
Student Award Paper

Resilience in Children at High Risk for Psychological Disorder¹

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This longitudinal study examined factors related to healthy adjustment in young children who had experienced conditions and stresses known to carry a substantial risk of adverse outcome. Psychological adjustment of 109 children at age 6 to 7 years was examined for its relationship to infancy risk status, determined at age 1 month by means of a multifactor screen assessing perinatal stress, psychological problems and stresses in the family, maternal attitudes toward self and parenthood, and maternal perceptions of infant temperament. Several variables believed to mediate outcome for high-risk children were studied, including subsequent stressful life events, social support available to child and mother, and child's locus of control orientation. Interactions between predictor variables showed that life events magnify synergistically the adverse effects of infancy risk factors, and social support and internal control orientation potently buffer the effects of risk and stress. Considered jointly in conjunction with their interactions, the predictor variables were strongly predictive of outcome, explaining 56% of the variance observed in behavior problems and 64% of the variance in school problems.

KEY WORDS: resilience; high-risk children; stressful life events; social support; locus of control.

Faced with biological infirmities, personal stresses, and unstable caregiving, many children develop serious psychological problems whereas others remain healthy. The latter, so-called "resilient" children contradict

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expectation by developing into well-adjusted young people. They thrive where others are overwhelmed, and so they present a welcome but striking anomaly. The purpose of the present study was to investigate the phenomenon of resilience by examining several factors, particularly those of a protective nature, that are thought to influence outcome in psychologically high-risk children.

Attempts to predict the course of psychological development over the first years of life on the basis of various risk factors have been less than satisfactory. Retrospective studies have often given the impression of clear relationships between pregnancy and birth complications and eventual developmental deviances, but prospective studies of the same variables have often not found the predicted negative effects (Sameroff & Chandler, 1975). Rates of correct prediction of problems have ranged from low to moderate (Cass & Thomas, 1979; Rutter, 1981; Zusman, 1975). Improvement in predictive accuracy may be obtained by greater focus on those who, contrary to expectation, do not develop problems: the puzzling false positive, or resilient children.

Very little study of unexpectedly resilient children has actually been conducted. The riddle of their seeming invulnerability to stress has often excited conjecture among clinicians but rarely systematic investigation. A more thorough understanding of the means by which they successfully adapt may (a) help to identify children who are at highest risk for later disorder and most in need of preventive intervention from mental health professionals; (b) indicate how to enhance the effectiveness of such interventions by applying to the vulnerable children the conditions that protect the resilient; and (c) deepen our theoretical understanding of both healthy and unhealthy development in children.

VULNERABILITY, RISK, AND PROTECTIVE FACTORS

Conditions widely considered to place a child at high risk are schizophrenic or affective disorder in parents, chronic poverty, difficult temperament, problematic mother–infant attachment, and perinatal stress. The present study focused on risk factors present in early infancy.

Early Organismic, Constitutional, and Social Factors

Organismic stresses known to be associated with eventual disorder include complications in the prenatal, perinatal, and neonatal periods, including malpresentation, anoxia, prematurity, low birth weight, and the like. Krakow and Kopp (1983) have reviewed the literature on biological risk and its

effects on development. Factors related to temperament, such as excessive activity or inactivity and irregular vegetative patterns, have also been associated with eventual psychological problems (Fries & Woolf, 1971; Thomas, Chess, & Birch, 1968). Insecure mother–infant attachment has been related to later psychopathology (Arend, Gove, & Sroufe, 1979; Lewis, Feiring, McGuffog, & Jaskir, 1984), and life stress appears to disrupt normal mother–infant attachment processes (Vaughn, Egeland, Sroufe, & Waters, 1979).

Interactive Effects

Generally, although predictive accuracy is seen in cases of grossly abnormal findings at infancy, results from infant examinations suggest that within the normal range of the population predictions are highly unreliable, and only a minority of infants suffering perinatal problems have abnormal outcomes (Rutter, 1970; Sameroff & Chandler, 1975). More often than not, predictions of poor outcome are considerably overinclusive; many more children are labeled high risk than actually develop problems. Research examining different clusters of risk factors (e.g., perinatal stress, infant temperament, maternal attitudes and caretaking patterns, and socioeconomic status) and their interactions has resulted in predictions more accurate than research utilizing a simple “main effects” model studying single variables (Parmelee & Haber, 1973; Rutter, 1981). Various influences may interact complexly to support a vulnerable child’s self-righting tendencies or, conversely, critically overtax and defeat the child’s coping mechanisms. Multiple risk factors may have more than an additive effect; they often potentiate each other.

