd VC. Socioeconomic disadvantage and child development. *American Psychologist* 1998;53(2):185-204.
4. Downey G, Coyne JC. Children of depressed parents: An integrative review. *Psychological Bulletin* 1990;108(1):50-76.
5. Garmezy N. Children in poverty: Resilience despite risk. *Psychiatry: Interpersonal and Biological Processes* 1993;56(1):127-136.
6. Sroufe LA, Carlson E, Collins WA, Egeland B. *The development of the person: The Minnesota study of risk and adaptation from birth to adulthood*. New York, NY: Guilford Press; 2005.
7. Rutter M. How the environment affects mental health. *British Journal of Psychiatry* 2005;186(1):4-6.
8. Garmezy N, Masten AS, Tellegen A. The study of stress and competence in children: A building block for developmental psychopathology. *Child Development* 1984;55(1):97-111.
9. Luthar SS. Resilience in development: A synthesis of research across five decades. In: Cicchetti D, Cohen DJ, eds. *Developmental psychopathology: Risk, disorder, and adaptation*. Vol 3. 2nd ed. New York, NY: Wiley. In press.
10. Garmezy N, Masten AS, Tellegen A. The study of stress and competence in children: A building block for developmental psychopathology. *Child Development* 1984;55(1):97-111.

11. Criss MM, Pettit GS, Bates JE, Dodge KA, Lapp AL. Family adversity, positive peer relationships, and children's externalizing behavior: A longitudinal perspective on risk and resilience. *Child Development* 2002;73(4):1220-1237.
12. Pianta RC, Harbers KL. Observing mother and child behavior in a problem-solving situation at school entry: Relations with academic achievement. *Journal of School Psychology* 1996;34(3):307-322.
13. Sampson RJ, Raudenbush SW, Earls F. Neighborhoods and violent crime: A multilevel study of collective efficacy. *Science* 1997;277(5328):918-924.
14. Duncan GJ, Brooks-Gunn J, Klebanov PK. Economic deprivation and early childhood development. *Child Development* 1994;65(2):296-318.
15. Sameroff AJ, Bartko WT, Baldwin A, Baldwin C, Seifer R. Family and social influences on the development of child competence. In: Lewis M, Feiring C, eds. *Families, risk, and competence*. Mahwah, NJ: Lawrence Erlbaum Associates; 1998:161-185.
16. Luthar SS. Vulnerability and resilience: A study of high-risk adolescents. *Child Development* 1991;62(3):600-616.
17. Masten AS, Coatsworth JD. The development of competence in favorable and unfavourable environments: Lessons from research on successful children. *American Psychologist* 1998;53(2):205-220.
18. Sameroff AJ. The science of infancy: Academic, social, and political agendas. *Infancy* 2005;7(3):219-242.
19. Bierman KL, Coie JD, Dodge KA, Greenberg MT, Lochman JE, McMahon RJ, Pinderhughes E, Conduct Problems Prevention Research Group. The implementation of the Fast Track Program: An example of large-scale prevention science efficacy trial. *Journal of Abnormal Child Psychology* 2002;30(1):1-17.

Resilience at an Early Age and Its Impact on Child Development: Comments on Luthar and Sameroff

Tuppett Marie F. Yates, PhD

The Stone Center, Wellesley College, USA

October 2013, 2e éd.

Introduction

For several decades now, the study of resilience has held a prominent place in our efforts to understand the relations among adversity, development and adaptation.^{1,2} The papers in this collection emerge as the study of resilience enters a new and conflicted era. Above the din of critics who call for the resignation of resilience as a tautological, redundant and intellectually static concept,^{3,4} others, including these authors, point to the tremendous potential for resilience research to inform future practice and research across multiple levels of analysis.⁵⁻⁷

Luthar and Sameroff provide valuable and timely observations regarding the extant research on resilience and its applications for service-providers who are interested in fostering positive outcomes for all children. Both authors highlight the multiply determined, multidimensional nature of resilience as a concept that describes better-than-expected adaptation in contexts of adversity. I will review the core ideas put forth by these authors, offer suggestions to extend and refine these ideas, and provide broad suggestions for future research and practice.

Research and Conclusions

Sameroff's paper speaks to the need for improved clarity in how we conceptualize resilience. He identifies key areas of concern centering on the need to demonstrate that resilience is distinct from competence (i.e. positive adaptation in the absence of adversity exposure), that emerges out of transactions within and among different levels of analysis, and that it is a dynamic and multidimensional construct. The authors' attention to resilience as a developmental process and to the need for contextual considerations in how we define and assess resilience is well taken. As Luthar rightly observes, the key question for resilience researchers is to understand how it is "that some children in high-risk conditions do relatively well, whereas others falter."

A more complicated situation emerges when we recognize, as Sameroff has, that our definition of doing “relatively well” reflects culturally embedded notions of positive and negative adaptation.^{8,9} Indeed, both authors highlight the multidimensional and dynamic nature of resilience. Luthar notes that children may demonstrate competence in one domain but not in another, or at one point in time, but not at another. Sameroff extends this to emphasize that behaviours considered adaptive in one sociocultural context may prove maladaptive in others. His argument is consistent with recent findings that demonstrate how specific factors and processes may operate differently as a function of risk exposure.¹⁰ However, his assertion that antisocial behaviour may reflect resilience in high-risk settings serves to negate the reality that positive adaptation is more than mere survival; a key aspect of resilience centers on positive engagement with the interpersonal world. With a growing recognition that resilience is a multidimensional process, attention must shift toward addressing the question of whether and how different aspects of positive adaptation (e.g. resilience, competence) relate to one another across time and context.¹¹

Just as resilience must be assessed with respect to particular cultural and contextual features, so, too, must current studies of resilience extend beyond traditional single-level analyses to address interactions and transactions within and among multiple developmental systems that shape pathways toward and away from competence in the face of adversity (i.e. resilience). To this end, Luthar highlights the growing awareness of biological influences on resilience. Her work echoes recent calls for greater attention to the biological correlates of or contributors to resilience.^{12,13} Beyond this, however, attention must be directed to transactions between biological and psychosocial influences on adaptation, as Luthar touched on in her mention of Caspi’s research on gene-environment interactions.^{14,15}

Contemporary resilience theory and research has shifted away from the study of individual characteristics to focus on developmental processes that engender positive outcomes.¹⁶⁻¹⁸ To this end, both authors emphasize the conceptualization of resilience as a dynamic developmental process, rather than as a static trait. Luthar does this quite clearly in her endorsement of terms such as “resilient adaptation” or “resilient patterns,” rather than “resilient individuals.” Sameroff highlights a core assumption of a developmental process perspective in his assertion that contemporary adaptation can only be understood in consideration of both current and historical experiences. However, at other points, he seems to focus more on resilience as a characteristic or ability, rather than as a developmental process, as when he discusses the need to “increase the resilience of less competent children.” Together, these researchers, to somewhat varying degrees,

support the assertion that resilience reflects the operation of normative adaptive processes that enable children to achieve positive outcomes despite exposure to incontrovertible adversity. The crux of this definition is that the very same processes that engender competence in favourable circumstance underlie resilience processes in adverse contexts. It is for this reason that studies of positive adaptation (and maladaptation) across multiple contexts are mutually informing and defining.

Implications for Policy and Services Perspectives

Although some have questioned the merit of resilience as a distinct developmental concept, the literature continues to demonstrate that resilience reflects a developmental process that is distinct from positive adjustment in the absence of adversity exposure (i.e. competence).^{10,19} Moreover, recent efforts to identify transactions within and across multiple levels of analysis have revealed new and exciting sources of explanation in understanding resilience processes. As our understanding of resilience advances toward a more dynamic, developmental and transactional perspective, the implications for future research and practice are manifold.

These papers encourage attention to developmental, contextual and multilevel studies of resilience as a dynamic process. In this view, resilience lies neither in the individual, nor the environment, but in the transactions between them. As discussed by Gottlieb, this relational view of causality encourages attention to the transactions between and within developmental systems that either promote or undermine resilience processes.²⁰ To this end, the integrative framework of developmental psychopathology holds great promise for grounding future studies of resilience within an inherently multilevel view of development that can incorporate research within and across multiple psychosocial and biological systems.¹⁷ In addition to bridging research on resilience and psychopathology across multiple settings and systems, developmental psychopathology has particular utility for encouraging translational efforts between research and practice.^{21,22}

Resilience is a developmental process that reflects the normative operation of basic adaptational systems in the context of current or prior adversity.¹⁶ Therefore, efforts to foster positive adaptation for at-risk youth must move beyond traditional models of asset provision or risk reduction to scaffold and buffer core motivational, regulatory, biological and attachment systems that underlie both competent and pathological pathways.²³ The most effective intervention programs will reduce factors associated with disorder (i.e. risks), provide resources associated

with positive adaptation (i.e. assets), *and* scaffold and support the operation of core adaptational systems through multi-faceted applications. Luthar's suggestion that successful interventions will strengthen core relational systems by targeting the quality and consistency of the early caregiving environment is but one example of such process-oriented interventions.

Resilience and the processes that engender it are not static. As noted by Sameroff, protective processes will vary in predictable ways across time and context. Therefore, interventions themselves must be dynamic, flexible and culturally specific to ensure that they are integrated into the structure of the target community. Effective applications of resilience research must begin at the level of the community, target multiple developmental systems and promote community participation and empowerment.^{5,24} Finally, there must be a reverse translation such that practice can inform resilience theory and research. Studies that demonstrate change in hypothesized causal processes as a function of intervention and corresponding changes in predicted outcomes provide convincing evidence for theories about developmental change and continuity.²¹ Time will tell if and how the study of resilience will negotiate the dual challenges of conceptual clarity and accessible applications. The papers reviewed here help guide us in responding to these challenges.

References

1. Luthar SS. *Resilience in development: A synthesis of research across five decades*. In: Cicchetti D, Cohen D, eds. *Developmental psychopathology: Risk, disorder, and adaptation*. New York, NY: John Wiley and Sons; 2006:739-795.
2. Cicchetti D, Garmezy N, eds. *Milestones in the development of resilience*. New York, NY: Cambridge University Press; 1993. *Development and psychopathology, special issue*; vol 5.
3. Tarter RE, Vanyukov M. *Re-visiting the validity of the construct of resilience*. In: Glantz MD, Johnson JL, eds. *Resilience and development: Positive life adaptations*. Dordrecht, Netherlands: Kluwer Academic Publishers; 1999:85-100.
4. Kaplan HB. *Toward an understanding of resilience: A critical review of definitions and models*. In: Glantz MD, Johnson JL, eds. *Resilience and development: Positive life adaptations*. Dordrecht, Netherlands: Kluwer Academic Publishers; 1999:17-83.
5. Yates TM, Masten AS. *Fostering the future: Resilience theory and the practice of positive psychology*. In: Linley PA, Joseph S, eds. *Positive psychology in practice*. Hoboken, NJ: John Wiley and Sons; 2004:521-539.
6. Luthar SS, Cicchetti D. The construct of resilience: Implications for interventions and social policies. *Development and Psychopathology* 2000;12(4):857-885.
7. Masten AS, Powell JL. *A resilience framework for research, policy, and practice*. In: Luthar SS, ed. *Resilience and vulnerability: Adaptation in the context of childhood adversities*. New York, NY: Cambridge University Press; 2003:1-25.
8. Ungar M. A constructionist discourse on resilience: Multiple contexts, multiple realities among at-risk children and youth. *Youth and Society* 2004;35(3):341-365.
9. Cowen EL. The enhancement of psychological wellness: Challenges and opportunities. *American Journal of Community Psychology* 1994;22(2):149-179.

