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Resilience in Development

Emmy E. Werner

During the past decade, a number of investigators from different disciplines—child development, psychology, psychiatry, and sociology—have focused on the study of children and youths who overcame great odds. These researchers have used the term resilience to describe three kinds of phenomena: good developmental outcomes despite high-risk status, sustained competence under stress, and recovery from trauma. Under each of these conditions, behavioral scientists have focused their attention on protective factors, or mechanisms that moderate (ameliorate) a person’s reaction to a stressful situation or chronic adversity so that his or her adaptation is more successful than would be the case if the protective factors were not present.¹

So far, only a relatively small number of studies have focused on children who were exposed to biological insults. More numerous in the current research literature are studies of resilient children who grew up in chronic poverty, were exposed to parental psychopathology, or experienced the breakup of their family or serious caregiving deficits. There has also been a grow-

Notes
1. For a review of the studies discussed in this introduction, see J.F. Werker, Becoming a native
2. C.T. Best. Learning to perceive the sound pattern
3. In this procedure, infants’ looking time to a visual display is used as an index of their attention
to the speech stimuli. During the habituation phase, the infants are familiarized to instances of a single
phoneme. Across trials, looking time decreases. A novel phoneme is then presented. If infants are able
to discriminate the difference between the novel and familiar phonemes, they show an increase in look-
ing time.
4. C.T. Best, G.W. McRoberts, and N.N. Sit-
hole, The phonological basis of perceptual loss for
non-native contrasts: Maintenance of discrimination
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5. J.E. Pegg and J.F. Werker, Infant perception
of an English allophone [Abstract], Infant Behavior &
6. S.E. Trehub, The discrimination of foreign
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47, 466–472 (1976).
7. P.A. Kuhl, K.A. Williams, F. Lacerda, K.N.
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ters phonetic perception in infants by 6 months of
8. L. Polka and J.F. Werker, Developmental
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9. L. Polka and O. Bohn, A cross-language com-
parison of vowel perception in English-learning and
German-learning infants, paper presented at the In-
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1994).
10. See, e.g., P.W. Jusczyk, A. Cutler, and N.J.
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cursor of language acquisition in young infants,
12. See, e.g., B. de Boysson-Bardies and M.
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Levitt, and Q. Wang, Intonational differences be-
tween the reduplicative babbling of French- and
English-learning infants, Journal of Child Language,

Recommended Reading


Werker, J.F., Lloyd, V.L., Pegg, J.E., and Polka, L.B. (in press). Putting the baby in the bootstraps: Toward a more complete understanding of the role of the input in infant speech processing. In Signal to Syntax: The Role of Bootstrapping in Language Ac-

Werker, J.F., and Tees, R.C. (1992). The organi-
zation and reorganization of human speech per-

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ing Research Council of Canada Grant
OGP0001103 to J.F. Werker.

an infant makes remarkable progress
toward mastering the sound struc-
ture of the native language. The bi-
ases and proclivities that allow the
neonate to detect regularities in the
speech stream are, by 1 year of age,
exquisitely tuned to the properties of
the native language. Our work doc-
uments the infant’s movement from
universal to language-specific pho-
neme perception. What we have de-
described, however, represents only
a part of the infant’s remarkable jour-
tney toward becoming a native lis-
tener. The challenge for future work
is to determine what makes the
movement from language-general to
language-specific perception possi-
able, and how sensitivity to the vari-
sous properties of the native language
is linked to the functional task of lan-
guage acquisition.

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ing body of literature on resilience in children who have endured the horrors of contemporary wars.

Despite the heterogeneity of all these studies, one can begin to discern a common core of individual dispositions and sources of support that contribute to resilience in development. These protective buffers appear to transcend ethnic, social-class, and geographic boundaries. They also appear to make a more profound impact on the life course of individuals who grow up in adversity than do specific risk factors or stressful life events.

Most studies of individual resilience and protective factors in children have been short-term, focusing on middle childhood and adolescence. An exception is the Kauai Longitudinal Study, with which I have been associated during the past three decades. This study has involved a team of pediatricians, psychologists, and public-health and social workers who have monitored the impact of a variety of biological and psychosocial risk factors, stressful life events, and protective factors on the development of a multiethnic cohort of 698 children born in 1955 on the “Garden Island” in the Hawaiian chain. These individuals were followed, with relatively little attrition, from the prenatal period through birth to ages 1, 2, 10, 18, and 32.

