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Family Resources and Parenting Quality: Links to Children's Cognitive Development Across the First 3 Years

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Reciprocal associations among measures of family resources, parenting quality, and child cognitive performance were investigated in an ethnically diverse, low-income sample of 2,089 children and families. Family resources and parenting quality uniquely contributed to children's cognitive performance at 14, 24, and 36 months, and parenting quality mediated the effects of family resources on children's performance at all ages. Parenting quality continued to relate to children's cognitive performance at 24 and 36 months after controlling for earlier measures of parenting quality, family resources, and child performance. Similarly, children's early cognitive performance related to later parenting quality above other measures in the model. Findings merge economic and developmental theories by highlighting reciprocal influences among children's performance, parenting, and family resources over time.

Economists and developmental psychologists have long been concerned with the factors that promote positive developmental outcomes in children (see Foster, 2002; Haveman & Wolfe, 1995, for reviews). However, the lenses of these disciplines differ in significant ways. Economists investigate the effects of parents' skills and monetary and time resources on their children's educational attainment, health, consumption, and ultimate wealth (Aiyagari, Greenwood, & Seshadri, 1999; Becker, 1964, 1991; Ermisch & Francesconi, 2000). In comparison, developmental psychologists emphasize social capital, especially parenting quality, as a core influence on children's development (Bornstein, 2002; Collins, Maccoby, Steinberg, Hetherington, & Bornstein, 2000; Landry, Smith, & Swank, 2006). To date, few studies have integrated economic and developmental perspectives (Guo & Harris, 2000) and few do rarely document

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the dynamics of parenting, economic resources, and children's abilities across early developmental periods. The present study addresses these gaps by focusing on reciprocal and unique influences among measures of parental economic resources, parenting behaviors, and children's cognitive performance within and across children's first 3 years.

Integrating Developmental and Economic Perspectives

Building on the traditions of Vygotsky (1978) and Bruner (1983), the developmental literature has long demonstrated the beneficial effects of parenting quality on children's language development, literacy, cognition, and school readiness (Bornstein, 2002; Leseman & de Jong, 1998; Storch & Whitehurst, 2001). Three features of parenting have been acknowledged to promote positive outcomes in young children: sensitivity, cognitive stimulation, and warmth (also termed positive regard or positive affect; Ainsworth, Blehar, Waters, & Wall, 1978; Baumrind, 1973; Bloom, 1993; Bornstein, 2002; Carpenter, Nagell, & Tomasello, 1998; Hart & Risley, 1995; Huttenlocher, Haight, Bryk, Seltzer, & Lyons, 1991; Landry, Smith, Swank, Assel, & Vellet, 2001; Maccoby & Martin, 1983; Matas, Ahrend, & Sroufe, 1978; Nelson, 1973, 1988; Pettit, Bates, & Dodge, 1997; Rohner, 1986; Skinner, 1986; Snow, 1986; Tamis-LeMonda, Bornstein, & Baumwell, 2001; Tamis-LeMonda, Shannon, Cabrera, & Lamb, 2004; Watson, 1985; Woodward & Markman, 1998). *Parenting sensitivity* refers to parents' attunement to their children's cues, emotions, interests, and capabilities in ways that balance children's needs for support with their needs for autonomy. *Cognitive stimulation* refers to parents' didactic efforts to enrich their children's cognitive and language development by engaging children in activities that promote learning and by offering language-rich environments to their children. *Parents' warmth* refers to parents' expressions of affection and respect toward their children and is thought to support skills for learning such as mastery, security, autonomy, and self-efficacy.

In contrast to developmentalists' focus on parenting quality, economists continue to build on the seminal work of Becker (1964) who emphasized the ways in which family resources (e.g., money and time) influence children's learning outcomes (e.g., Blau, 1999; Ermisch & Francesconi, 2000; Haveman & Wolfe, 1995; Hill & O'Neill, 1994; Levy & Duncan, 2000; T. W. Schultz, 1973; T. P. Schultz, 1993). Economists align with developmental psychologists in asserting that parents with fewer resources encounter numerous constraints in meeting their children's needs. However, economists rarely include direct observations of the quality of parent–child interactions in their assessments. Instead, economists conceptualize parenting quality as investments of time and money (Aiyagari et al., 1999; Becker, 1991; Davies & Zhang, 1995; Foster, 2002). Parents who spend more time and monetary resources on children's consumption, education, and care have children who achieve more in terms of cognitive development, educational achievement, and future earnings (e.g., Brown & Flinn, 2006; Hill & O'Neill, 1994; Moore, Evans, Brooks-Gunn, & Roth, 2001).

Although studies by developmentalists and economists have largely been pursued independently, there has been heightened awareness of the need to consider how parenting quality and economic resources *jointly* influence children's developmental outcomes. Studies have revealed that sustained poverty has significant negative effects on children's developmental outcomes and that the quality of parenting plays an important role in mediating these effects particularly at early ages (Bradley et al., 1989; Duncan, Brooks-Gunn, & Klebanov, 1994; Duncan, Yeung, Brooks-Gunn, & Smith, 1998; Garrett, Ng'andu, & Ferron, 1994; Mayer, 1997; National Institute of Child Health and Human Development [NICHD] Early Child Care Research Network, 2005; Yeung, Linver, & Brooks-Gunn, 2002). For instance, Garrett et al. (1994) analyzed the impact of poverty variables and family characteristics on the quality of the home environment (measured by the Home Observation for Measurement of the Environment [HOME]; Caldwell & Bradley, 1984). They found that being born into poverty and the duration and depth of poverty adversely affected the quality of children's home environments. Yeung et al. (2002) considered parental investments, such as the provision of cognitive stimulating materials, and warm and punitive parenting practices, as mediating associations between family income and the developmental outcomes of 3- to 5-year-old children. Although family income was directly associated with children's language and behavioral outcomes, the relationship was mostly mediated by maternal distress and parenting practices. Duncan et al. (1994) found that family income and poverty status predicted cognitive and behavioral outcomes in preschoolers, with effects being largely mediated by the quality of children's home environments.

Remaining gaps. Together, this new wave of studies offers insight into the pathways through which family economic resources and parenting quality jointly influence children's achievement. However, despite recent attempts to document these dual influences,

such efforts remain rare and several noteworthy gaps persist.

First, with a few notable exceptions, studies that jointly consider the influences of parenting quality and economic resources on children's outcomes are based on limited measures of one or the other construct. Many studies in the economics literature define parenting in terms of expenditures on children or the amount of time spent with children. Most typically, these indicators of parenting derive from surveys and self-report rather than actual observations of the quality of parent–child interactions (as are more typical in developmental studies). Similarly, studies of family resources and child development often use measures that are not temporally linked to children's age. For example, measures of family income are often based on data from time frames that are either too narrow (e.g., 1 month) or overly broad (e.g., average family income across a span of years). Family income might fluctuate significantly over time due to changes in family structure, the work status of family members, or extraordinary circumstances, such as illness, and therefore should be measured during the specific age at which child development is being assessed. Furthermore, monetary resources are not the only resources that might influence children's cognitive development. Family structure, father residency, and parents' education and language skills have been found to contribute to children's development and academic achievement (Dahl & Lochner, 2005) and should be included in models that examine family resources and child development.

