
What Can We Learn about Resilience from Large-Scale Longitudinal Studies?

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Since the mid-1980s, a number of investigators from different disciplines—child development, pediatrics, psychology, psychiatry, and sociology—have focused on the question why some children cope successfully with major adversities in their lives, while others develop severe and persistent psychopathology. The *resilience* these children display is conceived as an end-product of buffering processes that do not eliminate risks and stress in their lives, but that allow the individual to deal with them effectively (Rutter, 1987).

Lately, there has been a lively debate that centers on whether successful coping in the face of adversity is domain-specific, whether the protective factors that mitigate the effects of adversity tend to be universal or context-specific, and whether the factors that contribute to resilience among children exposed to high levels of childhood adversity are equally beneficial for those not exposed to these adversities.

These questions are not easily addressed in the existing literature. Much of the available evidence is based on cross-sectional studies, retrospective studies, short-term longitudinal studies of only a few years duration (mostly in middle childhood), and studies with relatively small samples without “low-risk” comparison groups.

Nonetheless, there are lessons to be learned from large-scale longitudinal studies that have

focused on the process of resilience at different points in time—from infancy to adulthood—and that are much rarer than the numerous reviews and handbooks that have been devoted to this topic. A *caveat is in order*: resilience itself, as Luthar and Zelazo (2003) remind us, is never *directly* measured in these studies—instead it is *inferred*, based on the measurement of two component constructs: risk and positive adaptation.

There are currently about a dozen large-scale longitudinal studies of high-risk children in different geographical regions of the United States that have reported their findings from different time periods in the life cycle. They include African American, Asian American, Caucasian and Hispanic youngsters who managed to cope successfully, despite significant adversities in their lives, such as poverty, parental mental illness, child abuse, parental divorce, and/or an accumulation of multiple risk factors in their families.

These longitudinal studies have (a) maintained a core group of 100 to a 1,000 or more participants; (b) included both males and females in their samples; (c) used multiple and age-appropriate measures of adaptation; (d) followed the children at several points in time; (e) kept their attrition rates low, and (f) collected data on “low-risk” comparison groups.

This chapter will also draw on report from longitudinal studies from Great Britain, New Zealand, Australia, the Scandinavian countries, and Germany whose findings complement the results reported by American investigators.

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Large-Scale Longitudinal Studies

U.S. Studies

The Kauai Longitudinal Study: Beginning in the prenatal period, the Kauai Longitudinal Study has monitored the impact of a variety of biological and psychosocial risk factors, stressful life events, and protective factors on the development of some 698 Asian, Caucasian, and Polynesian children, born in 1955, in the westernmost county of the United States. Some 30% of this cohort were exposed to four or more risk factors that included chronic poverty, perinatal complications, parental psychopathology, and family discord. Data on the children and their families were collected at birth, in the postpartum period, and at ages 1, 2, 10, 18, 32, and 40 years. The most comprehensive publication resulting from this study is the book *Journeys from childhood to midlife: risk, resilience, and recovery* (Werner & Smith, 2001). A follow-up in the mid-50s is planned.

The Minnesota Parent-child Project: Begun in 1975, this project followed some 190 of 267 low-income women and their first-born children in Minneapolis from the last trimester of pregnancy to ages 7 and 10 days, 3, 6, 9, 12, 18, 24, 30, 42, 48 months, and from grades 1, 2, 3, and 6 to age 25 years (Yates, Egeland, & Sroufe, 2003; Sroufe, Egeland, Carlson, & Collins, 2005).

Project Competence: Begun in 1977–1978, this study followed a normative school cohort of 205 third to sixth graders in the Minneapolis public schools (ages 8–12) after 7, 10, and 20 years, with high retention rates. Some 90% of the original cohort participated in the 20-year follow-up (Masten & Powell, 2003; Masten et al., 2004).

The Virginia Longitudinal Study of Divorce and Remarriage: Begun in 1971, the initial sample consisted of 144 white middle-class families, half divorced, half nondivorced, with a target child of 4 years. Children and families were studied at 2 months, and 1, 2, 6, 8, 11, and 20 years after divorce. Of the original 144 families, 122 are

continuing to participate in the study. When the children were 10 years old, the sample was expanded to include 180 families. When the children were 15 years old, it was expanded to include 300 families, and when the young people were 24 years old, it was expanded to include 450 families (Hetherington, 1989).

The Hetherington and Clingempeel Study of Divorce and Remarriage: Begun in 1980, this study examined the adaptation in stepfamilies of adolescent children at 4, 17, and 26 months after their parents' remarriage. Participants in this study were 202 white middle-class families living in Philadelphia and its suburbs, with the non-divorced and stepfamilies studied at equal intervals (Hetherington & Kelley, 2002).

The Rochester Longitudinal Study: Begun in 1970, the study included a core sample of 180 out of 337 women showing a history of mental illness (and a normal control group) whose children were studied at birth, 4, 12, 30 months, 4 years, and through grades 1–12 (Sameroff, Gutman, & Peck, 2003).