Focus on False Positives

Several authors, most notably Anthony (1974) and Garmezy (1974, 1981), have argued that examination of high-risk children who have healthy outcomes (false positives) should enhance predictive accuracy, may improve our understanding of the nature and etiology of psychopathology, and may suggest fruitful directions for intervention with vulnerable children. These false positive children have been variously referred to as *invulnerable* (Anthony, 1974; Garmezy, 1974, 1981; Rutter, 1979), *stress-resistant* (Antonovsky, 1979; Garmezy, 1981), and even *superkids* (Kaufman, Grunebaum, Cohler, & Garner, 1979), with the most frequent appellation being *invulnerable*. We prefer *resilient* as the term to apply to these children. Resilience refers to an unusual or marked capacity to recover from or cope successfully with significant stresses, of both internal and external

origin. Werner and Smith (1982) have defined it as the "capacity to cope effectively with the internal stresses of their vulnerabilities (such as labile patterns of autonomic reactivity, developmental imbalances, unusual sensitivities) and external stresses (such as illness, major losses, dissolution of the family)" (p. 4). More broadly, resilient children are those who do not develop emotional or behavioral problems despite their having experienced conditions and stresses that in the general population are known to be associated with adverse outcome (Rutter, 1981).

Possible Modifiers of Risk

The sparse literature on resilience is dominated by case studies (Brown, 1978; Engel, 1967; Krystal, 1968; Sobel, 1973); only a handful of controlled, empirical investigations have been conducted. Most important among these is Werner and Smith's (1982) large-scale longitudinal study which identified several factors associated with positive outcome among poor Hawaiian children with a history of family instability and perinatal stress or low birth weight. Resilient high-risk children differed from their more troubled peers in that many were firstborns; they had easier temperaments as infants; they received more social support from extended family and friends; they had fewer stressful life events; and they tended to have an internal locus of control orientation by adolescence. Murphy and Moriarty (1976), using a more process-oriented approach, found that coping capacity was related to a set of early influences, including infant activity level, the fit between maternal and infant temperaments, sensory reactivity, precursors of ambivalence, balances and imbalances in developed areas of functioning, and capacity for self-regulation (e.g., of activity, rest, intensity of accepted stimulation). In a small pilot study of inner-city elementary school children, Garmezy (1981) concluded tentatively that intelligence did *not* appear to be a mediator of adjustment within the more highly stressed children in the sample.

Stressful Life Events

One possible contribution to resilience in vulnerable children may be a relative lack of stresses that occur after infancy; resilient children may simply be those who experience relatively fewer stresses in the ensuing years. Evidence to support a cumulative stress hypothesis has mounted in the case of adults (Dohrenwend & Dohrenwend, 1974; Johnson & Sarason, 1979). Although less plentiful, increasing evidence links stressful events to physical and psychological disorder among children. Life stress has been related to

the onset of diabetes mellitus and other somatic disorders (Heisel, Ream, Raitz, Rappaport, & Coddington, 1973; Leaverton, White, McCormick, Smith, & Sheikholislam, 1980) and to serious school behavior problems (Sandler & Block, 1979), suicidal behavior (Cohen-Sandler, Berman, & King, 1982), and other forms of psychological distress (Gersten, Langner, Eisenberg, & Orzeck, 1974; Kashani, Hodges, Simonds, & Hilderbrand, 1981).

Research on adults shows that the strength of the stress-maladjustment relationship varies considerably and usually is of only moderate size, such that stress measures in themselves are of little practical value for purposes of prediction (Andrews, Tennant, Hewson, & Vaillant, 1978; Johnson & Sarason, 1979). Clearly, some individuals experience many events and do not become distressed, whereas others experience few events and do become distressed. (In this sense, life events resemble reproductive risk factors.) Almost certainly the effect of traumatic events depends on the quality of the individual's interpersonal relationships, as well as intrinsic personality factors, and so recent research has sought environmental and personality variables that mediate individual differences in response to life stress. Two such variables believed to have a protective role are social support and locus of control orientation.

Protective Factors: Social Support and Locus of Control

Evidence on adult samples suggests fairly consistently that social support protects individuals by *buffering* the adverse effects of life events. Thoits (1982), who has reviewed the literature on the buffering hypothesis, broadly conceives of social support as "interpersonal interaction that satisfies basic social needs, including affection, esteem or approval, belonging, identity and security." Studies investigating protective effects of social support in samples of children are few. With regard to reproductive risk, Nuckolls, Cassel, and Kaplan (1972) showed that the pregnancy complication rate among women who had many life events before and during pregnancy was three times higher in women who had low social support scores than in women who had high social support scores (as measured by quality of marital relationship, interaction with the extended family, and adjustment within the community). Neither stress nor social support were independently related to outcome but were significant only when considered conjointly. In a study of mothers and premature and full-term infants, Crnic, Greenberg, Ragozin, Robinson, and Basham (1983) found that maternal social support moderated the adverse effects of stress on mother's life satisfaction and also affected infant interactive behavior.