Second, few developmental studies offer a rigorous test of the contribution of parenting to children's outcomes. In particular, issues of selection bias or endogeneity are often not taken into account in analyses. For instance, parents with higher cognitive ability might be able to provide better parenting and also offer more resources to their children (in the form of income, the neighborhood where they choose to live, etc.). However, such characteristics of parents are not usually accounted for in analyses, thus creating selection bias in the estimates of the effects of parenting on children's outcomes. In addition, the associations between parenting practices and children's outcomes are reciprocal. With few exceptions, developmental studies do not regard both children's outcomes and parenting as potential dependent variables. In the absence of rigorous consideration of selection bias and endogeneity, developmental work is at risk of being ignored in the larger social science community (McCartney, Bub, & Burchinal, 2006).

Third, little is known about the contributions of family resources and parenting at *early developmental stages*. Family income has been found to most strongly influence children in the 1st years of life and has led to the recommendation that income-related policies target families with preschoolers (Duncan & Magnuson, 2005). Beyond family income, parent–child interactions shape the long-term trajectories of children already from infancy. For instance, children's literacy experiences influence their language and cognitive development by 14 months of age (Raikes et al., 2006; Rodriguez, Tamis-LeMonda, & Spellmann, 2005), and children's language and cognitive performance are stable from infancy to later ages (Adams, 1990; Campbell & Ramey, 1994; Magnuson, 2005; Mayer, 1997). However, most studies on family resources and parenting are based on families with school-aged children and adolescents. The few studies of "early childhood" include families with children older than 3 years or those with children across a span of ages (e.g., birth to 5 years). Such studies preclude precise statements about the ages at which parenting and family resources affect children in the first years of life.

Fourth, the effects of family resources and parenting on children's development have been typically examined at a single point in time, thereby limiting understanding of the dynamic processes that shape children's abilities across early development. An exception is longitudinal work showing that children who experienced low family income through early childhood showed worse academic achievement outcomes than children who experienced low levels of family income during middle childhood or adolescence (Duncan et al., 1998).

Longitudinal research also sheds light on reciprocal child–environment influences that might feed into children's developing abilities. Forty years ago, Bell (1968) argued against the dominant view in psychology that socialization was a parent-to-child process. He cited convincing research from human and animal studies that indicated the ways in which characteristics of offspring (ranging from physical appearance to skills and behaviors) evoked different responses in parents, which fed back into the development of their offspring. Ideas of reciprocity are further emphasized in current transactional models (e.g., Sameroff & MacKenzie, 2003), which posit that developmental outcomes are the product of continuous, dynamic interactions between children and their environments. In line with a transactional perspective, earlier measures of children's development should affect later measures of parenting just as earlier measures of parenting should affect later measures of children's development.

The limited focus on dynamic family–child influences is particularly evident in studies of low-income

families. Studies based on nationally representative data implicitly assume that parenting quality in low-income families influences children's development and mediates the effects of family economic conditions in similar ways as in middle- and upper income families. However, this assumption remains to be tested. In addition, policy concerns around the cognitive and language delays of children in poverty (Brooks-Gunn & Duncan, 1997; Hoff, Laursen, & Tardif, 2002; Votruba-Drzal, 2003) arise soon in development, with disparities already evident by 3 years of age (Ackerman, Brown, & Izard, 2004; Hart & Risley, 1995; Hirsh-Pasek & Golinkoff, 2002; Hoff, 2003; NICHD Early Child Care Research Network, 2001). It is therefore important to take a dynamic approach to examining reciprocal processes in low-income families.

The Current Study

In the current study, we take an integrative approach to understanding the contributions of family income and parenting quality to children's cognitive development in the first 3 years. A main contribution is the rigorous testing of parenting effects on children's development (and vice versa) above the influences of family resources and children's earlier abilities. We consider that family resources affect children's development directly as well as indirectly through the quality of parenting behaviors. We address gaps of previous studies by (a) integrating comprehensive measures of parenting quality and family economic resources that are linked to children's ages in analyses of family influences on children's development, (b) testing for selection bias and considering influences of children's development outcomes on parenting quality, (c) focusing on children's developmental outcomes during the first 3 years, and (d) taking a dynamic, transactional approach to analyses by considering lagged, reciprocal influences between parenting quality and children's development outcomes.

To these ends, we examined a group of low-income families and their children who participated in the Early Head Start (EHS) Research and Evaluation Study. Families were assessed at four specific points in early development (baseline, 14, 24, and 36 months). Our analyses include measures of family economic resources that are developmentally linked to children's age and measures of observed parenting quality. We emphasize processes in low-income families and explore reciprocal effects of family resources, parenting quality, and child development outcomes at adjacent ages.

Method

Participants

Participants were 2,089 mothers and their children drawn from the EHS Research and Evaluation Study.[1] The EHS project was a randomized control experimental evaluation conducted in 17 sites across the United States. Study participants were low-income families who had sought assistance from local EHS community agencies between 1996 and 1999. Data on family characteristics and functioning, parenting and children's health, and cognitive outcomes were obtained when mothers applied to EHS (i.e., baseline), as well as from interviews, observations, and direct child assessments when children were 14, 24, 36 months. These interviews were augmented with telephone interviews at 6, 15, and 26 months after the baseline interview.

The EHS Research and Evaluation Study originally recruited 3,001 mothers and their children. However, 355 of the initially recruited participants dropped out of the study soon after being selected and therefore had virtually no data. Of the remaining 2,646 families for whom some data existed, we included 2,089 families who had data on children's outcomes, parenting quality, and family income from *at least one of the three assessments*. This sample did not differ from the sample of families who did not have at least one measure of parenting, one child outcome, and one measure of family income ($N = 557$), with the exception that the participants without any data on these measures were more likely to be Black.[2]

Table 1 presents demographic characteristic of the sample of 2,089 low-income children and their families. Almost 71% of the families in the sample had annual income below the poverty line at the time of recruitment, and the average annual family income reported was $11,532.4 (in 2003 dollars). About one fifth of the mothers were adolescents when their children were born and all mothers averaged 22.4 years. At baseline, about a quarter of the mothers were married and living with their husbands. Slightly more than half of the children were male and more than 60% were firstborns. The mothers in the sample were from White, African American, and Hispanic backgrounds. About half of the mothers had at least a General Educational Development Test (GED) or high school degree at baseline and subsequent assessments. Most of the mothers reported that English was their first language.

Procedures

Home visits at 14, 24, and 36 months consisted of a 45-min parent interview, direct assessments of

Table 1
Demographics

Variable	Percent	Frequency (*n*)	Missing in sample	Valid percent
In EHS program	51.5	1,075	0	51.5
Focus child is male	50.7	1,059	0	50.7
Focus child was firstborn	61.4	1,283	9	61.7
Birth weight < 2,500 g	7.4	155	263	8.5
Mother's ethnicity				
White	40.2	839	0	40.2
Black	34.8	728	0	34.8
Hispanic	25.0	522	0	25.0
Teen mothers	20.6	430	0	20.6
Mother's primary language is English	77.3	1,615	75	80.2
Mother's education at baseline				
< 12 years	44.3	926	78	46.0
= 12 years	28.7	599	78	29.8
> 12 years	23.3	486	78	24.2
Mother's education at 14 months				
< 12 years	38.9	813	189	42.8
= 12 years	31.5	657	189	34.6
> 12 years	20.6	430	189	22.6
Mother's education at 24 months				
< 12 years	33.5	699	302	39.1
= 12 years	31.6	660	302	36.9
> 12 years	20.5	428	302	24.0
Mother's education at 36 months				
< 12 years	30.5	637	351	36.7
= 12 years	31.8	664	351	38.2
> 12 years	20.9	437	351	25.1
Living arrangements at baseline				
Mother is married and living with husband	25.7	536	3	25.7
Mother lives with other adults	39.0	815	3	39.1
Mother lives alone	35.2	735	3	35.2
Region of residence				
Northeast	21.4	448	0	21.4
Midwest	25.9	542	0	25.9
South	17.3	362	0	17.3
West	35.3	737	0	35.3
Families with annual income below poverty line	70.9	2,127	534	86.2

Note. EHS = Early Head Start.

children's cognitive abilities, a 10-min videotaped session of semistructured mother–child free play, and a videotaped dyadic challenge session (highchair task at 14 months, teaching tasks at 24 and 36 months). Interviewers also completed a checklist on their observations of the home environment at the end of each visit. At the 24-month assessment, mothers' cognitive and language skills were assessed using the Woodcock–Johnson (WJ) Picture Vocabulary Test (WJ–III Tests of Achievement [Standard Battery]; Woodcock & Johnson, 1989).

