

Social Risk and Protective Child, Parenting, and Child Care Factors in Early Elementary School Years

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SYNOPSIS

Objective. African American children exposed to multiple social risk factors during early childhood often experience academic difficulties, so identification of protective factors is important. **Design.** Academic and school behavior trajectories from kindergarten through third grade were studied among 75 African American children who have been followed prospectively since infancy to test hypothesized protective factors: quality of home and child care environments during early childhood, child language and social skills at entry to kindergarten, and school characteristics. **Results.** Children exposed to multiple risks in early childhood showed lower levels of academic and social-emotional skills from kindergarten through third grade. Parenting mediated the association with risk. Children's language skills, parenting, and child care quality serve as protective factors in acquisition of mathematics skills and reduction in problem behaviors during the first 4 years of primary school for African American children facing multiple risks. Attending a school with a higher proportion of children from low-income families might predict increasing numbers of problem behaviors over time. **Conclusions.** Exposure to social risk in early childhood negatively predicted academic achievement and adjustment during early elementary school for African American children, in part through associations between exposure to social risk and less responsive and stimulating parenting. Furthermore, the negative associations between risk and academic outcomes were substantially weaker when children had more responsive and sensitive parents or child care providers or entered school with stronger language skills.

INTRODUCTION

Children from families with multiple risk factors during early childhood are at risk for school failure, so identification of protective factors for academic achievement for these children is important. Recent findings from a

large nationally representative sample, Early Childhood Longitudinal Study–Kindergarten (West, Denton, & Germino-Hausken, 2000), indicated that children exposed to multiple risks demonstrate an achievement gap at entry to kindergarten when compared with children without risk factors. Furthermore, once in school, children with multiple risk factors also tend to fall further behind academically those children without risk factors (Alexander & Entwisle, 1998; Entwisle & Alexander, 1992; Gutman, Sameroff, & Cole, 2003; Gutman, Sameroff, & Eccles, 2002). Nevertheless, many children from risky contexts do succeed in school (Garmezy, 1993), so it is important to identify the factors that allow children exposed to risk to succeed academically. Identification of such protective factors is especially important for African-American children because in the United States African-American children are substantially more likely to experience multiple risk factors (Luster & McAdoo, 1994; McLoyd, 1998) and to fall behind in school (Children’s Defense Fund, 2001; The College Board, 1999). The purposes of this study are to determine the extent that exposure to risk factors in early childhood predict children’s poorer school achievement and adjustment during the first 4 years of elementary school and to determine whether selected child, parenting, and school characteristics mediate or moderate the anticipated negative relation between exposure to risk and early school success.

The multiple risk model as proposed by Rutter (1979) and Masten, Best, and Garmezy (1990) posits that developmental outcomes are a function of individual responses to risk factors, with negative outcomes linked to exposure to negative experiences and positive outcomes linked to exposure to positive experiences. Masten et al. (1990, p. 426) explicitly focused on identifying “protective factors” that lessen the link between adversity and child outcomes, providing “for successful adaptation despite challenging or threatening circumstances.” Therefore, protective factors are identified as factors that interact with risk in predicting child outcomes. However, it is difficult to identify protective factors because power to identify interactions is often limited even when good power exists to identify risk factors (McClelland & Judd, 1993).

Risk Factors

Individual risk factors linked to academic achievement for African-American children are often combined to form risk indexes. Individual risk factors such as poverty, low levels of maternal education, maternal depression, minority ethnic status, and large household size are strong predictors of children’s academic performance over time for African-American children (Burchinal, Campbell, Bryant, Wasik, & Ramey,

1997; Rauh et al., 2003; Sameroff, Seifer, Barocas, Zax, & Greenspan, 1987). Maternal depression has been linked to poorer cognitive, academic, and social-emotional development of children, particularly for children whose mothers are chronically depressed (Cummings & Davis, 1994; National Institute of Child Health and Human Development [NICHD] Early Child Care Research Network, 1999). However, due to the high level of correlation among risk variables, multiple risk indexes have been created and shown to predict cognitive outcomes in early childhood (Burchinal, Roberts, Hooper, et al., 2000; Linver, Brooks-Gunn, & Kohen, 2002; Sameroff et al., 1987), middle childhood (Krishnakumar & Black, 2002), and early adolescence (Sameroff, Seifer, Baldwin, & Baldwin, 1993) as well as academic outcomes during primary and secondary school (Gutman et al., 2002, 2003; Luster & McAadoo, 1994).

Decisions about how to combine the risk factors to create a multiple risk index impacts the power to detect protective factors. Various approaches that have been used involve combining risk variables empirically through factor analysis (e.g., Deater-Decker, Dodge, Bates, & Pettit, 1998), counting number of factors that met a priori or professionally determined risk criteria (e.g., Sameroff et al., 1987, 1993), or using each risk factor as separate predictors in multiple regressions (e.g., Burchinal, Roberts, Hooper, et al., 2000). Prior research, including analysis with this sample, has indicated that multiple regression analyses that consider individual risk factors simultaneously provide better overall prediction of language outcomes in early childhood than multiple risk indices. However, the high correlations among the predictors limited power to specify which individual variables serve as risk factors or as protective factors (Burchinal, Roberts, Hooper, et al., 2000; Deater-Decker et al. 1998, Pianta, Egeland, & Stroufe, 1990). In contrast, the use of factor analysis to create a single multiple risk factor score provided the most power for identifying interactions. The use of risk composites provided the best compromise in terms of retaining the information in the individual risk factors and increasing power for detecting interactions by reducing the number of variables and correlations among predictors in the analysis model (Burchinal, Roberts, Hooper, et al., 2000).

Protective/Promotive Factors

Fortunately, not all children who experience multiple risk factors experience cognitive, academic, or social problems, and therefore it is important to identify factors associated with school success among children exposed to multiple social risk factors. Two different types of factors related to school success (Gutman et al., 2003) that correspond to main effects and interactions in analyses (Rutter, 1979) can be identified. Promotive factors are re-

lated to better outcomes for all children (i.e., have main effects) and are often thought to mediate the anticipated negative pathway from exposure to multiple risk factors and impaired academic trajectories (Gutman et al., 2003). These factors are often the opposite end of the continuum from risk factors. For example, high maternal education is viewed as a promotive factor, whereas low maternal education is viewed as a risk factor. By definition, both protective and vulnerability factors are identified when interactions between that factor and risk are significant. Protective factors moderate the negative association between risk and outcomes such that they are stronger predictors of better outcomes for children who experience higher levels of risk than for children who experience lower levels of risk. Vulnerability factors, in contrast, interact with risk such that they become stronger predictors of negative outcomes for children who experience higher levels of risk than for children who experience lower levels of risk.

Multiple protective and promotive factors of academic achievement and adjustment have been identified, and we examine characteristics that serve as protective factors for African American children exposed to multiple social risks in previous research (Brody & Flor, 1998; Gutman et al., 2002, Masten et al., 1995). As indicated in previous work (Masten et al., 1995), although we anticipate that protective factors will be less commonly observed among families experiencing multiple risks, we hypothesize that child, family, and school characteristics can buffer children's academic development from the negative association with risk. We hypothesize that, especially in the presence of risk, children will show higher achievement scores and better social adjustment when family or child care environments are more stimulating and responsive and when parents or teachers scaffold teaching. Further, we believe that quality of caregiving in early childhood serves as a mediator through enhancing children's language and social skills prior to entry to primary school. We also hypothesize that school-related protective factors include schools that have fewer students from low-income families.

In addition to looking for protective factors, many studies have sought to identify family or school processes that account for negative associations between exposure to risk and child development. Most of these studies have focused on distal risk factors and examined more proximal processes as hypothetically explanatory mediators that account for why exposure to risk is negatively related to child outcomes (Krishnakumar & Black, 2002; Linver et al., 2002). The hypothesized protective factors were also regarded as process variables that could account for negative association between the distal risk factors and child development. These hypothesized family, child care, school, and child factors are described in the following discussion.

Family environment. Parenting has been shown to be one of the strongest predictors of children's academic performance for children in general (Bradley, Corwyn, Burchinal, McAdoo, & Garcia Coll, 2001) and for African-American children specifically (Bradley et al., 2001; Brody & Flor, 1998; Burchinal et al., 1997; Campbell, Pungello, Miller-Johnson, Burchinal, & Ramey, 2001). Theoretical risk models often focus on parenting as an explanatory process for risk exposure. The family process model (Conger & Elder, 1994; McLoyd, 1998) postulates that risk influences child outcomes such as school achievement or behavior problems primarily, although it has a negative effect on parental mental health, which, in turn, impairs parenting practices. This model postulates that parents who experience high levels of adversity are more likely to provide less optimal parenting because the multiple stressors in their lives make it more difficult for them to be stimulating, responsive, and sensitive with their children (McLoyd, 1998; Sameroff et al., 1987). This model has been examined in several recent studies of cognitive or academic outcomes in early childhood in African American samples (Krishnakumar & Black, 2002; Linver et al., 2002). Early risk was indirectly related to cognitive or academic outcomes through parenting for all studies, whereas only maternal ratings of adjustment showed the anticipated path from risk through maternal depression to parenting in these studies. Parenting also emerged as a mediator in a study of rural African American children's cognitive and behavioral adjustment between 6 and 9 years of age (Brody & Flor, 1998). In other studies, various aspects of parenting were examined, including overall or specific ratings of the family environment (Bradley et al., 2001; Brody & Flor, 1998; Brody, Dorsey, Forehand, & Armistead, 2002; Krishnakumar & Black, 2002; Linver et al., 2002) and observed warmth of maternal interactions (Linver et al., 2002; NICHD Early Child Care Research Network, 2002).