A Study of Child Rearing and Child Development in Normal Families and Families with Affective Disorders: Begun in 1980, the study enrolled 80 (Maryland) families where parents had affective disorders, with two children each: a younger child in the age range from 15 to 36 months, and an older child between the ages of 5 and 8 years, and 50 control families. There were three follow-ups at ages 42–63 months; 7–9 years, and 11–13 years (Radke-Yarrow & Brown, 1993).

A Longitudinal Study of the Consequences of Child Abuse: Begun in 1975, the study included a core sample of 353 out of 439 children from Pennsylvania families served by abuse centers, and controls drawn from daycare and Head Start programs. The children were seen between 1 and 6 years, and followed at 6–12 years, and in late adolescence (Herrenkohl, Herrenkohl, & Egolf, 1994).

The Virginia Longitudinal Study of Child Maltreatment: Begun in 1986, the study focused

on 107 maltreated children, identified from the statewide registry, and a normal control group of children attending public schools in Charlottesville. The children were assessed in grades 1–3, grades 4–5, and grades 6–7 (Bolger & Patterson, 2003).

The Notre Dame Adolescent Parenting Project (NDAPP) focused on the fate of more than a hundred teenage mothers and their children—born in the late 1980s and early 1990s across the first 14 years of their lives. The goal of the study was to understand the mechanisms and pathways through which risk and protective factors influenced the children’s development at 6 months, 1, 3, 5, 8, 10, and 14 years of age (Borkowski et al., 2007).

The Chicago Longitudinal Study: Begun in 1983, this is a longitudinal quasi-experimental cohort design, including 989 low-income children who entered the Child–Parent Center programs (CPC) in preschool and 550 low-income children who participated in an all-day kindergarten program. The youngsters were followed at age 14 and age 20 years, when 1,281 sample participants were still active (Raynolds & Ou, 2003).

British Studies

The National Child Development Study (NCDS): This study has followed some 16,994 persons, born in Great Britain between March 3 and 9, 1958, until adulthood. Data were collected on the physical, psychosocial, and educational development of the cohort at ages 7, 11, 16, 23, and 33 years (Wadsworth, 1999).

The British Cohort Study (BCS70): This study has followed 14,229 children, born in the week between April 5 and 11, 1970, for 3 decades. Follow-up data were collected when the cohort members were age 5, 10, 16, and 26 years (Schoon, 2001, 2006).

The Avon Brothers and Sisters Study (ABSS): Is a longitudinal study of some 192 families, each with a child born between August 1991 and December 1992 and an older sibling over the age

of 7, but below age 17. The aim of the research was to explore sibling relationships in different family types (two-parent families, single-parent families, and stepfamilies) and the risk and protective factors that impact their development and adjustment (Gass, Jenkins, & Dunn, 2007).

New Zealand Studies

The Dunedin Multidisciplinary Health and Development Study: This is a longitudinal investigation of a cohort of infants, born between April 1, 1972, and March 31, 1973, in Dunedin, New Zealand. The base sample comprised 1,037 children, followed at ages 3, 5, 7, 9, 11, 13, 15, 18, and 21 years, with 992 participating at age 21. In the latest follow-up, at age 26, 847 of the cohort were assessed (Caspi et al., 2003).

The Christchurch Health and Development Study: Begun in the mid-1977s, this study consists of a birth cohort of 1,265 children, born in the Christchurch urban region, and followed at 4 months, 1 year, and annual intervals to age 16 years, and at ages 18 and 21 years. In the last follow-up, 991 participants were assessed (Fergusson & Horwood, 2003).

Australian Studies

The Mater-University of Queensland Study of Pregnancy (Brisbane): This is a prospective study of 8,556 pregnant women begun in 1981. The mothers and their offspring were assessed between the third and fifth day postpartum and at 6 months, 5 years, and 14–15 years when 5,262 children participated. A follow-up at age 21 is under way (Brennen, Le Brocque, & Hammen, 2002).

The Australian Temperament Project (ATP) is a longitudinal study of the psychosocial development of a representative sample of 2,443 children born in the Australian State of Victoria between September 1982 and January 1983. DNA data were available for 584 adolescents at age 15–16 years, and 544 at age 17–18 years (Chipman et al., 2007).

Danish Studies

The Copenhagen High-Risk Study: This study has traced 207 children of schizophrenic mothers and 104 matched controls from age 15 to ages 25 and 42 years. More than half had exhibited *no* psychopathology from mid-adolescence through mid-life (Parnas et al., 1993).

Swedish Studies

The Lundby Study: This is a prospective longitudinal study of the mental health of some 2,550 persons, including 590 children (mean age 8 years at first assessment) living in southern Sweden. Cederblad (1996) followed a subsample of 148 individuals who had been exposed to three or more psychiatric risk factors (such as parental mental illness, alcoholism, family discord, or abuse) in childhood. Three out of four were functioning well in midlife.

German Studies

There are two longitudinal studies of risk and protective factors in Germany: Losel and Bliesener (1990) have studied adolescents in residential institutions in Bielefeld; Laucht, Esser, & Schmidt (1999) have followed a birth cohort of 347 children in Mannheim from 3 months to 8 years. Reports on the findings of their studies are available in German in the book *Was Kinder starkt* (What Makes Children Strong?) (Laucht et al., 1999).