10. Cicchetti D, Rogosch FA. The role of self-organization in the promotion of resilience in maltreated children. *Development and Psychopathology* 1997;9(4):797-815.
11. Masten AS, Burt KB, Roisman GI, Obradovic J, Long JD, Tellegen A. Resources and resilience in the transition to adulthood: Continuity and change. *Development and Psychopathology* 2004;16(4):1071-1094.
12. Charney DS. Psychobiological and vulnerability: Implications for successful adaptation to extreme stress. *American Journal of Psychiatry* 2004;161(2):195-216.
13. Curtis WJ, Cicchetti D. Moving research on resilience into the 21st century: Theoretical and methodological considerations in examining the biological contributors to resilience. *Development and Psychopathology* 2003;15(3):773-810.
14. Caspi A, McClay J, Moffitt TE, Mill J, Martin J, Craig IW, Taylor A, Poulton R. Role of genotype in the cycle of violence in maltreated children. *Science* 2002;297(5582):851-854.
15. Caspi A, Sugden K, Moffitt TE, Taylor A, Craig IW, Harrington H, McClay J, Mill J, Martin J, Braithwaite A, Poulton R. Influence of life stress on depression: Moderation by a polymorphism in the 5-HTT gene. *Science* 2003;301(5631):386-389.
16. Masten AS. Ordinary magic: Resilience processes in development. *American Psychologist* 2001;56(3):227-238.
17. Yates TM, Egeland B, Sroufe LA. *Rethinking resilience: A developmental process perspective*. In: Luthar SS, ed. *Resilience and vulnerability: Adaptation in the context of childhood adversities*. New York, NY: Cambridge University Press; 2003:243-266.
18. Egeland B, Carlson E, Sroufe LA. Resilience as process. *Development and Psychopathology* 1993;5(4):517-528.
19. Luthar SS, Cicchetti D, Becker B. The construct of resilience: A critical evaluation and guidelines for future work. *Child Development* 2000;71(3):543-562.
20. Gottlieb G, Halpern CT. A relational view of causality in normal and abnormal development. *Development and Psychopathology* 2002;14(3):421-435.
21. Cicchetti D, Hinshaw SP, eds. *Prevention and intervention science: Contributions to developmental theory*. New York, NY: Cambridge University Press; 2002. *Development and psychopathology, special issue; vol 14*.
22. Cicchetti D, Toth SL, eds. *Developmental approaches to prevention and intervention*. Rochester, NY: University of Rochester Press; 1999. *Rochester Symposium on Developmental Psychopathology; vol. 9*.
23. Yates TM, Masten AS. *The promise of resilience research for practice and policy*. In: Newman T, ed. *What works? Building resilience: Effective strategies for child care services*. Ilford, England: Barnado's; 2004:6-15.
24. Cicchetti D, Rappaport J, Sandler I, Weissberg RP, eds. *The promotion of wellness in children and adolescents*. Washington, DC: CWLA Press; 2000.

Resilience in Development: The Importance of Early Childhood

Ann S. Masten, PhD, Abigail H. Gewirtz, PhD, Julianna K. Sapienza, BA

University of Minnesota, USA

October 2013, Éd. rév.

Introduction

Resilience, from the Latin *resilire* (to rebound, recoil, or spring back), is a general concept that can be defined broadly as follows: The capacity of a dynamic system to withstand or recover from significant challenges that threaten its stability, viability, or development.¹⁻³ This concept is widely applied in ecology, engineering, communications, disaster management, and other fields.⁴ In the science of human development, resilience usually refers to pathways or processes leading to positive adaptation or development manifested in the context of adverse experiences.

Although people have been fascinated with stories of resilience for thousands of years, judging from ancient tales of individuals who triumph over adversity, the scientific study of resilience only began in the 1960s and 1970s.^{1-3,5} Nonetheless, great strides have been made in the past five decades of research and it is clear that early childhood is an important window of time for understanding and promoting resilience.⁶⁻⁹ During these years, the roots of competence are established and many of the most important protective systems for human development emerge. These early years hold great promise for interventions to prevent and reduce risk, boost resources, promote competence and build a strong foundation for future development.

Subject

Understanding naturally occurring resilience provides important clues for policies and practices designed to promote healthier development in children threatened by adversity or disadvantage. It is also necessary to learn how to foster positive change, so that the odds for favourable development can be improved. Prevention and intervention studies are required to test the ideas coming from resilience research, to learn the best goals, methods and developmental timing for interventions, and also to learn which approaches work best for whom.^{1,2,10-13}

Problems

To study resilience, one must define and operationalize it. This has proven to be challenging for several key reasons. First, resilience refers to a variety of phenomena, such as recovery after the loss of a parent, normalization of behaviour after a child is adopted from an institution, school success among children growing up in poverty or dangerous neighbourhoods, and mental health in children of mentally ill parents. Second, resilience is an inferential construct that involves human judgments about desirable and undesirable outcomes as well as definitions of threat or risk.^{2,3,5,14-16} Investigators must define the criteria for positive adaptation and also the standards and measures of adversity or risk confronting the child. A child who develops well may be viewed as adaptive or competent, but not necessarily as manifesting resilience, unless some explicit or implicit threshold of risk or adversity has been met. It is also clear that there are multiple criteria by which to judge success in life; adaptation (good or bad) is inherently multidimensional and multifaceted in nature. Thus, it is not surprising that definitions and measures have varied, greatly complicating comparisons across studies and the task of building a coherent body of knowledge about resilience in development.

Third, many processes at multiple levels of analysis are likely to be involved in human resilience.^{1,4,17,18} To understand resilience, one must understand the complex adaptation and development of living systems in context over time, from “neurons to neighbourhoods”¹⁹ and beyond. Nonetheless, findings from the first generation of resilience research were remarkably consistent, suggesting the influence of powerful but common adaptive processes.^{1,15}

Research Context

Systematic research on resilience in childhood emerged from studies of vulnerability and risk in the search for the causes of mental illness.^{1,20} Investigators began to study children with elevated risk for problems, often due to mental illness or stress in the family, social disadvantages, or poverty. The goals of pioneering researchers, including Norman Garmezy, Lois Murphy, Michael Rutter, Arnold Sameroff, and Emmy Werner, required integrative perspectives and collaboration among developmental and clinical scientists. Such collaborations forged a new science of resilience in development, while at the same time energizing the rise of developmental psychopathology.^{1,15,21} The great insight of these pioneers was recognizing the potential of resilience research to inform practice and policies aimed at better development among high-risk children.

Key Research Questions

Developmental studies of resilience often address the following questions:

- What accounts for positive development or recovery among children who experience hazardous circumstances?
- What are the naturally occurring protective processes for human development?
- What are the most effective intervention strategies for fostering positive development among children with high potential risk for problems?

Although resilience researchers focus on positive outcomes and their causes, they also acknowledge the importance of understanding risks and threats to development and how to reduce or eliminate them.

Recent Research Results

There is exciting convergence in developmental research on competence, resilience, behavioural and emotional problems, brain development and prevention science, all underscoring the importance of early childhood for building protections into human development at multiple levels, within the child, the family, the community and their interactions.^{6-8,10,18,20,22-24} Problems in learning and self-control often begin in the preschool years and are related to the quality of available parenting.²⁵⁻²⁸ Effective preventive intervention programs during infancy and preschool years support parenting in multiple ways and provide enriched learning environments for children.^{7,9,29} Early success in school – related to effective care, positive home-school connections and effective classroom practices – appears to be a key segue to resilience, particularly for very disadvantaged children.² Programs or systems of care that focus on building competence and strengths in young children and their families, along with reducing risk and addressing problems early, are yielding promising successes.^{2,8,9,12,30,31}

A neurobiology of resilience is also beginning to emerge.^{17,18,20,32-34} New insights into brain development and plasticity, how stress interacts with development, and the interplay of genes and experience in shaping development promise to revolutionize the science of resilience and prevention.

Conclusion

Resilience research indicates that during the early childhood years, it is important for children to have good quality of care and opportunities for learning, adequate nutrition, and community

support for families, to facilitate positive development of cognitive, social and self-regulation skills. Young children with healthy attachment relationships and good internal adaptive resources are very likely to get off to a good start in life, well equipped with the human and social capital for success as they enter school and society. Such children typically manifest resilience in the face of adversity, as long as their fundamental protective skills and relationships continue to operate and develop. The greatest threats to young children occur when key protective systems for human development are harmed or disrupted. In early childhood, it is particularly important that children have the protections afforded by attachment bonds with competent and loving caregivers, the stimulation and nutrition required for healthy brain development, opportunities to learn and experience the pleasure of mastering new skills, and the limit-setting or structure needed to develop self-control.

Implications

Resilience research, studies of normal development and psychopathology and prevention science all highlight the importance of early childhood for establishing fundamental protections afforded children by positive relationships, healthy brain development, good self-regulation skills, community supports for families and learning opportunities. A resilience framework for practice and systems of care has emerged, with an emphasis on building strengths and competence in children, their families, their relationships, and the communities where they live.^{2,35,36} It is clear that many children in modern societies face multiple and accumulating risks that require multiple protective interventions and comprehensive efforts to prevent or ameliorate risk for children and their families.^{2,23} No child is invulnerable and, as risk levels rise, fewer children escape the developmental consequences of adversity. Early childhood is a crucial window of opportunity for families and societies to ensure that children have the resources and protections required to develop the adaptive tools and relationships they will need to engage the future well prepared.

References

1. Masten AS. Resilience in developing systems: Progress and promise as the fourth wave rises. *Development and Psychopathology* 2007;19:921-930.
2. Masten AS. Resilience in children threatened by extreme adversity: Frameworks for research, practice, and translational synergy. *Development and Psychopathology* 2011;23:141-154.
3. Masten AS. Risk and resilience in development. In: Zelazo PD, ed. *Oxford Handbook of Developmental Psychology. Vol.2. Self and other*. New York: Oxford University Press; 2013:579-607.
4. Masten AS, Obradović J. Disaster preparation and recovery: Lessons from research on resilience in human development. *Ecology and Society* 2008; 13(1): 9.

5. Luthar SS. Resilience in development: A synthesis of research across five decades. In: Cicchetti D, Cohen DJ, eds. *Developmental psychopathology. Vol. 3, Risk, disorder, and adaptation*. 2nd ed. New York, NY: John Wiley and Sons; 2006:739-795.
6. Masten AS, Cicchetti D. Editorial: Developmental Cascades. *Development and Psychopathology* 2010;22:491-495.
7. Masten AS, Gewirtz AH. Vulnerability and resilience in early child development. In: McCartney K, Phillips DA, eds. *Handbook of early childhood development*. Malden, Mass: Blackwell Publishing; 2006: 22-43.
8. Heckman JJ. Skill formation and the economics of investing in disadvantaged children. *Science* 2006;312:1900-1902.
9. Reynolds AJ, Rolnick AJ, Englund MM, Temple JA, eds. *Childhood programs and practices in the first decade of life: A human capital integration*. NY: Cambridge University Press; 2010.
10. Reynolds AJ, Ou SR. Promoting resilience through early childhood intervention. In: Luthar SS, ed. *Resilience and vulnerability: Adaptation in the context of childhood adversities*. New York: Cambridge University Press; 2003:436-459.
11. Cicchetti D, Rappaport J, Sandler I, Weissberg RP, eds. *The promotion of wellness in children and adolescents*. Washington, DC: Child Welfare League of America; 2000.
12. Masten AS, Burt KB, Coatsworth JD. Competence and psychopathology in development. Cicchetti D, Cohen DJ, eds. *Risk, disorder, and adaptation*. New York, NY: John Wiley and Sons; 2006:696-738. *Developmental psychopathology*. 2nd ed; vol 3.
13. Luthar SS, Cicchetti D. The construct of resilience: Implications for interventions for interventions and social policies. *Development and Psychopathology* 2000;12:857-885.
14. Masten AS, Coatsworth JD. The development of competence in favorable and unfavorable environments: Lessons from research on successful children. *American Psychologist* 1998;53(2):205-220.
15. Masten AS. Ordinary magic: Resilience processes in development. *American Psychologist* 2001;56(3):227-238.
16. Luthar SS, Cicchetti D, Becker B. The construct of resilience: A critical evaluation and guidelines for future work. *Child Development* 2000;71(3):543-562.
17. Cicchetti D. Resilience under conditions of extreme stress: A multilevel perspective. *World Psychiatry* 2010; 9(3): 145-154.
18. Cicchetti D, Curtis WJ. Special issue: A multilevel approach to resilience. *Development and Psychopathology* 2007;19 (3).
19. Shonkoff JP, Phillips DA, eds. *From neurons to neighborhoods: The science of early childhood development*. Washington, DC: National Academy Press; 2000.
20. Sapienza JK, Masten AS. Understanding and promoting resilience in children and youth. *Current Opinion in Psychiatry* 2011;24(4):267-273.
21. Masten AS. Developmental psychopathology: Pathways to the future. *International Journal of Behavioral Development* 2006; 31: 47-54.
22. Lester BM, Masten AS, McEwen B, eds. Resilience in children. *Annals of the New York Academy of Sciences* 2006;1094.
23. Shonkoff JP, Boyce TW, McEwen BS. Neuroscience, Molecular Biology, and Childhood Roots of Health Disparities: Building a New Framework for Health Promotion and Disease Prevention. *The Journal of the American Medical Association* 2009;301(21):2252-2259.
24. Shonkoff JP, Meisels SJ, eds. *Handbook of early childhood intervention*. 2nd ed. New York, NY: Cambridge University Press; 2000.
25. Shaw, D, Dishion, TJ, Connell A, Gardner F. The family check-up with high-risk indigent families: Outcomes of positive parenting and problem behavior from ages 2 through 4 years. *Child Development* 2008;79:1395-1414.
26. Bernier A, Carlson SM, Whipple N. From External Regulation to Self-Regulation: Early Parenting Precursors of Young Children's Executive Functioning. *Child Development* 2010;81(1):326-339.