Considering the nature of stressful life events, it seems reasonable to expect that one's locus of control orientation would play a central role in one's perception of and reaction to stressful life changes. It would be expected that individuals with an internal orientation (Internals) would perceive themselves as having more control over life events and, following the event, they would be more likely to initiate coping actions directly responsive to the event. Individuals with an external orientation (Externals), on the other hand, would be expected to react with fewer coping responses and to be more vulnerable to depression and anxiety. The role of locus of control in moderating stress has been studied in adult samples (Johnson & Sarason, 1978; Lefcourt, Miller, Ware, & Sherk, 1981; Sandler & Lakey, 1982) and adolescent samples (Werner & Smith, 1982) but not in child samples.

The present study examined several variables that singly, or in combination, may modify the original high-risk condition in infancy. The variables studied were (a) stressful life events occurring after infancy, (b) social support available to the child and mother, and (c) the child's locus of control orientation. We expected that these variables, as well as infancy risk classification, would each be independently related to outcome, though only modestly, but that considering these variables in combination and in conjunction with their interactions would yield significant predictive power.

METHOD

Participants

Infancy Risk Classification. A total of 772 infants born at one San Francisco hospital in 1976 were screened at 1 month of age through the Kaiser Infant Development Study (KIDS). Conducted by the second author and described in detail elsewhere (Metz, O'Grady, Schreiber, & Shinefield, 1985), the screening consisted of a broad-based assessment of risk by means of a questionnaire completed by the mother and a medical chart review. Variables examined included (a) family background, parental characteristics; (b) parents' history of emotional problems, mother's attitude and comfort with the maternal role (e.g., afraid to be with baby alone, wishes she never had baby); (c) mother's perception of baby's temperament and her report of problems with baby (e.g., more than average trouble feeding, more than average irritability); (d) mother's medical background (e.g., diabetes); (e) pregnancy conditions (e.g., toxemia); (f) labor and delivery conditions (e.g., intrapartum anoxia); (g) conditions of the neonate (e.g., hyperirritability). All screening items were weighted, assigned to scales, and a formula was developed using scale

sums to arrive at a high-risk/low-risk decision. Critical values for separate scales were set at the 5th percentile, and the decision formula yielded 84 children (11%) classified as at high risk (HR) for the development of serious adjustment problems; the remainder were classified as low risk (LR).

Selection. When the children were 6 to 7 years old we attempted to recruit through the mail and then by telephone all of the HR children and their mothers for participation in the follow-up evaluation. A similar effort was made to locate and recruit from the cohort a like number of randomly selected LR children. Many of the subjects remained members of a prepaid health plan and thus were easily relocated. Of the subjects we located, the response rate to the invitation to participate was 65.7% ($N = 109$). Of the 84 children who were originally classified as HR, 60.7% participated in the present follow-up evaluation. Parents gave informed consent for participation.

Characteristics. The sample was composed of 50 girls and 59 boys ranging in age from 6 years 4 months to 7 years 2 months ($M = 6$ years 11 months). Fifty-eight (53%) of these 109 children were classified at age 1 month as LR, 51 (47%) as HR. Most came from small families, 74% having only one or no siblings, and a majority (62%) were firstborns. Although predominantly white, the sample reflected the racially heterogeneous population of the San Francisco area: 36% of the children were nonwhite, and these included Japanese, Chinese, Filipino, black, Central-American Hispanic, and Mexican-American children, as well as some children of mixed race. It was a mixed urban, suburban, and rural sample. At this follow-up the mothers ranged in age from 24 to 46 years ($M = 35$). Most parents were well educated: 85% of the mothers and 80% of the fathers had had some college or had earned a college degree. Seventy-nine percent of the sample fell into Hollingshead (1957) SES level III or above (middle to upper-middle class); 65% of the fathers were employed in clerical/technical, administrative, or professional positions.

Predictor Measures

Risk Screening. Described above.

Children's Life Events Survey (CLES). A life stress events checklist, completed by each mother, was used to gather information concerning stressful events that had occurred in the child's life (e.g., death of a sibling; mother beginning to work). Coddington's (1972) Social Readjustment Scale for Children (elementary school age form) was adapted for this purpose. Following Gersten et al.'s (1974) suggestion, items from the Coddington

scale that might confound associations to measures of adaptation were deleted. Some new items were added, drawn primarily from other existing life event scales for children. For all major statistical analyses, the score used was the weighted total score, reflecting both the frequency and severity of life events experienced by the child since age 1 month.