Child care quality. Child care quality is also a modest but consistent predictor of cognitive and language skills and, less consistently, of social skills (Vandell, 2004). Children who attend higher quality child care programs display modestly more advanced language, cognitive, and social skills. In many but not all studies, these associations are stronger for children exposed to risk than for more advantaged children (Vandell, 2004). Using standard measures of child care quality, researchers found that child care quality was related to language, cognitive, and social development, even after they controlled for such family selection factors as socioeconomic status, maternal education, parenting, or family structure in both large multi-site studies (Clarke-Stewart, Gruber, & Fitzgerald, 1994; Kontos, Howes, Shim, & Galinsky, 1996; NICHD Early Child Care Research Network, 2000, 2002; Peisner-Feinberg & Burchinal, 1997; Peisner-Feinberg et al., 2001) and

in smaller single-site studies (Burchinal, Roberts, Riggins, et al., 2000; Burchinal, Roberts, Nabors, & Bryant, 1996; Dunn & Dunn, 1997; McCartney, 1984; Schliecker, White, & Jacobs, 1991). In addition, some evidence exists that quality child care serves as a protective factor (Burchinal, Peisner-Feinberg, et al., 2000; Dearing, Taylor, & McCartney, 2004; Peisner-Feinberg et al., 2001). In these studies, all children appeared to benefit from high quality care, but child care quality was a stronger predictor when children had mothers with less education (Peisner-Feinberg et al., 2001), were African American (Burchinal, Peisner-Feinberg et al., 2000), or were from low-income families (Dearing et al., 2004). Furthermore, some but not all child care studies have shown modest long-term associations between child care quality and school-age child outcomes. In most but not all studies, academic outcomes were enhanced even after children left child care for primary school when children were in high quality university-based or community-based child care (Lazar & Darlington, 1982; Campbell et al., 2001; NICHD Early Child Care Research Network, 2005 Peisner-Feinberg et al., 2001).

School characteristics. School experiences have also been offered as an explanation for the negative association between risk and youth's school outcomes (Brody et al., 2002; Caldas & Bankston, 2001; Coleman, 1990). Schools in which proportionately fewer children were from low-income families appeared to buffer children from the negative impact of exposure to multiple risk factors (Caldas & Bankston, 2001; Klinger, 2000).

Child factors. Child characteristics at entry to school are strongly associated with academic skills and can buffer the child from the negative impact of risk (Alexander & Entwisle, 1998). Children's intelligence is clearly related to academic skills (see Neisser et al., 1996, for review). Intelligence served as a protective factor in two studies (Gutman et al., 2002; Masten et al., 1999) that followed African American children in elementary and middle school, although not in another study (Gutman et al., 2003) that followed a predominantly European American sample through all 12 years of schooling. Children's language skills are thought to account for much of the association between intelligence and academic skills (Neisser et al., 1996; Scarborough, 2001; Snow, Burns, & Griffin, 1998). The classroom setting is a pervasive language environment, and almost all interactions among teachers and students during the school day depend on language (Adams, Treiman, & Presley, 1998; American Speech-Language-Hearing Association, 2001; Snow et al., 1998).

In addition to demonstrating that cognitive skills buffer children from the negative impact of social risk, considerable evidence exists that expo-

sure to risk in early childhood is negatively related to academic outcomes through less optimal parenting, which results in less optimal language development. Numerous studies have shown that parenting in early childhood is a strong predictor of language skills at entry to school (Bradley et al., 2001, NICHD Early Child Care Research Network, 2002), and a few studies have suggested that early exposure to risk is negatively related to preschool language and cognitive skills (Krishnakumar & Black, 2002; Linver et al., 2002). Therefore, language, rather than intelligence in general, was selected as a potential protective factor in this study. Finally, many professionals in the early education field, including kindergarten teachers, hypothesize that children who have good social skills will enter school ready to learn, regardless of the number of risk factors in the child's life (Pianta & Cox, 1999). However, social adjustment has not been shown to play a protective role in relating social risk to academic achievement (Gutman et al., 2003; Masten et al., 1995).

Prior analyses of data from this sample examined the association between risk and outcomes and sought to identify mediating and protective factors. Three studies found social and family risk factors related to language development in infancy and early childhood for African American children. Children who experienced more risk factors had significantly lower cognitive and language outcomes at 1 year of age (Hooper, Burchinal, Roberts, Zeisel, & Neebe, 1998) and between 1 and 5 years of age (Burchinal, Roberts, Hooper, et al., 2000). A single risk factor based on education, depression, life events, and family poverty and structure provided the most parsimonious representation of the exposure to adversity during early childhood. Children exposed to multiple risks in early childhood showed lower cognitive and language scores in early childhood (Burchinal, Robert, Hooper, et al., 2000). In addition, articles based on this sample have reported that children who experienced higher quality child care had more advanced cognitive and language skills during the first 5 years of life (Burchinal et al., 1996; Burchinal, Roberts, Riggins, et al. 2000) and those who experienced greater responsiveness and support of the home environment demonstrated more advanced language and early literacy skills through second grade (Jackson & Roberts, 2001; Poe, Burchinal, & Roberts, 2004; Roberts, Burchinal, & Zeisel, 2002; Roberts et al., 2000; Roberts, Jurgens, & Burchinal, 2005).

In conclusion, children who experience multiple risk factors are more likely to experience academic and social-emotional problems and child, family, and school factors may serve as either mediators or protective factors. It is especially important to identify mediators or protective factors for African American children to ensure they begin school successfully because, relative to the general population, they are at greater risk for expo-

sure to social risk factors and experience an achievement gap at entry to school that only widens during the school years (West et al., 2000). Therefore, the purpose of this study is to determine whether child language and social skills, parenting style, child care quality, or level of school resources serve as mediators or protective factors for African American children facing multiple risk factors in their first 4 years of elementary school.

METHODS

Participants

Seventy-five African American infants attending community-based child care centers participated in this study (see Roberts et al., 1995, for complete details regarding this sample). Children were part of a prospective longitudinal project examining the relation between otitis media and associated hearing loss on children's language development. Invited to participate were African American infants less than 12 months of age who appeared to be developing normally and who attended one of nine child care centers in two small adjacent Southeastern cities. One hundred forty-four families were invited to participate over a 3-year period. Of 118 children enrolled in the project, 75 children were included in this study. Excluded from this analysis were the 23 children who left their child care center prior to 12 months of age and were not followed subsequently, 11 who moved from the area, 5 who asked not be followed into school, and 2 who were later diagnosed as having autistic spectrum disorder or Asperger's syndrome. Comparisons of children included and excluded in the analyses indicate that excluded children were more likely to score lower on the developmental assessments at 1, 2, and 3 years, to have entered and left center child care at younger ages, and to be from families rated as having less stimulating and responsive home environments.

The 75 children included in this study entered their child care program between the ages of 1 month and 11 months, $M = 5.4$ months, and all attended child care full time. The children attended over 30 child care centers or Head Start programs prior to entry to kindergarten. All were assessed through their fourth year of public school. Slightly over half of the infants were girls. Most of the children (72%) were from families with incomes that were less than 185% of the federal poverty threshold. A single parent headed 65% of these families. See Table 1 for a description of the child and family characteristics of this sample. As shown, the sample is not representative of African American families in the United State, but provides sufficient diversity to look at the extent to which risk and protective factors are related to school success (i.e., samples of convenience are useful for de-

TABLE 1
Description of Sample

	Child's Age			
	12 Months	24 Months	36 Months	48 Months
Risk Factors (<i>n</i>=75)				
Poor (%)	72	72	72	59
Single parent (%)	65	70	68	65
Maternal education	12.57 (2.14)	12.70 (2.15)	12.80 (2.13)	13.01 (2.06)
Household size	4.48 (1.73)	4.42 (1.70)	4.54 (1.79)	4.45 (1.65)
Stressful life events	14.86 (11.34)	5.53 (7.81)	9.30 (9.11)	—
Maternal depression (PSI)	2.04 (.75)	1.99 (.60)	1.99 (.66)	—
Covariates (<i>n</i>=75)				
Sex (% boys)	45			
Maternal IQ	86.55 (10.06)			
Child characteristics at entry to kindergarten (<i>n</i> = 73)				
Language ^a				0.0 (1.0)
CELF expressive				100.3 (12.1)
CELF receptive				93.4 (15.9)
PPVT				82.6 (15.3)
Social skills ^a				
SSRS social skills				101.0 (10.7)
Parenting (<i>n</i> = 75)				0.0 (1.0)
Maternal teaching style ^b				0.0 (1.0)
Communication adequacy				4.01 (.43)
Percentage of correct answers on task				77.8 (19.5)
Number of utterances on topic				13.7 (10.3)
HOME Total				.80 (.10)
Child care quality (<i>n</i> =72)				3.46 (.87)

Note. Unless indicated otherwise, means are given, with standard deviations in parenthesis. PSI = Parenting Stress Index. CELF = Clinical Evaluation of Language Fundamentals. PPVT = Peabody Picture Vocabulary Test. SSRS = Social Skills Rating System. HOME = Home Observation for Measurement of the Environment.

^aData collected at Prekindergarten assessment

^bData collected at Grade 1 assessment

scribing associations, not means or proportions, even when they are not representative of the population when those processes tend to be observed consistently within the population).

Procedure

Children were recruited during their first year of life and followed prospectively. Social risk factors were measured annually. During early child-

hood, children's child care classroom and the family environments were observed annually during the spring. Teachers' ratings of social adjustment, language, and academic outcomes were assessed using standardized measures administered by trained professionals in the summer prior to entry to kindergarten, at entry to kindergarten, and during the spring or summer following each of the first 4 years of elementary school.

Family and Social Risk Factors

Family and social risk factors were identified because they were either theoretically or empirically associated with cognitive outcomes. We include factors shown to be risk factors in previous research (Brody & Flor, 1998; Deater-Deckard et al., 1998; Masten et al., 1999; Sameroff et al., 1987, 1993). Six risk factors are assessed in this study: poverty, father absent in household, large household size, low maternal education, high maternal depression, and high life stress. Almost all risk measures were collected annually. Annual interviews with the primary caregiver of the target child provided information about the caregiver's education, number of people in the household, family income, household size, and maternal depression and life stress.

The risk indexes for stressful life events and maternal depression were defined by summary variables from the Parenting Stress Index (Abidin, 1995). The annual interview with the primary caregiver included administration of the Parenting Stress Index at entry to the study and when children were 18 months, 30 months, and 42 months.