For the *free play sessions*, mothers were presented with three bags containing a book and a standard set of age-appropriate toys. At the 14- and 24-month assessments, the bags contained a book (*Good Dog Carl* and *The Very Hungry Caterpillar*, respectively), a cooking set, and a Noah's Ark set with animals. At the 36-month assessment, the bags contained a book (*The Very Hungry Caterpillar*), a cash register and grocery items, and a container of interlocking blocks. Mothers were instructed to begin with Bag 1 and to finish with Bag 3 and were encouraged to play with their children as they ordinarily would and to face the camera.

The challenge task at 14 months consisted of mother placing her infant in a booster chair, with the infant's back toward the mother. Mothers sat behind the infant and were asked to draw a picture of the family while the infant remained in the chair without

any objects for a period of 4 min. Mothers were told "I'd like you to put [Child's Name] in this chair and strap him/her in. You will then sit in this chair behind your baby. We'd like your child to remain in the chair for 4 minutes while you draw a picture of your family. Feel free to take care of your child as you normally would, but we ask that you not provide him/her with any objects and that you not remove him/her from the chair." The challenge task at 24 months consisted of mothers teaching their toddlers how to sort blocks according to color or learn words for articles of clothing shown in a book. Mothers selected the task that they felt their child did not know. Once they selected the task, they were asked to sit on a mat and to let the experimenter know when they had finished teaching the child. The challenge task at 36 months consisted of the child being presented with three puzzles of increasing difficulty one at a time. Mothers were told that the puzzles were challenging for 3-year-olds. They were instructed to first let the child work on each puzzle alone, and then, they could give the child the help they felt the child needed. All mother and child interactions were videotaped and subsequently coded by staff at the Center for Children and Families, Columbia University, Teachers College.

Measures

All measures in this study, except family income, were based on data obtained during home visits. Family income was measured at baseline and at the telephone interviews conducted at 6, 15, and 26 months after the baseline interview. These income data were reconstructed to create an income timeline that enabled us to estimate household annual income for the periods leading up to each of the three child ages (14, 24, and 36 months).

Child cognitive outcomes. At the 14-, 24-, and 36-month assessments, cognitive development was assessed with the Mental Development Index (MDI) of the Bayley Scale for Infant Development, Second Edition (BSID – II; Bayley, 1993). The MDI assesses vocalizations, language skills, memory, problem solving, early number concepts, classification abilities, generalization, and social skills. This indexed scale has a mean of 100 and a standard deviation of 15. The MDI has shown adequate internal consistency and interrater reliability.[3] A score of 85 – 100 in this scale is within normal limits.

Background factors. Several background factors were included as controls for initial conditions of mother and child. These were conceptualized as characteristics of mothers and children that do not change over time and are likely to influence parenting quality and children's outcomes. Background factors were children's gender, birth weight, mother's age at childbirth, ethnicity, primary language, and mothers' cognitive skills as indexed by the WJ.

Children's characteristics such as gender and birth weight might play an important role in determining parenting quality and children's developmental outcomes. For example, it has been found that girls present a slight advantage over boys during early stages of cognitive and language development (Bornstein, 2002; Fenson et al., 1994). In addition, it has been found that birth weight significantly predicts later development (Bradley, Whiteside, Mundfrom, & Blevins-Knabe, 1995; Landry et al., 2006; Shenkin, Starr, & Deary, 2004).

Maternal characteristics and skills influence the quality of parenting styles and child development outcomes (Bornstein, 2002). For instance, teenage mothers tend to be less mature and lack a well-established maternal self-definition (Brooks-Gunn & Chase-Lansdale, 2002) and their children perform less well than those of older mothers on measures of cognitive and language development (Keown, Woodward, & Field, 2001; Rodriguez et al., 2005). Mothers' ethnicity and/or primary language relates to how responsive or intrusive mothers are in their interactions with the children (Ispa et al., 2004) and to maternal teaching styles and shared narratives in the preschool years (Melzi, Paratore, & Krol-Sinclair, 2000; Paratore, Melzi, & Krol-Sinclair, 2003). Finally, measures of mothers' cognitive abilities, as assessed through standardized instruments, relate to parenting and children's cognitive outcomes (e.g., Yeung et al., 2002).

Here, dichotomous indicators were used for child gender, birth weight ($<$ 2,500 g vs. other), mothers' age ($<$ 18 years old at child's birth vs. other), ethnicity (contrasts for African American vs. other and for Hispanic vs. other), and mothers' primary language (1 indicating English).

Family resources. We considered four measures of family resources: mother's own reading frequency, mother's educational achievement, parental living arrangements, and income per capita in the family. Summary statistics of these measures are presented in Table 3. Although these four measures do not fully capture a family's human capital (conceptualized as all resources that enable individuals to achieve well-being), they each contribute in significant ways to children's and family's well-being. For instance, mother's own reading frequency and educational achievement indicate maternal ability to teach and stimulate learning. Father's residency reflects the availability of additional financial and parenting resources.

Income per capita in the family relates to wealth and consumption resources allocated to children.

Mothers' educational achievement was represented by mothers' years of education at the time of the assessment. Mother's own reading frequency was assessed with a single item coded on a 5-point Likert scale (5 = *daily reading*, 1 = *reading a few times per year*, 0 = *never reads*). Father residency was coded dichotomously at each assessment, representing whether the biological father lived with the mother and child at the 14-, 24-, and 36-month assessments.

Family income was measured at baseline or recruitment and at the assessments that took place at 6, 15, and 26 months after the baseline interview. Given the goal of including repeated measures of annual monetary resources that temporally aligned with the child assessments, we computed the amount of money received by all family members (including the mother) for the periods in which each child in the sample was 0–14 months, 14–24 months old, and 24–36 months. Therefore, family income represented the total amount of money received by the mother and the members of the family, as reported by the mother. It included public assistance and other transfers (e.g., food stamps) because the question was not limited to the amount of money *earned* by family members but excluded taxes and deductions. From these multiple assessments, monthly family income was calculated for each of the 36 months from the child's birth date through the child's third birthday. These month-by-month calculations were summed to create totals for 0–14 months, 14–24 months, and 24–36 months income figures. Whenever data were not available for a portion of a development period, the available monthly income data were prorated so as to span the relevant developmental periods. To provide a more accurate portrayal of the amount of monetary resources available to children at each age, income per capita was used in analyses.