Children's Social Support Questionnaire (CSSQ). The CSSQ was developed by the first author specifically to assess the social support available to young children and their mothers, because no appropriate existing instrument was available. About half of its 19 items were adapted from instruments developed for adults (Andrews et al., 1978; Berkman & Syme, 1979; Moos, 1974); the remaining items are new. The questionnaire is primarily in Likert-type multiple choice, Yes/no and true/false formats. It was completed by the child's mother. The CSSQ assesses social support that is available to the child from three different perspectives: (a) Support provided directly to the child. This includes the perceived quality of parent-child interaction, the stability of caretaking patterns, the presence of secondary attachment figures, and frequency of supportive parent-child contacts. (b) Support available to the primary caregiver (in this study, the mother). This includes the number of her close friends and relatives, the frequency of her contact with them, her satisfaction with friendships and her spousal relationship, and the availability of substitute caretakers. (c) The general supportiveness of the family environment, that is, the degree of commitment, help, and support family members provide to one another, as perceived by the mother. The questionnaire is thus designed to tap the range of social support in each of its dimensions of content, structure, and quality. That is, it gives consideration to the following questions: What kind of support is given? How frequently is it given and by whom? How satisfying is it? The internal consistency of the CSSQ was found to be very satisfactory (unstandardized coefficient alpha = 0.84). Test-retest reliability for a random subsample at an average interval of 13.7 weeks was found to be very high ($r = .91, p < .001, n = 26$).

Preschool and Primary Internal-External Control Scale (I-E). Developed by Nowicki and Duke (1974), this scale is administered in interview format and assesses locus of control orientation for children 5 to 8 years of age. It consists of 26 yes/no questions (e.g., "When a kid your age decides to hit you, is there anything you can do to stop him or her?;" "Are you often blamed for things that just aren't your fault?"). The total score of the I-E scale is the number of external responses.

Outcome Measures

Child Behavior Checklist (CBCL). The CBCL (Achenbach, 1981; Achenbach & Edelbrock, 1981) records the behavioral problems and com-

petencies of children as perceived by their parents or parent surrogates. In the present study the CBCL was completed by the children's mothers. The CBCL includes a diverse array of behavior problems (113 items), as well as a sampling of items reflecting social competencies, including participation in various activities, social relationships, and school success (23 items). The mother indicates if each behavior problem item is or has been "very true or often true," "sometimes true or somewhat true," or "not true" of her child within the last 6 months. The CBCL yields a total behavior problem score and a total social competence score.

Pupil Behavior Rating Scale (PBRs). The PBRs (Lambert, Bower, & Hartsough, 1979) is a scale for teachers to rate the classroom behavior of children (Grades K-7). The instrument is a simple Likert-type scale containing 11 items descriptive of behavior related to academic and social adjustment in school. Teachers rate the individual child on the 11 attributes, which are well anchored by behavioral descriptions of the range of the attributes. The instrument yields a total problem score, with higher scores indicating more problematic behavior at school. It has been shown to be reliable and valid for the screening of school adjustment problems (Lambert et al., 1979). Teachers completed the PBRs in the Spring of the academic year, so they had ample time (at least 6 months) to get to know the child before making the rating.

Human Figure Drawings (HFD). Human Figure Drawings were obtained from the participants as a projective index of emotional disturbance (Koppitz, 1968). In the present study the HFDs were scored only for the number of Emotional Indicators present. Koppitz has reported satisfactory interrater reliability for this scoring method, as well as satisfactory discriminant validity between psychiatric clinic patients and well-adjusted children.

Procedure

Mothers were interviewed briefly at a hospital clinic to check the accuracy of the completed questionnaires. All children were interviewed alone by the first author, except for one boy who was interviewed with his mother present. The Human Figure Drawings (HFD) were then obtained in standard fashion, and the locus of control interview (I-E) was administered. Fourteen of the mothers who completed and returned questionnaires were unable or unwilling to come for a personal interview, so HFD and I-E data are missing for their children. Two judges, both highly experienced in the clinical analysis of children's projective drawings, were recruited to score the HFDs for the number of emotional indicators present. The PBRs was mailed to teachers along with a cover letter explaining the project and asking that the questionnaires be returned by mail. In contrast to the standard

PBRS rating procedure, which requires the teacher to rate all children in his/her class, the teachers in the present study were asked to rate only the index child. Nonresponders were given reminder telephone calls. All but 6 of the 109 children in the study were rated by teachers.