Individual Attributes and Sources of Support Associated with Successful Coping Among High-Risk Children

Tables 6.1 and 6.2 summarize the individual attributes and sources of support in the family and community associated with successful coping among high-risk children that have been replicated in a number of large-scale longitudinal studies in the United States of America and abroad. In most cases the factors that contributed to resilience among those exposed to high levels of childhood adversity also benefited “low-risk”

children, that is, they showed a main effect rather than an interaction effect in statistical analyses (Fergusson & Horwood, 2003).

Children who coped successfully with adversity tended to become less easily distressed than those who developed problems and had an active, sociable, “engaging” temperament that attracted adults and peers alike. They possessed good communication and problem-solving skills, including the ability to recruit substitute caregivers; they had a talent or special skill that was valued by their peers, and they had faith that their actions could make a positive difference in their lives.

They also drew on external resources in the family and community. Foremost were affectional ties that encouraged trust, autonomy, and initiative. These bonds were often provided by alternative caregivers who were members of the extended family, such as grandparents or older siblings. There were also informal support systems in the community that reinforced and rewarded the competencies of such youngsters and that provided them with positive role models, such as teachers, mentors, and peer friends.

The frequency with which the same predictors of resilience emerge from diverse studies with different ethnic groups, in different geographic and sociopolitical contexts, conveys a powerful message of universality (Masten & Powell, 2003). That does not preclude the possibility that some protective factors are more age-, gender-, and context-specific than others. For example, in the Kauai Longitudinal Study we found some variables that discriminated significantly between positive and negative developmental outcomes *only* when there was a series of stressful life events or when children were exposed to poverty. They did not discriminate between good and poor outcomes among middle-class children whose lives were relatively secure, stable, and stress-free (Werner & Smith, 1989).

Among such protective factors were autonomy and self-help skills in early childhood for the males and a positive self-concept in adolescence for the females. Among protective factors in the caregiving environment for *both* boys and girls were a positive parent–child relationship observed during the second year of life and the number of sources of emotional support they could draw on

Table 6.1 Individual attributes associated with successful coping in high-risk children-replicated in two or more large-scale longitudinal studies

Source notes	Characteristics of individual	Time period studied	Multiple (4+) risk factors	Childhood adversities			
				Poverty	Parental mental illness	Child abuse	Divorce
1	Low distress; low emotionality	Infancy–adulthood	+	+	+	+	+
2	Active; vigorous	Infancy–adulthood	+	+			
3	Sociable	Infancy–adulthood	+	+	+	+	
4	Affectionate “engaging” temperament	Infancy–childhood	+	+	+	+	+
5	Autonomy; social maturity	Early childhood	+	+			
6	Average-above average intelligence (incl. reading skills)	Childhood–adulthood	+	+	+	+	+
7	High achievement motivation	Childhood–adulthood	+	+	+		
8	Special talents	Childhood–adolescence	+	+	+		
9	Positive self-concept	Childhood–adolescence	+	+	+		+
10	Internal locus of control	Childhood–adulthood	+	+	+	+	+
11	Impulse control	Childhood–adulthood	+	+	+		
12	Planning; foresight	Adolescence–adulthood	+	+			
13	Faith; a sense of coherence	Adolescence–adulthood	+	+	+		
14	Required helpfulness	Childhood–adulthood	+	+	+		

Source notes:

1. Farber and Egeland (1987); Fergusson and Horwood (2003); Werner and Smith (1992, 2001)
2. Farber and Egeland (1987); Werner and Smith (1992, 2001)
3. Farber and Egeland (1987); Losel and Bliesener (1990); Werner and Smith (1992, 2001)
4. Farber and Egeland (1987); Hetherington (1989); Werner and Smith (1992, 2001)
5. Farber and Egeland (1987); Masten et al. (2004); Werner and Smith (1989, 1992, 2001)
6. Farber and Egeland (1987); Fergusson and Lynsky (1996); Hetherington and Elmore (2003); Losel and Bliesener (1990); Masten and Powell (2003); Masten et al. (2004); Seifer et al. (1992); Werner and Smith (1992, 2001)
7. Fergusson and Horwood (2003); Losel and Bliesener (1990); Masten and Powell (2003); Masten et al. (2004); Radke-Yarrow and Brown (1993); Schoon (2001); Werner and Smith (1992, 2001)
8. Anthony (1987); Werner and Smith (1992, 2001)
9. Cederblad (1996); Fergusson and Horwood (2003); Hetherington and Elmore (2003); Losel and Bliesener (1990); Radke-Yarrow and Brown (1993); Werner and Smith (1992, 2001)
10. Bolger and Patterson (2003); Cederblad (1996); Hetherington and Elmore (2003); Masten and Powell (2003); Seifer et al. (1992); Werner and Smith (1992, 2001)
11. Fergusson and Lynsky (1996); Fergusson and Horwood (2003); Masten and Powell (2003); Werner and Smith (1992, 2001)
12. Masten et al. (2004); Rutter (2000); Werner and Smith (1992, 2001)
13. Cederblad (1996); Hansson et al. (2008); Hetherington and Kelley (2001); Howard et al. (2007); Rumbaut (2000); Suarez-Orozco (2001); Werner and Smith (1992, 2001)
14. Anthony (1987); Boyden (2009); Losel and Bliesener (1990); Werner and Smith (2001)

