

SECTION 3. MANAGEMENT OF CLINICAL PROBLEMS AND EMOTIONAL CARE

Environmental Risk Factors in Infancy

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ABSTRACT. Environment plays an important role in shaping development from the newborn period through adolescence. Many individual environmental risk factors may impinge on development (poverty, mental illness, minority status, and many others), but the most detrimental effects are caused when multiple risk factors act on a single infant. These effects were revealed by the Rochester Longitudinal Study, an ongoing comprehensive investigation of environmental risk factors, summarized in this article. *Pediatrics* 1998;102:1287–1292; *mental health, environmental risk factors, infant development, Rochester Longitudinal Study, socioeconomic status (SES).*

ABBREVIATIONS. RLS, Rochester Longitudinal Study; SES, socioeconomic status.

The pursuit of happiness is a fundamental right in our society, yet the goal of achieving a sense of satisfaction with one's abilities and achievements is becoming increasingly elusive for large segments of the population. Our interest in emotional development in early childhood is in part a concern that infants and toddlers be happy, but also a concern that this early evidence of mental health will be predictive and continuous with happiness and mental health in later life. Yet greater than half of today's 10- to 17-year-olds engage in two or more risk behaviors, including unsafe sex, teenage pregnancy, drug or alcohol abuse, school failure, delinquency, and crime—and 10% of these youths engage in all of these risks.¹ To what extent can these problems of later life be attributed to emotional behavior during early childhood, and to what extent must we examine intervening life circumstances as determinants of later emotional behavior?

The roots of these failures are frequently attributed to environmental factors that undermine achievement and mental health.² Therefore, attention must be paid to the multiple contexts that support development in the family, the school, and the community from infancy through adolescence. Moreover, few studies have tested directly the premise that it is continuing environmental adversity that undermines development. Many studies have examined the sta-

bility of child characteristics over time, but few have examined continuities of contextual risk. Brooks-Gunn and associates³ found the best predictor of competence during early childhood was not the current economic circumstance of the family but the number of previous years that the family had spent in poverty. In the Rochester Longitudinal Study (RLS), we too have found long-term continuities in the effects of social risk on children that should improve our understanding of the relative contributions of early emotional behavior and later environmental circumstance on mental health.

ASSESSING ENVIRONMENTS

Despite the nominal interest of developmentalists in the effects of the environment, the analysis and assessment of context have fallen more in the domain of sociology than of developmental psychology.^{4–6} The magnitude of a social ecologic analysis involving multiple settings and multiple systems⁷ has daunted researchers trained primarily to focus on individual behavioral processes. An additional daunting factor has been the increasing need to use multicausal models to explain developmental phenomena.^{8,9}

To examine the effects of the environment on early emotional behavior and later mental health, we began an investigation of the development of a group of children from the prenatal period through adolescence living in a socially heterogeneous set of family circumstances—the RLS. During the early childhood phase of the RLS,¹⁰ we assessed children and their families at birth and then at 4, 12, 30, and 48 months of age, both in the home and in the laboratory. During adolescence, we made new assessments of the families when the children were 13 and 18 years old. At each age, we evaluated two major indicators of developmental status: the child's cognitive and social-emotional competence. Because many of the families had single parents, we focused our assessments on characteristics of the mother. This approach was taken not because we believed that fathers were unimportant, but because there were too few available for participation in our study.

In the RLS, we hypothesized that differences in family socioeconomic status (SES) would produce differences in child behavior. We found these social status effects throughout the first 4 years of life. Children from the poorest families in our sample exhibited the poorest development. They had poorer obstetric status, more difficult temperaments, and lower developmental test scores at 4 months, less

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responsivity during the home and laboratory observations at 12 months, and less adaptive behavior in the home and laboratory at 30 and 48 months of age.

At the end of 4 years of development, we had discovered the effects of multiple risk factors. On one hand, if the only developmental risk for a child was a mother with an emotional problem *or* who lacked social support *or* had a low educational level, usually the child was doing fine. On the other hand, if the child had a mother who was mentally ill *and* poor and uneducated *and* without social supports, that child was doing poorly. What we learned was the overriding importance of attending to the combination of environmental adversity with the social context of children to understand their development. To understand better the role of contextual factors, a more differentiated view of environmental influences needed to be taken. We had to discover what was different about the experience of children raised in different socioeconomic environments.