Parenting quality. Parenting quality was based on a composite score of several dimensions of parenting that were assessed from three protocols at each age: videotaped mother–child play (three-bag task), videotaped challenge tasks (high chair and teaching), and the HOME scale. First, maternal supportiveness was assessed from free play at 14, 24, and 36 months. Supportiveness was the average of mothers' ratings on three Likert-scaled items: maternal sensitivity, positive regard, and cognitive stimulation (1 = *very low* to 7 = *very high* on each dimension), following the established precedent of the EHS Consortium studies (e.g., Berlin, Brady-Smith, & Brooks-Gunn, 2002; Love et al., 2005; Shears & Robinson, 2005; Tamis-LeMonda et al., 2004). Sensitivity reflected the extent to which the mother was responsive to her child's distress and nondistress cues; positive regard reflected mothers' demonstration of love, respect, and admiration toward her child; and cognitive stimulation reflected mothers' attempts to teach her child so as to enhance perceptual, cognitive, and linguistic development. These items covaried strongly at all ages (r ranges from .60 to .62, .53 to .68, and .50 to .71 at 14, 24, and 36 months, respectively. All were significant at the .01 level). The supportiveness composite also showed adequate internal consistency at each age (Cronbach's αs = .82, .83, and .82 at 14, 24, and 36 months, respectively).

Second, interviewers completed the HOME scale (Caldwell & Bradley, 1984), and total HOME scores were used. This scale rates the quality of the home environment including provision of learning materials, activities (e.g., reading), and observations of mother and child verbal interactions during the full duration of the home visit.

Finally, mother–child interactions were coded from the videotaped challenge task at each age (high-chair task at 14 months, teaching task at 24 months, and puzzle task at 36 months). At 14 months, maternal sensitivity and positive regard were coded on 7-point Likert scales and summed to create a composite supportiveness score. At 24 months, mothers' teaching was coded using the teaching scale of the Nursing Child Assessment Satellite Training (NCAST; Barnard, 1976). This scale coded a total of 50 binary items reflecting mother's sensitivity, responsiveness to child distress cues, cognitive growth fostering, and social-emotional growth fostering. These items were assessed as present or absent and summed to a total score (Barnard, 1976). At 36 months, scores on mothers' supportive presence and quality of maternal assistance were rated during the teaching and puzzle tasks (1 = *very low* to 7 = *very high*). Supportive presence measured the mother's emotional availability and physical and affective presence during the task and quality of assistance focuses on the instrumental support and assistance provided by the mother during the task.

Because the coding of the three parenting protocols yielded scores on different metrics, scores were z transformed and then summed into a total parenting quality score at each age. Bivariate correlations between the three parenting quality scores were significant at the $p < .01$ level at all ages (r ranges from .31 to .45, .30 to .42, and .41 to .51 at 14, 24, and 36 months, respectively). Confirmatory factor analysis was then run to verify that the three measures of parenting loaded onto a single factor at each of the three ages. Table 2 presents the results from this analysis. The strongest loadings were obtained for

Table 2
Factor Loadings of Confirmatory Factor Analysis of Parenting Quality Aspects

Measure and variable	Unstandardized factor loading	Standardized factor loading	R^2
14-month parenting quality			
14-month Maternal Supportiveness score	1.00[a]	0.70	.49
14-month HOME score	3.03*	0.63	.40
14-month High Chair Task score	0.99*	0.48	.23
24-month parenting quality			
24-month Maternal Supportiveness score	1.00[a]	0.69	.48
24-month HOME score	2.94*	0.62	.37
24-month Teaching Task score	2.82*	0.50	.25
36-month parenting quality			
36-month Maternal Supportiveness score	1.00[a]	0.71	.50
36-month HOME score	4.19*	0.58	.34
36-month Puzzle (Teaching) Task score	1.21*	0.72	.52

Note. HOME = Home Observation for Measurement of the Environment.
[a]Not tested.
*$p \leq .05$.

the HOME score at all ages. However, as indicated by the standardized estimates, the largest correlations with the parenting factor were seen for maternal supportiveness during free play at 14 and 24 months and by supportiveness in the teaching task at 36 months. All the unstandardized estimates that were not normalized to be 1 were significant at a level of $p < .05$. As indicated by the R^2 of each indicator, parenting quality explained between 23.4% and 51.7% of the variances of the indicators. Because all factor loadings were significant, the creation of composite constructs of parenting at each age was deemed to be appropriate. The parenting quality composite at each age showed sufficient internal consistency (Cronbach's αs = .63, .62, and .70 at 14, 24, and 36 months, respectively).

Results

We first present descriptive statistics of background measures, parenting quality, family resources, and child cognitive performance, followed by bivariate associations among these measures. Next, structural equation modeling (SEM) tests associations among measures across the three ages. The conceptual model that guided the structural equation analyses is presented in Figure 1. At each age (14, 24, and 36 months), we assumed that family resources (family income, father's residency, etc.) influence child outcomes both directly and indirectly (through parenting quality). Parenting quality was assumed to directly affect children's outcomes at each age. We controlled for earlier experiences by linking parenting quality at 24 and 36 months to previous parenting quality and by linking child cognitive performance at 24 and 36 months to previous child performance. We hypothesized reciprocal effects between children and parents. Thus, the model includes lagged effects from children's performance at each age to parenting quality at the adjacent age and vice versa (diagonal paths). Family background factors (e.g., mothers' and children's demographic characteristics) served as controls.[4]

Descriptive Statistics

Descriptive statistics for all measures and constructs appear in Tables 3 and 4. As indicated in Table 3, mothers averaged 89 on the WJ Test of Achievement, which is approximately 0.75 *SD* below the population norm. Children's Bayley MDI scores were within the normal limits but below population norms at all ages. Bayley scores declined significantly from 14 to 24 and 36 months, as indicated in a repeated measures analysis of variance. This drop may reflect changes to the skills being tapped by the Bayley MDI at earlier versus later ages. That is, the Bayley MDI at 14 months in part measures motor skills, whereas at 24 and 36 months, Bayley items increasingly tap language development.

Table 4 presents summary statistics of mothers' own reading frequency, family income, and parenting quality. On average, mothers were reading on their own between a few times a month and once a week. Sample averages of total family income and income per capita (all in 2003 dollars) for the considered developmental periods were stable over time. The averages at 24 months shown in Table 4 appear to be lower than at other ages because family income amounts at 24 months represented economic resources for the period between 14 and 24 months, which is only a 10-month period. The average income per capita ranges from about $4,600 during the 0- to 14-month period to about $5,100 in the 24- to 36-month period, with average family size between four and five family members. Although summary statistics are presented for both total and per capita income, analyses were based on income per capita.

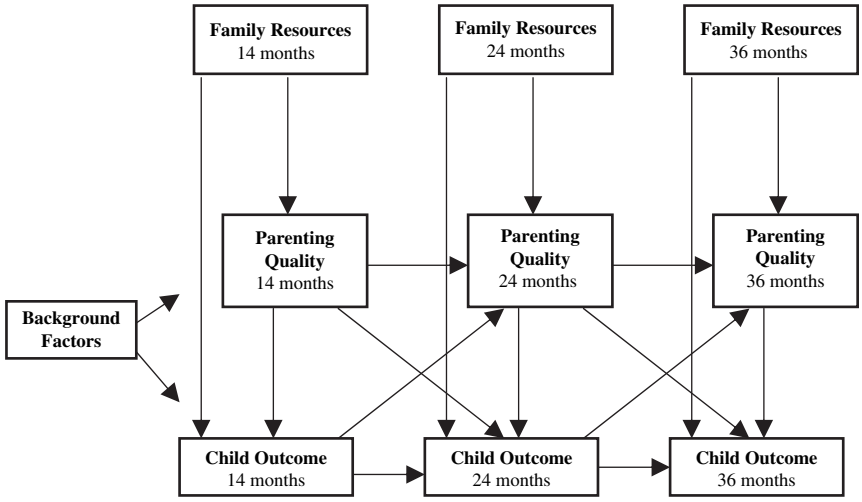

Figure 1. Conceptual model.