Covariates

Maternal IQ. Maternal IQ are included in all analyses in this study as a control variable to adjust, in part, for genetic contributions to the development of a child's cognitive and language skills. Maternal IQ was determined by the Vocabulary and Block Design subtests of the Wechsler Adult Intelligence Scale-Revised (Wechsler, 1955) administered during the child's first year in the study. This short form has good reliability and validity, including for African Americans (Sattler, 1990).

Sex. In addition, sex was included as a covariate.

Mediators, Protective, and Promotive Factors

Home Observation for Measurement of the Environment (HOME). The childrearing environment at home was assessed with the HOME Inventory for Preschoolers (Elardo & Bradley, 1981). This semistructured obser-

vation/interview examines the quality and responsiveness of the home environment, measuring aspects of the child's home environment that are believed to foster cognitive development. The HOME total, computed as the proportion of items passed, is used in the analyses. Good internal consistency, acceptable levels of test-retest reliability, and high levels of content validity for the HOME have been reported for African-American families (Bradley et al., 1989), and raters were trained to obtain reliabilities of 95% before collecting data.

Maternal teaching style. Each child and his or her mother participated in a series of structured activities when the child was in first grade. A composite was formed computing the mean of the three teaching style scores described in the following discussion after demonstrating that a single factor accounted for 54% of the variance in the three scores ($\alpha = .60$).

The magnet task is designed to examine explanatory talk (science talk) as a form of discourse. Each mother and child were given two large magnets and a box with magnetic and nonmagnetic items and instructed to play with these materials. These conversations were audio and video recorded. The conversation was transcribed from audiotape, and each mother's and child's turn was scored for whether the content of the talk was science (talking about explanations or properties of magnets; e.g., "See if the magnet can pick up the nail."), artistic (talking about building, fantasy, or playing a pretend game; e.g., "You can make a tree from this."), object (labeling or nonmagnetic properties; e.g., "Is this a quarter?"), conversation (discussion about things not related to objects, building, fantasy, or magnetizing), or no code (unintelligible utterances) as modified from the work of Snow and Kurland (1996). The proportion of the mother's talk that was science and artistic was computed.

The Guessing Game, an interactive game in which the child and his or her mother gave clues to each other to elicit the correct word on a card, was adapted from the Jobs Wave II Observation Coding testing protocol (De Temple, 1998). Each mother was given 10 cards with a picture and word on each card. The mother was instructed to give clues to the child, and the child would then try to guess the word. Three min were allotted for this task. The task was scored in two different ways — the percentage of the words that the child correctly guessed and the communicative adequacy of the mother's clues. Communicative adequacy was scored by how clear and specific the clue was or the quality of the clue using a scale with items ranging from 1 to 5. For example, if the clue was so specific that it could not mean anything else but the denoted word, had specific meaning to the child, or was guessed on the first clue, it received a score of 5 (e.g., "It is your favorite thing to eat for breakfast."). However if the clue was general

and could apply to multiple things (e.g., “You eat it”; “It is good.”), then it was scored a 1. The mean communicative adequacy score was computed across the 10 cues.

A *parenting composite* was formed as the unweighted mean of the within-sample standardized HOME total score and the teaching style composite. This factor accounted for 65% of the variance, with a correlation of $r = .40$ between the HOME and teaching style total scores. This index of parenting style was treated as a measure that would remain relatively consistent across the repeated assessments from 54 months through third grade. Indeed similar measures of environmental stimulation on the HOME from early childhood showed high consistency over time (Bradley et al., 2001).

Child care quality. The overall quality of the child care was assessed using the Infant/Toddler Environment Rating Scale (ITERS; Harms, Cryer, & Clifford, 1990) and the Early Childhood Environment Rating Scale (ECERS; Harms & Clifford, 1980). The ITERS was collected in classrooms that included children under the age of 2 years. The ECERS was used in classrooms in which all children were 2 years or older. The ITERS is a 35-item, 7-point scaled tool that examines the environment, curriculum, teacher–child interactions, and teaching practices in classes with children from birth to 30 months of age. The ECERS examines developmental appropriateness of practices in preschool classrooms including routine care needs, furnishings and displays, activities and experiences related to motor, language, cognitive, and social development and adult provisions. Like the ITERS, it is a 37-item tool utilizing a 7-point scale. Four trained observers completed all observations in the spring of each year the child was in child care. An inter-rater reliability of .85 or better was achieved with other trained observers.

Child characteristics at entry to school. Children’s language skills were assessed in the spring and summer prior to entry to kindergarten. Kindergarten teachers rated children’s social skills in the fall. Children’s language was assessed using standardized language tests administered by speech and language researchers. Language was assessed using the Peabody Picture Vocabulary Test–Revised (PPVT–R; Dunn & Dunn, 1981) and the Clinical Evaluation of Language Fundamentals–Preschool (CELF–P; Wiig, Secord, & Semel, 1992). Both instruments show good reliability and validity for African-American children (Sattler, 1990). The PPVT–R assesses receptive vocabulary, and a standardized score was computed. The CELF–P measures receptive language including linguistic and basic concepts, sentence structure, expressive language including the ability to recall and repeat spoken sentences, formulation of labels, and word structure. A principal components analysis combined the three scores into a single composite. It accounted for 79% of the variance, and loading all exceeded

.90 (i.e., correlations ranged from .63 to .73). Social skills at school were assessed using the Social Skills Rating System–Preschool (SSRS–R; Gresham & Elliot, 1990) at entry to kindergarten. In this questionnaire, the teacher is asked to assess whether the child has displayed the social skills *never*, *occasionally*, or *frequently* in the past month.

Academic and Social Skills During First 4 Years of Elementary School

Children were administered individual achievement tests during the summer after each year of school. In addition, each spring teachers were asked to complete questionnaires describing the children’s social skills and behavior problems.

Academic outcomes. Academic skills were assessed with the Woodcock–Johnson Tests of Achievement–Revised (WJ–R; Woodcock & Johnson, 1990). Overall reading and mathematics skills were measured with the Broad Reading and Broad Math cluster scores. The Broad Reading cluster includes letter – word identification, which assesses the ability to identify isolated letters and words, and passage comprehension, which involves silently reading a passage and stating a word appropriate to the context of the passage. The Broad Math cluster includes calculations, which measures skill in performing basic (addition, subtraction, multiplication, and division), combined and advanced (geometric, trigonometric, and calculus) mathematical skills, and applied problems, which assesses skills in analyzing and solving verbal mathematics problems.

Social skills. The child’s social skills were assessed annually by teachers using the Social Skills Rating System, Grades K–6 (Gresham & Elliot, 1990). In these questionnaires, the teacher is asked to assess whether the child has displayed the social skills *never*, *occasionally*, or *frequently* in the past month. In addition, the Grades K–6 version includes a Problem Behaviors Scale, which measures behaviors that can interfere with the development of positive social skills. This measure is widely used, with reasonable reliability and validity for African-American children (NICHD Early Child Care Research Network, 2002).

The poverty level in each school was determined from data from the National Center for Educational Statistics. The percentage of children receiving free or reduced price lunches was calculated as an index of school poverty.

Data Analysis

Various methods have been used to compute multiple risk indices (see Burchinal, Roberts, Hooper, et al., 2000, for further discussion), ranging

from a count of the number of factors in the at-risk range (Burchinal, Roberts, Hooper, et al., 2000; Deater-Deckard et al., 1998; Gutman et al., 2002, 2003; Hooper et al., 1998; Sameroff et al., 1987, 1993) to the use of multiple factor scores from a factor analysis of the risk scores (Burchinal, Roberts, Hooper, et al., 2000; Deater-Deckard et al., 1998; NICHD Early Child Care Research Network, 1999; Pianta et al., 1990). Careful examination of the various methods suggested that use of factor scores provides more precision because it uses all of the information in each risk factor instead of categorizing them (Burchinal, Roberts, Hooper, et al., 2000). In addition, it appeared that a single index provided better power for detecting interactions than did multiple indexes. Accordingly, a single multiple risk index was created from the risk scores. Each risk score was averaged over the 4 years of data collection during early childhood, and a factor analysis of the averaged scores was conducted using a principle components analysis. A single risk index emerged that included all risk variables, accounting for 40% of the variance in the six risk variables.

Hierarchical linear models (HLM) tested the extent to which developmental trajectories in reading, mathematics, social skills, and behavior problems varied as a function of social risk in early childhood and whether child, family, and school factors moderated those associations (Bryk & Raudenbush, 2002; Singer & Willett, 2003). The HLM were used because they can identify predictors of developmental patterns by estimating both individual and group growth curves. Individual linear growth curves were estimated as having separate intercepts and slopes for each child, and quadratic group curves were estimated from the individual curves. In particular, we chose to look at developmental processes instead of endpoints for two reasons. First, we were interested in describing the extent to which risk and protective factors related to outcomes in children from entry to school through third grade. Second, using the HLM approach provides greater power than analysis of outcomes at a single age (Bryk & Raudenbush, 2002), and our sample size is moderate.

A series of models was fit to each outcome because the child and family characteristics were clearly endogenous. That is, we were concerned about overlap because theory suggests that parenting and child language and social skills have bidirectional and strong links (Bronfenbrenner & Morris, 1998). The base model included as predictors of the population growth curve: age, age-squared, the risk index, age \times risk, maternal IQ, child gender, and gender \times risk. Follow-up analyses tested whether maternal IQ or child gender interacted with risk to ensure we were not biasing parameter estimates. No evidence suggests either variable moderated the association between risk and child outcomes.

The second and third models tested hypotheses regarding mediation and moderation. The second model added the parenting composite, child care

quality score, and the time-varying index of school poverty. All three hypothesized protective/vulnerability factors were interacted with the risk index, and the robustness of estimates was examined. These models were examined to ensure that interactions tended to be observed when moderately to highly correlated factors were and were not included in the model. The third model added the child characteristics to this model to determine the extent to which they appeared to mediate or moderate the association between exposure to risk and child outcomes. Evidence of mediation in Models 2 and 3 were evaluated using the Sobel Test (MacKinnon, Lockwood, Hoffman, West, & Sheets, et al., 2002).