ENVIRONMENTAL CONDITIONS AS DEVELOPMENTAL RISKS

Although SES is the best single variable for predicting children's cognitive competence and an important, if less powerful, predictor of social-emotional functioning, we decided to add more psychological content to this sociologic variable. SES operates at many levels of the ecology of children. It impacts on parenting, parental attitudes and beliefs, family interactions, and many institutions in the community. From the data available in the RLS, we searched for a set of variables that were related to economic circumstance but not the same as SES. The factors we chose were from distal variables (such as the financial resources of the family) to intermediate variables (such as the mother's mental health) to proximal variables (such as the mother's here-and-now behavioral interaction with the child).

From the 4-year assessment of the children in the RLS, we chose a set of 10 environmental variables that were correlates of SES, but not equivalents.¹¹ We then tested whether poor cognitive and social-emotional development in our preschool children was a function of the compounding of environmental risk factors found in low-SES groups. The definitions of the 10 environmental risk variables are as follows: 1) history of maternal mental illness; 2) high maternal anxiety; 3) parental perspectives that reflected rigidity in the attitudes, beliefs, and values that mothers had in regard to their child's development;

4) few positive maternal interactions with the child observed during infancy; 5) head of household in unskilled occupations; 6) minimal maternal education; 7) disadvantaged minority status; 8) single parenthood; 9) stressful life events; and 10) large family size (Table 1).

We found, indeed, that each of these variables was a risk factor. We compared the high-risk and low-risk groups for each variable separately. For both the cognitive and the mental health outcomes, the low-risk group had higher scores than did the high-risk group. Most of the differences were enough to demonstrate the effects for group comparisons, but certainly not enough to detect which specific individuals with the risk factor would have an adverse outcome. Although statistically significant differences in outcome are associated with single environmental risk factors, these differences rarely explain large proportions of outcome variance.

ACCUMULATING RISK FACTORS

In a much-cited study, Rutter¹² argued that it was not any particular risk factor but the number of risk factors in a child's background that led to psychiatric disorder. Psychiatric risk for a sample of 10-year-olds he studied rose from 2% in families with zero or one risk factor(s) to 20% in families with four or more. The six risk factors included severe marital distress, low SES, large family size or overcrowding, paternal criminality, maternal psychiatric disorder, and admission of the child to foster care. Another study¹³ found similar results relating behavioral disorders in 11-year-olds to a cumulative disadvantage score based on number of residence and school changes, single parenthood, low SES, marital separation, young motherhood, low maternal cognitive ability, poor family relations, seeking marriage guidance, and maternal mental health symptoms.

In the RLS, there were significant effects for the single risk factors, but it was clear that most children with only a single risk factor would not end up with a major developmental problem. But how would children growing in environments with many risk factors compare with children growing in environments with very few? We created a multiple risk score that was the total number of risks for each individual family. In the RLS, the range was well-distributed between scores of 0 and 8, with one family having as many as 9 risk factors. When these risk factors were related to the child's intelligence and

TABLE 1. Summary of Risk Variables¹¹

Risk Variables	Low Risk	High Risk
Mental illness	0-1 Psychiatric contact	More than 1 contact
Anxiety	75% Least	25% Most
Parental perspectives	75% Highest	25% Lowest
Spontaneous interaction	75% Most	25% Least
Occupation	Skilled	Semi- or unskilled
Education	High school	No high school
Minority status	No	Yes
Family support	Father present	Father absent
Stressful life events	75% Fewest	25% Most
Family size	1-3 Children	Four or more children

mental health, major differences were found between those children with few risks and those with many.

The relation between the multiple risk scores and the emotional health can be seen in Fig 1. It is clear that the effect of combining the 10 risk variables was to strongly accentuate the differences noted for the individual scores described above. As the number of risk factors increased, performance decreased for children at 4 years of age. Thus, the combination of risk factors resulted in a nearly threefold increase in the magnitude of differences found in groups of children relative to the effect of single variables.¹⁴ Similarly, on an intelligence test, children with no environmental risks scored >30 points higher than did children with eight or nine risk factors.¹¹ On average, each risk factor reduced the child's IQ score by 4 points.

These analyses of the RLS data were attempts to elaborate environmental risk factors by reducing global measures such as SES to component social and behavioral variables. We were able to identify a set of risk factors that were predominantly found in lower SES groups but that affected child outcomes in all social classes. Moreover, no single variable was determinant of outcome. Only in families with multiple risk factors was the child's competence placed in jeopardy.