27. Herbers JE, Cutuli JJ, Lafavor TL, Vrieze D, Leibel C, Obradovic J, Masten, AS. Direct and indirect effects of parenting on academic functioning of young homeless children. *Early Education and Development* 2011;22:77-104.
28. Rothbart MK, Bates JE. Temperament. In: Eisenberg N, Damon W, Lerner RM, eds. *Handbook of child psychology: Vol 3, Social, emotional, and personality development* (6th ed). Hoboken, NJ: John Wiley & Sons Inc.; 2006:99-166
29. Bruce J, McDermott JM, Fisher PA, Fox NA. Using Behavioral and Electrophysiological Measure to Assess the Effects of a Preventive Intervention: A Preliminary Study with Preschool-Aged Foster Children. *Preventative Science* 2009;10:129-140.
30. Diamond A, Barnett WS, Thomas J, Munro S. Preschool program improves cognitive control. *Science* 2007; 318(5855):1387-1388.
31. Weissberg RP, Kumpfer KL, Seligman MEP. Prevention that works for children and youth: An introduction. *American Psychologist* 2003;58(6-7):425-432.
32. Feder A, Nestler EJ, Charney DS. Psychobiology and molecular genetics of resilience. *Nature Reviews Neuroscience* 2009;10:446-457.
33. Rutter, M. Implications of resilience concepts for scientific understanding. *Annals of the New York Academy of Sciences* 2006;1094:1-12.
34. Kim-Cohen J, Gold AL. Measured gene-environment interactions and mechanisms promoting resilient development. *Current Directions in Psychological Science* 2009;18:138-142.
35. Akos P, Galassi JP. Special issue: Strengths-Based School Counseling. *Professional School Counseling* 2008; 12.
36. Masten AS. Promoting resilience in development: A general framework for systems of care. In: Flynn RJ, Dudding P, Barber JG, eds. *Promoting resilience in child welfare*. 2nd ed; vol 3. Ottawa, Ontario: University of Ottawa Press; 2006:

Early Childhood Relationships and the Roots of Resilience

Sabrina M. Peterson, BS, Tuppett M. Yates, PhD

University of California, USA

October 2013

Introduction

As the expression of competence in contexts of adversity, resilience is of great interest to researchers and practitioners in its own right, as well as for what it can tell us about development in contexts of security. Indeed, processes that compromise or engender positive adaptation despite prior or concurrent adversity are more similar to those that support typical development than they are different.¹ Nowhere is this more apparent than in the role of relationships as central risks and resources for understanding resilient adaptation.

Whether in contexts of adversity or security, early relationships form the foundation for cognitive, affective and neurobiological adaptation.^{2,3,4} Whereas relational vulnerabilities engender distress and maladaptation, relational resources foster emotional health and competence.^{5,6,7} In the context of safe and responsive relationships with caregivers and others, young children develop core regulatory and processing capacities that enable them to maximize developmental opportunities and effectively negotiate developmental challenges.

Subject

Efforts to identify the relational roots of resilience can reveal modifiable developmental influences that can be harnessed in the service of positive youth development. Prevention and intervention efforts can protect, restore or provide positive relationships in contexts of risk. When taken to scale through community-based mentors, after-school programming, or other systematic support services, relational resources will foster children's capacity to reach age- and culturally-significant milestones. Thus, as prominent gateways to both positive and problematic adjustment, relationships are a key focus of resilience research.

Key Questions and Recent Research Results

Which relationships are important for understanding resilience?

Relational resources are variable in both form and function over development. Parents, age-mates (e.g., siblings, peers, partners) and nonparental adults (e.g., teachers, mentors) vary in their relative influence across developmental time and contexts. While peers are of particular salience during the school and adolescent years, for example, their influence is later subsumed by that of romantic relational partners in early adulthood. Despite these variations, however, the roots of relationships and, to a significant degree, of resilience are grounded in the foundational experiences of early childhood.

In the context of the early caregiving relationship, children develop core regulatory and relational capacities. In addition to the basic substrates of stress reactivity and regulation, patterns of exchange in the early caregiving relationship form the template for the child's emerging expectations of the self and others.^{6,8} Over time, relationships with siblings, peers, and other adults may further canalize or challenge these early relational schemas. Thus, children's successful adaptation in contexts of adversity (i.e., resilience) reflects the combined influence of multiple relationships, with a unique role accorded to early caregiving experiences.

Although we typically think of the early caregiving relationship as originating in the recurrent exchanges that typify the caregiver-infant relationship, recent evidence from attachment research directs our attention even earlier in development, to the prenatal period. As assessed during pregnancy, mothers' relational representations of their own childhood experiences predict the quality of the mother-infant relationship one year later.⁹ Beyond mothers' own childhood experiences, Siddiqui and Haggloff¹⁰ demonstrated that mothers' representations of their unborn child just three months into the pregnancy were related to the quality of the mother-infant relationship three months postpartum. Thus, the relational roots of resilience may reach from prior generations to support and frame children's negotiation of contemporaneous and prospective developmental issues and challenges.

How do relationships contribute to resilience?

Resilience research has identified several mechanisms by which protective and vulnerability factors operate to increase or decrease the probability of competence in contexts of adversity, respectively.¹¹ As noted previously, sensitive caregiving engenders adaptive neurobiological, behavioural, and cognitive organization in early childhood.^{4,8} Thus, positive relationships

contribute to resilient adaptation by promoting resources, such as self-esteem, self-efficacy and coping capacities. A second mechanism of relational protection is the reduction of risk impact, such as when a sibling provides sensitive supervision to a younger sibling at a time when the parent is unable to do so. Third, relational processes may stymie the progression of negative chain reactions, such as when the presence of an alternate caregiver may quell the series of negative consequences that might otherwise befall a child in the wake of parental loss.¹¹ Finally, relationships may serve as conduits to new avenues and opportunities for positive adaptation,¹² such as when a mentor exposes a young child to positive outlets for expression and connection through new interests, art or sport.

As discussed earlier, the salience of specific relational partners (e.g., parents versus peers) varies over time. Similarly, the content and meaning of relational qualities vary by context. Resilience research highlights the need for a contextually- and culturally-sensitive view of development. Sensitive and responsive caregiving engenders positive youth development, but the specific features that constitute high quality care may look different across cultures.¹³ In contexts of heightened risk, relational factors that are associated with poor outcomes in low-risk contexts may engender positive development. For example, studies have shown that authoritarian parenting (i.e., high parental control, low warmth), which may be detrimental in typically developing youth,^{14,15} can be protective for children who are at-risk due to their environmental and/or behavioural profiles.^{16,17} Similarly, although parentification was once conceived of as an inherently detrimental phenomenon,¹⁸ children's provision of care to parents and kin may be associated with heightened self-esteem and achievement among some groups and depends strongly on the culture and value judgments of individuals within the family.¹⁹

Relational processes may vary in their importance across different contexts and individuals. Mentoring relationships, for example, appear to be more influential for positive outcomes among at-risk youth than they are for typically developing youth.^{20,21} Relational processes associated with competence (i.e., positive adaptation in conditions of normative risk) may be distinct from those associated with resilience (i.e., positive adaptation in conditions of adversity).

Implications for the Policy and Practice

The quality of the early caregiving relationship has an enduring, though not definitive, impact on a child's development. Thus, efforts to support this relationship are central to most prevention and intervention programs in early childhood (e.g., home visitation programs,²² parent-child interaction

therapy²³). Even in contexts of extreme adversity, such as out-of-home placement, supporting a positive caregiver-child relationship is vital to successful intervention in infancy and early childhood.²⁴ To that end, several factors are central to support the relational roots of resilience.

First, prevention and intervention efforts must start early, perhaps even before birth. Working with expectant parents, biological or otherwise, is essential to support positive development, particularly for children at heightened risk due to parents' own legacies of loss and trauma and/or contemporaneous stressors, such as domestic violence or war.²⁵ In early development, support services may expand beyond the caregiving relationship to consider siblings, peers and teachers as resources for protective relational processes.^{26,27}

Second, relational supports must extend beyond the childhood years to ensure positive youth development. Early relationships are special, but not determinative. Just as opportunities for righting maladapted trajectories remain in later development, so, too, might early positive trajectories be derailed by subsequent adversity. Positive relationships should be supported and protected across the life course, particularly as they become contexts in which the relational roots of resilience for future generations may flourish or flounder.

Finally, applied policy and practice must be sensitive to individuals' developmental and cultural contexts. Individuals may value and interpret experiences, including presumed adversities, very differently as a function of their developmental and/or cultural context. Thus, researchers and practitioners alike should attend to individuals' unique solutions to the challenges of adaptation, and remain open to the possibility that relationships may have multiple dimensions of meaning. Even a presumably negative or deviant relationship (e.g., criminal association in gang activity) may confer some relational protection to vulnerable youth (e.g., safety and connection). As demonstrated in a recent investigation of resilience among former foster youth,²⁸ empirical research may also benefit from person-oriented approaches, which begin with the experiences of individuals, as a complement to knowledge afforded by variable-oriented perspectives, which focus on mean differences across groups of individuals.¹ By studying individuals in context, we are beginning to understand the complexity of resilience as a developmental construction over time and in the context of lived experience.

Conclusions

Resilience is a relational process that reflects organization among systems and among people. It is not a personality or genetic trait, and is not something one has or lacks. Resilience reflects dynamic processes of adaptation that can be engendered or compromised by relational processes to a significant degree. Relational partners and processes differ in salience over time and context. Applied efforts that are appropriately sensitive to developmental, cultural and contextual factors have tremendous potential to harness the power of relationships to support positive development for all children.

References

1. Masten AS. Ordinary magic: Resilience processes in development. *American Psychologist* 2001;56(3):227-238.
2. Collins WA, Laursen BP, eds. *The Minnesota Symposia on child psychology, relationships as developmental contexts*. Vol.30. Mahwah, NJ: Lawrence Erlbaum Associates, Inc; 1999.
3. Schore AN. The self-organization of the right brain and the neurobiology of emotional development. In Lewis MD & Granic I, eds. *Emotion, development, and self-organization*. New York: Cambridge University Press; 2001.
4. Siegel DJ. Toward an interpersonal neurobiology of the developing mind: attachment relationships, 'mindsight' and neural integration. *Infant Mental Health J.* 2001;22:67-94.
5. Rubin KH, Coplan RJ, Bowker JC. Social withdrawal in childhood. *Annual Review of Psychology* 2009;60:141-171.
6. Sroufe A. Early relationships and the development of children. *Infant Mental Health Journal* 2000;21:67-74.
7. Siegel DJ. An interpersonal neurobiology of psychotherapy: The developing mind and the resolution of trauma. In Solomon M, Siegel DJ, eds. *Healing trauma*. New York: Norton; 2003:1-56.
8. Sroufe LA. The coherence of individual development: Early care, attachment, and subsequent developmental issues. *American Psychologist* 1979;34(10):834-841.
9. Fonagy P, Leigh T, Steele M, Steele H, Kennedy R, Matoon G, Target M, Garber A. The relation of attachment status, psychiatric classification, and response to psychotherapy. *Journal of Consulting and Clinical Psychology* 1996;64:22-31.
10. Siddiqui A, Haggloff B. An exploration of prenatal attachment in Swedish expectant women. *Journal of Reproductive and Infant Psychology* 1999;17:369-380.
11. Rutter M. Psychosocial resilience and protective mechanisms. In Rolf J, Masten AS, Cicchetti D, Nuechterlein KH, Weintraub S, eds. *Risk and protective factors in the development of psychopathology*. New York: Cambridge University Press; 1990:181-214.
12. Ronka A, Oravala S, Pulkinen L. "I met this wife of mine and things got onto a better track" Turning points in risk development. *Journal of Adolescence* 2002;25:47-63.
13. Deater-Deckard K, Dodge KA, Bates JE, Pettit GS. Physical discipline among African American and European American mothers: Links to children's externalizing behaviors. *Developmental Psychology* 1996;32(6):1065-1072.
14. Baumrind D. Child care practices anteceding three patterns of preschool behavior. *Genetic Psychology Monographs* 1967;75(1):43-88.
15. Fletcher AC, Walls JK, Cook EC, Madison KJ, Bridges TH. Parenting style as a moderator of associations between maternal disciplinary strategies and child well-being. *Journal of Family Issues* 2008;29:1724-1744.
16. Mason CA, Cauce AM, Gonzalez N, Hiraga Y. Neither too sweet nor too sour: Problem peers, maternal control, and problem behavior in African American adolescents. *Child Development* 1996;67:2115-2130.