Table 6.2 Resources in the family and community associated with successful coping in high-risk children—replicated in two or more large-scale longitudinal studies

Source notes	Resources	Time period studies	Multiple (4+) risk factors	Childhood adversities			
				Poverty	Parental mental illness	Child abuse	Divorce
1	Small family (<4 children)	Infancy	+	+			
2	Maternal competence	Infancy–adolescence	+	+	+	+	
3	Close bond with primary caregiver	Infancy–adolescence	+	+	+	+	
4	Supportive grandparents	Infancy–adolescence	+	+	+	+	+
5	Supportive siblings	Childhood–adolescence	+	+	+	+	+
6	Competent peer friends	Childhood–adolescence	+	+		+	+
7	Supportive teachers	Preschool–adulthood	+	+	+		+
8	Successful school experiences	Childhood–adulthood	+	+	+		+
9	Mentors (elders)	Childhood–adulthood	+	+			
10	Prosocial organizations: (youth clubs, religious groups)	Childhood–adulthood	+	+			

Source:

1. Cederblad (1996); Werner and Smith (1992, 2001)
2. Egeland, Carlson, and Stroute (1993); Masten and Powell (2003); Seifer et al. (1992); Werner and Smith (1992, 2001)
3. Cederblad (1996); Fergusson and Horwood (2003); Losel and Bliesener (1990); Masten et al. (2004); Mednick et al. (1987); Rumbaut (2000); Seifer (2003); Werner and Smith (1992, 2001)
4. Farber and Egeland (1987); Herrenkohl et al. (1994); Hetherington (1989); Howard et al. (2007); Radke-Yarrow and Brown (1993); Werner and Smith (1992, 2001)
5. Gass et al. (2007); Hetherington (1989); Wallerstein and Blakeslee (1989); Werner and Smith (1992, 2001)
6. Bolger and Patterson (2003); Fergusson and Horwood (2003); Hetherington (1989); Losel and Bliesener (1990); Rumbaut (2000); Suarez-Orozco (2001); Wallerstein and Kelley (1980); Werner and Smith (1992, 2001)
7. Hetherington (1989); Losel and Bliesener (1990); Radke-Yarrow and Brown (1993); Reynolds and Ou (2003); Rumbaut (2000); Werner and Smith (1992, 2001)
8. Fergusson and Lynskey (1996); Hetherington (1987); Masten et al. (2004); Schoon (2001, 2006); Wadsworth (1999); Werner and Smith (1992, 2001)
9. Howard et al. (2007); Yates et al. (2003); Werner and Smith (2001)
10. Howard et al. (2007); Masten and Powell (2003); McGee (2003); Rumbaut (2000); Suarez-Orozco (2001); Werner and Smith (1989, 1992, 2001); Wyman (2003)

in early and middle childhood. Further, in the Rochester Child Resilience Project, Wyman (2003) reported context-specific effects of involvement in structured after-school activities among high-risk teens. Participation in pro-social group activities lowered the risk for delinquent behavior for youngsters with many antisocial friends, but not for those with few antisocial friends.

The Importance of Early Developmental Competence and Support

Because the majority of research on resilience has focused on middle childhood and adolescence, an early history of developmental competence has received little attention in the literature on resilience. Yet, both the Kauai Longitudinal

Study and the Minnesota Parent–child Project have shown that an early history of positive adaptation, engendered by consistent and supportive care, is a powerful and enduring influence on children’s adaptation, and it increases the likelihood that they will utilize both formal and informal sources of support in their environment at later stages in the life-cycle.

For example, Yates et al. (2003) found that children with early histories of secure attachment in infancy and generally supportive care in the first 2 years demonstrated a greater capacity to rebound from a period of poor adaptation when they entered elementary school compared to those with less-supportive histories. Likewise, children who exhibited positive transitions from maladaptation in middle childhood to competence in adolescence were able to draw on a positive foundation of early support and positive adaptation.

That the process of resilience is manifested at later stages in the developmental trajectory became apparent to us in our follow-up studies in early adulthood and midlife on Kauai (Werner & Smith, 1992, 2001). The majority of high-risk children who had become troubled teenagers (with delinquency records and mental health problems) recovered in the third and fourth decade of life and became responsible partners, parents, and citizens in their communities. The individuals who availed themselves of informal sources of support in the community, and whose lives subsequently took a positive turn, differed in significant ways from those who did not make use of such options. They had been exposed to more positive interactions with their primary caregivers in the first 2 years, that is, their early rearing conditions fostered a sense of trust.

The Shifting Balance Between Vulnerability and Resilience

Large-scale longitudinal studies that have followed boys and girls from birth to adulthood (whether children of poverty, divorce, or children coming from multirisk families) have repeatedly found a shifting balance between stressful life

events that heighten children’s vulnerability and protective factors that enhance their resilience. The follow-up in adulthood in the Kauai Longitudinal Study, for example, found a few offspring of psychotic parents who had managed to cope successfully with a variety of stressful life events in childhood or adolescence, but whose mental health began to deteriorate in the third decade of life (Werner & Smith, 1992).