Effect sizes were computed to describe the magnitude of the association between risk and child outcomes. The effect size for this continuous predictor was computed as the unstandardized regression coefficient times the standard deviation for the predictor divided by the standard deviation for the outcome measure (see Gutman et al., 2003, or NICHD Early Child Care Research Network & Duncan, 2003, for details). This effect size index roughly corresponds to a partial correlation and should be interpreted as such, with $d = .10$ indicating a small effect, $d = .30$ a moderate effect, and $d = .50$ as a large effect (Cohen, 1988). Protective factors were identified through interactions between risk and the hypothesized protective factor, and effect sizes were computed to assist in interpreting these interactions. The interaction terms entered the analysis model as the product of the continuous predictors, after all predictors were centered at the sample mean. A significant interaction implies that the association between one predictor and the outcome varies linearly as a function of the other predictor included in the interaction. The most parsimonious way to interpret these interactions involves estimating regression coefficients for one of the predictors at selected values such as the twenty-fifth and seventy-fifth percentile score on the other predictor (Aiken, West, Schwalm, Carroll, & Hsing, 1998). Effect sizes for the coefficients for risk at the twenty-fifth and seventy-fifth percentile scores on the hypothesized protective factor were estimated when significant interactions involving risk were detected.

RESULTS

Description of Multiple Risk, Hypothesized Protective Factors, and Children's Academic and Social Outcomes

Early childhood multiple risk index. The families in this sample experienced a variety of risk factors. Seven risk factors were assessed repeatedly during early childhood and combined to form the risk index. The top section of Table 1 lists the six factors examined in this article and in previous

work with this sample (Burchinal, Roberts, Hooper, et al., 2000; Hooper et al., 1998). The children in this sample were likely to experience multiple risks, especially during infancy. About two-thirds of the children lived in households with a single parent and had family incomes that qualified them for public services due to poverty, although the proportion of families in poverty decreased over time. Most mothers finished high school (73%), but the average level of education ranged from 12.6 to 13.0 years over the early childhood period. Furthermore, very high to moderate levels of across-time stability were observed in the risk factors of maternal education, $.91 < r < .99$, $\alpha = .99$, household size, $.50 < r < .80$, $\alpha = .90$, and maternal depression, $.60 < r < .90$, $\alpha = .92$. Only one risk factor — stressful life events, $.20 < r < .50$, $\alpha = .73$ — showed modest across-time correlations. Due to the moderate to high stability in all risk factors, each risk factor was summarized across the 3 to 4 years of repeated assessments in early childhood. Across time means were computed.

A factor analysis was conducted using the averaged-over-time individual risk factors. A factor analysis was conducted using principle components decomposition followed by a varimax rotation. One criterion, the plot of eigenvalues, indicated one large factor, and all risk factors loaded substantively on the first factor. The first principle component was retained as our risk index, accounting for 40% of the variance in the six distal risk factors. A single risk factor, computed as the unweighted mean of within-sample standardized risk scores, was retained for these analyses instead of the three factors retained in the previous article (Burchinal et al., 2000) for two reasons. First, it represented the information in the risk factors well, and, second, using one instead of three factors provides greater power for detecting interactions in the subsequent analyses designed to identify protective factors.

Hypothesized protective factors. The hypothesized protective factors are presented in Tables 1 and 2. The bottom half of Table 1 shows the two hypothesized protective child factors that were assessed prior to entry to elementary school. They include the children's language scores used to form a prekindergarten child language composite (i.e., CELF and PPVT scores) and the prekindergarten social skills score (i.e., SSRS). Children's language skills at entry to kindergarten were on average about half a standard deviation below the test norm, whereas ratings of social skills were average relative to the test norms.

Table 1 also shows the repeated assessments of the other hypothesized protective factors that were assessed after the child entered elementary school. Parenting, child care quality, and school characteristics were hypothesized as protective factors. The parenting measure was computed

TABLE 2
Elementary School Characteristics and Child Outcomes

	Grade			
	K	1	2	3
School characteristics				
% poor— <i>n</i>	65	67	69	69
%	35.80 (25.73)	43.30 (28.34)	46.54 (28.80)	45.40 (27.47)
> 50% poor—%	29	32	32	31
Child outcomes				
Achievement— <i>n</i>		75	75	75
WJ-R reading	<i>M (SD)</i>	448.4 (22.4)	476.1 (18.4)	489.3 (14.8)
WJ-R mathematics	<i>M (SD)</i>	455.2 (14.2)	474.0 (13.2)	490.7 (14.0)
Teacher ratings— <i>n</i>	66	69	65	69
SSRS social skills	93.05 (11.69)	91.7 (12.6)	94.9 (15.6)	93.9 (13.8)
SSRS behavior problems	108.41 (13.9)	109.5 (14.8)	107.3 (16.5)	108.0 (15.8)

Note. WJ-R = Woodcock-Johnson Tests of Achievement-Revised. SSRS = Social Skills Rating System.

from the HOME total and a maternal teaching style composite, which included the measure of communication adequacy and percentage correct on the guessing game and proportion of talk involving either science or art on the magnet task. Descriptive statistics are shown on the bottom of Table 1. Mothers' communication adequacy scores indicate that they gave clues on the guessing game task that were generally clear and specific to the item. Furthermore, children guessed correctly about three-fourth of these words from clues provided by mothers, and mothers provided task-relevant information on most turns in conversations during that task. About 80% of the items on the HOME were passed, indicating moderate levels of stimulation and responsiveness on average.

Three characteristics of the child's school experience were also examined as possible protective factors and are shown in the second block of rows in Table 2. Slightly less than one-third of the children attended schools in which over half of the students received free or reduced price lunch.

Child outcomes. Longitudinal assessments of academic skills and school behaviors are described in the bottom block of rows in Table 2. Children clearly showed gains in terms of reading and mathematics over time, with these Raush scores corresponding to standard scores that were slightly below average at entry to kindergarten, $M = 95$, $SD = 12.4$. Children were rated by their teachers, on average, as showing levels of social skills that

were about half a standard deviation below the norm and behavior problems that were about two-thirds of a standard deviation above the norm.

Correlations. The correlations between the outcomes and both the multiple risk factor score and each hypothesized protective factor are shown in Table 3. As shown, the early childhood risk index was moderately to highly correlated with both academic and social outcomes at all ages. The multiple risk factor score ranged in correlations from $r = -.18$ (social skills in kindergarten) to $r = -.45$ (mathematics in third grade), with a median correlation of $-.31$. In addition, moderate to strong correlations were detected between child outcomes with maternal IQ, parenting, and prekindergarten language. Children who had higher levels of language skills at entry to school also scored substantially higher on reading, median $r = .49$, and mathematics, median $r = .49$. Similarly, higher parenting scores predicted higher reading, median $r = .44$, and mathematics scores, median $r = .46$. In contrast, neither child care quality nor the child's social skills at entry to kindergarten were consistently related to children's outcomes.

Finally, correlations among the risk and protective factors are shown in Table 4. These correlations are relatively stable over time, thus only the correlations for second grade are provided. Children who experience more risk factors during early childhood entered school with substantially lower language skills, had mothers with lower IQ scores who were less responsive and stimulating, and attended lower quality child care centers prior to entry to school. Once in elementary school, children exposed to more risk in early childhood were more likely to attend schools with a higher proportion of students being from low-income families. Correspondingly, children who entered school with more advanced language skills had more stimulating and responsive mothers with higher IQs, attended higher quality child care centers, and attended schools with fewer children from low-income families.

Longitudinal Analysis of Children's Academic and Social Outcomes During Early Elementary Years

HLM analyses were conducted to describe patterns of change in WJ-R broad reading, WJ-R broad math, SSRS social skills ratings, and SSRS behavior problem ratings in the first 4 years of elementary school. Linear individual growth curves and quadratic group curves were estimated in a series of models. All models included gender and maternal IQ as covariates. The base model included the early childhood risk factor score and controlled for maternal IQ, gender, and age. Preliminary analyses tested whether risk was linearly or nonlinearly related to outcomes and

TABLE 3
Correlations Between Child Outcomes and Multiple Risk Index
and Hypothesized Protective Factors

	WJ-R Reading	WJ-R Mathematics	SSRS Skills	SSRS Behavior Problems
Multiple risk index				
K			-.18	.22
Grade 1	-.16	-.28*	-.24*	.26*
Grade 2	-.31*	-.38**	-.31*	.36**
Grade 3	-.33**	-.45***	-.23	.18
Maternal IQ				
K			-.08	-.06
Grade 1	.21	.34**	.10	-.12
Grade 2	.28*	.33**	.30*	-.25*
Grade 3	.36**	.41***	.17	-.10
Parenting				
K			.32**	-.43***
Grade 1	.37***	.46***	.27*	-.35**
Grade 2	.48***	.41***	.36**	-.34**
Grade 3	.44***	.55***	.36**	-.31**
Child care quality				
K			.23	-.22
Grade 1	.08	.15	.17	-.18
Grade 2	.23	.02	.09	-.11
Grade 3	.23*	.17	.07	-.20
School poverty				
K			-.21	.20
Grade 1	-.20	-.24*	-.14	.04
Grade 2	-.30**	-.23*	-.21	.08
Grade 3	-.30*	-.32*	-.37*	.33**
Child prekindergarten language				
K			.25*	-.24*
Grade 1	.37**	.49***	.21 ⁺	-.18
Grade 2	.49***	.45***	.24 ⁺	-.21 ⁺
Grade 3	.53***	.56***	.29*	-.25*
Child prekindergarten social skills				
K			.33**	-.36**
Grade 1	.12	.12	.10	-.10
Grade 2	.27*	.01	.13	-.13
Grade 3	.13	.09	.29*	-.28*

Note. WJ-R = Woodcock-Johnson Tests of Achievement-Revised. SSRS = Social Skills Rating System.

⁺ $p < .10$. * $p < .05$. ** $p < .01$. *** $p < .001$.

TABLE 4
Correlations Among Cumulative Risk Index and Hypothesized Protective Factors: Second Grade

	Risk Index	Maternal IQ	Parenting	Child Care Quality	School Poverty	Child Language	Child Social Skills
Multiple risk index		-.50***	-.63***	-.40***	.35***	-.48***	-.02
Maternal IQ			.53***	.12	-.22	.38***	-.06
Parenting					-.31**	.50***	.25*
Child care quality						.48**	.11
Child language—PK							.19
Child social skills—PK							

* $p < .05$. ** $p < .01$. *** $p < .001$.