Some 30% of the survivors in this study population were considered high-risk children because they were born in chronic poverty, had experienced perinatal stress, and lived in family environments troubled by chronic discord, divorce, or parental psychopathology. Two thirds of the children who had experienced four or more such risk factors by age 2 developed serious learning or behavior problems by age 10 or had delinquency records, mental health problems, or pregnancies by age 18. But one third of the children who had experienced four or more such risk factors developed instead into competent, confident, and caring adults.

**PROTECTIVE FACTORS WITHIN THE INDIVIDUAL**

**Infancy and Early Childhood**

Our findings with these resilient children are consistent with the results of several other longitudinal studies which have reported that young children with good coping abilities under adverse conditions have temperamental characteristics that elicit positive responses from a wide range of caregivers. The resilient boys and girls in the Kauai study were consistently characterized by their mothers as active, affectionate, cuddly, good-natured, and easy to deal with. Egeland and his associates observed similar dispositions among securely attached infants of abusing mothers in the Minnesota Mother-Child Interaction Project, and Moriarty found the same qualities among infants with congenital defects at the Menninger Foundation. Such infants were alert, easy to soothe, and able to elicit support from a nurturant family member. An “easy” temperament and the ability to actively recruit competent adult caregivers were also observed by Elder and his associates in the resourceful children of the Great Depression.

By the time they reach preschool age, resilient children appear to have developed a coping pattern that combines autonomy with an ability to ask for help when needed. These characteristics are also predictive of resilience in later years.

**Middle Childhood and Adolescence**

When the resilient children in the Kauai Longitudinal Study were in elementary school, their teachers were favorably impressed by their communication and problem-solving skills. Although these children were not particularly gifted, they used whatever talents they had effectively. Usually they had a special interest or a hobby they could share with a friend, and that gave them a sense of pride. These interests and activities were not narrowly sex typed. Both the boys and the girls grew into adolescents who were outgoing and autonomous, but also nurturant and emotionally sensitive.

Similar findings have been reported by Anthony, who studied the resilient offspring of mentally ill parents in St. Louis; by Felsman and Vaillant, who followed successful boys from a high-crime neighborhood in Boston into adulthood; and by Rutter and Quinton, who studied the lives of British girls who had been institutionalized in childhood, but managed to become well-functioning adults and caring mothers.

Most studies of resilient children and youths report that intelligence and scholastic competence are positively associated with the ability to overcome great odds. It stands to reason that youngsters who are better able to appraise stressful life events correctly are also better able to figure out strategies for coping with adversity, either through their own efforts or by actively reaching out to other people for help. This finding has been replicated in studies of Asian-American, Caucasian, and African-American children.

Other salient protective factors that operated in the lives of the resilient youths on Kauai were a belief in their own effectiveness (an internal locus of control) and a positive self-concept. Such characteristics were also found by Farrington among successful and law-abiding British youngsters who grew up in high-crime neighborhoods in Lon-
don,11 and by Wallerstein and her associates among American children who coped effectively with the breakup of their parents' marriages.12

PROTECTIVE FACTORS
WITHIN THE FAMILY

Despite the burden of chronic poverty, family discord, or parental psychopathology, a child identified as resilient usually has had the opportunity to establish a close bond with at least one competent and emotionally stable person who is attuned to his or her needs. The stress-resistant children in the Kauai Longitudinal Study, the well-functioning offspring of child abusers in the Minnesota Mother-Child Interaction Project, the resilient children of psychotic parents studied by Anthony in St. Louis, and the youngsters who coped effectively with the breakup of their parents' marriages in Wallerstein's studies of divorce all had received enough good nurturing to establish a basic sense of trust.2,3,6,12

Much of this nurturing came from substitute caregivers within the extended family, such as grandparents and older siblings. Resilient children seem to be especially adept at recruiting such surrogate parents. In turn, they themselves are often called upon to take care of younger siblings and to practice acts of "required helpfulness" for members of their family who are ill or incapacitated.2