Bivariate Associations

Table 5 presents bivariate correlations between the background factors and the parenting quality score at each age. The strongest associations are between mothers' scores on the WJ Test of Achievement and parenting quality at each age. The maternal primary language indicator (=1 if the primary language is English) also relates to parenting quality, but associations decrease over time (*r*s = .20, .13, and .11, at 14, 24, and 36 months, respectively, all with $p \leq .01$). The indicators for being a teenager, African American, and Hispanic are all negatively and significantly associated with the quality of parenting score but again decrease over time. Neither child gender nor low birth weight related to parenting quality.

We calculated bivariate correlations between income per capita in the family, mother's years of education, mother's own reading frequency, father residency, and parenting quality at each age. Income per capita was positively associated with all variables at each age. Mothers' own reading frequency was very modestly associated with income per capita in the family at each age ($r = .06$, $p \leq .05$ at 14 months; $r = .11$, $p \leq .01$ at 24 months; $r = .07$, $p \leq .01$ at 36 months). Income per capita related most strongly to parenting quality (*r*s = .26, .25, and .28, at 14, 24, and 36 months, respectively, all with $p \leq .01$). The parenting quality score was also associated with all other variables at each age, with associations being strongest to mothers' years of education (*r*s = .45, .37, and .38, at 14, 24, and 36 months, respectively, all with $p \leq .01$).

Table 6 presents the associations between background factors, family resources, and parenting quality scores and children's Bayley MDI scores at each age. Both family resources and parenting scores correlated with children's Bayley scores at all ages. The weakest associations were between mothers' background factors at 14 months and children's Bayley scores at 14 months and between children's

Table 3
Background Factors

Variable	Valid *N*	*M*	*SD*	Minimum	Maximum
Male focus child indicator	2,089	0.51	0.50	0	1
Low birth weight indicator	1,826	0.08	0.28	0	1
Teen mother indicator	2,089	0.21	0.40	0	1
African American indicator	2,089	0.35	0.48	0	1
Hispanic indicator	2,089	0.25	0.43	0	1
Mother's primary language is English indicator	2,014	0.80	0.40	0	1
Mother's score on WJ Test	1,477	89.15	11.62	50.00	130.00

Note. WJ = Woodcock–Johnson.

Table 4
Child Outcomes, Family Resources, and Parenting Quality

Variable	Valid *N*	*M*	*SD*	Minimum	Maximum
Child outcomes					
14 months Bayley MDI	1,642	98.26	11.21	49	130
24 months Bayley MDI	1,585	89.22	13.61	49	134
36 months Bayley MDI	1,485	90.79	12.57	49	134
Mother's years of education					
Completed at 14-month assessment	1,280	11.24	2.71	0	19
Completed at 24-month assessment	1,614	11.44	2.61	0	20
Completed at 36-month assessment	1,712	11.50	2.60	1	20
Mother's own reading frequency					
14 months reading frequency score	1,907	3.29	1.73	0	5
24 months reading frequency score	1,798	3.36	1.71	0	5
36 months reading frequency score	1,752	3.46	1.65	0	5
Family income (tens of thousands of dollars)					
0–14 months income	1,507	1.84	1.40	0.03	13.70
14–24 months income	1,910	1.46	1.12	0.01	9.41
24–36 months income	1,775	1.98	1.45	0.01	11.04
Family income (tens of thousands of dollars)					
0–14 months income per capita	1,415	0.46	0.37	0.01	4.39
14–24 months income per capita	1,702	0.37	0.29	0.00	2.37
24–36 months income per capita	1,632	0.51	0.42	0.00	4.92
Father lives with mother and child					
14 months resident father	1,905	0.48	0.50	0	1
24 months resident father	1,750	0.47	0.50	0	1
36 months resident father	1,673	0.46	0.50	0	1
Parenting quality score[a]					
14 months parenting quality score	1,543	—	2.29	−7.48	6.67
24 months parenting quality score	1,494	—	2.26	−9.65	5.59
36 months parenting quality score	1,442	—	2.35	−7.49	6.19

Note. MDI = Mental Development Index.
[a]Sum of *z*-score values with a mean of 0.

Bayley scores at 14 months and later family resources at 24 and 36 months.

Finally, income per capita, parenting quality, and children's cognitive development outcomes were stable across the three assessments, as suggested by bivariate correlations of each variable at a given time with itself at the subsequent assessment. In particular, parenting quality was strongly stable and stability

Table 5
Bivariate Correlations of Background Variables to Parenting Quality

	Parenting quality		
Variable	14 months	24 months	36 months
Male child indicator	−.06*	−.05	−.05
Low birth weight indicator	−.03	−.05	−.04
Teen mother indicator	−.16**	−.16**	−.16**
African American indicator	−.24**	−.23**	−.22**
Hispanic indicator	−.20**	−.13**	−.11**
Mother's primary language is English indicator	.20**	.13**	.11**
Mother's score on WJ Test	.54**	.46**	.48**

Note. WJ = Woodcock–Johnson.
*$p \leq .05$. **$p \leq .01$.

coefficients increase over time (*r*s = .62, .63, and .65, for comparisons of 14–24, 14–36, and 24–36 months, respectively, all with $p \leq .01$).

Together, these findings indicate that background factors and family resources are associated with parenting quality at each age and that background factors, family resources, and parenting quality consistently predict children's Bayley scores. Thus, testing a model that includes repeated assessments of these sets of measures is justified. Moreover, in light of the high stability in child cognitive performance and parenting quality across 14-, 24-, and 36-month assessments, the inclusion of earlier measures of child performance and parenting quality produces a very conservative estimate of the effects of parenting and income on children's performance at later ages.

Estimation Strategy

SEM was used to test paths between background factors, family resources, parenting quality, and child outcomes across the three assessments. This estimation approach simultaneously tests associations between all measures in the proposed model (Schumacker & Lomax, 1996; Yeung et al., 2002). In addition, SEM estimates direct and indirect effects of predictors in a longitudinal design. We used the Mplus (Muthén & Muthén, 2004) program to estimate our model. Mplus uses maximum likelihood and permits estimation of structural equation models for which some or all variables have missing data. In this estimation procedure, the likelihood function is conditioned to the missing data in the model, and the nonmissing data are used to find the parameters that maximize the conditioned likelihood function. Thus, this estimation method uses all the information that is available from the data. This technique has been shown to yield better estimates than estimation methods that rely on case deletion or single imputation (McCartney et al., 2006; Schafer & Graham, 2002).

Model Fit

We present several statistical evaluations of the model in Table 7. Specification 1 reports results of a model in which direct paths from the family resources variables (i.e., family income per capita, mother's years of education, father's residency, and

Table 6
Bivariate Correlations of All Variables With Bayley MDI 14, 24, and 36 Months

	Bayley MDI		
Variable	14 months	24 months	36 months
Male child indicator	−.09**	−.11**	−.08**
Low birth weight indicator	−.15**	−.05*	−.09**
Teen mother indicator	−.01	−.07**	−.05*
African American indicator	−.03	−.11**	−.18**
Hispanic indicator	−.01	−.11**	−.07**
Mother's primary language is English indicator	−.01	−.07**	−.05**
Mother's score on WJ Test	.16**	.38**	.32**
Income per capita at 14 months	.09**	.17**	.16**
Mother's years of education at 14 months	.12**	.24**	.21**
Mother's own reading frequency at 14 months	.07**	.12**	.09**
Father lives with mother and child at 14 months	.04	.06*	.07*
Parenting quality score at 14 months	.26**	.40**	.39**
Income per capita at 24 months	.06*	.18**	.15**
Mother's years of education at 24 months	.11**	.25**	.22**
Mother's own reading frequency at 24 months	.04	.10**	.03
Father lives with mother and child at 24 months	.04	.07**	.04
Parenting quality score at 24 months	.21**	.38**	.40**
Income per capita at 36 months	.09**	.10**	.14**
Mother's years of education at 36 months	.09**	.24**	.21**
Mother's own reading frequency at 36 months	.04	.09**	.09**
Father lives with mother and child at 36 months	.02	.08**	.07**
Parenting quality score at 36 months	.18**	.36**	.41**

MDI = Mental Development Index; WJ = Woodcock–Johnson.
*$p \leq .05$. **$p \leq .01$.

mothers' reading frequency) to the children's outcomes at each age are *excluded*. Specification 2 reports the same results for a specification in which all paths from the model presented in Figure 1 are included. Disturbance terms and unanalyzed associations in background factors and resources variables are not depicted but were included in all estimations.