Other high-risk children had grown into competent, confident, and caring adults, but felt a persistent need to detach themselves from parents and siblings whose domestic and emotional problems threatened to engulf them. This was especially true for the adult offspring of alcoholic parents, some of whom had been physically and emotionally abused when they were young. The balancing act between forming new attachments to loved ones of their choice and the loosening of old family ties that evoked painful memories exacted a toll in their adult lives. The price they paid varied from stress-related health problems to a certain aloofness in their interpersonal relationships.

On the positive side, the Kauai study demonstrated that the opening of opportunities at major life transitions (high school graduation, entry into the world of work, marriage) enabled the majority of the high-risk individuals who had a troubled adolescence to rebound in their 20s and 30s. Among the most potent second chances for such youth were adult education, voluntary military service, active participation in a church community, and a supportive friend or marital partner. Likewise, *Project Competence* identified a number of young people who did poorly in adolescence but turned their lives around in the transition to adulthood (Masten & Wright, 2009).

Protective Mechanisms: Interconnections Over Time

Just as risk factors tend to co-occur in a particular population (i.e., children of poverty) or within a particular developmental period (i.e., adolescence), protective factors are also likely to occur together to some degree (Gore & Eckenrode,

1994). The presence of a cluster of (interrelated) variables that buffer adversity at one point in time also makes it more likely that other protective mechanisms come into play at a later period of time.

There are only a few large-scale longitudinal studies that have demonstrated such interconnections over time. The highlights of the results of the latent variable path analyses that were applied to the data from the Kauai Longitudinal Study at six points in the life cycle illustrate the complexity of the phenomenon of resilience. They show how individual dispositions and outside sources of support and stress are linked together from infancy and early childhood to middle childhood and adolescence, and how these variables in turn, predict the quality of adaptation in young adulthood and midlife (Werner & Smith, 1992, 2001).

When the links between individual dispositions and outside resources were examined, men and women who had made a successful adaptation at midlife—despite serious childhood adversity—had relied on sources of support within the family and community that *increased* their competence and efficacy, *decreased* the number of stressful life events they subsequently encountered, and *opened up* new opportunities for them.

The protective processes that fostered resilience manifested themselves early in life. Across a span of several decades, maternal competence in infancy was positively related to their offsprings' adaptation in adulthood (at 32 and 40 years). Girls whose mothers interacted in a consistently positive way with their infant daughters were more autonomous at age 2 and more competent at age 10. They also attracted more sources of emotional support in childhood and adolescence and encountered fewer stressful life events than did the daughters whose mothers were less competent caregivers. Males with more competent mothers were more successful at school at age 10, more resourceful and efficacious at age 18, and utilized more sources of emotional support in adulthood than did the sons of mothers who were less competent caregivers.

For both boys and girls there was a positive association between autonomy at age 2 and scholastic

competence at age 10. Boys who were more autonomous at age 2 encountered fewer stressful life events in the first decade of life and had fewer health problems in childhood and adolescence. Girls who were more autonomous as toddlers had fewer health problems in each decade of life and fewer coping problems by age 40.

For both boys and girls, there was a positive association between the number of sources of emotional support they were attracted in childhood, their scholastic competence at age 10, and the quality of adaptation at age 40. Individuals who could count on more sources of emotional support in childhood reported fewer stressful life events at later stages of their lives than those who had little emotional support.

For both sexes, scholastic competence at age 10 was positively linked to self-efficacy and the ability to make realistic plans at age 18. Males with higher scholastic competence at age 10 had fewer health problems in adolescence and higher activity scores on the EAS Temperament Survey at age 32. They also availed themselves of more sources of emotional support in adulthood. Females with higher scholastic competence at age 10 attracted more sources of emotional support in adolescence. For both boys and girls, the number of sources of emotional support they could rely on in adolescence was positively linked to their self-efficacy and ability to make realistic plans at age 18.

Men and women who were more resourceful and more realistic in their educational and vocational plans at age 18 received higher scores on the Scales of Psychological Well-Being at age 40. Their temperament was related to the quality of their adult adaptation as well. Men who scored higher on the activity scale of the EAS Temperament Survey at age 32 coped better at age 40 than did males with lower activity scores. Women with higher distress scores at age 32 had more health problems and lower scores on the Scales of Psychological Well-Being at age 40.

Most of the variance in the quality of adaptation at age 40 was accounted for by earlier predictors of resilience (i.e., variables associated with successful coping at ages 2, 10, and 18). Most was attributed to four clusters of protective

factors that had been independently assessed in the first decades of life: (1) *maternal competence* (a cluster of variables that included mother's age and education and the proportion of positive interactions with her child, observed independently at home at age 1, and during developmental examinations at age 2); (2) the number of *sources of emotional support available to the child between ages 2 and 10 years* (including members of the extended family); (3) *scholastic competence at age 10* (a cluster of variables that included IQ scores and scores on the PMA reasoning test and the STEP reading test); (4) the *health status* of the child (between birth and 2 years for females; between birth and 10 years for males).