Note. PK = prekindergarten.

whether risk interacted with either maternal IQ or gender. No evidence supported either concern, so models did not include either risk-squared or the interactions between risk and the covariates. The second model added the parenting composite, child care quality composite, time-varying index of school poverty and interactions with risk and age. The third model added the child's prekindergarten language and social skills and interactions with age and risk. In both of these models, we tested the robustness of interactions between risk and protective factors by determining whether those interactions contributed when considered individually and jointly. The interactions between exposure to risk and school poverty were dropped when results proved to be unstable when those interactions were included due to the moderate to high correlations among risk, parenting, and school poverty. The interaction was significantly different from zero in only one analysis — mathematics — but only when interactions between parenting and risk were also included. Results from the final models are shown in Table 5, listing the coefficients for variables added in each model.

Reading. The first column in Table 5 shows the fixed-effect coefficients and standard errors from the HLM analyses of the WJ-R broad reading Raush score. As shown in the row under the label *Model 1*, the exposure to multiple risk factors during early childhood was significantly related to lower reading scores, $B = -4.56$, $p < .05$, and the magnitude of this association did not vary significantly between first and third grade, $B = .26$, *ns*. An effect size was computed to represent the magnitude of the association in standard deviation units of risk and reading, and indicated moderate association, $d = -.30$.

The second model added parenting and school poverty to the base model. Risk was no longer a significant predictor of reading score in this analysis that included parenting and schooling variables. Results, shown in the rows labeled *Model 2* indicated that parenting was a significant predictor of reading, $B = 5.86, p < .05$. The effect size for risk had reduced about two-thirds from $d = -.30$ to $d = -.10$. The Sobel test of mediation suggested that parenting served to mediate the association between exposure to risk and reading, $z = 2.07, p = .04$. Neither child care quality nor school poverty appeared to be mediators or moderators of risk.

The third model added the child protective factors, and results are shown in the rows labeled *Model 3*. Children who entered school with better language skills demonstrated better reading skills at all ages, $B = 5.68, p < .05$. The association between risk and reading skills was substantially smaller than in Model 1, suggesting that these child characteristics, in part, mediated this association for children exposed to risk, $z = 2.19, p = .03$. Parenting, $B = 4.00, ns$, no longer provided independent prediction of reading skills when child language was also considered. In contrast, social skills did not mediate or moderate the association between risk and reading skills.

Mathematics. The second column in Table 5 shows the coefficients and their standard errors from the HLM analyses of the WJ-R broad math Raush score. As shown under Model 1, children who experienced more risk factors in early childhood scored significantly lower on their mathematics tests, $B = -4.26, p < .01, d = -.31$, and this negative moderate association remained relatively consistent from first to third grade, $B = -1.04, ns$.

The next model examined parenting and schooling. The main effects of risk were substantially smaller in these analyses that also considered parenting and school characteristics. The multiple risk index was a non-significant predictor, with an effect size of $d = -.19$, a reduction of 39% compared with Model 1. This model also indicates that mathematics scores tend to be higher when parenting scores are higher, especially if children experienced higher levels of risk during early childhood, $B = 3.81, p < .05$. Parenting appeared to mediate the association between risk and mathematics score for children exposed to risk in early childhood, $z = 2.08, p < .05$. The extent to which parenting served as a protective factor is illustrated by contrasting the estimated effect size when parenting was low (twenty-fifth percentile score), $d = -.32$, and when parenting was high (seventy-fifth percentile score), $d = -.02$.

In addition, these analyses suggest that child care quality increasingly serves as a protective factor over time, $B = 1.52, p < .05$. For children who attended higher quality child care, exposure to risk was negatively related to

TABLE 5
 Hierarchical Linear Model Growth Curve Analysis: Unstandardized Regression Coefficients from Group Growth Curve

		WJ-R Reading	WJ-R Mathematics	SSRS Social Skills	SSRS Behavior Problems
Intercept	B (se)	475.09 (2.01)	473.37 (1.44)	94.22 (1.38)	108.39 (1.61)
Age	B (se)	18.15 (0.85)***	15.97 (0.53)***	.53 (0.58)	-0.15 (0.60)
Age ²	B (se)	-4.58 (0.71)***	-0.03 (0.65)	-0.56 (0.55)	0.22 (0.55)
Men	B (se)	-9.83 (3.89)*	-1.58 (2.68)	1.35 (2.40)	-0.05 (2.92)
Age × men	B (se)	3.13 (1.71)	-0.09 (1.05)	-0.47 (1.15)	0.48 (1.19)
Maternal IQ	B (se)	0.31 (0.22)	0.29 (0.15)	-0.04 (0.14)	-0.03 (0.17)
Maternal IQ × age	B (se)	0.03 (0.10)	-0.02 (0.06)	0.15 (0.07)	-0.05 (0.07)
Risk	B (se)	-4.56 (2.24)*	-4.26 (1.54)**	-2.82 (1.35)*	4.05 (1.64)*
Risk × age	B (se)	0.26 (1.00)	-1.04 (0.62)	0.20 (0.67)	-0.05 (0.69)
Model 2: Parenting and schooling					
Risk	B (se)	-1.44 (2.56)	-2.78 (1.72)	-0.77 (1.58)	1.03 (1.85)
Parenting	B (se)	5.86 (2.58)*	3.21 (1.73)	4.50 (1.65)**	-6.52 (1.92)***
Parenting × age	B (se)	-1.66 (1.20)	0.20 (0.73)	0.22 (0.80)	1.04 (0.79)
Poor school	B (se)	-2.26 (3.30)	-2.33 (2.38)	-0.83 (2.42)	-3.42 (2.63)
Poor school × age	B (se)	-0.83 (2.11)	-2.21 (1.34)	-2.28 (1.50)	3.17 (1.50)*
Child care quality	B (se)	-0.06 (2.15)	-0.56 (1.45)	0.50 (1.38)	-1.24 (1.61)
CC quality × age	B (se)	1.28 (1.03)	-0.18 (0.64)	-1.08 (0.69)	0.22 (0.68)
Risk × parenting	B (se)	2.57 (2.28)	3.81 (1.55)*	-0.60 (1.40)	1.18 (1.63)
Risk × age × parenting	B (se)	-1.60 (0.90)	-0.15 (.61)	-1.32 (0.65)*	1.08 (0.63)
Risk × CC quality	B (se)	-1.16 (2.40)	-1.39 (1.62)	2.69 (1.49)	-2.50 (1.75)
Risk × age × CC quality	B (se)	1.89 (1.10)	1.52 (.68)*	0.92 (0.72)	-1.92 (0.71)**

Model 3: PK child language and social skills

Risk	B (se)	-1.49 (2.88)	-1.07 (1.78)	-0.48 (1.84)	-0.20 (2.12)
Parenting	B (se)	4.00 (2.86)	2.29 (1.77)	3.53 (1.84)	-5.68 (2.12)**
PK language	B (se)	5.68 (2.73)*	6.57 (1.70)**	2.86 (1.79)	-2.21 (2.06)
PK language × age	B (se)	-0.93 (1.33)	-.99 (.79)	-0.39 (0.88)	0.29 (0.87)
PK social skills	B (se)	0.05 (0.19)	-.13 (.12)	0.08 (0.12)	-0.11 (0.14)
PK social skills × age	B (se)	-0.05 (0.09)	-.04 (.05)	0.02 (0.06)	-0.01 (0.06)
PK language × risk	B (se)	2.54 (2.74)	3.80 (1.70)*	1.17 (1.79)	.04 (2.08)
PK language × risk × age	B (se)	-0.03 (1.35)	-1.27 (.80)	-0.87 (0.88)	0.00 (0.87)
PK social skills × risk	B (se)	-0.19 (0.25)	-.16 (.15)	-0.09 (0.16)	0.10 (0.18)
PK social × risk × age	B (se)	-0.03 (0.12)	-.09 (.07)	-0.01 (0.08)	0.05 (0.08)

Note. WJ-R = Woodcock-Johnson Tests of Achievement-Revised. SSRS = Social Skills Rating System. CC = child care. PK = prekindergarten. Boldface indicates statistically significant coefficients.

* $p < .05$. ** $p < .01$. *** $p < .001$.

mathematics skills in first grade (e.g., $d = -.33$ at the seventy-fifth percentile score on child care quality), and exposure to risk was less negatively related to mathematics skills by third grade (e.g., $d = -.17$ at the seventy-fifth percentile). In contrast, risk became a stronger negative predictor over time for children who attended lower quality child care centers.

When the children's prekindergarten language and social skills were added in Model 3, the association between risk and mathematics skills was substantially smaller than in Model 1 suggesting that these child characteristics might also, in part, mediate this association. In addition, results indicate that language skills at entry to kindergarten are related to the acquisition of mathematics skills. Children who entered school with better language skills demonstrated better mathematics skills at all ages, $B = 6.57$, $p < .01$, and language skills at entry to school appeared to mediate the association between risk and mathematics skills, $z = 2.59$, $p < .01$. Language skills also served as a protective factor, as evidenced by the Language \times Risk interaction, $B = 3.80$, $p < .05$. The effect size for risk when language scores were at the twenty-fifth percentile, $d = -.25$, is substantially more negative than the effect size when language scores were at the seventy-fifth percentile, $d = .07$.

Social skills. The results from analyses of teacher ratings of the child's social skills from kindergarten through third grade are shown in the third column in Table 5. Again, exposure to multiple risks is a substantial negative predictor, $B = -2.82$, $p < .05$, $d = -.19$, and its association does not change reliably over time, $B = .20$, *ns*.