17. Cornell AH, Frick PJ. The moderating effects of parenting styles in the association between behavioral inhibition and parent-reported guilt and empathy in preschool children. *Journal of Clinical Child and Adolescent Psychology* 2007;36:305-318.
18. Zeanah CH, Klitzke M. Role reversal and the self-effacing solution: Observations from infant-parent psychotherapy. *Psychiatry: Interpersonal and Biological Processes* 1991;54(4):346-357.
19. Fuligni AJ, Pedersen S. Family obligation and the transition to young adulthood. *Developmental Psychology* 2002;38(5):856-868.
20. Rhodes JE, Ebert L, Fischer K. (1992) Natural mentors: an overlooked resource in the social networks of youth, African American mothers. *American Journal of Community Psychology* 1992;20:445-446.
21. Werner EE. Risk, resilience, and recovery: Perspectives from the Kauai Longitudinal Study. *Development and Psychopathology* 1993;5:503-515.
22. Olds DL, Kitzman H, Cole R, Robinson J, Sidora K, Luckey DW, Hendersen CR, Hanks C, Bondy J, Holmberg J. Effects of nurse home-visiting on maternal life course and child development: Age 6 follow up results of a randomized trial. *Pediatrics* 2004;114:1550-1559.
23. Lieberman AF, Silverman R, Pawl JH. Infant-parent psychotherapy: core concepts and current approaches. In Zeanah CH, ed. *Handbook of Infant Mental Health*, 2nd ed. New York: Guilford; 2000:472-484.
24. Fisher PA, Gunnar MR, Dozier M, Bruce J, Pears KC. Effects of therapeutic interventions for foster children on behavioral problems, caregiver attachment, and stress regulatory neural systems. *Annals of the New York Academy of Sciences* 2006;1094: 215-225.
25. Garmezy N. Children in poverty: resilience despite risk. *Psychiatry* 1993;56(1):127-136.
26. Gass K, Jenkins J, Dunn J. Are sibling relationships protective? A longitudinal study. *Journal of Child Psychology and Psychiatry* 2007;48:167-175.
27. Hamre BK, Pianta RC. Early teacher-child relationships and the trajectory of children's school outcomes through eighth grade. *Child Development* 2001;72(2):625-638.
28. Yates TM, Grey IK. Adapting to Aging Out: Profiles of Risk and Resilience among Emancipated Foster Youth. *Development and Psychopathology* 2012;24:475-492.

The Role of Physiological Reactivity in Understanding Resilience Processes in Children's Development

Ximena A. Portilla, PhD, Jelena Obradović, PhD

Stanford University School of Education, USA

October 2013

Introduction

Stress and adversity affect children in different ways. Some children exhibit negative outcomes when exposed to difficult environments, while others overcome challenges. For decades, researchers have studied this variability of developmental outcomes in hopes to identify processes that enable some children to demonstrate resilience or positive adaptation in the face of adversity.¹⁻³ Most recently, researchers have turned to examining resilience processes across multiple levels of analysis, from children's neurobiological sensitivity to the effects of neighbourhoods they are raised in. By investigating biological processes, researchers can shed more light on how adversity gets "under the skin" and why some children are more susceptible to both positive and negative environmental effects than others.

Research Context

When exposed to various types of challenges and stressors, children's bodies react with a set of highly integrated, physiological responses that include changes in heart rate, breathing and stress hormones, referred to as physiological reactivity. By studying differences in children's physiological reactivity, researchers are helping us understand the dynamic interplay between contextual adversity, biology and behavioural adaptation. Individual differences in children's physiological reactivity are complex and dynamic because they can be shaped by early experience, can change over time and their effect on adaptation can vary across different contexts and in response to different challenges.

Current research has focused on two systems of the body that are activated when children face challenging or stressful situations. The first system responds with a fast-acting repertoire of biobehavioural changes, known as the "*fight or flight response*", and can also help the body

recover from a state of arousal and regulate it back to *homeostasis*. The second system is slow-acting and prepares the body for chronic exposure to stress by suppressing systems that do not promote immediate coping and increasing available energy to deal with stress.⁴ These systems' responses can be measured using various noninvasive measures such as cardiac readings or hormone levels collected from saliva samples.⁵

Key Research Questions

Researchers studying how physiological reactivity is associated with resilience are tackling the following key questions:

1. How do early experiences and the environment shape children's physiological reactivity?
2. How do children's physiological reactivity and the environment interact dynamically to explain differences in adaptation and resilience?
3. How do children's self-regulation skills affect the association between the physiological reactivity and adaptation?

Recent Research Results and Gaps

Physiological reactivity as an index of adversity exposure

Resilience researchers theorize that differences in children's adaptive functioning after experiencing adversity are related to changes in their physiological reactivity.⁶ Research has found that exposure to adversity can result in a dysregulated stress response (i.e., too high or too low). Studies examining this association have typically shown that in contexts of early insensitive or abusive parenting, children develop heightened physiological reactivity to stress.⁷⁻¹¹ Early experiences of fear may sensitize children's systems to react more readily to future threatening situations by heightening their stress response.^{12,13} This heightened physiological response can be protective in situations of immediate threat, but it has also been linked to increased susceptibility to psychopathology such as depression or anxiety.^{11,14} This association provides evidence of the biological embedding of adversity, a hypothesis which states that early exposure to negative environments will affect the central nervous system in ways that adversely affect children's cognitive, social and behavioural development.¹⁵ As such, physiological reactivity may be indicative of how children are functioning when exposed to early or chronic adversity.

Interestingly, researchers have also posited that early exposure to some degree of psychological or physiological stress may promote positive adaptation by preparing children to more effectively deal with future exposure to adversity. This stress-inoculation hypothesis adopts the metaphor of a vaccine to describe how children who are exposed to a limited amount of stress early on may develop dampened physiological reactivity over time, making them less susceptible to stressful experiences in later life. Most evidence supporting this hypothesis has been found in research with animals. For example, infant monkeys who experienced stress in a form of brief, early separations from their mothers showed less physiological reactivity, lower levels of anxiety, higher cognitive skills and more curiosity when presented with a novel situation.¹⁶

While we do not have empirical evidence that this association between stress and adaptation functions similarly for children, it was recently proposed that resilience may emerge from infants' every day experiences with normative stressors, such as a parent misreading an infant cue or demand, rather than from experiences of overcoming extreme adversity, such as harsh parenting.¹⁷ More research needs to be conducted with children to support this hypothesis and to better understand whether stress-inoculation occurs in contexts of low, moderate, or high levels of adversity exposure.⁶ Future studies could examine the physiological reactivity profiles infants develop when exposed to varying degrees of maternal sensitivity, and how their physiological reactivity is associated with adaptation in later life.

Physiological reactivity as a marker of susceptibility to environmental influences

Physiological reactivity has been conceptualized as a marker of susceptibility to contextual influences. Applying evolutionary principles, researchers have theorized that children who show heightened physiological or behavioural reactivity are more sensitive to both positive and negative environments than their peers who exhibit lower reactivity, “for better and for worse:” high physiological reactivity may be maladaptive in contexts of adversity, but healthy and promotive in contexts of nurturance and protection.^{18,19} For example, in a community sample of kindergarten children, researchers found that high physiological reactivity exacerbated risk for children who were exposed to high levels of family adversity such as marital conflict, maternal depression, harsh parenting and financial stress. Conversely, in the context of low family adversity, high physiological reactivity promoted adaptive functioning such as better school competence and more prosocial behaviour.²⁰

While many studies have demonstrated the association between low reactivity and better adjustment in the context of adversity, we should not assume that only low reactivity is associated with resilience.⁶ There is evidence that high physiological reactivity may be protective for children who are exposed to interpersonal conflict,²¹ highlighting the plasticity of children's physiological reactivity and the importance of examining under what conditions high or low reactivity has a buffering effect against adversity.⁶

Since resilience often emerges over time from the combination of both positive and negative influences, future studies should aim to identify when high physiological reactivity promotes adaptation in high risk children.⁶ To accomplish this, studies must also include measures of positive environmental influences as well as positive indices of adaptive functioning. Highly reactive children may be more susceptible to prosocial peer groups, positive parenting, as well as preventative intervention programs which may inform future educational and social policies aimed at improving the lives of at-risk youth.⁶

Self-regulation, physiological reactivity and adaptation

Researchers are beginning to examine the role of children's executive functioning skills in self-regulating physiological arousal during stressful or challenging situations. Traditional approaches of measuring physiological reactivity tend to oversimplify the dynamic nature of children's physiological response to a stressful situation. By examining the entire trajectory of children's reactivity and subsequent recovery from that arousal, researchers may be able to determine whether all children in high-risk contexts show similar levels of arousal, and whether resilient children demonstrate a faster physiological recovery, indicative of better self-regulation strategies. Supporting this argument, past studies have linked moderate levels of physiological arousal to better self-regulatory skills in children.^{22,23} Although exposure to high levels of environmental adversity may predispose most children to develop highly sensitive physiological profiles, resilient children may also develop self-regulatory skills that produce fast and efficient recovery from that arousal. Examining how different aspects of physiological reactivity and self-regulation work together will be a significant next step to understanding how physiological reactivity relates to developmental resilience.⁶

Conclusion and Implications

Resilience researchers have made significant advances in linking physiological reactivity to both adversity exposure and adaptive functioning. This work has highlighted the importance of examining how the biological embedding of adversity affects children and how the environment and children's physiological responses interact dynamically to predict developmental outcomes. These associations may help researchers and practitioners understand why certain interventions work for some children but not for others and may help to better target services. By examining the association between physiological reactivity and self-regulatory skills, we may be better able to understand the resilience process for children who exhibit high physiological reactivity. Importantly, we must always remember that resilience is a dynamic process. Future work must examine how physiological reactivity is affected by and interacts with the environment longitudinally, to understand how differences in timing, level and chronicity of adversity exposure affect resilience over time.