Both the Kauai Longitudinal Study and Block and Gjerde's studies of ego-resilient children9 found characteristic child-rearing orientations that appear to promote resiliency differentially in boys and girls. Resilient boys tend to come from households with structure and rules, where a male serves as a model of identification (father, grandfather, or older brother), and where there is some encouragement of emotional expressiveness. Resilient girls, in contrast, tend to come from households that combine an emphasis on risk taking and independence with reliable support from a female caregiver, whether mother, grandmother, or older sister. The example of a mother who is gainfully and steadily employed appears to be an especially powerful model of identification for resilient girls.2 A number of studies of resilient children from a wide variety of socioeconomic and ethnic backgrounds have also noted that the families of these children held religious beliefs that provided stability and meaning in times of hardship and adversity.2,6,10

PROTECTIVE FACTORS IN
THE COMMUNITY

The Kauai Longitudinal Study and a number of other prospective studies in the United States have shown that resilient youngsters tend to rely on peers and elders in the community as sources of emotional support and seek them out for counsel and comfort in times of crisis.2,6

Favorite teachers are often positive role models. All of the resilient high-risk children in the Kauai study could point to at least one teacher who was an important source of support. These teachers listened to the children, challenged them, and rooted for them—whether in grade school, high school, or community college. Similar findings have been reported by Wallerstein and her associates from their long-term observations of youngsters who coped effectively with their parents' divorces12 and by Rutter and his associates from their studies of inner-city schools in London.13

Finally, in the Kauai study, we found that the opening of opportunities at major life transitions enabled the majority of the high-risk children who had a troubled adolescence to rebound in their 20s and early 30s. Among the most potent second chances for such youths were adult education programs in community colleges, voluntary military service, active participation in a church community, and a supportive friend or marital partner. These protective buffers were also observed by Elder in the adult lives of the children of the Great Depression,14 by Furstenberg and his associates in the later lives of black teenage mothers,15 and by Farrington11 and Felsman and Vaillant in the adult lives of young men who had grown up in high-crime neighborhoods in London and Boston.

PROTECTIVE FACTORS:
A SUMMARY

Several clusters of protective factors have emerged as recurrent themes in the lives of children who overcome great odds. Some protective factors are characteristics of the individual: Resilient children are engaging to other people, adults and peers alike; they have good communication and problem-solving skills, including the ability to recruit substitute caregivers; they have a talent or hobby that is valued by their elders or peers; and they have faith that their own actions can make a positive difference in their lives.

Another factor that enhances resilience in development is having affectational ties that encourage trust, autonomy, and initiative. These ties are often provided by members of the extended family. There are also support systems in the community that reinforce and reward the competencies of resilient children and provide them with positive role models: caring neighbors, teachers, elder mentors, youth workers, and peers.
LINKS BETWEEN PROTECTIVE FACTORS AND SUCCESSFUL ADAPTATION IN HIGH-RISK CHILDREN AND YOUTHS

In the Kauai study, when we examined the links between protective factors within the individual and outside sources of support, we noted a certain continuity in the life course of the high-risk individuals who successfully overcame a variety of childhood adversities. Their individual dispositions led them to select or construct environments that, in turn, reinforced and sustained their active approach to life and rewarded their special competencies.

Although the sources of support available to the individuals in their childhood homes were modestly linked to the quality of the individuals’ adaptation as adults, their competencies, temperament, and self-esteem had a greater impact. Many resilient high-risk youths on Kauai left the adverse conditions of their childhood homes after high school and sought environments they found more compatible. In short, they picked their own niches.

Our findings lend some empirical support to Scarr and McCartney’s theory about how people make their own environment. Scarr and McCartney proposed three types of effects of people’s genes on their environment: passive, evocative, and active. Because parents provide both children’s genes and their rearing environments, children’s genes are necessarily correlated with their own environments. This is the passive type of genotype-environment effect. The evocative type refers to the fact that a person’s partially heritable characteristics, such as intelligence, personality, and physical attractiveness, evoke certain responses from other people. Finally, a person’s interests, talents, and personality (genetically variable traits) may lead him or her to select or create particular environments; this is called an active genotype-environment effect. In line with this theory, there was a shift from passive to active effects as the youths and young adults in the Kauai study left stressful home environments and sought extrafamilial environments (at school, at work, in the military) that they found more compatible and stimulating. Genotype-environment effects of the evocative sort tended to persist throughout the different life stages we studied, as individuals’ physical characteristics, temperament, and intelligence elicited differential responses from other people (parents, teachers, peers).