Statistical Procedures

Major Analyses. The model used for the major statistical analyses was an analysis of variance (ANOVA) by means of multiple regression. This procedure was selected over simple correlation analysis because of its ability to examine interrelationships among predictor variables and the effects of interactions on outcome (Cohen & Cohen, 1983). Separate standard multiple regressions were calculated to predict for outcome variables: (a) school adjustment problems as reported by the teacher (PBRS), (b) social competence as reported by the mother (CBCL), (c) behavior problems as reported by the mother (CBCL), and (d) emotional problems as evident in the HFD emotional indicators score. The predictors were (a) infancy risk classification (dummy coded as 0 = LR or 1 = HR), (b) stressful life events (CLES), (c) social support (CSSQ), and (d) locus of control orientation (I-E). Next, each predictor variable in turn was omitted from this set and another multiple correlation was calculated with the remaining three predictors. The unique main effect of each variable was found by subtracting the proportion of variance (R^2) associated with the three predictors from the R^2 associated with all four predictors. Interaction effects were determined by subtracting the R^2 associated with the two predictors of interest from the associated with the two predictors plus an interaction variable computed as their product. The difference in R^2 hence indicates the independent relationship of the interaction to each criterion variable. Total effects were calculated by including all predictors, with and without their two-way interactions, in standard multiple regressions.

Analyses of Demographic Variables. The relationships between the demographic variables and each of the independent and dependent variables were assessed via bivariate correlations and t tests (138 statistical tests). In addition, since SES is known to sometimes have an overshadowing effect on measures of psychological functioning, the relationships among the main study variables were examined controlling for SES. Specifically, zero order Pearson correlation coefficients were computed for all possible pairs of variables. Next, the same correlations were computed partialing out the effects of SES to reveal whether the degree of relationship between the variables changed significantly.

RESULTS

Main Effects

The results, shown in Table I, indicate that risk classification, life events, and social support each demonstrated the expected main effect. High-risk classification and higher levels of stress were related to poorer adjustment, and higher levels of social support were associated with healthier adjustment. However, each of these predictor variables related to only one of the four outcome measures, and the magnitude of these relationships was modest ($sr = .16$ to $-.29$). No main effect was found for I-E.

Interaction Effects

As seen in Table I, all the interaction effects tested proved related to at least one outcome measure. In order to determine the direction of the effects, we conducted appropriate post hoc tests for each significant interaction. Separate Pearson correlation coefficients and t tests were calculated after dividing the sample into two separate groups along the median score of the variable of interest (e.g., High Stress and Low Stress children were those scoring above and below the median on CLES). The results of these analyses follow.

Risk Classification \times *Stress*. This interaction predicted emotional problems ($sr = .27$). Among HR children, greater stress was related to

Table I. Semipartial Correlations of Predictor Variables with Outcome Variables

Variable	School problems	Social competence	Behavior problems	Emotional indicators
Main effects				
Risk	.16 ^a	-.14	.08	-.01
Stress	.00	-.06	.22 ^b	.14
Support	.00	.15	-.29 ^c	-.08
I-E	.09	-.09	-.08	-.03
Two-way interactions				
Risk \times Stress	.07	-.05	.00	.27 ^b
Risk \times Support	.18 ^b	.00	.05	.08
Risk \times I-E	-.40 ^b	.03	-.18 ^a	.03
Stress \times Support	.00	-.20 ^a	-.21 ^b	-.34 ^a
Stress \times I-E	.51 ^c	-.48 ^c	.08	.10
Support \times I-E	.17 ^a	-.31 ^b	.33 ^c	.10

^a $p < .05$.

^b $p < .01$.

^c $p < .001$.

greater emotional problems ($r = .46, p < .01$), while among LR children, stress and emotional problems were essentially unrelated ($r = -.12, ns$).

Risk Classification × Social Support. This interaction predicted school problems ($sr = .18$), but the direction of the effect was not identifiable by post hoc analyses. That is, the relationship between social support and school problems was not significantly different for HR children or LR children, and the difference in school problems between HR and LR children was not significant among children experiencing High Support or among children experiencing Low Support.

Risk Classification × I-E. This interaction predicted both school problems ($sr = .40$) and behavior problems ($sr = .18$). Among children with an Internal control orientation, HR children were rated as having more school problems than LR children ($t(56) = -2.17, p < .05$). Among Externals no significant difference was found for risk classification ($t(44) = 0.09, ns$). This interaction was not further specifiable for behavior problems.