Adding parenting and school characteristics in Model 2 substantially reduced the association between risk and social skills. The effect size, $d = .05$, is considerably smaller (i.e., a reduction of 74%) and not reliably different from zero. Teachers rated children's social skills as higher when parenting scores were also higher, $B = 4.50$, $p < .01$, and parenting appeared to mediate, in part, the association between exposure to risk and teacher ratings of social skills, $z = 2.50$, $p < .05$. However, exposure to risk becomes a stronger negative predictor over time for children with higher than lower parenting scores (Age \times Risk \times Parenting), $B = -1.32$, $p < .05$. Risk was not significantly related to social skills in first grade for children regardless of the quality of parenting, but children who were exposed to more risk during early childhood were rated slightly lower on social skills by their third grade teacher when parents were more responsive, $d = -.13$ at the seventy-fifth percentile score for parenting, and not for when parents were less responsive, $d = .02$ at the twenty-fifth percentile score. This finding is somewhat easier to interpret by focusing on the association between parenting and social skills as moderated by risk. From this viewpoint, the in-

teraction suggests that parenting is positively related to social skills for all children in kindergarten. It becomes a weaker predictor over time for children who experienced higher levels of risk in early childhood, but remains a consistent predictor over time for other children. Finally, neither child care quality nor school poverty shows evidence of mediation or moderation. Adding the child's language and social skills at entry to kindergarten in Model 3 does not yield any significant predictors.

Behavior problems. The last outcome examined was the teacher's rating of behavior problems on the SSRS. On this measure, higher scores indicate more problems. Again, children who experienced more risk factors in early childhood looked more problematic. They were rated as showing more problems across time, $B = 4.05, p < .05, d = .27$, with no reliable difference in this moderate negative association across the four grades, $B = -.05, ns$.

Adding the hypothesized protective factors yields evidence of mediation and moderation. Risk is not significantly related to behavior problems, and the effect size is substantially smaller, $d = -.07$. This analysis suggests that children whose parents are more responsive and stimulating also are rated as having fewer problem behaviors, $B = -6.52, p < .001$, and that parenting appears to serve as a mediator in the association between exposure to risk and teacher ratings of behavior problems, $z = 2.83, p < .01$.

In addition, child care quality emerged as a protective factor over time, as shown by the interaction among risk, child care quality, and year in school, $B = -1.92, p < .05$. The estimated effect size for risk among children who had attended higher quality child care programs (i.e., effect size for risk estimated at the seventy-fifth percentile score for child care quality) decreased from kindergarten, $d = .04$, to third grade, $d = -.15$, whereas the effect sizes for risk among children who attended lower quality child care programs (i.e., effect sizes for risk estimated at the twenty-fifth percentile score for child care quality) increased from kindergarten, $d = .11$, to third grade, $d = .29$. That is, these findings suggest that exposure to risk is related to a pattern of increasing numbers of problem behaviors reported by teachers over time when children had attended lower quality child care programs during early childhood and to decreasing numbers of problems behavior over time when they had attended higher quality programs.

School characteristics also related to teacher ratings of behavior problems. The interaction between school poverty and age, $B = 3.33, p < .05$, suggests that teachers rated children as showing more problems over time at schools with more than half of the students receiving free or reduced priced lunch. That is, at schools serving primarily low-income children, children were characterized by increasing behavior problem scores over

time, whereas schools that served fewer low-income children were characterized by decreasing problem behavior scores over time.

The final model indicates that the child's social and language skills at entry to school are not significantly related to teacher ratings of behavior problems when family, child care, and school characteristics are also considered.

DISCUSSION

Results from this study provide further evidence that children who experience multiple risk factors are more likely to experience academic and social-emotional problems during early childhood, the transition to school, and early school years. Perhaps more important, these analyses identify child, family, and school factors that appear to mediate or moderate associations between risk and outcomes for African American children. Notably, parenting appears to mediate these associations between risk and all four outcomes (reading, mathematics, social skills, and behavior problems) and appears to be a protective factor for the acquisition of mathematics skills. Child care quality emerged as a protective factor over time for the acquisition of mathematics skills and in the development of behavior problems during early primary school years. The child's language skills at entry to kindergarten mediated associations between risk and the two achievement outcomes and moderated the association between risk and mathematics.

The association between the extent of exposure to social risk factors and impaired development is one of the most consistent findings in child development (Sameroff & Fiese, 2000). Children in this study who experienced more social risk factors during early childhood demonstrated lower reading and mathematics skills in standardized tests, fewer prosocial skills, and more problem behaviors as rated by their teachers during the first four years of elementary school. Risk was related to the overall level of academic outcomes but not to patterns of change over time. These results are consistent with previous studies that also have reported lower levels of cognitive, academic, and social skills when children are exposed to more social risk (Deater-Deckard et al., 1998; Gutman et al., 2002, 2003; Krishnakumar & Black, 2002; Linver et al., 2002; Masten & Coatworth, 1995; Pianta et al., 1990; Rutter, 1979; Sameroff et al., 1987, 1993). They extend the previous work that demonstrated parenting mediates the association between early risk and school-related outcomes in early childhood (Brody & Flor, 1998; Duncan & Brooks-Gunn, 2000; Linver et al., 2002; Krishnakumar & Black, 2002) by providing further evidence that parenting accounts for a

substantial proportion (40–74%) of the negative association between exposure to risk and academic trajectories during early elementary years. Furthermore, analyses provide some evidence that children's language at entry to school already reflects the negative impact of risk and suggest that early exposure to risk is related to later academic outcomes because risk is related to language and language is an essential skill for learning reading and mathematics skills.

Protective Factors

Identification of factors associated with success among youth exposed to multiple social risk factors is important for research and policy. Results from this study provide further evidence of protective factors observed in previous studies and extended those findings by indicating specific factors that seem to protect children from the negative effects of adversity. Obtaining evidence for protective factors indicates that risk has an impact on child outcomes through a pathway model (Hertzman & Wiens, 1996), providing some hope that children exposed to risk in early childhood are not permanently impaired by their negative early experiences.

Parenting. As in previous studies (Brody et al., 2002; Krishnakumar & Black, 2002; Linver et al., 2002; Masten et al., 1999), this study indicates that the extent of exposure to early social risk is a weaker predictor of mathematics when home environments are more stimulating and responsive and indicates that parenting also protected children from the adverse effects of risk on academic achievement. In contrast, these findings also suggest that children whose mothers are more responsive and stimulating tend to have better social skills according to their teachers, but this became less true over time for children who experienced more social risk in early childhood. Therefore, our results suggest that, although parenting appears to mediate the negative impact of risk on both academic and social-emotional outcomes during the first years of primary school, responsive and stimulating parenting may protect children from the negative impact of risk on mathematics skills but may make children more vulnerable to the negative impact of risk in the acquisition of social skills between kindergarten and third grade.

Child care quality. In this study, children who attended higher quality child care programs appear to be somewhat protected from the association of exposure to risk to both higher levels of behavior problems and lower levels of mathematics skills between kindergarten and third grade. This finding is somewhat consistent with the finding from the two previous

studies. The larger Cost, Quality, and Child Outcomes study (Peisner-Feinberg et al., 2001) reported that preschool quality is related to more advanced mathematics skills and fewer behavior problems through second grade for children whose mothers had less education. The Abecedarian Project (Campbell et al., 2001) demonstrated that high quality child care enhances academic skills from early childhood into early adulthood. Therefore, these findings provide further evidence that quality child care might be an important means to reduce the risk of behavior problems and increase academic skills among a group of children who are at higher risk for developing serious behavior problems and underachieving academically during their school years.

School poverty. Results from this study provide limited evidence that attending schools in which more than half of the students are from low-income families may serve as a risk factor. Our results indicates that teachers report increasing numbers of behavior problems over the first four years among children who attended a school in which at least half of the children were from low-income families.

Child characteristics. Previous studies provided contradictory evidence regarding whether child characteristics served to protect children from the adverse effects of risk. One study reported that parental ratings of intelligence served as a protective factor (Masten et al., 1999), but another study found that a direct assessment of IQ at entry to school was not protective (Gutman et al., 2002). Rather than study intelligence globally, we examine language skills specifically because language facility is one of the more important skills underlying academic achievement and accounts for much of the association between intelligence and academic achievement (Neisser et al., 1996; Scarborough, 2001). Results support our hypothesis that language skills specifically could serve as a protective factor, finding that the extent of exposure to early social risk was a weaker predictor of mathematics for children who started school with better language skills and a stronger predictor for children who started school with lower language skills.

In summary, the results from this study and from previous research (Gutman et al., 2003) support the importance of characteristics of the child and of parenting as protective factors among children exposed to multiple social risk factors. High correlations between our measures of risk and these protective factors suggest that children who experience high levels of social risk in early childhood are substantially less likely to experience these protective factors. Nevertheless, results from this study and other studies indicate that children who experience both protective and risk factors can show similar patterns of academic trajectories as

children who experience fewer risk factors. This finding suggests that early childhood programs that enhance children's language or parents' sensitivity and responsiveness offer an opportunity to reduce the apparent negative impact of risk. Because child care research has fairly consistently suggested that high-quality child care experiences enhance intellectual and especially language development of children, particularly children from low-income families (Hertzman & Wiens, 1996; Lamb, 1998; Magnuson, Meyers, Ruhn, & Waldfogel, 2004; Vandell, 2004), it is likely that programs such as Head Start or prekindergarten programs may be able to achieve their goals of reducing the long-term deleterious association between exposure to risk and academic trajectories. In contrast, the parenting intervention literature has failed to demonstrate consistent evidence of changing child outcomes through changing parenting styles for families with multiple risk factors associated with poverty (Brooks-Gunn & Markman, 2005; St. Pierre, Layzer, & Barnes, 1995), although parenting interventions have proven successful for families undergoing divorce (Patterson, DeGarmo, & Forgatch, 2004) and have been especially successful with families with lower parenting quality at baseline (Tein, Sandler, MacKinnon, & Wolchik, 2004). Indeed, previous work indicates that high quality child care was one of the strongest predictors of children's language skills during early childhood in this sample (Burchinal et al., 2000) and, over time, of lower levels of behavior problems in this study.