IMPLICATIONS

So far, most studies of resilience have focused on children and youths who have “pulled themselves up by their bootstraps” with informal support by kith and kin, not on recipients of intervention services. Yet there are some lessons such children can teach society about effective intervention: If we want to help vulnerable youngsters become more resilient, we need to decrease their exposure to potent risk factors and increase their competencies and self-esteem, as well as the sources of support they can draw upon.

In Within Our Reach, Schorr has isolated a set of common characteristics of social programs that have successfully prevented poor outcomes for children who grew up in high-risk families. Such programs typically offer a broad spectrum of health, education, and family support services, cross professional boundaries, and view the child in the context of the family, and the family in the context of the community. They provide children with sustained access to competent and caring adults, both professionals and volunteers, who teach them problem-solving skills, enhance their communication skills and self-esteem, and provide positive role models for them.

There is an urgent need for more systematic evaluations of such programs to illuminate the process by which we can forge a chain of protective factors that enables vulnerable children to become competent, confident, and caring individuals, despite the odds of chronic poverty or a medical or social disability. Future research on risk and resiliency needs to acquire a cross-cultural perspective as well. We need to know more about individual dispositions and sources of support that transcend cultural boundaries and operate effectively in a variety of high-risk contexts.

Notes


2. All results from this study that are discussed in this review were reported in E.E. Werner, Risk Resilience, and Recovery: Perspectives from the Kauai Longitudinal Study, Development and Psychopathology, 5, 503–515 (1993).


Time-Place Learning
Donald M. Wilkie

Recent observations of time-place learning in both the field and the laboratory are important for understanding animals’ natural foraging behavior and for providing empirical support for a new theoretical framework in which to view animals’ memory processes. I begin with a simplified description of the theory.1

One part of the theory involves temporal processes. Animals are thought to have two timing systems. One, phase timing, lets animals anticipate events that recur at a fixed time in the light-dark cycle. The second, interval timing, lets animals anticipate events that happen some fixed time after some other event. Phase timing seems to be governed by entrainable, self-sustaining, endogenous oscillators. Although interval timing could in principle also be performed by computations made on the phases of oscillators, many researchers believe that interval timing is done with an internal clock that has stopwatch-like properties.

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A second part of the theory involves spatial processes. A vast amount of literature has demonstrated that many animals have accurate and detailed knowledge of the physical space in which they live. This knowledge is represented in a cognitive map that records the geometric relations between the components that make up the macroscopic environment. This map enables an animal to navigate through space from one location to another.

And now the theory: Whenever a biologically significant event occurs (e.g., the discovery of food by a hungry forager), a record of its time of occurrence (e.g., from a phase timing system) is stored by the brain, as is a record of the spatial location (from the cognitive map) at which the event occurred. The nature of this event is also stored. Thus, a biologically important event triggers the memory storage of a time-place-event code. Over time, a series of such records is built up in memory:

\[ \text{time}_1\times\text{place}_1\times\text{event}_1 \]
\[ \text{time}_2\times\text{place}_2\times\text{event}_2 \]
\[ \text{time}_1\times\text{place}_1\times\text{event}_1 \]
\[ \text{time}_2\times\text{place}_2\times\text{event}_2 \]
\[ \text{time}_1\times\text{place}_1\times\text{event}_1 \]

These memory codes organize behavior. If, for example, event, is food availability, a hungry forager can scan memory and find that food has previously occurred several times at place$_1$ at time$_1$. The hungry forager can then proceed to this place at the appropriate time and find food. If memory scanning reveals that event, also happened at place$_2$ at time$_2$, and if time$_3$ is earlier in the day than time$_1$, then the forager may choose to visit place$_3$ rather than place$_1$.

Both field observation and laboratory experimentation support this theory of time-place memory coding. Several of these studies are described in this review. The temporal part of the theory suggests that a time entry in the list of records in memory might indicate either the phase of the animal’s circadian clock or the interval elapsed since some previous event. I present evidence that animals use both types of time entries to decide which place to visit. In a concluding section, I discuss briefly why animals have multiple timing systems.

FIELD OBSERVATIONS

Several field studies have shown that birds and other animals appear to be able to adjust their behavior to changing temporal and spatial patterns of food availability. In one of these studies,2 wading oystercatchers (Haematopus ostralegus) appeared to anticipate the tidal rhythms that determine mollusk availability on tidal mud flats. Mol-