References

1. Luthar SS. Resilience in development: A synthesis of research across five decades. In: Cicchetti D, Cohen JD, eds. *Developmental psychopathology. Vol 3: Risk, disorder and adaptation*. 2nd ed. Hoboken, NJ: Wiley; 2006:739-795.
2. Masten AS, Obradović J. Competence and resilience in development. *Annals of the New York Academy of Sciences* 2006;1094(1):13-27.
3. Rutter M. Psychosocial resilience and protective mechanisms. *American Journal of Orthopsychiatry* 1987;57(3):316-331.
4. Sapolsky RM. *Why zebras don't get ulcers: The acclaimed guide to stress, stress-related diseases, and coping-now revised and updated*. New York, NY: Holt Paperbacks; 2004.
5. Obradović J, Boyce WT. Stress reactivity in child development research: Indices, correlates, and future directions. In: Mayes LC, Lewis M, eds. *The Cambridge handbook of environment in human development*. New York, NY: Cambridge University Press; 2012:655-681.
6. Obradović J. How can the study of physiological reactivity contribute to our understanding of adversity and resilience processes in development? *Development and Psychopathology* 2012;24(02):371-387.
7. Essex MJ, Klein MH, Cho E, Kalin NH. Maternal stress beginning in infancy may sensitize children to later stress exposure: effects on cortisol and behavior. *Biological Psychiatry* 2002;52(8):776-784.
8. Tarullo AR, Gunnar MR. Child maltreatment and the developing HPA axis. *Hormones and Behavior* 2006;50(4):632-639.
9. Hill-Soderlund AL, Mills-Koonce WR, Propper C, et al. Parasympathetic and sympathetic responses to the strange situation in infants and mothers from avoidant and securely attached dyads. *Developmental Psychobiology* 2008;50(4):361-376.
10. Cicchetti D, Rogosch FA. Diverse patterns of neuroendocrine activity in maltreated children. *Development and Psychopathology* 2001;13(03):677-693.
11. Cicchetti D, Rogosch FA. The impact of child maltreatment and psychopathology on neuroendocrine functioning. *Development and Psychopathology* 2001;13(04):783-804.
12. Heim C, Nemeroff CB. The role of childhood trauma in the neurobiology of mood and anxiety disorders: Preclinical and clinical studies. *Biological Psychiatry* 2001;49(12):1023-1039.

13. Gunnar MR, Vazquez D. Stress neurobiology and developmental psychopathology. In Cicchetti D, Cohen D, eds. *Developmental psychopathology: Developmental neuroscience*. 2nd ed. Vol.2. Hoboken, NJ: Wiley; 2006:533-577.
14. Boyce WT, Quas J, Alkon A, et al. Autonomic reactivity and psychopathology in middle childhood. *The British Journal of Psychiatry* 2001;179(2):144-150.
15. Hertzman C. The biological embedding of early experience and its effects on health in adulthood. *Annals of the New York Academy of Sciences* 1999;896(1):85-95.
16. Parker KJ, Buckmaster CL, Schatzberg AF, Lyons DM. Prospective investigation of stress inoculation in young monkeys. *Archives of general psychiatry* 2004;61(9):933.
17. DiCorcia JA, Tronick E. Quotidian resilience: exploring mechanisms that drive resilience from a perspective of everyday stress and coping. *Neuroscience & Biobehavioral Reviews* 2011;35(7):1593-1602.
18. Boyce WT, Ellis BJ. Biological sensitivity to context: I. An evolutionary-developmental theory of the origins and functions of stress reactivity. *Development and Psychopathology* 2005;17(02):271-301.
19. Ellis BJ, Boyce WT, Belsky J, Bakermans-Kranenburg MJ, van Ijzendoorn MH. Differential susceptibility to the environment: An evolutionary-neurodevelopmental theory. *Development and Psychopathology* 2011;23(01):7-28.
20. Obradović J, Bush NR, Stamperdahl J, Adler NE, Boyce WT. Biological sensitivity to context: The interactive effects of stress reactivity and family adversity on socioemotional behavior and school readiness. *Child Development* 2010;81(1):270-289.
21. Obradović J, Bush NR, Boyce WT. The interactive effect of marital conflict and stress reactivity on externalizing and internalizing symptoms: The role of laboratory stressors. *Development and Psychopathology* 2011;23(01):101-114.
22. Blair C, Granger D, Peters Razza R. Cortisol reactivity is positively related to executive function in preschool children attending Head Start. *Child Development* 2005;76(3):554-567.
23. Marcovitch S, Zelazo PD. A hierarchical competing systems model of the emergence and early development of executive function. *Developmental Science* 2009;12(1):1-18.

Resilience after Trauma in Early Development

Erin T. Reuther, PhD, Joy D. Osofsky, PhD

Louisiana State University Health Sciences Center – New Orleans, Departments of Psychiatry and Pediatrics, USA

October 2013

Introduction

The construct of resilience has been reviewed in the psychology literature for the past several decades. Only recently has this construct been applied to younger children, ages 0-5. One of the most useful conceptualizations was proposed by Masten¹ who described resilience as “ordinary magic,” that is, the idea that resilience does not require something rare or special. Rather, children and adults, even young children who are able to “bounce back” after adversities have more resources within themselves, their families and communities. Other scholars have described “minimal-impact resilience,” when there is little or no disturbance in function following an acute traumatic event.² For a young child, protective factors that enable a rapid recovery to pre-event adaptation levels include good functioning of key adaptive systems that normally protect child development. Although most children will show resilience and the ability to recover relatively quickly after a significant traumatic event, ongoing trauma and cumulative traumatic experiences challenge a young child’s ability to recovery.

Subject

Resilience has been described in young children following traumatic events such as witnessing community violence, domestic violence, loss of a parent due to death, multiple disruptions including frequent moves and changes in caregivers, entering into child protection systems, exposure to wars and military violence, and following natural disasters such as hurricanes, earthquakes, tsunamis, and technological disasters such as oil spills or nuclear fallout. With different types of trauma, expected reactions from young children will differ depending on the circumstances surrounding the trauma, physical and emotional availability of caregivers, and developmental factors including the age of the child.

There is increasing knowledge that brain development in early childhood is negatively impacted by exposure to trauma and neglect;³⁻⁶ therefore, intervening in early childhood soon after a trauma

can have lasting effects for the rest of a child's lifetime. Children who have been traumatized and/or neglected have been shown to have more limited dendritic branching and less efficient neuronal pruning later in life when compared to their same-aged peers not impacted by trauma.⁴ It is possible that promoting resilience in young children exposed to trauma and supporting recovery from trauma with sensitive interventions will allow them to recover and continue a normal trajectory of brain development.

Problems

The problems in studying resilience in young children come from several sources. First, many believe that young children are not impacted by trauma because they are too young to know what is happening and do not have the cognitive capacity to understand. The DSM-5 has made progress over the previous version in identifying traumatic reactions in young children.⁷ The DSM-5, in acknowledging that the experience and reaction to trauma may be different for young children than it is for older children, adolescents and adults includes criteria for posttraumatic stress disorder that are specific to children under six years of age. Authors of the DSM-5 also note that although the prevalence of PTSD in young children was lower than that of adults, this may have been due to problems with the criteria in the DSM-IV not being sensitive enough to the experiences of young children. In DSM-5, additions such as irritable behaviour, expressions of reenactment through play and limitations of young children in explaining their feelings and reactions have been included to better describe this diagnosis for this younger age group. The task force for ZERO TO THREE Diagnostic Classification 0-3R,⁸ among other sources, has noted that the previous definition of trauma in DSM-IV did not adequately account for situations that may be experienced by young children as traumatic, such as multiple moves, instability in the home environment and loss of a primary caregiver. As the new DSM-5 is used, it will be important for clinicians to do a careful evaluation to determine whether a young child has a traumatic response to a situation. Their disorganized or agitated responses may still be more easily overlooked than those in older children or go unnoticed until they demonstrate problem behaviours or noncompliance when confronted with reminders of the event in the future.⁹⁻¹⁰

Similar questions arise when defining resilience in young children. Research on understanding resilience in younger children has primarily come from downward extensions of resilience work with older children.^{2,11-12} Young children are adept at resilience; however, more information about the expected trajectories of normal, traumatic, and resilient response patterns in young children following trauma are needed.¹³

Research Context

Although authors have written about resilience and response to trauma in young children,¹³⁻¹⁴ there are only few empirical studies on resilience patterns.¹⁵⁻¹⁶ Non-empirical publications have typically been based on case studies and observations¹⁷ or downward extensions of work with older children.¹⁸ Empirical studies have typically been downward extensions of studies with older children with inconsistent operational definitions and measurement of resilience.¹⁹⁻²¹

Key Research Questions

Research questions and areas of study regarding resilience following exposure to trauma in young children include:

- Defining trauma and resilience in young children.
- Identifying protective factors that promote resilience in young children.
- Describing the trajectories of normal, traumatic, and resilient reactions to traumatic events in young children.
- How patterns of resilience may differ across different ages and developmental levels.
- Measurement of resilience in young children.
- Best practices for promoting resilience in young children following exposure to traumatic events.

Recent Research Results on Resilience in Young Children Following Trauma

Recent research in the area of resilience in young children has focused on the areas described above. Sapienza and Masten¹² describe four waves of research on resilience in children, which can be applied to young children as well. The first wave described patterns of resilience in children. The second wave examined how some children show patterns of resilience while others were adversely affected by trauma, and the third wave sought to promote resilience through intervention and treatment. Finally, the fourth wave of research in childhood resilience attempts to achieve system level changes to promote resilience. Howell et al. recently studied differences in ratings of social competence, an index of resilience, by mothers and child therapists of preschoolers exposed to intimate partner violence in their households.²² The authors measured resilience using the Social Competence Scale (SRS) parent and teacher versions.²³ Mothers and

therapists were found to rate young children consistently for prosocial skills; however, mothers consistently rated children as having less emotion regulation than their therapists.²² This study highlights the importance of seeking ratings of resilience from multiple informants, as well as the need for questionnaires and standardized measures for resilience, specifically.

Many empirical studies of resilience in young children infer resilience by a lack of symptoms on scales of posttraumatic stress and better adjustment following exposure to traumatic events. Feldman and Vengrober examined posttraumatic stress symptoms in children ages 1.5 to 5 years exposed to war-related trauma living near the Gaza strip.²⁴ Children and their mothers were interviewed and videotaped for later coding. Videos were coded for maternal sensitivity, child secure base behaviour, and child avoidant behaviour according to a standardized and valid coding system. Children's exposure and posttraumatic symptoms were rated by their mothers; however, the scales used for the study were not standardized or shown to be valid due to a lack of prior research in this population. Posttraumatic stress disorder (PTSD) was diagnosed in 38% of children exposed to war-related trauma. Children described as resilient were those who were exposed to trauma, but did not meet full criteria for PTSD. Resilient children were found to have mothers with less symptomology for PTSD, depression and anxiety. Mothers of resilient children also rated themselves as having more social support. In coding, mothers of resilient children were found to have more sensitivity to their children during the trauma interview, and resilient children actively sought maternal support and demonstrated less avoidance during the interview than trauma-exposed children with PTSD. This study demonstrated a pattern of resilience that has been discussed in the literature for some time—resilient children often have resilient parents or caregivers with fewer psychological symptoms and strong social support networks. Parents of resilient children are also physically and emotionally available for their children and respond sensitively when their children are in distress.

Much of the extant literature describing resilience in young children arises from treatment of childhood trauma and descriptions of best practices for promoting resilience in young children exposed to trauma.^{13,17,20,25-26} Treatment of young children is typically based in attachment theory. Zeanah and colleagues reviewed attachment therapies for young children²⁵ and found that nearly all of these treatment approaches involve both the parent and child in the treatment. Child-Parent Psychotherapy (CPP)¹⁰ has been shown in several randomized clinical trials to be effective in helping children who have been exposed to trauma recover.²⁷⁻²⁹ CPP involves play therapy with the parent and child in the same room and techniques individualized for each dyad designed to

promote resilience and recovery in line with goals of: 1) Encouraging a return to normal development, 2) Fostering capacity to appropriately respond to threats, 3) Establishing regular levels of affective arousal, 4) Reestablishing trust in body sensations, 5) Restoring reciprocity in intimate relationships, 6) Normalizing traumatic responses, 7) Differentiating between reliving and remembering trauma, and 8) Placing the traumatic experience in perspective.⁹

Research Gaps

While research on reactions to trauma in young children has been well-established, studies focusing specifically on resilience is still in its infancy. There have been few studies and a comprehensive review of research in the area has not been done to establish interventions and guidelines for how to promote resilience. There are no standardized measures of resilience for young children as there are for older children and adults, which makes empirical research difficult to conduct. Empirical research also has yet to examine individual differences variables that can affect resilience in young children, such as temperament and functioning level before the traumatic event. These areas are important to examine since they have been found to significantly predict resilience and development of posttraumatic stress in adults and older children.^{2,30-31}

Conclusions

Factors that promote resilience following traumatic exposure include individual, situational, and caregiver variables. Caregiver variables that promote resilience include healthy psychological functioning, emotional and physical availability, and the caregiver's sensitivity to the child's emotional needs.^{18,24,32-33} Situational variables that promote resilience and recovery from traumatic exposure include establishment of safety, return to normal routines following the trauma, and helping children to put the traumatic experience into a more general context of the world being a safe place.^{18,34} Research has yet to fully examine the impact of individual child variables as risk or protective factors for resilience in young children following traumatic exposure. This area is potentially important given research on older children showing that anxiety symptoms prior to experiencing trauma is a risk factor for later PTSD development,^{30,34} and individual strengths serve as protective factors against the development of PTSD.¹⁹ Finally, psychotherapies based in attachment theory have been shown to help promote recovery and resilience in young children following traumatic exposure, with CPP having the strongest evidence-base.^{10,27-29}

Implications for Parents or Caregivers, Services, and Policy

Current literature on resilience has implications for informing practices for children following exposure to traumatic events in early childhood. The strongest evidence for resilience supports parental characteristics, especially support and emotional availability as being most important to help young children. Following a traumatic event, parents should be encouraged to take care of themselves and their own psychological well-being, since parental psychological resilience and strong parental support systems are protective factors for young children. Parents should also try to re-establish some sense of normalcy and routine as soon as possible, although after some disasters and trauma, this may require establishment of a “new normal” if return to previous patterns and routines is not possible.³⁵ Parents should also ensure they provide not only physical availability, but also emotional availability and sensitivity to their children’s emotional reactions. If they are able to do so supportively, parents should listen to their children, discuss the traumatic event with them at an age-appropriate level when they are ready, and allow children to ask questions. This approach gives parents the opportunity to re-establish safety and provide reassurance for children. If parents feel unable to handle these tasks on their own and provide needed support for their children, they should seek professional help from a counselor who is trauma-informed who can help support the parent and child and, if needed, provide appropriate therapeutic treatment.