Stress × Social Support. This interaction predicted three of the four outcome variables: Social competence ($sr = -.20$), behavior problems ($sr = -.21$), and emotional problems ($sr = -.34$). Social support was linked to social competence in Low Stress children ($r = .44, p < .001$), but the same did not hold for High Stress children ($r = -.12, ns$). Similarly, higher stress was associated with poorer social competence among High Support children ($r = -.25, p < .05$), but not among Low Support children ($r = .17, ns$). Greater social support was related to fewer behavior problems among High Stress children ($r = -.51, p < .001$) and, to a lesser degree, among Low Stress children ($r = -.25, p < .05$). A test of the difference between these correlations (r to z transformation) showed that the social support-behavior problem relationship was significantly stronger for the High Stress group ($p < .001$). Similarly, for Low Support children, stress and behavior problems were positively related ($r = .39, p < .01$), but stress was not related to behavior problems among children experiencing High Support ($r = .17, ns$). Lower social support was related to more emotional problems among High Stress children ($r = -.39, p < .01$), but not among Low Stress children ($r = .19, ns$), and higher stress was related to more emotional problems among Low Support children ($r = .25, p < .05$), but not among High Support children ($r = -.06, ns$).

Stress × I-E. This interaction predicted school problems ($sr = .51$) and social competence ($sr = -.48$). Greater stress was related to more school problems among Externals ($r = .32, p < .025$) but not among Internals ($r = -.21, ns$). I-E was not related to school problems for High Stress or Low Stress children. This interaction could not be further specified for social competence.

Social Support × I-E. This interaction predicted school problems ($sr = .17$), social competence ($sr = -.31$) and behavior problems ($sr = .33$). Social support was linked to social competence among Externals ($r = .31, p < .025$), but not among Internals ($r = .02, ns$). Social support was also

Table II. Multiple Correlations of Predictor Variables with Different Measures of Outcome

Variable	School problems	Social competence	Behavior problems	Emotional indicators
Main effects	.18 ^b	.23 ^a	.48 ^c	.20 ^a
Main effects + interactions	.80 ^c	.31	.75 ^b	.46

^a $p < .05$.^b $p < .01$.^c $p < .001$.

negatively related to behavior problems among both Externals ($r = -.48$, $p < .001$) and Internals ($r = -.35$, $p < .01$), although this relationship was significantly stronger among Externals ($p < .001$). The direction of this interaction could not be specified for school problems.

Total Effects: Multiple Correlation Coefficients

For this analysis we asked two questions: How well do these four predictors (risk classification, stressful life events, social support, and locus of control orientation) account for differences in the adjustment of the children when they are considered jointly in a multiple regression? And, does adding to this equation the interactions between predictors improve the power of prediction? The multiple correlation coefficients (R) for the four outcome variables are presented in Table II. In answer to our first question, the four predictor variables considered jointly but excluding interaction effects accounted for 3% of the variance observed in school problems, 5% of the variance observed in social competence, 23% of the variance observed in behavior problems, and 4% of the variance observed in emotional problems. In answer to our second question, regression equations including the four predictors plus their two-way interactions yielded nonsignificant correlations for social competence and emotional problems but accounted for 56% of the variance observed in behavior problems and 64% of the variance observed in school adjustment problems. For each criterion variable a marked increase occurred in R^2 when the interaction terms were added to the regression equation. In all cases the jump in predictive power was significant ($p < .001$), but the increase was especially large for the school problems outcome variable, where the increment in explained variance was 61%.

Relation of Demographic Variables to Predictor and Outcome Variables

One sex difference was found: Teachers rated boys as having more school problems than girls ($t(102) = -2.11$, $p < .05$). One effect of race was found: The mothers of white children rated their children higher in social competence than did the mothers of nonwhite children ($t(107) =$

2.68, $p < .01$). SES was related to one predictor, social support, with higher SES being related to greater social support ($r_S = -.36, p < .001$). SES was also related to three outcome measures: higher SES children were rated as having fewer school problems ($r_S = .20, p < .05$), fewer behavior problems ($r_S = .18, p < .05$), and greater social competence ($r_S = -.26, p < .01$). Family income showed the same pattern of small correlations. Higher income was related to less stressful change ($r_S = -.22, p < .05$), higher social support ($r_S = .25, p < .01$), lower behavior problem scores ($r_S = -.23, p < .05$), and higher social competence scores ($r_S = .18, p < .05$).

In order to determine whether SES overshadowed the significant relationships that we found between the predictors and outcomes, we partialled out the effects of SES to see if these correlations would be diminished significantly. We found that in no case was the zero order correlation significantly reduced when SES was partialled out.