Those findings point to the importance of the first decade of life in laying the foundations for later resilience—as has been also documented by Sroufe and his collaborators in the *Minnesota Parent-child Project* (Sroufe et al., 2005).

Gender Differences

All large-scale longitudinal studies of risk and resilience report gender differences that appear to vary with the stages of the life cycle and the demands made on each gender in the context of the prevailing sex role expectations.

At each developmental period, beginning in the prenatal period and infancy, more males than females perished. In childhood and adolescence, more boys than girls developed serious learning and behavior problems and displayed more externalizing symptoms. In contrast, in late adolescence and young adulthood, more girls than boys were subject to internalizing symptoms, especially depression (Caspi et al., 2003; Fergusson & Horwood, 2003; Werner & Smith, 1989).

But among the high-risk youths who had become “troubled teenagers,” more women than men managed to make a successful transition into their 30s and 40s, at least on Kauai. Protective factors *within* the individual—an engaging temperament, scholastic competence, and self-efficacy—tended to make a greater contribution to the quality of adult adaptation for females than

for males who successfully coped with adversities in their lives. In contrast the sources of support available in the family and community tended to make a greater impact on the lives of the men who successfully overcame childhood adversities (Werner & Smith, 2001).

Biological Aspects of Resilience

Most of the longitudinal studies reviewed here were conducted by educators, psychologists, and sociologists, but there has been a growing interest in biological and genetic variables that may mitigate or modify the impact of stress and childhood adversities on the quality of adaptation at different stages of the life cycle (Curtis & Cicchetti, 2008).

Health

Surprisingly, the general health status of the individual tends to be overlooked in most studies concerned with resilience and vulnerability. Even in large-scale longitudinal studies, in which the original focus has been “health and development,” the variables that are included in complex regression equations that look for “resiliency factors” tend to denote psychological or sociological constructs or are concerned with educational attainment rather than health (Fergusson & Horwood, 2003; Schoon, 2001).

Path analyses of the data of the Kauai Longitudinal Study suggest that it might be worthwhile to explore the effects of good health or debilitating illnesses or accidents on children's ability to cope with stressful life events and adversity. On Kauai, at each stage of the life cycle—from early childhood to adulthood—individuals who encountered more stressful life events also encountered more health problems. Health problems in *early childhood* (a count of serious illnesses or accidents reported by the parents between birth and age 2; the number of referrals to health care providers, and the pediatrician's low rating of the toddler's physical status at age 2) were significantly correlated with

copied problems in adulthood, both at 32 and age 40 (Werner & Smith, 1992, 2001).

On the positive side, perinatal health (i.e., the absence of pregnancy and birth complications) was a significant protective factor in the lives of adolescents who were the offspring of mothers who suffered from mental illness. These findings have been replicated in the Copenhagen High-Risk Study (Parnas et al., 1993) and in a study of 15-year-old-children of depressed mothers who were participants in the Mater-University Study of Pregnancy and Outcomes in Brisbane, Australia (Brennen et al., 2002).

Biological Sensitivity to Context

An exciting new avenue of research has focused on the role of psychobiologic factors as moderators of children's vulnerability to stress. The concepts of "biological sensitivity to context" and "differential susceptibility to environmental influences" have been advanced to explore the possibility that some children are more sensitive to the influence of context than others, whether the context is adverse or beneficial (Belsky, Bakermans-Kranenburg, & van Ijzendoorn, 2007; Ellis, Essex, & Boyce, 2005).

Biological reactivity to naturally occurring stressors appears to be a robust, replicable phenomenon that involves a set of complex responses within the neural circuitry of the brain, and within peripheral neuro-endocrine pathways regulating metabolic, immunologic, and cardiovascular functions. Boyce and his collaborators (2005) have demonstrated in several studies that a disproportionate number of preschool children in supportive home environments displayed high autonomic reactivity. Conversely, a relatively high proportion of children in very stressful family environments, followed from infancy to age 7, showed evidence of heightened adrenocortical and sympathetic reactivity. In both studies, children from moderately stressful home environments displayed the lowest reactivity levels.

These findings suggest that relations between levels of childhood support/adversity and the magnitude of stress reactivity are curvilinear, an

observation supported by Belsky et al. (2007) who speculates that the anxiety displayed by fearful children reflects a highly sensitive nervous system on which experience registers powerfully—one that makes them especially susceptible to both negative and positive rearing effects.

Research on differential susceptibility has only just begun. Studies that include twins and other siblings from the same family (such as the Swedish Twin Registry) may prove especially powerful as they could distinguish genetically and environmentally induced variations in susceptibility (Hansson et al., 2007)

Gene-Environment Interactions

There is ample evidence of the important role genetic factors play in the susceptibility of individuals to psychopathology, such as alcoholism, antisocial behavior, and severe psychiatric illnesses (schizophrenia and bi-polar disorder). Several studies, including the Copenhagen High-Risk Study (Parnas et al., 1993) and the Kauai Longitudinal Study have reported findings that suggest that adverse environments, including serious pre- and perinatal stress, have the most negative impact on individuals who are genetically vulnerable, among them the offspring of alcoholic and schizophrenic mothers (Werner & Smith, 2001).