Limitations and Strengths

Several limitations need to be considered. First, the sample size is moderate, and therefore power to detect interactions is limited (Cohen, 1988). Accordingly, despite our attempts to form concise composites to represent risk and protective factors, we likely lack sufficient power to identify other important protective or vulnerability factors in this sample. In addition, we conducted many analyses so our results need to be interpreted cautiously, especially for findings not obtained across multiple outcomes. Second, the sample is clearly a sample of convenience, and results can be generalized to the extent that the observed main effects and interactions in our HLM regression analyses represent processes that operate relatively consistently in the population. Third, as in any study, it is important to replicate findings — particularly those involving interactions because they are especially vulnerable to being specific to a given sample and because of the number of analyses conducted in this study. Fourth, we assumed that our measures of parenting, HOME and maternal teaching style, were consistent between entry to school and third grade. It is likely that bidirectional

effects are present, and therefore children who have better academic skills may have also influenced their parents as well as parents with more optimal teaching styles influencing their children.

This study has a number of strengths as well. Children were recruited in their first year of life, so we were able to characterize the exposure to risk from infancy through entry to school. Extensive psychometric analyses were conducted to define risk and protective factors in a manner that would optimize our ability to detect mediation and moderation. The study employed direct assessments of both the academic skills of children, parenting, and the classroom and did not rely solely on either parent or teacher ratings or grades as in previous studies with larger sample sizes.

In conclusion, this study provides further evidence that exposure to multiple risk factors during early childhood is related to lower academic achievement skills and more problem behavior in school and responsive and stimulating care by parents and child care providers can serve to protect children from the apparent deleterious effects of exposure to risk. In addition, results suggest that child characteristics at entry to school such as children's language mediate, in part, associations between risk and academic achievement and that language skills may serve as a protective factor. As such, these findings provide further evidence supporting current policies related to ensuring that children exposed to risk can attend child care programs that enhance cognitive and language skills such as Head Start, prekindergarten programs, or high-quality child care (Magnuson et al., 2004).

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REFERENCES

- Abidin, R. R. (1995). *Parenting Stress Index* (3rd ed.). Charlottesville, VA: Pediatric Psychology Press.
- Adams, M. J., Treiman, R., & Presley, M. (1998). Reading, writing and literacy. In I. E. Sigel & K. A. Renninger (Eds.), *Handbook of child psychology: Vol. 4. Child psychology in practice* (pp. 275–356). New York: Wiley.
- Aiken, L. S., West, S. G., Schwalm, D. E., Carroll, J., & Hsiung, S. (1998). Comparison of a randomized and two quasi-experiments in a single outcome evaluation: Efficacy of a university-level remedial writing program. *Evaluation Review*, 22, 207–244.
- Alexander, K. L., & Entwisle, D. R. (1998). Achievement in the first two years of school: Patterns and processes. *Monographs of the Society for Child Development*, 53.
- American Speech-Language-Hearing Association. (2001). Roles and responsibilities of speech-language pathologists with respect to reading and writing in children and adolescents. *ASHA Supplement*, 21, 17–27.
- Bradley, R. H., Caldwell, B. M., Rock, S. L., Ramey, C. T., Barnard, K. E., Gray, C., et al. (1989). Home environment and cognitive development in the first three years: A collaborative study involving six sites and three ethnic groups in North America. *Developmental Psychology*, 25, 217–235.
- Bradley, R. H., Corwyn, R. F., Burchinal, M., McAdoo, H. P., & Garcia Coll, C. (2001). The home environments of children in the United States: Part 2. Relations with behavioral development from birth through age 13. *Child Development*, 72, 1868–1886.
- Brody, G. H., Dorsey, S., Forehand, R., & Armistead, L. (2002). Unique and protective contributions of parenting and classroom processes to the adjustment of African-American children living in single-parent families. *Child Development*, 73, 274–286.
- Brody, G. H., & Flor, D. L. (1998). Maternal resources, parenting practices, and child competence in rural single-parent African-American families. *Child Development*, 69, 803–816.
- Bronfenbrenner, U., & Morris, P. A. (1998). The ecology of developmental processes. In W. Damon (Ed.), *Handbook of child psychology* (Vol. 4, pp. 993–1028). New York: Wiley.
- Brooks-Gunn, J., & Markman, L. B. (2005). The contribution of parenting to ethnic and racial gaps in school readiness. *The Future of Our Children*, 15, 139–168.
- Bryk, A. S., & Raudenbush, S. W. (2002). *Hierarchical linear models: Applications and data analysis methods* (2nd ed.). Thousand Oaks, CA: Sage.
- Burchinal, M. R., Campbell, F. A., Bryant, D. M., Wasik, B. A., & Ramey, C. T. (1997). Early intervention and mediating processes in cognitive performance of children of low-income African-American families. *Child Development*, 68, 935–954.
- Burchinal, M. R., Peisner-Feinberg, E., Bryant, D. M., & Clifford, R. (2000). Children's social and cognitive development and child care quality: Testing for differential associations related to poverty, gender, or ethnicity. *Journal of Applied Developmental Sciences*, 4, 149–165.
- Burchinal, M. R., Roberts, J. E., Hooper, S., & Zeisel, S. A. (2000). Social risk and developmental patterns during the first four years. *Developmental Psychology*, 36, 793–807.
- Burchinal, M. R., Roberts, J. E., Nabors, L. A., & Bryant, D. M. (1996). Quality of center child care and infant cognitive and language development. *Child Development*, 67, 606–620.

- Burchinal, M. R., Roberts, J. E., Riggins, R., Zeisel, S., Neebe, E., & Bryant, M. (2000). Relating quality of center child care to early cognitive and language development longitudinally. *Child Development, 71*, 339–357.
- Caldas, S. J., & Bankston, C. (2001). Effect of school population socioeconomic status on individual academic achievement. *Journal of Educational Research, 90*, 269–277.
- Campbell, F. A., Pungello, E. P., Miller-Johnson, S., Burchinal, M. R., & Ramey, C. (2001). The development of cognitive and academic abilities: Growth curves from an early intervention educational experiment. *Developmental Psychology, 37*, 231–242.
- Children's Defense Fund. (2001). *The state of America's children: Yearbook 2001*. Washington, DC: Author.
- Clarke-Stewart, K. A., Gruber, C. P., & Fitzgerald, L. M. (1994). *Children at home and in day care*. Mahwah, NJ: Lawrence Erlbaum Associates, Inc.
- Cohen, J. (1988). *Statistical power analysis for the behavioral sciences*. Hillsdale, NJ: Lawrence Erlbaum Associates, Inc.
- Coleman, J. S. (1990). *Equality and achievement in education*. Boulder, CO: Westview.
- The College Board. (1999). *Reaching to top: A report of the National Task Force on Minority High Achievement*. New York: Author.
- Cummings, E. M., & Davis, P. T. (1994). Maternal depression and child development. *Journal of Child Psychology and Psychiatry, 35*, 73–112.
- De Temple, J. (1998). *Job Wave II Observational Coding: Language and literacy coding of the JOBS Observational Study*. Unpublished manuscript, Harvard Graduate School of Education, Cambridge, MA.
- Dearing, E., Taylor, B. A., & McCartney, K. (2004). Implications of family income dynamics for women's depressive symptoms during the first 3 years after childbirth. *American Journal of Public Health, 94*, 1372–1377.
- Deater-Deckard, K., Dodge, K. A., Bates, J. E., & Pettit, G. S. (1998). Multiple risk factors in the development of externalizing behavior problems: Group and individual differences. *Development and Psychopathology, 10*, 469–493.
- Duncan, G. J., & Brooks-Gunn, J. (2000). Family poverty, welfare reform, and child development. *Child Development, 71*, 188–196.
- Dunn, L. M., & Dunn, L. M. (1981). *Peabody Picture Vocabulary Test—Revised*. Circle Pines, MN: American Guidance Service.
- Dunn, L. M., & Dunn, L. M. (1997). *Peabody Picture Vocabulary Test* (3rd ed.). Circle Pines, MN: American Guidance Service.
- Elardo, R., & Bradley, R. H. (1981). The Home Observation for Measurement of the Environment (HOME) Scale: A review of research. *Developmental Review, 1*, 113–145.
- Elder, G. H., Jr., & Conger, R. D. (1994). *Families in troubled times: Adapting to change in rural America*. Hawthorne, NY: Aldine de Gruyter.
- Entwisle, D. R., & Alexander, K. L. (1992). Summer setback: Race, poverty, school composition, and mathematics achievement in the first two years of school. *American Sociological Review, 57*, 72–84.
- Garnezy, N. (1993). Children in poverty: Resilience despite risk. *Psychiatry: Interpersonal and Biological Processes, 56*, 127–136.
- Gresham, F. M., & Elliott, S. N. (1990). *Social Skill Rating System*. Circle Pines, MN: American Guidance Services.
- Gutman, L. M., Sameroff, A. J., & Cole, R. (2003). Academic growth curve trajectories from 1st grade to 12th grade: Effects of multiple social risk factors and preschool child factors. *Developmental Psychology, 39*, 777–790.
- Gutman, L. M., Sameroff, A. J., & Eccles, J. S. (2002). The academic achievement of African-American students during early adolescence: An examination of multiple risk, promotive, and protective factors. *American Journal of Community Psychology, 30*, 367–400.