Services for children and policies affecting children after a trauma should promote the same goals described above to the extent possible. Traumatized children should be encouraged to remain with or return to their primary caregivers as soon as possible when it is safe to do so. Their environment should be one in which routines and establishment of normalcy is built into the system. If parents and primary caregivers are unable to be emotionally available to their children due to their own traumatization or stress following the traumatic experience, policies need to recognize the need for interventions both for individuals and for the child and parent together (dyadic) in order to support the relationship.

References

1. Masten AS. Ordinary magic. *Am Psychol*. 2001; 56(3): 227-238.
2. Bonanno GA and Diminich, E.D. Annual research review: Positive adjustment to adversity – trajectories of minimal-impact resilience and emergent resilience. *J Child Psychol Psychiatry*. 2012; 54(4): 378-401. *Am Psychol*. 2004; 59(1): 20-28.
3. Carrion VG, Weems CF, Bradley T. Natural disasters and the neurodevelopmental response to trauma in childhood: A brief overview and call to action. *Future Neurology*. 2010; 5: 667-674.

4. Glaser D. Effects of child maltreatment on the developing brain. In: Garralda ME, Raynaud JP, eds. *Brain, Mind, and Developmental Psychopathology in Childhood*. Lanham, MD: Jason Aronson; 2012:199-218.
5. Gunnar M, Quevedo K. The neurobiology of stress and development. *Annu Rev Psychol*. 2007;58:145-173.
6. Pollak SD, Cicchetti D, Klorman R, Brumaghim JT. Cognitive brain event-related potentials and emotion processing in maltreated children. *Child Dev*. 1997;68(5): 773-787.
7. American Psychiatric Association. *Diagnostic and Statistical Manual of Mental Disorders*. 5th ed. text revision. Arlington, VA: American Psychiatric Association; 2013.
8. Zero to Three. *Diagnostic Classification of Mental Health and Developmental Disorders of Infancy and Early Childhood (DC:0-3R)*. Revised ed. Washington, DC: Zero to Three Press; 2005.
9. Lieberman AF, Van Horn P. *Don't Hit My Mommy!: A Manual for Child-Parent Psychotherapy with Young Witnesses of Family Violence*. Washington DC: Zero to Three Press; 2005.
10. Lieberman AF, Van Horn P. *Psychotherapy with infants and young children*. New York: Guilford Publishers; 2008.
11. Vernberg EM, La Greca AM, Silverman WK, Prinstein MJ. Prediction of posttraumatic stress symptoms in children after hurricane andrew. *J Abnorm Psychol*. 1996;105(2): 237-248.
12. Sapienza JK, Masten AS. Understanding and promoting resilience in children and youth. *Curr Opin Psychiatry*. 2011;24:267-273.
13. Osofsky JD, ed. *Clinical Work with Traumatized Young Children*. New York, NY: The Guilford Press; 2011.
14. Osofsky JD, Lieberman AF. A call for integrating a mental health perspective into systems of care for abused and neglected infants and young children. *Am Psychol*. 2011;66(2):120-128.
15. Kithakye M, Morris AS, Terranova AM & Myers SS. The Kenyan political conflict and children's adjustment. *Child Dev*. 2010;81:1114-1128.
16. Masten AS. Resilience in developing systems: progress and promise as the fourth wave rises. *Dev Psychopathol*. 2007;19:921-930.
17. Appleyard K, Osofsky JD. Parenting after trauma: supporting parents and caregivers in the treatment of children impacted by violence. *Infant Mental Health Journal*. 2003; 24(2):111-125.
18. Masten AS, Osofsky JD. Disasters and their impact on child development: introduction to the special section. *Child Dev*. 2010;81:1029- 1039.
19. Griffin G, Martinovich Z, Gawron T, Lyons JS. Strengths moderate the impact of trauma on risk behaviors in child welfare. *Residential Treatment for Children & Youth*. 2009;26:105-118.
20. Sossin KM, Cohen P. Children's play in the wake of loss and trauma. *Journal of Infant, Child, and Adolescent Psychotherapy*. 2011;10:255-272.
21. Vaage AB, Thomsen PH, Rousseau C, Wentzel-Larsen T, Ta TV, Hauff E. Parental predictors of the mental health of children of Vietnamese refugees. *Child and Adolescent Psychiatry and Mental Health*. 2011;5:2.
22. Howell KH, Miller LA, Graham-Bermann SA. Inconsistencies in mothers' and group therapists' evaluations of resilience in preschool children who live in households with intimate partner violence. *Journal of Family Violence*. 2012;27:489-497.
23. Conduct Problems Prevention Research Group (CPPRG). Psychometric properties of the social competence scale- teacher and parent ratings. Fast Track Project Technical Report. 2002.
24. Feldman R, Vengrober A. Posttraumatic stress disorder in infants and young children exposed to war-related trauma. *J Am Acad Child Adolesc Psychiatry*. 2011;50(7):645-658.

25. Zeanah CH, Berlin LJ, Boris NW. Practitioner review: clinical applications of attachment theory and research for infants and young children. *J Child Psychol Psychiatry*. 2011;52(8):819-833.
26. Osofsky JD, Cohen G, Drell M. The effects of trauma on young children: a case of 2-year-old twins. *Int J Psychoanal*. 1995;76:595-607.
27. Cicchetti D, Rogosch FA, Toth SL. Fostering secure attachment in infants in maltreating families through preventative interventions. *Dev Psychopathol*. 2006;18:623-649.
28. Lieberman AF, Ghosh Ippen C, Van Horn P. Child-parent psychotherapy: 6 month follow-up of a randomized control trial. *J Am Acad Child Adolesc Psychiatry*. 2006;45:913-918.
29. Toth SL, Maughan A, Manly JT, Spagnola M, Cicchetti D. The relative efficacy of two interventions in altering maltreated preschool children's representational models: implications for attachment theory. *Dev Psychopathol*. 2002;14:877-908.
30. La Greca AM, Silverman WK, Wasserstein SB. Children's predisaster functioning as a predictor of posttraumatic stress following hurricane andrew. *J Consult Clin Psychol*. 1998;66(6):883-892.
31. Masten AS, Narayan AJ. Child development in the context of disaster, war, and terrorism: pathways of risk and resilience. *Annu Rev Psychol*. 2012; 63: 227-257.
32. Masten AS, Gewirtz AH., Sapienza, JK. Resilience in development: The importance of early childhood. In: Tremblay RE, Barr RG, Peters RDeV, eds. *Encyclopedia on Early Childhood Development* [online]. Montreal, Quebec: Centre of Excellence for Early Childhood Development; 2011:1-7. Available at: <http://www.child-encyclopedia.com/documents/Masten-GewirtzANGxp.pdf>. Accessed March 8, 2011.
33. Narayan AJ, Masten AS. Children and adolescents in disaster, war, and terrorism: pathways to psychopathology and resilience. In: Widom C, ed. *Trauma, psychopathology, and violence*. New York: Oxford University Press; 2012: 131-158.
34. La Greca AM, Silverman WK, Lai B, Jaccard J. Hurricane-related exposure experiences and stressors, other life events, and social support: concurrent and prospective impact on children's persistent posttraumatic stress symptoms. *J Consult Clin Psychol*. 2010;78(6):794-805.
35. Osofsky JD, Osofsky HJ, Harris WW. Katrina's children: social policy considerations for children in disasters. *Social Policy Reports, Society for Research in Child Development*. 2007;21(1):1-20.

Protective Role of Executive Function Skills in High-Risk Environments

Amanda J. Wenzel, BA, Megan R. Gunnar, PhD

University of Minnesota, USA

April 2013

Introduction

Recently, the field of resilience has begun to focus on the protective role of executive functions in the school success of children facing adversity. Executive function (EF), also termed cognitive control, describes goal-directed abilities to control thought, behaviour and emotions.¹ These skills can be seen in the ability to retain information in working memory, sustain or shift attention, inhibit automatic responses to perform an instructed or goal-directed action, and delay gratification.

EF skills develop rapidly in the preschool period² and are thought to provide a foundation for cognitive and behavioural school readiness.³ In the classroom, executive function skills may manifest as the ability to pay attention, follow instructions, wait one's turn, and remember rules. These skills have shown particular importance for children exposed to early life stress, with recent research suggesting that executive function skills predict resilient school and peer functioning above and beyond intelligence level.^{4,5,6,7}

Although these skills are protective for high-risk children, the development of executive function skills is vulnerable to exposure to trauma and chronic stress.⁸ Children from various adverse backgrounds (e.g., homeless/highly mobile, poverty, early institutionalism, maltreatment, etc.) tend to have deficits in executive function.^{6,7,9,10,11} Taken together, these findings suggest a need to lower chronic stress exposure and target building executive function skills through intervention and prevention efforts with children.

Subject

High-risk youth with more developed executive function skills show better cognitive and behavioural school readiness and performance.^{3,12} These skills appear to enable children to navigate their constantly changing environment,^{9,13} which may be especially key for children

developing in chaotic environments.

However, recent research has shown that children exposed to high levels of adversity may be less prepared to succeed in school, in part due to deficits in executive function skills.^{6,7,9,10,11} These deficits may undermine children's abilities to succeed in academics and develop positive peer and teacher relationships.^{12,14,15} This may have long-term implications for school success given that the achievement gap tends to persist and even widen throughout the school years.^{16,17}

Given evidence that executive function skills are malleable to intervention and children who demonstrate poorer initial performance make greater gains,¹⁸ recent efforts to improve high-risk children's transition to school have targeted building executive function skills prior to kindergarten.^{4,19} Furthermore, research suggests that executive function skills are responsive to intervention across the school years.¹⁸

Problems

Studying the protective role of executive function presents several challenges. First, there are few measures capable of fully capturing executive function abilities for children who are experiencing delays in the development of these skills. Since exposure to chronic early life stress has been linked with impaired executive function skills in some children,⁸ it is critical to be able to measure a wide range in functioning to fully capture the variability in these skills.

Current interventions to improve executive function skills employ a variety of methods including training, classroom curriculum, or physical activity.¹⁸ Though these programs suggest executive function skills are malleable, they also show varied success in skill improvements.^{20,21,22,23,24}

Programs that utilize computer-based training show promise in enhancing executive function skills; however, improvements are specific to the domain trained (e.g., working memory) and do not seem to expand to other areas of executive function more generally.¹⁸

Other programs designed to boost executive function skills integrate executive function activities into the daily lives of children, such as the preschool curriculum Tools of the Mind.²⁵ Throughout this curriculum, children are encouraged to utilize private speech or visual reminders (e.g., a picture of an ear to remind them that they need to listen or pay attention) to develop inhibitory control skills. Initial findings suggested children in these classrooms develop better executive function skills.²⁶ However, recent studies have failed to replicate these findings,²⁷ suggesting possible challenges with the curriculum or fidelity of implementation.