It stands to reason that gene-environment interactions also play a significant role in relation to the phenomenon of resilience. Evidence of gene-environment interactions in which an individual's response to the environmental insults appears to be moderated by his or her genetic makeup has been reported by Caspi et al. (2002, 2003) from the 26-year follow-up of the Dunedin (New Zealand) Multi-Disciplinary Health and Development Study, in which 847 Caucasian cohort members participated.

Individuals with one or two copies of the short allele of the 5-HTTLPR gene (a serotonin transporter) exhibited significantly more (self-reported) depressive symptoms in relation to four or more stressful life events between the ages of 21 and 26 than individuals homozygous for the

long allele. Of special interest was the finding that childhood maltreatment in the first decade of life predicted adult depression *only* among individuals carrying a short allele, but not among individuals homozygous for the long allele (Caspi et al., 2003).

In another analysis of data from the Dunedin Study, Caspi and his associates found that a functional polymorphism in the X-linked gene encoding the neurotransmitter-metabolizing enzyme monoamine oxidase A (MAOA) was found to moderate the effects of childhood maltreatment in males. Boys with a genotype conferring high levels of MAOA expression who had been maltreated in childhood were less likely to develop antisocial problems (conduct disorders between ages 10 and 18; convictions for violent crimes by age 26) than those with low levels of MAOA activity (Caspi et al., 2002). The authors wisely suggested that “until this study’s findings are replicated, speculations about clinical implications are premature” (p. 853).

Kim-Cohen and her associates (2006) were able to replicate the original finding by showing that the MAOA genotype moderated the development of psychopathology after exposure to physical abuse in a cohort of 975 7-year-old British boys. Her meta-analysis of the results of five independent investigations (from Great Britain, New Zealand and the U.S.A.) demonstrated that across studies the association between childhood maltreatment and mental health problems was significantly stronger in the group of males with the genotype conferring low MAOA activity. These findings provide the strongest evidence to date suggesting that the MAOA gene influences vulnerability to environmental stress and that this biological process can be initiated early in life. But that evidence so far is based only on samples of Caucasian males.

Meta-analyses of studies of the interaction between the serotonin transporter gene (5-HTTLPR), stressful life events, and increased risk of major depression have yielded mostly negative results—though substantial resources have been devoted to replication efforts.

Risch et al. (2009) conducted a meta-analysis of 14 studies, using both published data and

individual-level original data. Of a total of 14,250 participants, 1,769 were classified as having depression. In the meta-analysis of published data, the number of stressful life events was significantly associated with depression. No association was found between the 5-HTTLPR genotype and depression in any of the individual studies, and no interaction effect between genotype and stressful life events on depression was observed. This meta-analysis yielded no evidence that the serotonin transporter genotype alone or in interaction with stressful life events was associated with an elevated risk of depression in men alone, women alone, or in both sexes combined.

Munafo et al. (2009), at the University of Bristol, carried out an independent meta-analysis on 15 studies that focused on gene x environment interactions at the serotonin transporter locus and concluded that the main effects of the 5-HTTLPR genotype and the interaction effect between 5-HTTLPR and stressful life events on risk of depression are negligible. Only a minority of studies (Kaufman, 2008; Kendler, 2005) report a replication that is qualitative comparable to that in the original report. In general, the positive results for the 5-HTTLPR x stressful life events interactions were compatible with chance findings.

Diversity of methods and approaches used to measure environmental risk may explain the inconsistencies in results across G x E studies. Health practitioners, educators, and behavioral scientists need to recognize the importance of replication of findings from genetic analyses that seek to anchor in neurobiology individual differences in resilience (Reiss, 2010; Stein et al., 2009).

Resilience in a Cross-Cultural Context

Research on resilience needs to acquire a cross-cultural perspective that focuses on children in the developing world who have been exposed to many biological and psychosocial risk factors that increase their vulnerability far beyond that of their peers born in more stable and affluent conditions.

Immigrant and refugee children are the fastest growing segment of the U.S. child population. *The Children of Immigrants Longitudinal Study* (CILS) have examined the aspirations, educational performance, and psychological adaptation of more than 5,000 teenage youths in two key areas of immigrant settlements in the United States: southern California and south Florida (Rumbaut, 2000). The original survey (T1) conducted in spring 1992 interviewed 2,420 students enrolled in the eighth and ninth grade in the San Diego Unified School District and 2,842 students in public and private schools in the Miami area. Three years later, from 1995 to 1996, a second survey (T2) of the same youths was conducted, supplemented by interview with their parents. The students from San Diego were mostly of Mexican and Southeast Asian origin, the students from Florida came mostly from Latin America.

Regardless of their country of origin, immigrant children with higher school achievement, aspirations, and self-esteem relied on high levels of social support by their parents and the extended family, and on competent peers from the same ethnic group. Among protective factors that enhanced their psychological well-being was closeness with parents, religion, and social support from family, friends, and teachers.