Because Specifications 1 and 2 represent nested models, we performed a likelihood ratio test to assess which model provided a better fit. The test statistic shown in Table 7 (a χ^2 value with 12 *df*) indicates that at a .05 significance level, it is not possible to reject the null hypothesis that the paths of the family resources variables to the child cognitive outcomes are statistically equal to zero (based on a critical χ^2 value of 21.03). This result suggests that the effects of family resources on child outcomes are completely mediated by parenting quality at each age.

We also tested Specification 1 against a model that excluded the paths between past child outcomes and current parenting and between past parenting quality and current child outcomes (Specification 3). Similarly to Specification 1, Specification 3 excludes direct paths from family resources variables to child outcomes. Again, a likelihood ratio allowed us to assess whether the reciprocal paths between child outcomes and parenting quality significantly contribute to a better model fit. The test statistic (a χ^2 value with 4 *df*) indicates that at a .05 significance level, we can reject the null hypothesis that the paths of past child outcomes to current parenting quality and paths from past parenting to present child outcomes are statistically equal to zero (based on a critical χ^2 value of 9.49). This result suggests that reciprocal effects between children and parents exist.

Given the results of these tests, we next adopted the more parsimonious specification of the model that excludes direct paths from the family resources variables to the child outcomes at each age but considers reciprocal paths between child outcomes and parenting quality (Specification 1).

Overall, the fit indices indicate that Specification 1 provides a better fit than Specifications 2 and 3. The standardized root mean square residual and the root mean square error of approximation for Specification 1 are below .05, which can be considered a good fit. The Tucker–Lewis index (TLI) and the comparative fit index are above .90 for Specification 1, which in general is considered a good fit. The TLI for Specifications 2 and 3 are slightly below .90. The chi-square values of model fit were also computed for the three specifications. However, because this statistic is sensitive to the sample size (N = 2,089 in the present study), its value for all specifications was significant. Given that all other fit indices reported in the present study take into account the value of the chi-square and the degrees of freedom in our model, we considered that the values obtained from these indices provide enough evidence that the model we propose fits the data well.

Finally, the proportion of explained variance (R^2) for each of the dependent variables in the model also provides a measure of model fit. The proportion of explained variance of the Bayley MDI at 14 months is close to 10% and it increases to 32% and 40% at 24 and 36 months, respectively. The model also explains a significant proportion of the variance of parenting quality at each age. In all specifications, the proportion of explained variance across parenting quality scores ranges from 38% at 14 months to almost 50% at 36 months. Increasing proportions of explained variance across time suggest cumulative

Table 7
Model Fit

Specification	SRMR	RMSEA	TLI	CFI	Log likelihood	Chi-square value of log-likelihood difference
1. Direct paths from family resources to child outcomes are excluded	.02	.04	.90	.93	−57,303.43	
2. Direct paths from family resources to child outcomes are included	.02	.04	.89	.93	−57,296.49	
Difference between Specifications 2 and 1					6.94	13.89
3. Reciprocal paths from child outcomes to parenting and vice versa are excluded	.03	.04	.89	.91	−57,335.26	
Difference between Specifications 3 and 1					31.83	63.64

Note. The differences in log likelihoods are absolute values. SRMR = standardized root mean square residual; RMSEA = root mean square error of approximation; TLI = Tucker–Lewis index; CFI = comparative fit index.

influences in children's cognitive development and parenting quality.

Parameter Estimates

Figure 2 presents standardized (in bold font) and unstandardized estimates of the paths of the model in which the effects of family resources variables on child outcomes are mediated by the quality of parenting (Specification 1).[5]

At all ages, the largest effect on parenting quality from a family resource variable was obtained for mothers' years of education, with higher maternal education being associated with higher parenting quality. Fathers' residency and mothers' reading frequency were positively associated with parenting quality at 24 and 36 months (net of other measures in the model), although effect sizes were small. Higher income per capita in the family is also related to higher parenting quality, although the associations were small relative to others in the model. The effects of the family resources variables on parenting quality were small at all ages. However, these effects remained significant at 24 and 36 months even after controlling for past parenting quality. The strongest effects in the model were the associations between current and past parenting quality, revealing high levels of stability being already established at these early child ages. The standardized estimate of the path from parenting quality at 14 months to parenting quality at 24 months was .52, and the estimate of the path from 24 months to 36 months parenting quality was .53. Parenting quality at each age had a positive direct effect on child cognitive outcomes. The effects of parenting quality on child outcomes were moderate, but these effects were still significant even when the strongest effects on child cognitive outcomes were included—namely, prior child outcomes. Finally, lagged parenting quality was positively associated with child outcomes at 24 and 36 months, and lagged child outcomes had positive effects on parenting quality at 24 and 36 months. Although these estimates were small, they suggest the presence of reciprocal effects between children's abilities and subsequent parenting behaviors under extremely conservative tests.