Key Research Questions

Developmental studies designed to understand the protective role of executive function often address the following questions:

- What is the mechanism through which executive function prepares children for school success?
- What helps foster executive function skills in young children experiencing delays?
- What helps protect these skills from chronic stress?

Recent Research Results

Research consistently indicates that children with more developed executive function skills prior to kindergarten experience greater school success.^{6,7} For academic achievement, these skills may scaffold language and mathematic success.¹² In fact, in a low-income sample of children, researchers have found that executive function skills prior to kindergarten predict growth in both numeracy and literacy skills across the kindergarten year.¹² A successful transition to school may be particularly critical for children who have faced high levels of adversity and may be at risk for poorer school performance.

In addition to providing a cognitive foundation for learning, executive function skills may also support academic success by promoting appropriate classroom behaviour.³ Many kindergarten teachers report that it is more important for children to control themselves in the classroom, follow directions, and not be disruptive than it is to know the alphabet or how to count to 20.³ This suggests that teachers may find children with better executive function skills to be more teachable than children who are more distracted and prone to disruption.³

Furthermore, executive function skills may promote the development of positive teacher and peer relationships.²⁸ Studies suggest that there is overlap between the development of executive function and Theory of Mind (ToM), which is the ability to identify that others' desires and knowledge differ from one's own. These skills are associated with lower levels of aggression, better problem solving skills, and positive social skills.^{29,30} Additionally, the ability to delay gratification may be linked with children's ability to regulate frustration and stress.^{31,32}

Research Gaps

Currently, there is limited research on the effectiveness of interventions to boost executive function skills with very high-risk children. When developing interventions for these children, it may be critical to consider that children from a variety of adverse backgrounds may consistently demonstrate impairments in executive function.^{6,7,9,10,11} Nevertheless, it will be important to remember that intervention needs and responses of children with different experiences may differ. For children currently experiencing chronic stress (e.g., homeless/highly mobile), it is unclear whether it is feasible to target executive function skills without first reducing stress and building coping skills. Future research will be needed to learn how best to tailor interventions to account for the needs of different children.

Conclusions

Studies consistently suggest that exposure to trauma or chronic early life stress may impair the development of executive function skills.^{6,7,9,10,11} These skills appear to provide the foundation for school readiness through cognition and behaviour.^{3,12} Children with better executive function skills may be more teachable.³ Indeed, in a high-risk sample, children with better executive function skills at the beginning of kindergarten showed greater gains in literacy and numeracy than children with poorer initial skills.¹² Considering there is evidence that

the achievement gap persists and may even widen across the school years,^{16,17} it is critical that high-risk children begin school with as successful of a start as possible.

For this reason, there has been increased attention to interventions that promote executive function. Although there is evidence that executive function is malleable,^{18,33} few interventions have attempted to boost skills in children currently experiencing toxic levels of stress. Efforts to design interventions that promote executive function in these children may need to address current levels of stress exposure and simultaneously work to reduce these to gain maximum benefit.

Implications for Parents, Services and Policy

Research to date underscores the importance of executive function skills for school success, especially for children living in high-risk environments. Programs designed to boost executive function have shown success across multiple levels, including school curriculum, computer-based training, and even physical activities, like martial arts.^{18,33,34} Similar to computer-based training, parents may be able to promote these skills with games that require turn-taking, attention skills,

and memory. Furthermore, sensitive caregiving may promote these skills by shielding children from some of the chaos they are experiencing.³⁵

executive function skills also have been successfully targeted through school-based curriculum in preschool²⁶ and Head Start classrooms.^{4,34} Experimental evidence suggests early childhood classrooms, like Head Start, can successfully build executive function skills by providing more self-regulatory support in a classroom (e.g., implementing clear rules and routines, redirecting or rewarding children's behaviour).³⁴ Increasing attention to executive function skills in early childhood programs may reduce the achievement gap that is apparent before school begins and persists throughout the school years.

References

1. Best JR, 1. Miyake A, Friedman NP, Emerson MJ, Witzki AH, Howerter A, Wager T. The unity and diversity of executive functions and their contributions to complex "frontal lobe" tasks: A latent variable analysis. *Cognitive Psychol.* 2000;41:49-100.
2. Zelazo PD, Anderson JE, Richler J, Wallner-Allen K, Beaumont JL, Weintraub S. NIH toolbox cognitive function battery (CFB): Measuring executive function and attention. *Monogr Soc Res Child.* In press.
3. Blair C. School readiness: Integrating cognition and emotion in a neurobiological conceptualization of children's functioning at school entry. *Am Psychol.* 2002;57:111-127.
4. Bierman KL, Nix RL, Greenberg MT, Blair C, Domitrovich CE. Executive functions and school readiness intervention: Impact, moderation, and mediation in the Head Start REDI program. *Developmental Psychopathol.* 2008;20:821-843.
5. Bierman KL, Domitrovich CE, Nix RL, et al. (2008). Promoting academic and social-emotional school readiness: The Head Start REDI program. *Child Dev.* 2008;79:1802-1817.
6. Masten AS, Herbers JE, Desjardins CD, et al. Executive function skills and school success in young children experiencing homelessness. *Educational Res.* 2012;41:375-384.
7. Obradovic J. Effortful control and adaptive functioning of homeless children: Variable-focused and person-focused analyses. *J App Dev Psychol.* 2010;31:109-117.
8. Pechtel P, Pizzagalli DA. Effects of early life stress on cognitive and affective function: An integrated review of human literature. *Psychopharmacology(Berl).* 2011;214:55-70.
9. DePrince AP, Weinzierl KM, Combs MD. Executive function performance and trauma exposure in a community sample of children. *Child Abuse Neglect.* 2009;33:353-361.
10. Loman MM, Johnson AE, Westerlund A, et al. The effect of early deprivation on executive attention in middle childhood. *J Child Psychol Psyc.* 2012;54:37-45.
11. Pears KC, Fisher PA, Bruce J, Kim HK, Yoerger K. Early elementary school adjustment of maltreated children in foster care: The role of inhibitory control and caregiver involvement. *Child Dev.* 2010;81:1550-1564.
12. Welsh JA, Nix RL, Blair C, Bierman KL, Nelson, KE. The development of cognitive skills and gains in academic school readiness for children from low-income families. *J Educ Psychol.* 2010;102:43-53.
13. Willcutt, EG, Brodsky K, Chhabildas N, et al. The neuropsychology of ADHD: Validity of the executive function hypothesis. In: Gozal D, Molfese DL, eds. *Attention deficit hyperactivity disorder: From genes to patients.* 3rd ed. Totowa, NJ: Humana

Press;205:185-213.

14. Liew, J. Effortful control, executive functions, and education: Bringing self-regulatory and social-emotional competences to the table. *Child Dev Perspect.* 2011;6:105-111.
15. McClelland MM, Cameron CE, Connor CM, Farris CL, Jewkes AM, Morrison FJ. Links between behavioral regulation and preschoolers' literacy, vocabulary, and math skills. *Dev Psychol.* 2007;43:947-959.
16. Cutuli JJ, Desjardins CD, Herbers JE, et al. Academic achievement trajectories of homeless and highly mobile students: Resilience in the context of chronic and acute risk. *Child Dev.* In press.
17. Herbers JE, Cutuli JJ, Supkoff LM, et al. Early reading skills and academic achievement trajectories of students facing poverty, homelessness, and high residential mobility. *Educational Res.* 2012;41:366-365.
18. Diamond A, Lee K. Intervention shown to aid executive function development in children 4-12 years old. *Science.* 2011;333:959-964.
19. Blair C, Razza RP. Relating effortful control, executive function, and false belief understanding to emerging math and literacy ability in kindergarten. *Child Dev.* 2007;78:647-663.
20. Holmes J, Gathercole SE, Dunning DL. Adaptive training leads to sustained enhancement of poor working memory in children. *Developmental Sci.* 2009;12:F9-F15.
21. Holmes J, Gathercole SE, Place M, Dunning DL, Hilton KA, Elliott JG. *Appl Cognitive Psych.* 2010;24:827-836.
22. Klingberg T, Fernell E, Olesen P, et al. Computerized training of working memory in children with ADHD- a randomized, controlled trial. *J Am Acad Child Adolesc Psychiatry.* 2005;44:177-186.
23. Bergman-Nutley S, Söderqvist S, Bryde S, Thorell LB, Humphreys K, Klingberg T. Gains in fluid intelligence after training non-verbal reasoning in 4-year-old children: a controlled randomized study. *Dev Sci.* 2011;14:591-601.
24. Thorell LB, Lindqvist S, Bergman-Nutley S, Bohlin G, Klingberg T. Training and transfer effects of executive functions in preschool children. *Dev Sci.* 2009;12:106-113.
25. Bodrova E, Leong DJ. *Tools of the Mind: The Vygotskian approach to early childhood education.* ed. 2. New York: Merrill/Prentice Hall; 2007.
26. Diamond A, Barnett WS, Thomas J, Munro S. Preschool program improves cognitive control. *Science.* 2007;318:1387-1388.
27. Wilson SJ, Farran DC. Experimental evaluation of the Tools of the Mind preschool curriculum. Paper presented at the Society for Research on Educational Effectiveness; March 2012; Washington, DC.
28. Riggs NR, Jahromi LB, Razza RP, Dillworth-Bart JE, Mueller U. *J Appl Dev Psychol.* 2006;27:300-309.
29. Capage L, Watson AC. Individual differences in theory of mind, aggressive behavior, and social skills in young children. *Early Educ Dev.* 2001;12:613-628.
30. Jenkins JM, Astington JW. Theory of mind and social behavior: Causal model tested in a longitudinal study. *Merrill Palmer Quart.* 2000;46:203-220.
31. Mischel W, Shoda Y, Rodriguez ML. Delay of gratification in children. *Science.* 1989;244:933-938.
32. Sethi A, Mischel W, Aber JL, Shoda Y, Rodriguez, ML. The role of strategic attention deployment in development of self-regulation: Predicting preschoolers' delay of gratification from mother - toddler interactions. *Dev Psychol.* 2000;36:767-777.
33. Zelazo PD, Carlson SM. Hot and cool executive function in childhood and adolescence: Development and plasticity. *Child Dev Perspect.* 2012;6:354-360.
34. Raver CC, Jones SM, Li-Grining C, Zhai F, Bub K, Pressler E. CSRPs impact on low-income preschoolers' preacademic skills: Self-regulation as a mediating mechanism. *Child Dev.* 2011;82:362-378.

35. Lewis-Morrarty E, Dozier M, Bernard K, Terraciano SM, Moore SV. Cognitive flexibility and theory of mind outcomes among foster children: Preschool follow-up results of a randomized clinical trial *J Adolescent Health*. 2012;51:S17-S22.

Gene-environment Interplay and Risk and Resilience During Childhood

K. Lee Raby, MA, Glenn I. Roisman, PhD

Institute of Child Development, University of Minnesota, USA

October 2013

Introduction

Developmental scientists have long acknowledged that genetically-based characteristics of the child contribute to developmental processes associated with risk and resilience. For example, quantitative behaviour-genetic (e.g., twin and adoption) studies have highlighted genetic influences on children's behaviour and development, increasingly with a focus on resilience-related outcomes.¹ However, such studies often assume that genetic and environmental influences operate independently of one another. Recently, focus has shifted towards the idea that development is shaped by ongoing, reciprocal influences across multiple levels of analysis, spanning from the child's sociocultural context to molecular and cellular processes.²⁻⁵ Studying the complex interplay between genetic and environmental influences has increasingly focused the field on the contributions of molecular variations within specific genes.

Subject

One class of gene-environment interplay is the interactions between measured genetic variations and environmental experiences. Gene-by-environment interaction (G×E) refers to the idea that genetic variations might not shape development outcomes directly but rather confer vulnerabilities and protections against the effects of adverse experience.⁶ Research on G×E processes has implications for our understanding of risk and resilience because these studies have the potential to explain children's heterogeneous responses to adversity. Indeed, recent advances in our understanding and measurement of molecular genetic variations have ushered in a growing number of genetically informed investigations of risk and resilience in children's development.