We found that the following all play a role in the contemporary development of child intelligence test performance and mental health: multiple pressures of environmental stress, the family's resources for coping with that stress, the number of children that must share those resources, and the parents' flexibility in understanding and dealing with their children.

CONTINUITY OF ENVIRONMENTAL RISK

Studies such as the RLS that have explored the effects of environmental risk factors on early development have shown major consequences for children living in multiproblem families. What are the long-term consequences of these early adverse circumstances? Will later conditions alter the course for such children or will early experiences lock children into pathways of deviance? To answer this question, we must return to a consideration of data from the adolescent phase of the RLS.

Within the RLS, our attention has been devoted to the source of continuities and discontinuities in child

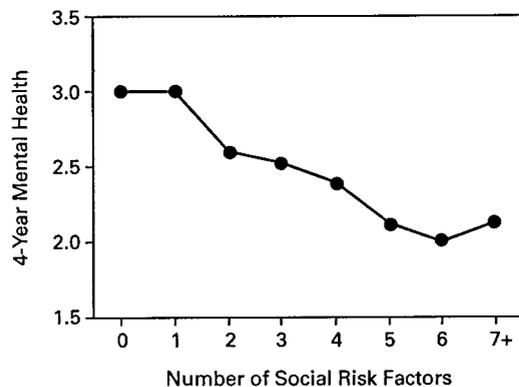


Fig 1. Multiple risk by 4-year mental health.

performance. We completed additional assessments of the sample when the children were 13 and 18 years of age.^{15,16} Because of the potent effects of our multiple risk index at 4 years, we calculated new multiple environmental risk scores for each family based on their situation 9 and 14 years later. To our surprise, there were very few families that showed major shifts in the number of risk factors across the 9-year intervening period. Between 4 and 13 years, the factor that improved most was maternal education, for which the number of mothers without a high school diploma or equivalent decreased from 33% to 22%. The risk factor that increased the most was single parenthood, wherein the number of children being raised by the mother alone increased from 24% to 41%. On average, however, there was little change in the environments of the children in our sample.

The typical statistic reported in longitudinal research is the correlation between early and later performance of the children. We too found such correlations. Mental health at 4 years correlated significantly with mental health at 13 years. Intelligence at 4 years correlated even more strongly with intelligence at 13 years. The usual interpretation of such numbers is that there are continuities of competence or incompetence in the child. Such a conclusion cannot be challenged if the only assessments are of the children. Fortunately, in the RLS we examined and were also able to correlate environmental characteristics across time. We found a higher correlation between environmental risk scores at the two ages that was as great or greater than any continuity within the child. Whatever the child's ability for achieving higher levels of competence, it was undermined severely by the continuing paucity of environmental support in high-risk contexts and fostered in low-risk contexts. Whatever the capabilities provided to the child by individual factors, the environment acted to limit or expand additional opportunities for development.

Because of the very high stability in the number of risks experienced by these families, it was impossible to determine whether the effects of early adversity or contemporary risk were having the greater effect on the later behavior of the children. Those children who had been living in high-risk environments at 4 years of age still were living in them at 13 years of age. Moreover, these contemporary high-risk contexts were producing the same negative effects on behavior as did the earlier contexts.

SECULAR TRENDS

The thrust of a contextual analysis of developmental regulation is not that individual factors in the child are nonexistent or irrelevant, but that they must be studied in a context larger than that of the single child. The risk analyses discussed thus far have implicated parent characteristics and the immediate social conditions of family support and life event stress as important moderators of healthy psychological growth in the child. To this list of risks must be added changes in the historical supports for families in a given society. The importance of this added level of complexity was emphasized when we examined

secular trends in the economic well-being of families in the United States.

At 4 years, we had divided the sample into high-, medium-, and low-risk groups, based on the number of cumulative risks: 0 or 1 in the low-risk group, 2 or 3 in the medium-risk group, and 4 or more in the high-risk group. We found that 22% of the high-risk group had IQs <85, whereas none in the low-risk sample did. Conversely, 59% of the low-risk group had IQs >115 but only 4% of the high-risk sample did.