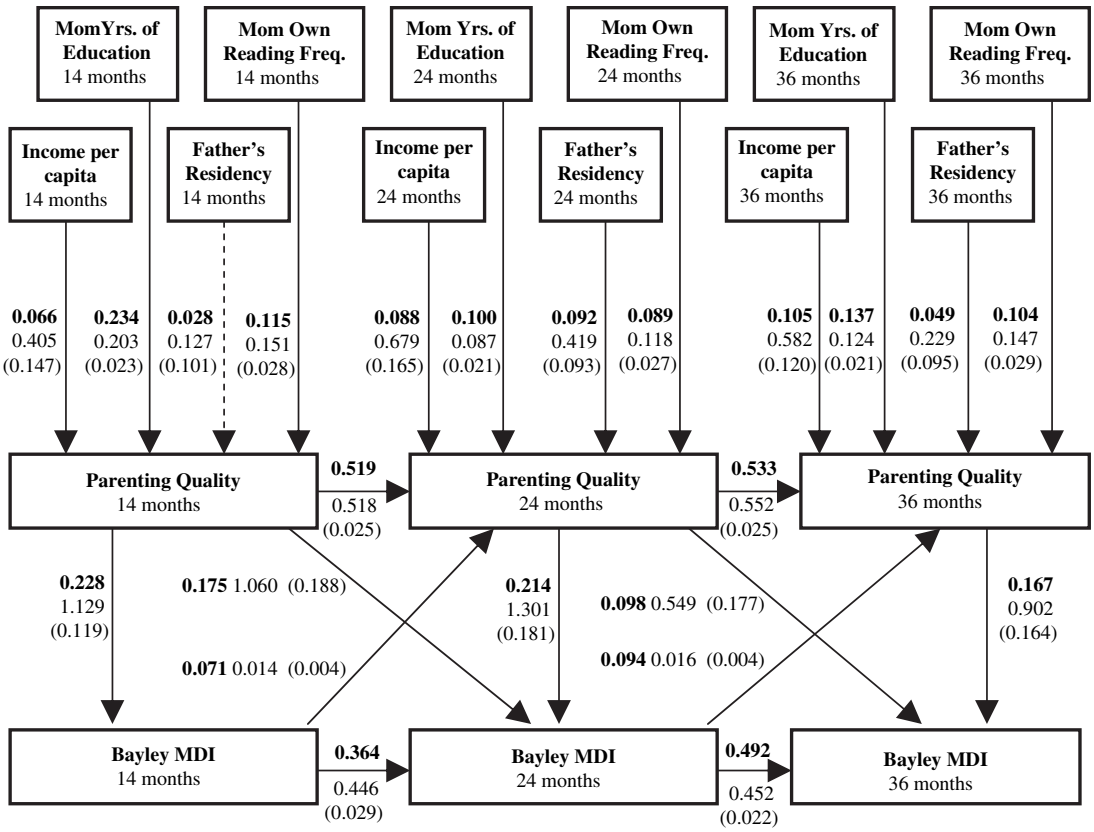

Figure 2. Standardized (bold) and unstandardized coefficient estimates (values given in parentheses are standard errors).
Note. Paths with solid lines are significant at the $p < .05$ level. This model excludes direct paths from family resources variables to child outcomes. MDI = Mental Development Index.

Table 8
Unstandardized Estimates for Indirect Effects of Family Resources and Background Variables on Child Outcomes

	Bayley MDI		
Variable	14 months	24 months	36 months
Income per capita at 14 months	.46*	—	—
Mother's years of education at 14 months	.23*	—	—
Mother's own reading frequency at 14 months	.17*	—	—
Father lives with mother and child at 14 months	.14	—	—
Income per capita at 24 months	—	.88*	—
Mother's years of education at 24 months	—	.11*	—
Mother's own reading frequency at 24 months	—	.15*	—
Father lives with mother and child at 24 months	—	.55*	—
Income per capita at 36 months	—	—	.53*
Mother's years of education at 36 months	—	—	.11*
Mother's own reading frequency at 36 months	—	—	.13*
Father lives with mother and child at 36 months	—	—	.21*
Male child indicator	−2.10*	−.97*	−.49*
Low birth weight indicator	−6.63*	−3.08*	−1.54*
Teen mother indicator	−.28*	−.57*	−.40*
African American indicator	−.16*	−2.32*	−1.66*
Hispanic indicator	−.35	−.71	−.50
Mother's primary language is English indicator	−.18	−.36	−.26
Mother's score on WJ Test	.07*	.14*	.10*

Note. Statistical significance of indirect effects is based on bootstrap standard errors. MDI = Mental Development Index; WJ = Woodcock–Johnson.
*$p \leq .05$.

Table 8 presents estimates of the indirect effects of family resources variables on children's outcomes and of the total effects (i.e., direct and indirect [through parenting] effects) of background factors on children's outcomes. We report unstandardized estimates for interpretation purposes.[6] These unstandardized coefficients represent the effect of a unit increase in family resources variables and background factors on the child's Bayley MDI score. The estimates reported in Table 8 show small effects of a unit increase in family resources variables on child outcomes. For instance, an increase of 1 year in maternal education at 14 months produces an increase in the score on the Bayley MDI of less than one fourth of a point. Likewise, increases of 1 year in maternal education at 24 and 36 months create increases in the Bayley MDI score of about one ninth of a point. Similar effects on child outcomes were found in the case of mother's own reading habits and father's residency. The effect of income per capita on child cognitive outcomes was small and weakly increasing over time. According to the estimates presented in Table 8, an increase of $10,000 in the income per capita for the period between birth and 14 months of age would increase the score on the Bayley MDI by almost half a point. For the period between 14 and 24 months, a similar increase in income per capita would increase the score on the Bayley MDI at 24 months by close to a point. Finally, an increase of $10,000 in the income per capita for the period between 24 and 36 months of age would increase the score on the Bayley MDI at 36 months by about half of a point. Although each of these influences is small by itself, they are significant, and the total accumulation of these predictors on children's Bayley scores is meaningful.

We consider important to compare the effects of the family resources variables on child outcomes to the effects of the background factors. According to the results reported in Table 8, being a male child decreases the score on the Bayley MDI at 14 months by 2.1 points. At 24 and 36 months, the negative effects of child gender on child outcomes were smaller but still significant. Low birth weight had significant negative effects on cognitive outcomes at all ages. At 14 months, having low birth weight decreases the score on the Bayley MDI by 6.6 points. Although this negative effect declines over time, it was still significant at 36 months. Being a teen mother at the birth of the child and being African American had negative effects on the Bayley MDI scores at all ages. Being Hispanic and the mothers' primary language did not

have significant effects on the child outcomes. Finally, mothers' language and cognitive skills, measured by their score on the WJ Picture Vocabulary Test, had small effects on the child cognitive outcomes at all ages. For example, at 14 months, an increase of 10 points in the mothers' WJ Test would increase the score on the Bayley MDI by close to a point. At 24 and 36 months, a similar increase in the mothers' WJ would create an increase in the Bayley MDI scores of 0.14 and 0.10, respectively. Regarding the effect of background variables on parenting quality, mothers with higher language and cognitive skills provided higher parenting quality. However, this effect was close to zero. Teenage and African American mothers tended to provide lower parenting quality.

Selection Bias

We were concerned about potential selection bias (from included and excluded variables) in our estimates. Economic or social resources might appear to affect child development outcomes but do so via their association to other measures not included in the model as well as unobserved characteristics and abilities of parents and children. Dahl and Lochner (2005) addressed this issue by using an estimation strategy that accounts for measurement error and omitted variable bias when analyzing the effects of income on children's math and reading outcomes. However, the authors did not consider the role of parenting quality and family resources other than income on determining child cognitive outcomes. NICHD Early Child Care Research Network and Duncan (2003) examined the effects of child care quality on children's cognitive development at preschool entry. As one way to assess whether selection bias might account for the identified associations between child care and child outcomes (e.g., characteristics in parents and children might underlie both child care choices and child measures), the authors ran a set of regression equations in which they progressively added controls to their models and compared estimates across models for their key associations. This analytic approach is based on earlier versions of the work of Altonji, Elder, and Taber (2005), which rests on the assumption that control variables included in nested models represent a subset of all possible controls. If the magnitude of the change in the coefficients of interest (e.g., child care to child outcome effects) is large, then selection bias is likely. If changes to coefficients are small or negligible, it suggests little additional bias from unobservable variables (Altonji et al., 2005).

Adopting this approach, we estimated changes to model coefficients for parenting effects in models that included the background variables in Figure 1 against models that included a larger set of controls. The additional controls were time invariant based on measures of parent and child characteristics gathered at the baseline assessment for the EHS Research and Evaluation Project as well as maternal depression measured by the Center for Epidemiological Studies Depression Scale (Radloff, 1977). These added controls included childbirth order, number of moves in the past year, family income as percentage of the poverty line, urban versus rural indicator, maternal employment status, maternal marital status, welfare receipt, and maternal education at baseline. The magnitude of the change of the effects of parenting quality on child outcomes in the contrasting models was negligible, even when measured in terms of standard deviations. (Maternal depression related inversely to child outcomes and the urban indicator related positively to child outcomes.) Parenting at all three assessments retained its significance in the fuller model. This suggests that there was little additional bias from unobserved variables.