DISCUSSION

Main Effects

We predicted that children classified in infancy as high risk would show more problems in adjustment at age 6 to 7 years than children classified as low risk, but we expected that the relationship between risk classification and outcome would be small due to the effects of intervening variables. In the case of school problems, this is in fact what we found. The infancy risk classification was not, however, predictive of the other three outcome measures. These findings are consistent with other longitudinal studies that have found only modest predictive validity to infancy screenings (Sameroff & Chandler, 1975). However, the limited effect found for risk classification may have been due in part to membership in a prepaid health plan where readily available preventive health care may have diminished the rate of adverse outcomes in the high-risk group. Also, it is noteworthy that the semipartial correlations derived from the multiple regression analyses represent what is *uniquely* attributable to risk classification, with the variance shared by the other predictors removed. Since many previous studies of infancy risk did not partial out the shared effects of other variables (e.g., social support and life events), it is not surprising that they should have found somewhat stronger predictive power for infancy risk factors. Bearing this point in mind—that the semipartial correlations represent unique relationships—is worthwhile when evaluating the magnitude and range of the effects of all the predictor variables in this study.

We expected that each of the other predictor variables would also exert modest main effects, and the results generally support the conclusion that life events and social support do indeed influence adjustment as expected. Life events experienced by the child subsequent to the risk screening, and social support available to child and mother, were each found to a small but significant degree to relate to behavior problems reported by the mother, but they were substantially unrelated to the other measures of adjustment. These findings are consistent with other studies that have found modest direct effects of life events on psychological adjustment (Gersten et al., 1974; Johnson & Sarason, 1979; Thoits, 1982). Some degree of confound may have occurred between the measure of social support used in the present study and the measures of social competence and behavior problems, insofar as the CSSQ is in part a measure of the mother-child relationship, and the mother is the rater for both social support and social competence/behavior problems.

We predicted that locus of control orientation would be related to adjustment, with children with an internal control orientation showing fewer problems. No support was found for this hypothesis, insofar as I-E considered alone was not found to be related to any of the measures of adjustment. Of course, this finding contrasts with those of other studies which have demonstrated a relationship between I-E and adjustment in older children (Dudley-Marling, Snider, & Traver, 1982; Lefkowitz, Tesing, & Gordon, 1980).

Interactions Between Risk, Stress, and Protective Factors

The findings of interaction effects are significant practically and theoretically because they indicate specifically which groups of children are at greatest risk, and because they explain how some high-risk and highly stressed children manage to surmount their liabilities. Interaction effects were found more frequently and were often larger than the main effects. The general pattern of results suggests that multiple risk factors may *combine* complexly and *potentiate* each other, and protective factors—such as social support and Internal control orientation—may powerfully *buffer* the adverse effects of risk and stress.

For example, among low-risk children, stressful life events generally had no significant adverse effect. But among high-risk children, stress was strongly related to emotional problems ($r = .46$). Similarly, among children low in stress, social support was negatively related to behavior problems ($r = -.25$), but among highly stressed children social support took on

much greater importance ($r = -.51$). Additionally, among children low in social support, stress was associated with greater emotional and behavior problems, but children who received higher amounts of support demonstrated no emotional or behavior problems in relation to stress. Also, for children who experienced little life stress, higher levels of social support seemed to enhance social competence and help them to remain free of behavior problems, whereas lower levels of social support contributed to greater problems. The protective effect of social support for highly stressed children did not, however, extend to enhancing social competence. Unlike children under low stress, highly stressed children did not manifest greater social competence when receiving greater social support.

Social support appeared particularly important for External control children. With scant social support, Externals showed greater behavior problems and poorer social competence; with plentiful support they showed few behavior problems and greater social competence. Internals were not as strongly affected by social support. Although social support aided Internals, its impact appeared weaker, inasmuch as the relationship between support and behavior problems was smaller for them than for Externals, and support was not related to social competence at all among Internals. One interpretation is that Internals do not require as much of this kind of social support as Externals do, a finding consistent with their theoretically greater self-reliance and self-confidence. Additional support for this view of Internals as being more resilient comes from the finding that stressful events were not related to adjustment problems among Internal control children but were significantly related to school problems among Externals. Surprisingly, Internals may in fact be inclined to *benefit* from stress, inasmuch as they showed a nonsignificant but *negative* relationship between stress and school problems, whereas Externals showed the expected positive relationship.

Predictive Power

The four main predictors considered simultaneously yielded significant predictive power for all measures of outcome, but especially for behavior problems ($R = .48$). Considered jointly, these variables predicted outcome better than any single variable considered alone.