After the 13-year assessment, we made the same breakdown into high-, medium-, and low-risk groups and examined the distribution of IQs within risk groups. Again we found a preponderance of low IQ scores in the high-risk group and a preponderance of high IQ scores in the low-risk group, indicating the continuing negative effects of an unfavorable environment. But strikingly, the number of children in the high-risk group with IQs <85 had increased from 22% to 46%, more than doubling. If our analysis was restricted to the level of the child and family, we would hypothesize that high-risk environments operate synergistically to worsen further the intellectual standing of these children during the period from preschool to adolescence, placing them in a downward spiral of increasing incompetence.

An alternative hypothesis was that society was changing during the 9 years between the RLS assessments. In a study completed by the US House of Representatives Ways and Means Committee,¹⁷ it was found that between 1973 and 1987, during the time of this study, the average household income of the poorest fifth of Americans fell 12%, whereas the income of the richest fifth increased 24%. Elder⁴ has made a strong case for attending to major changes in society as determinants of the life course for growing children. His work centered on the Great Depression of the 1930s. Similar effects seem to be apparent in our own times.

PROTECTIVE FACTORS AND THE SEARCH FOR RESILIENCY

When studies are successful in identifying protective factors, the issue is raised of identification on an individual basis of resilient (or protected) individuals. Ideally, one would like to identify a substantial subset of children who, by any measure of competence, were doing better than average, despite the adversity they faced in daily life. We selected a high-risk subsample of children who had four or more environmental risks to determine the characteristics of those who were doing better than expected. Only 3 of the 50 high-risk children were above the total sample mean on our 13-year child outcome measures; but all 3 also had improved in their risk status. They had been in the highest risk category at 4 years of age, but by 13 years they were doing better. Thus, it is unclear whether the more favorable outcomes in these children were attributable to protective factors or to a lessening of risk.

When we examined the entire RLS sample to see what the consequences were for children moving from high (four or more) to low (0 or one) environ-

mental risk (or from low to high risk), we found striking effects. The group that changed from high risk at 4 years to low risk at 13 years improved in mental health. In contrast, the group that changed from low risk at 4 years to high risk at 13 years showed a decline in mental health. These findings make a strong case for the powerful effects of environmental risks on the children. Unfortunately, such changes in number of risk factors is not common. We discussed above the stability of risk factors from early childhood to adolescence. Only 1 child was in the group that went from high to low risk, and there was only 1 child in the group that went from low to high risk. Stability rather than change appeared to be the rule.

There are many who argue that children do poorly in conditions of poverty because they don't have individual characteristics that would promote resilience, overcome challenge, and eventuate in productive work and family life. By identifying characteristics of children who achieve despite adverse circumstances, some people hope that we could instill those characteristics in other children to help them overcome environmental adversity. In contrast, others hold the position that environmental risks are so pervasive that opportunities do not exist for positive development, even if the child does have excellent coping skills. Is it possible that despite social adversity, children with high levels of personal resources are able to overcome minimal resources at home and in the community to reach levels of achievement comparable with children from more highly advantaged social strata?

Thus far, the presentation of our data has focused on issues of environmental adversity and neglected individual factors that may permit children to overcome disadvantage. At this point, we can turn to an examination of individual factors in the child, including emotional behavior during infancy. From the Rochester data collected during the first year of life, we created a multiple competence score for each child during infancy that included a number of emotional indices. The infant risk score included 12 factors—Brazelton neonatal test scores, easy temperament scores, and Bayley Infant Behavior Rating scores. We then divided the sample into low-, medium-, and high-competence groups of infants and examined as outcomes the 4-year IQ and social-emotional functioning scores noted previously.

There was no relation between infant emotion scores and 4-year mental health, especially when compared with the effects of the contemporaneous infant environmental multirisk scores described above (Fig 2). However, there is a general feeling that infant developmental scales may be weak predictors, because they assess different processes than are captured by later mental health and personality assessments. Perhaps if we move up the age scale, we can determine whether characteristics of these children at 4 years of age contribute to adolescent achievements at our 18-year assessment. We divided the 4-year-olds into high and low mental health groups. We then compared these groups on how they did at 18 years on their mental health assessment (Fig 3).

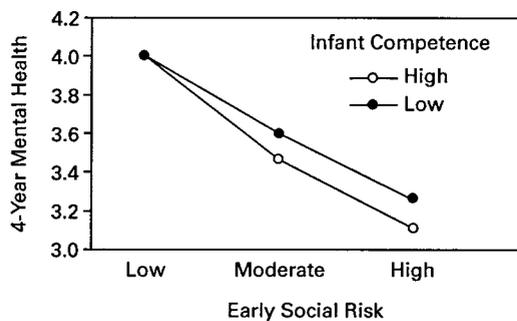


Fig 2. Relation of early social environmental risk to 4-year mental health scores for high and low competence infants.