Research Context

To date, research on G×E processes has focused on a relatively small but expanding number of genetic variations. Moreover, nearly all of the genetic markers investigated to date transcribe

proteins that regulate the availability and functioning of neurotransmitters such as serotonin, dopamine, and norepinephrine. In this way, current G×E research has emphasized the idea that the effects of adverse experiences on later adaptation and functioning may be, at least partially, accounted for by neurobiological processes.^{7,8}

Key Research Questions

Although children may experience many kinds of adversity, maltreatment is one that has been observed to overwhelm the child's adaptive capacities, therefore leading to a host of problematic developmental outcomes.^{9,10} However, not all maltreated children develop maladaptively. Some abused and neglected youth function in a competent manner despite the pernicious experiences they have encountered. Recent investigations have begun to shed light on how G×E processes may account for the variability in outcomes associated with child maltreatment.¹¹⁻¹⁶

Recent Research Results

In a groundbreaking study, Caspi and colleagues reported that a functional variation in the gene encoding the neurotransmitter-metabolizing enzyme monoamine oxidase A (MAOA) moderated the consequences of child maltreatment on later antisocial behaviour.¹¹ More specifically, individuals who experienced maltreatment were at an increased risk for antisocial behaviour if their genotype conferred low levels of MAOA expression. There were no associations between MAOA genetic variation and antisocial behaviour in the absence of maltreatment. Thus, the combination of genetic vulnerability and childhood maltreatment posed the greatest risk for antisocial outcomes. In a second study, Caspi and colleagues observed that individuals carrying one or two copies of the less efficient version of a serotonin related genetic marker exhibited more depressive symptoms following childhood maltreatment compared to maltreated individuals with the more efficient version.¹² Once again, genetic variations were not associated with mental health outcomes among individuals who had not experienced maltreatment earlier in development.

Subsequent attempts to replicate these findings in independent samples have not produced a uniform body of evidence, thus sparking a debate about the magnitude and replicability of G×E effects for children's development.¹⁷⁻²⁰ However, consensus is building around the possibility that measurement issues play a critical role in researchers' ability to detect G×E effects.²¹ For example, recent longitudinal studies that include prospectively collected information about child

maltreatment have supported the hypotheses that MAOA and serotonin transporter genetic variations moderate the associations between child maltreatment and antisocial and depression outcomes, respectively.¹³⁻¹⁶ For both developmental outcomes, the maladaptive consequences of child maltreatment are most pronounced among genetically susceptible individuals. These results have ushered in a wave of research interest in the possibility of G×E effects involving other child development outcomes and other types of stressors.²² However, the findings from many of these studies have not yet been thoroughly replicated, so the prevalence of G×E effects for children’s development remains uncertain.

One exciting new avenue for research on genetic contributions to risk and resilience is the possibility that children’s genetic characteristics moderate the effectiveness of preventive interventions. For example, Bakermans-Kranenburg and colleagues reported that children’s genotype moderated their responses to an intervention designed to reduce children’s behaviour problems by training parents to provide responsive care and sensitive discipline.²³ Children who were randomly assigned to the intervention showed significant reductions in externalizing behaviour problems compared a control group only if they carried the less efficient version of a dopamine-related genetic marker. This finding, among others, points to the possibility that genotypic differences may contribute to children’s differential responses to positive interventions as well as adversities.^{24,25} Future research in this area may uncover avenues of tailoring prevention and intervention efforts to the needs of the individual.

Research Gaps

Altogether, the studies of gene-by-environment interactions are beginning to shed light on genetic factors that might moderate the impact of early adverse experiences for children’s behavioural and mental health. However, this is still a new research area and several gaps remain. First, many of the findings still await thorough replication. This is important because molecular genetic investigations have generally been difficult to replicate in both the biomedical and psychological sciences.^{26,27} Corroborating evidence from diverse samples is vital to the development of empirically supported interventions and preventions. Second, it has been argued that some genetic variations confer increased susceptibility to all contextual influences, not only adversity.²² According to this perspective, genetic variants formerly viewed as vulnerability factors may actually heighten susceptibility to positive environments as well. If confirmed, this would have far-reaching implications for our understanding of genetic contributions to risk or resilience.

Conclusions

Increased knowledge about the genome promises to elucidate how children's resilience in the face of adversity is shaped by the complex interplay between their genetic makeup and experiences. In particular, the research on gene-by-environment interactions indicates that genetic variations may not have direct associations with children's developmental outcomes but instead predispose individuals to be especially susceptible to the harmful effects of adversities such as child maltreatment. Although the available evidence is still limited in some respects, this area of research has already begun to enhance our understanding of children's heterogeneous responses to their experiences. Still, it is important to remember that the processes of resistance and recovery from adversity are shaped by multiple factors, not just the child's genetic makeup. As such, the risks associated with an individual's genome or early childhood experiences may be buffered by experiences later in life.²⁸ Also, the interplay between genetic and environment factors involves more than just gene-by-environment interactions. Another type of interplay that is receiving increased attention among developmental researchers is the environmental regulation of genomic functioning, a phenomenon referred to as epigenetics.²⁹ Although research in this area is still in its infancy, investigations of epigenetic modification may shed light on neurobiological mechanisms by which early adverse experiences exert a detrimental influence on children's adaptation across the life-course.

Implications

The hope for many involved in research on gene-environment interplay is that increased knowledge of genetic contributions to risk and resilience will eventually yield practical applications for prevention and intervention programs aimed at reducing the burden of mental illness and improving the quality of life for individuals in higher risk contexts. For example, genetic information could potentially be used to identify and selectively target individuals who are at the greatest risk for problematic outcomes. In addition, it may be possible in the future for intervention and prevention programs to customize their treatment protocols based on each individual's genotype. However, scientific understanding remains a long way from being able to make suggestions about how to tailor interventions to specific groups of children on the basis of genotype. Nonetheless, advances in our conceptual understanding of the factors (genetic and otherwise) that account for individuals' varied responses to their environments will provide clues for aiding efforts that treat the wide range of problems associated with childhood adversity.

References

1. Kim-Cohen J, Moffitt TE, Caspi A, Taylor A. Genetic and environmental processes in young children's resilience and vulnerability to socioeconomic deprivation. *Child Dev.* 2004;75(3):651-668.
2. Cicchetti D, Blender JA. A multiple levels of analysis perspective on resilience. *Ann N Y Acad Sci.* 2006;1094(1):248-258.
3. Gottlieb G. Probabilistic epigenesis. *Developmental science.* 2006;10(1):1-11.
4. Masten AS. Resilience in developing systems: Progress and promise as the fourth wave rises. *Dev Psychopathol.* 2007;19(3):921-930.
5. Sameroff A. A unified theory of development: A dialectic integration of nature and nurture. *Child Dev.* 2010;81(1):6-22.
6. Rutter M, Moffitt TE, Caspi A. Gene-environment interplay and psychopathology: Multiple varieties but real effects. *Journal of Child Psychology and Psychiatry.* 2005;47(3-4):226-261.
7. Cicchetti D. How a child builds a brain: Insights from normality and psychopathology. In: Hartup W, Weinberg RA, eds. *The Minnesota symposia on child psychology. Child psychology in retrospect and prospect: In celebration of the 75th anniversary of the Institute of Child Development. Volume 32.* Mahwah, NJ: Lawrence Erlbaum Associates Publishers; 2002:23-71.
8. Feder A, Nestler EJ, Charney DS. Psychobiology and molecular genetics of resilience. *Nature Reviews Neuroscience.* 2009;10(6):446-457.
9. Cicchetti D., Valentino. K. An ecological-transactional perspective on child maltreatment: Failure of the average expectable environment and its influence on child development. In: Cicchetti D, Cohen DJ, eds. *Developmental psychopathology. Volume three: Risk, disorder, and adaptation.* 2nd ed. Hoboken, New Jersey: John Wiley & Sons, Inc.; 2006:129-201.
10. Gilbert R, Widom CS, Browne K, Fergusson D, Webb E, Janson S. Child maltreatment 1: Burden and consequences of child maltreatment in high-income countries. *Lancet.* 2009;373(9657):68-81.
11. Caspi A, McClay J, Moffitt TE, et al. Role of genotype in the cycle of violence in maltreated children. *Science.* 2002;297(5582):851-854.
12. Caspi A, Sugden K, Moffitt TE, et al. Influence of life stress on depression: Moderation by a polymorphism in the 5-HTT gene. *Science.* 2003;301(5631):386-389.
13. Cicchetti D, Rogosch FA, Thibodeau EL. The effects of child maltreatment on early signs of antisocial behavior: Genetic moderation by tryptophan hydroxylase, serotonin transporter, and monoamine oxidase A genes. *Dev Psychopathol.* 2012;24(3):907-928.
14. Kim-Cohen J, Caspi A, Taylor A, et al. MAOA, maltreatment, and gene-environment interaction predicting children's mental health: New evidence and a meta-analysis. *Mol Psychiatry.* 2006;11(10):903-913.
15. Karg K, Burmeister M, Shedden K, Sen S. The serotonin transporter promoter variant (5-HTTLPR), stress, and depression meta-analysis revisited: Evidence of genetic moderation. *Arch Gen Psychiatry.* 2011;68(5):444-454.
16. Cutuli J, Raby KL, Cicchetti D, Englund MM, Egeland B. Contributions of maltreatment and serotonin transporter genotype to depression in childhood, adolescence, and early adulthood. *J Affect Disord.* 2013;149(1-3):30-37.
17. Risch N, Herrell R, Lehner T, et al. Interaction between the serotonin transporter gene (5-HTTLPR), stressful life events, and risk of depression. *JAMA: The journal of the American Medical Association.* 2009;301(23):2462-2471.
18. Uher R, McGuffin P. The moderation by the serotonin transporter gene of environmental adversity in the etiology of depression: 2009 update. *Mol Psychiatry.* 2010;15(1):18-22.
19. Munafò MR, Durrant C, Lewis G, Flint J. Genex environment interactions at the serotonin transporter locus. *Biol Psychiatry.* 2009;65(3):211-219.

20. Rutter M, Thapar A, Pickles A. Gene-environment interactions: Biologically valid pathway or artifact? *Arch Gen Psychiatry*. 2009;66(12):1287-1289.
21. Caspi A, Hariri AR, Holmes A, Uher R, Moffitt TE. Genetic sensitivity to the environment: The case of the serotonin transporter gene and its implications for studying complex diseases and traits. *Am J Psychiatry*. 2010;167:509-527.
22. Belsky J, Pluess M. Beyond diathesis stress: Differential susceptibility to environmental influences. *Psychol Bull*. 2009;135(6):24.
23. Bakermans-Kranenburg MJ, Van IJzendoorn MH, Pijlman FTA, Mesman J, Juffer F. Experimental evidence for differential susceptibility: Dopamine D4 receptor polymorphism (DRD4 VNTR) moderates intervention effects on toddlers' externalizing behavior in a randomized controlled trial. *Dev Psychol*. 2008;44(1):293.
24. Cicchetti D, Rogosch FA, Toth SL. The effects of child maltreatment and polymorphisms of the serotonin transporter and dopamine D4 receptor genes on infant attachment and intervention efficacy. *Development and Psychopathology*. 2011;23:357-372.
25. van IJzendoorn MH, Bakermans-Kranenburg MJ. Differential susceptibility experiments: Going beyond correlational evidence--comment on beyond mental health, differential susceptibility articles. *Dev Psychol*. 2012;48(3):769-774.
26. Duncan LE, Keller MC. A critical review of the first 10 years of candidate gene-by-environment interaction research in psychiatry. *Am J Psychiatry*. 2011;168(10):1041-1049.
27. Ioannidis J. Genetic associations: False or true? *Trends Mol Med*. 2003;9(4):135-138.
28. Kaufman J, Yang B, Douglas-Palumberi H, et al. Brain-derived neurotrophic factor-5-HTTLPR gene interactions and environmental modifiers of depression in children. *Biol Psychiatry*. 2006;59(8):673-680.
29. Meaney MJ. Epigenetics and the biological definition of gene x environment interactions. *Child Dev*. 2010;81(1):41-79.