- Harms, T., & Clifford, R. M. (1980). *Early Childhood Environment Rating Scale*. New York: Teachers College Press.
- Harms, T., Cryer, D., & Clifford, R. M. (1990). *The Infant/Toddler Day Care Rating Scale*. New York: Teachers College Press.
- Hertzman, C., & Wiens, M. (1996). Child development and long-term outcomes: A population health perspective and summary of successful interventions. *Sociological Science in Medicine*, 43, 1083–1095.
- Hooper, S., Burchinal, M. R., Roberts, J. E., Zeisel, S., & Neebe, E. C. (1998). Social and family risk factors for infant development at one year: An application of the cumulative risk model. *Journal of Applied Developmental Psychology* 19, 85–96.
- Jackson, S. C., & Roberts, J. E. (2001). Complex syntax production of African-American preschoolers. *Journal of Speech, Language and Hearing Research*, 44, 1083–1096.
- Klinger, D. A. (2000). Hierarchical linear modelling of student and school effects on academic achievement. *Canadian Journal of Education*, 25, 41–55.
- Kontos, S., Howes, C., Shim, M., & Galinsky, E. (1996). Does training make a difference to quality in family child care? *Early Childhood Research Quarterly*, 11, 427–445.
- Krishnakumar, A., & Black, M. M. (2002). Longitudinal predictors of competence among African-American children: The role of distal and proximal risk factors. *Applied Developmental Psychology*, 23, 237–266.
- Lamb, M. (1998). Nonparental child care: Context, quality, correlates, and consequences. In I. Sigel & A. Renninger (Eds.), & W. Damon (Series Ed.), *Handbook of child psychology: Vol. 4. Child psychology in practice* (5th ed.). New York: Wiley.
- Lazar, I., & Darlington, R. (1982). Lasting effects of early education: A report from the Consortium for Longitudinal Studies. *Monographs of the Society for Research in Child Development*, 47(2–3, Serial No. 195).
- Linver, M. R., Brooks-Gunn, J., & Kohen, D. E. (2002). Family processes in pathways from income to young children's development. *Developmental Psychology*, 38, 719–734.
- Luster, T., & McAdoo, H. P. (1994). Factors related to the achievement and adjustment of young African-American children. *Child Development*, 65, 1080–1094.
- MacKinnon, D., Lockwood, C. M., Hoffmann, J. M., West, S. G., & Sheets, V. (2002). A comparison of methods to test mediation and other intervention variable effects. *Psychological Methods*, 7, 83–104.
- Magnuson, K. A., Meyers, M. K., Ruhm, C. J., & Waldfogel, J. (2004). Inequality in preschool education and school readiness. *American Educational Research Journal*, 41, 115–157.
- Masten, A. S., Best, K. M., & Garmezy, N. (1990). Resilience and development: Contributions from the study of children who overcome adversity. *Development and Psychopathology*, 2, 425–444.
- Masten, A. S., & Coatworth, J. D. (1995). Competence, reliance, and psychopathy. In D. Cicchetti & D. J. Cohen (Eds.), *Developmental psychopathology: Vol. 2. Risk, disorder, and adaptation* (pp. 715–752). New York: Wiley.
- Masten, A. S., Coatsworth, J. D., Neemann, J., Gest, S. D., Tellegen, A., & Garmezy, N. (1995). The structure and coherence of competence from childhood through adolescence. *Child Development*, 66, 1635–1659.
- Masten, A. S., Hubbard, J. J., Gest, S. D., Tellegen, A., Garmezy, N., & Ramirez, M. (1999). Competence in the context of adversity: Pathways to resilience and maladaptation from childhood to late adolescence. *Development and Psychopathology*, 11, 143–169.
- McCartney, K. (1984). The effect of quality of day care environment upon children's language development. *Developmental Psychology*, 20, 244–260.
- McClelland, G. H., & Judd, C. M., (1993). Statistical difficulties of detecting interactions and moderator effects. *Psychological Bulletin*, 114, 376–390.
- McLoyd, V. C. (1998). Socioeconomic disadvantage and child development. *American Psychologist*, 53, 185–204.

- Neisser, U., Boodoo, G., Bouchard, T. J., Boykin, A. W., Brody, N., Ceci, S. J., et al. (1996). Intelligence: Knowns and unknowns. *American Psychologist*, *51*, 77–101.
- National Institute of Child Health and Human Development Early Child Care Research Network. (1999). Chronicity of maternal depressive symptoms, maternal sensitivity, and child functioning at 36 months: Results from the NICHD Study of Early Child Care. *Developmental Psychology*, *35*, 1297–1310.
- National Institute of Child Health and Human Development Early Child Care Research Network. (2000). The relation of child care to cognitive and language development. *Child Development*, *71*, 958–978.
- National Institute of Child Health and Human Development Early Child Care Research Network. (2002). Early child care and children's development prior to school entry: Results from the NICHD Study of Early Child Care. *American Educational Research Journal*, *39*, 133–164.
- National Institute of Child Health and Human Development Early Child Care Research Network. (2004). Multiple pathways to early academic achievement. *Harvard Educational Review*, *1*–29.
- National Institute of Child Health and Human Development Early Child Care Research Network. (2005). Early child care and children's development in the primary grades: Follow-up results from the NICHD Study of Early Child Care. *American Educational Research Journal*, *43*, 537–570.
- NICHD Early Child Care Research Network, & Duncan, G. J. (2003). Modeling the impacts of child care quality on children's preschool cognitive development. *Child Development*, *74*, 1454–1475.
- Patterson, G. R., DeGamo, D., & Forgatch, M. S. (2004). Systematic change in families following prevention trials. *Journal of Abnormal Child Psychology*, *32*, 621–633.
- Peisner-Feinberg, E. S., & Burchinal, M. R. (1997). Relations between preschool children's child-care experiences and concurrent development: The Cost, Quality, and Outcomes Study. *Merrill-Palmer Quarterly*, *43*, 27.
- Peisner-Feinberg, E. S., Burchinal, M. R., Clifford, R. M., Culkin, M. L., Howes, C., Kagan, S. L., et al. (2001). The relation of preschool child care quality to children's cognitive and social developmental trajectories through second grade. *Child Development*, *72*, 1534–1553.
- Pianta, R. C., & Cox, M. J. (1999). *The transition to kindergarten*. Baltimore, MD: Brookes.
- Pianta, R. C., Egeland, B., & Stroufe, L. A. (1990). Maternal stress and children's development: Prediction of school outcomes and identification of protective factors. In J. E. Rolf, A. S. Masten, D. Cicchetti, K. H. Nuechterlein, & S. Weintraub (Eds.), *Risk and protective factors in the development of psychopathology* (pp. 215–235). New York: Cambridge University Press.
- Poe, M. D., Burchinal, M. R., & Roberts, J. E. (2004). Early language and the development of children's reading skills. *Journal of School Psychology*, *42*, 315–332.
- Rauh, V. A., Lamb Parker, F., Garfinkel, R. S., Perry, J., & Andrews, H. F. (2003). Biological, social, and community influences on third grade reading levels of minority Head Start children: A multilevel approach. *Journal of Community Psychology*, *31*, 255–278.
- Roberts, J. E., Burchinal, M. R., Jackson, S. C., Hooper, S. R., Roush, J., Mundy, M., et al. (2000). Otitis media in childhood in relation to preschool language and school readiness skills among black children. *Pediatrics*, *106*, 725–735.
- Roberts, J. E., Burchinal, M. R., Medley, L. P., Zeisel, S. A., Mundy, M., Roush, J., et al. (1995). Otitis media, hearing sensitivity, and maternal responsiveness in relation to language during infancy. *Journal of Pediatrics*, *126*, 481–489.
- Roberts, J. E., Burchinal, M. R., & Zeisel, S. A. (2002). Otitis media in early childhood in relation to children's school-age language and academic skills. *Pediatrics*, *110*, 696–706.

- Roberts, J. E., Jurgens, J., & Burchinal, M. (2005). The role of home literacy practices in pre-school children's language and emergent literacy skills. *Journal of Speech, Language, and Hearing Research, 48*, 1–16.
- Rutter, M. (1979). Psychosocial resilience and protective mechanism. *American Journal of Orthopsychiatry, 57*, 316–331.
- Sameroff, A. J., & Fiese, B. H. (2000). Models of development and ecological risk. In C. H. Zeanah (Ed.), *Handbook of infant mental health* (2nd ed., pp. 3–19). New York: Guilford.
- Sameroff, A. J., Seifer, R., Baldwin, A., & Baldwin, C. (1993). Stability of intelligence from pre-school to adolescence: The influence of social and family risk factor. *Child Development, 64*, 80–97.
- Sameroff, A. J., Seifer, R., Barocas, R., Zax, M., & Greenspan, S. (1987). Intelligence quotient scores of 4-year-old children: Social-environmental risk factors. *Pediatrics, 79*, 343–350.
- Sattler, J. M. (1990). *Assessment of children's intelligence and special abilities*. Boston: Allyn and Bacon.
- Scarborough, H. S. (2001). Connecting early language and literacy to later reading (dis)abilities: Evidence, theory, and practice. In S. B. Neuman & D. K. Dickinson (Eds.), *Handbook for research on early literacy*. New York: Guilford.
- Schliecker, E., White, D. R., & Jacobs, E. (1991). The role of day care quality in the prediction of children's vocabulary. *Canadian Journal of Behavioural Science, 23*, 12.
- Singer, J. D., & Willett, J. B. (2003). *Applied longitudinal data analysis: Modeling change and event occurrence*. New York: Oxford University Press.
- Snow, C. E., Burns, M. S., & Griffin, P. (1998). *Preventing reading difficulties in young children*. Washington, DC: National Academy Press.
- Snow, C. E., & Kurland, B. F. (1996). Sticking to the point: Talk about magnets as a context for engaging in scientific discourse. In D. Hicks (Ed.), *Child discourse and social learning* (pp. 189–219). Cambridge, UK: Cambridge University Press.
- St. Pierre, R. G., Layzer, J. I., & Barnes, H. V. (1995). Two-generation programs: Design, cost, and short-term effectiveness. *The Future of Children, 5*, 76–93.
- Tein, J. Y., Sandler, I. N., MacKinnon, D. P., & Wolchik, S. A. (2004). How did it work? Who did it work for? Mediation in the context of a moderated prevention effect for children of divorce. *Journal of Consulting and Clinical Psychology, 72*, 617–624.
- Vandell, D. (2004). Early child care: The known and unknown. *Merrill Palmer Quarterly, 50*, 387–414.
- Wechsler, D. (1955). *Wechsler Adult Intelligence Scale*. New York: Psychological Corporation.
- West, J., Denton, K., & Germino-Hausken, E. (2000). *America's kindergartners. Findings from the Early Childhood Longitudinal Study, Kindergarten Class of 1998–99, Fall 1998*. Report No. NCES 2000-070. Washington, DC: National Center for Education Statistics. Retrieved August 12, 2005, from <http://nces.ed.gov/pubs2000/2000070.pdf>
- Wigg, E., Secord, W. A., & Semel, E. (1992). *Clinical evaluation of language fundamentals—Pre-school*. San Antonio, TX: Psychological Corporation.
- Woodcock, R. W., & Johnson, M. B. (1990). *Woodcock-Johnson Psycho-Educational Battery—Revised*. Allen, TX: DLM Teaching Resources.

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