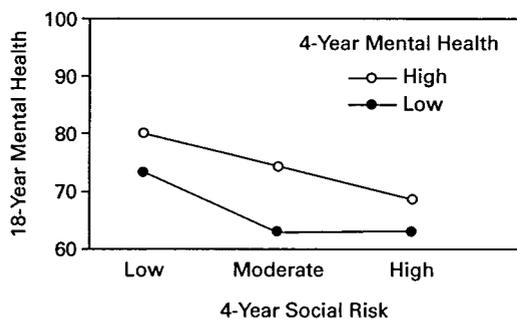


Fig 3. Relation of 4-year social environmental risk status to 4-year mental health scores for high and low competence infants.

Although as a group, the high mental health 4-year-olds were doing better at 18 years than were the low mental health group, when we controlled for environmental risk, the differences between children with high and low levels were small compared with the differences in performance between children in high- and low-risk social environments. Moreover, in each case, high competent children in high-risk environments did worse than low competent children in low-risk environments.

Perhaps at 4 years, mental health still is too ephemeral to resist the negative consequences of adverse social circumstance. Would competent children at 13 years succeed where competent children at 4 years had failed? How would they measure at our 18-year assessments of mental health? To find out, we divided the sample of children into high and low mental health groups based on their assessments at 13 years of age and examined their 18-year behavior (Fig 4).

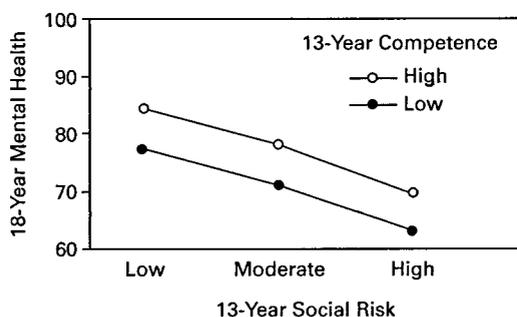


Fig 4. Relation of 13-year social environmental risk status to 18-year mental health scores for 13-year-olds in high and low mental health groups.

Again, in each case controlled for environmental risk, we found that the highly competent children in personality or intelligence do far less well than we would have expected. Those groups of children with earlier high levels of competence living in conditions of high environmental risk did worse than similar groups in low-risk conditions, but even more to the point, did worse than low competent children in low-risk environments. The negative effects of a disadvantaged environment seem to be more powerful contributors to the emotional health of the child at every age than the previous personality characteristics of the child.

SUMMARY

Our findings from the RLS reveal that single environmental or child risk factors alone may have statistically significant effects on emotional development, but these differences are small in comparison with the effects of the accumulation of multiple negative influences that characterize high-risk groups. There are many successful adults who were raised in poverty and unsuccessful adults who were raised in affluence. There are many healthy and happy adults who come from broken homes, and there are many unhappy adults who were raised by two parents.

The important implication is that a focus on single characteristics of individuals (like resourcefulness or intelligence) or families (like welfare or marital status) can never explain more than a small proportion of variance in normal behavioral development involving a wide variety of environments. But major differences do emerge when comparisons are made between groups of children with many risk factors and those with only a few. To truly appreciate the determinants of competency requires that attention be paid to a broad constellation of ecologic factors in which these individuals and families are embedded.

We have indicated that there are many environmental risk factors associated with poor developmental outcomes. Our analyses of the effects of environmental risk on development have focused on the negative aspect of each variable. This was intentional in that we were trying to find a way to identify those infants who are likely to be the most troubled and truly in need of intervention. These risk factors can be found in all socioeconomic strata, but are most concentrated in areas of poverty. There may be social consequences of this research if changes can be made in the number of risk factors experienced by families. In the natural course of time in the sample we studied, there were few such changes. High-risk families remained high risk and low-risk families remained low risk.

In the introduction to this article, I contrasted a concern with the current and future happiness of infants. The conclusion from our work is that the future happiness of children is related only minimally to their behavior during infancy. The current and future social context is a major developmental determinant with the power to foster or hinder later emotional well-being. The study of the social ecology of children must be a central concern of professionals

hoping to understand and promote the emotional development of children.

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