A 5-year *Longitudinal Immigrant Student Adaptation* (LISA) Study, directed by Carola and Marcel Suarez-Orozco (2001), reports similar findings. The LISA study followed some 400 immigrant children (ages 9–14) who came from five regions (China, Central America, the Dominican Republic, Haiti, and Mexico) to the Boston and San Francisco areas.

Qualitative interview data and quantitative survey data employed in the LISA study illustrated the importance of supportive friends, counselors, and members of the extended family in the social world of immigrant youths, and the protective role of religion and church-based relationships in the lives of immigrant teenagers.

Young Lives is a longitudinal study of childhood poverty in four developing countries:

Ethiopia, India (Andhra Pradesh), Peru, and Vietnam (Hardgrove, Boyden, & Dornan, 2010). So far, data have been gathered on some 12,000

children and their families over a span of 15 years. The children are in two age groups: The older cohort was born in 1994–2010, the younger in 2001–2002. Some of the overall trends across the three rounds of available survey data (2002, 2006, 2009) are:

Maternal education is a significant correlate of an array of positive outcomes for poor children, especially their nutritional status. In turn, there is a strong relationship between nutrition and children's cognitive achievement and psychosocial well-being.

Intergenerational interdependency is crucial to children's well-being and resilience in poor families where children's efforts are combined with parents and elders to meet family needs. Norms concerning what constitutes a "good child" tend to reinforce their work contributions.

Evidence on children's active contributions to the domestic economy suggests that it is not just essential to household maintenance in poor families, but can foster their sense of belonging and responsibility, and ease their transition to adulthood (Boyden, 2009). We found the same to be true in our longitudinal study of multiracial families on Kauai (Werner & Smith, 2001).

Evaluation Studies of the Effectiveness of Programs Designed to Foster Resilience

Scarr (1992) points out that it is not easy to intervene deliberately in children's lives. We know how to rescue children from extremely bad circumstances and to return them to normal developmental pathways, but only within the limits of their own heritable characteristics, such as intelligence, temperament (activity, excitability, sociability), and psycho-biologic reactivity (cardiac and immunologic responses under stress). Since the 1980s, many "competence enhancement" and "strength" or "asset" building programs for high-risk children have been introduced in North America, most of which have focused on preschool and school-age children. So far, there have been very few evaluation programs that have examined their long-term effectiveness.

Some of these programs are discussed in other chapters of this book.

A notable example is the Chicago Longitudinal Study, begun in 1983, an ongoing investigation of the effects of the CPC, the oldest extended childhood intervention program in the United States of America and the second-oldest federally funded preschool program (after Head Start). The program stresses center-based language learning and parent participation and provides educational and family support services to disadvantaged children from preschool to the early elementary grades (3–9 years). The data available on more than a thousand participants in the Chicago public schools cover nearly 2 decades of life.

Reynold and Ou (2003) reported the results of several path analyses that modeled the effect of preschool participation (from year 3 to 5), cognitive skills (at age 5), parent involvement at school (in the years 8–12), quality of school (at ages 10–14), on school achievement and grade retention (at ages 14–15), and on the diminished likelihood of special education placement and dropping out of high school by age 20.

Effect sizes on measures of social competence averaged 0.70 standard deviations, modest, but higher than those reported from several meta-analyses on the effectiveness of preventive mental health programs (average 0.34 SD) and of a wide range of psychological and behavioral treatments (0.47 SD). Children who attended programs in the poorest neighborhoods benefited most from the CPC programs.

Because the pathways that lead to positive adaptation despite childhood adversities are influenced by context, it is not likely we will discover a “magic bullet,” a model intervention program that will succeed every time with every youngster who grows up under adverse circumstances. Knowing this does not mean we should despair. But it does mean, as Rutter (2002) admonishes us that “caution should be taken in jumping too readily onto the bandwagon of whatever happens to be the prevailing enthusiasm of the moment” (p. 15).

Conclusions

Large-scale longitudinal studies, extending from childhood to adulthood, have documented the shifting balance between stressful life events and risk factors that increase children’s vulnerability, and internal dispositions and outside sources of support that enhance their resilience. This balance may change at different stages in life for each gender and is affected by the cultural context.

The frequency with which the same predictors of resilience emerge from longitudinal studies conducted with different ethnic groups and in different geographic settings is impressive. In most cases the factors that mitigated the negative effects of childhood adversity also benefited children who lived in stable and secure homes, but they appear to have particular importance when adversity levels are high.

Large-scale longitudinal studies have demonstrated that an early history of developmental competence, engendered by consistent and supportive care, is a powerful and enduring influence on children’s adaptation at later stages of the life cycle and increases that likelihood that they will rebound from a “troubled” adolescence.

The pathways that lead to positive adaptation, despite childhood adversity, are complex, and there is great need to map the interconnections between individual dispositions and outside sources of support that increase competence and self-efficacy, decrease negative chain effects, and open up opportunities, whether in natural settings or in structured intervention programs.

Longitudinal research needs to focus more on the role of gene–environment interactions that moderate an individual’s response to stressful life events. It also needs to acquire a cross-cultural perspective that focuses on children from the developing world. We need to know more about individual dispositions and sources of support in the family and community that enable these children to operate effectively in a variety of high-risk contexts.

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