Furthermore, adding the interaction terms to the main predictors markedly increased the explained variance for all measures of outcome, and for the measure of school problems this increase was dramatic. These findings serve to further underscore the importance of interactions between risk and protective factors.

The four predictors and their interactions accounted for a large proportion of variance in two outcome variables: 56% in the case of behavior

problems, and 64% in the case of school adjustment problems. It may be concluded that individual differences in children's behavioral and school adjustment can be explained and predicted by these variables to a very significant degree.

Influence of Demographic Variables

The findings of one sex difference and one effect of race are consistent with normative studies of the outcome instruments (Achenbach & Edelbrock, 1981; Lambert et al., 1979). Although the effects of sex and race in the present study were small, they are consistent with other studies that report more frequent problems of adjustment among boys and nonwhite children (Sameroff, Seifer, & Zax, 1982).

Higher SES was associated with greater social support, fewer school and behavior problems, and greater social competence. SES was the best single predictor of social competence and school problems. However, the predictors taken together dwarfed SES alone. For example, the joint predictors correlated with school problems at .80, whereas SES correlated with school problems at only .20.

The failure to find significant changes in the relationships between the main study variables when SES was partialled out suggests that these relationships are essentially independent of SES. This finding contrasts with the findings of other studies, wherein SES played an apparently greater role (Sameroff et al., 1982). Several explanations are possible: (a) The sample, being predominantly middle and high SES, did not sufficiently represent low SES groups to show a measurable effect of SES. (b) The adverse effects of SES were partly offset by the prepaid, readily available health care available to most participants in the study. (c) The effects of SES were partly offset by potent familial and environmental factors (e.g., social support and life events) which are usually subsumed in SES but are accounted for separately in this study. The true cause of the unusually small role of SES found in the present study is probably a combination of the above three factors.

CONCLUSIONS

1. Stresses in early infancy – either organismic stresses related to birth or environmental stresses related to caregiving—place a child at significantly greater risk for adjustment problems later in childhood. Many stressful changes throughout childhood also place a child at significantly greater risk for adjustment problems, as does a lack of social support.

However, the actual degree of risk incurred with these variables is relatively small when they are considered independently.

2. Stressful life events magnify synergistically the adverse effects of infancy risk factors.

3. Social support and Internal control orientation act potently as protective factors, buffering the effects of both infancy risk and stressful life events.

4. Considering the above variables in conjunction helps to explain and predict individual differences in adjustment to a very significant degree, much better than any single variable.

5. The relationships between these variables and outcome appear to be essentially independent of SES, and together they predict outcome much better than SES.

It should be noted that the above tentative conclusions apply to the better educated segments of the population, since this sample was predominantly middle-class. Also, since 39% of the high-risk infants were lost to follow-up, there may exist a sampling bias of unknown degree. In addition, further analyses are required to specify what particular types of problem outcomes (such as depression, anxiety, or aggressiveness) are associated with the general high-risk classification, or with particular risk factors (such as biological or psychosocial risk variables). And it remains for other more process-oriented investigations to delineate the specific mechanisms whereby the protective factors operate. Finally, the findings do not as yet support their clinical use for prediction in individual cases.

Theoretical Implications

The findings of present study attest to children's self-righting tendencies; many children successfully overcame forces pressing them toward deviation, and they instead achieved healthy developmental directions. The results provide additional support to the cumulative stress hypothesis, which asserts that psychological disorder emerges as a consequence of multiple risk factors that combine interactively to hamper normal development (Rutter, 1979; Sameroff & Chandler, 1975; Thomas et al., 1968; Werner and Smith, 1982). The usefulness of the concept of protective factors was demonstrated clearly. Much past psychological research has focused exclusively on the negative influences of various adverse conditions and has failed to adequately take into account the positive factors that may help to offset those conditions. Similarly, theoretical formulations of the genesis of psychopathology have been unable to account for anomalous positive outcomes insofar as they have not postulated positive factors that act concurrently in favor of the child. The findings of the present study contribute to an understanding of resilience,

suggesting that high-risk infants who eventually overcome their early liabilities are those who subsequently experience few stressful life events, receive plentiful social support, and/or develop an Internal control orientation. Similarly, older children who are highly stressed but nevertheless cope well may be those whose infancy was healthy and not marked by special biological, temperamental and family problems, who have close supportive relationships with caregivers in their formative years, and who have a solid sense of their own efficacy. The results have implications for prevention in that high-risk and highly stressed children may benefit significantly if the social support systems in their care-giving environment can be strengthened or if their generalized expectancies of control can be modified to an internal orientation.

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