Discussion

Despite widespread consensus that both parenting and economic resources matter for children's development, few studies have investigated the joint and unique influences of economic resources and parenting quality to children's development. This gap is particularly notable for infants and toddlers from low-income families. Furthermore, the dynamic nature of parenting behaviors and other family resources (e.g., mothers' education, father residency) is rarely examined. Thus, little is known about the effects of earlier experiences on current and later child outcomes and how child cognitive development reciprocally affects parenting behaviors over time.

In this study, we investigated the effects of parenting quality and family economic resources on the cognitive development of 0- to 3-year-old children from low-income families who participated in the EHS Research and Evaluation Study. The measure of parenting quality was based on direct observations of mother–child interactions and the home environment. With respect to family economic resources, we considered income per capita in the family during three developmental periods in the first 3 years, thereby matching family income to the time frame of child testing. In addition, models included other

measures of families' resources such as maternal education, maternal reading habits, and fathers' residency. Finally, we analyzed mutual and dynamic influences of parenting quality and child cognitive outcomes across adjacent ages.

We found that the effects of family economic resources on children's outcomes at 14, 24, and 36 months were completely mediated by parenting quality at each age. Income per capita in the family and the other family resources variables had statistically significant indirect effects on child outcomes at every age. Although the effects of family income and other family resources on parenting quality were small, they remained unique predictors even after controlling for prior parenting quality. In this investigation of early development, economic resources influenced children primarily through parents' behaviors, which accords with the finding that socioeconomic status indirectly affects children's performance on language outcomes and academic achievement through its influence on parents' beliefs and behaviors (Davis-Kean, 2005; Raviv, Kessenich, & Morrison, 2004). It is likely that economic resources also influence children's development through other paths, including child-care settings, schools, peers, and neighbors, as children age.

Parenting quality also had unique effects on current child cognitive outcomes even after considering child outcomes at prior ages. Moreover, the effects of current parenting quality on current child cognitive outcomes were significant even after controlling for parenting quality at previous ages. Therefore, we present an extremely conservative approach to modeling economic resources and parenting influences on child development.

We found that the effects of lagged parenting quality on current child outcomes, net of the effects of lagged child outcomes, were significant. Our results also showed that past child cognitive outcomes significantly influenced current parenting quality. Furthermore, a model with reciprocal effects from children to parents and vice versa provided a better fit to the data than a model that did not include those paths. The presence of significant reciprocal effects, even after considering prior parenting experiences, suggests that although parenting is stable over time, parents continue to modify their behaviors in response to children's developmental achievements. Beyond cognitive development, other characteristics in children, such as temperament and even physical attributes, have been shown to affect parenting over time; thus, children are active participants in the construction of their own experiences.

Finally, these findings support a cumulative model of developmental influence. The estimated model resulted in increasing explained variance of the Bayley MDI over successive child ages. By 36 months, 40% of the variance in Bayley MDI was accounted for by model estimates that included prior and current measures of parenting, family resources, and child development. Thus, although specific influences on children resulted in relatively small increments on cognitive achievement at any given age when single variables were considered, these small effects accumulated over time to explain a substantial portion of the variance in cognitive development by the time children reached age 3.

The present study should be interpreted in light of certain limitations. The measures of family resources that were considered do not reflect all dimensions of the stock of human capital in a family nor did analyses include all types of parenting behaviors. For instance, parents' time allocation and their goals for their children's achievement could influence both parenting quality and children's cognitive development. In addition, in constructing our measure of income per capita, we assumed that each member of the family receives an equal share of the family income. A better measure of the resources (including income) that the family allocates to the child would have been the expenditures of the family on child-specific goods (Meyer & Sullivan, 2003). However, this information was not available from our data. Researchers have found positive associations between expenditures on child-specific goods and cognitive development outcomes of infants from low-income and ethnically diverse backgrounds (Lugo-Gil, Yoshikawa, & Tamis-LeMonda, 2007). Moreover, the effect size of family resources on children's cognitive performance reported here is likely a low estimate given our sample characteristics. The current sample was restricted to low-income families, which resulted in a relatively narrow range of family resources compared to the population at large. It is therefore even notable that family resources still related to parenting quality at all ages after controlling for a range of child and parent characteristics. An important direction for future research would be to consider the joint influences of parenting behaviors and parents' expenditures on children's development outcomes in samples that include participants from a greater range of socioeconomic backgrounds.

Another potential limitation is the creation of composite scores of parenting quality at each age. Specifically, the measure of ''parenting quality'' is derived from free play interactions, the HOME, and a challenge task, and each of these measures in turn

comprise multiple indicators. For example, mothers' positive regard, cognitive stimulation, and sensitivity were coded from the videotaped free play assessments and were combined into a composite of ''supportiveness'' following precedent as well as based on their high collinearity. On the positive side, the combination of parenting measures and tasks into composite scores that are based in multiple measures with strong reliability coefficients (as here) provides a more robust and comprehensive measurement of parenting than a single item. More practically, it would be unwieldy to present separate model solutions for the multiple indicators of parenting obtained in this study. Nonetheless, the decision to use composite measures precludes examination of whether certain aspects of parenting are more predictive of child outcomes than are others. Research on parenting reveals that different forms or aspects of parenting differentially predict children's developmental outcomes, supporting a specificity model of effects (e.g., Baumwell, Tamis-LeMonda, & Bornstein, 1997; Bornstein & Tamis-LeMonda, 2001; Bornstein, Tamis-LeMonda, & Haynes, 1999; Tamis-LeMonda et al., 2001). However, in the present study, models testing the separate scores of parenting did not vary from those yielded in the overall model. Therefore, we felt confident that the use of a parenting quality composite did not conceal differential contributions of individual items or tasks.

Another potential limitations is the use of Likert scales and categorical data for a number of variables included in models, including low birth weight (dichotomous variable) and mothers' own reading practices (Likert scale with responses that were not equidistant). Although these variables predicted parenting and/or child development, they may have underestimated effects given that categorical measures do not reflect the full range of variation obtained with interval data.

Additionally, in testing our conceptual model, we controlled for parents' ethnicity and race in models. Not shown is the finding that when associations were examined separately in White, Latino, and Black families, patterns of covariation among measures did not vary. However, despite general similarities of influence, parenting is clearly shaped by parents' ''ethnotheories'' or views about children's development and appropriate ways to parent. Parents from different cultural communities vary in their beliefs and practices, and these differences are evident in the daily routines and experiences of young children (Tamis-LeMonda, 2003; Weisner, 2002). Therefore, future research should attend to both similarities and differences in the nature and effects of socialization processes on children's developmental outcomes across different racial and ethnic populations.

Further studies are also needed on the processes that may determine family income, maternal educational achievement, and other family resources. Although focus here was on the ways that family resources might affect parenting and child development, it is also plausible that parenting behaviors and child development influence the amount of available resources in a family. Future research should consider multiple influences among parenting behaviors, children's development outcomes, and family resources within a framework in which the child is viewed as an investment that yields returns across the span of the child's lifetime (Brown & Flinn, 2006).

A final caveat of the current paper is that the statistical approach to modeling reciprocal influences between parenting quality and children's cognitive development did not fully account for simultaneity biases in our estimates. That is, although we analyzed reciprocal effects between parenting quality and child cognitive development outcomes, one could argue that these processes are determined at the same time. Evidence from level and change models of parenting quality and child cognitive development suggests that concerns about selection bias should not be critical. However, to fully address both the selection bias and the issue of simultaneity, we should develop and estimate a model of parents' behavior in which parenting quality and outcomes for children are determined simultaneously (Dahl & Lochner, 2005; NICHD Early Child Care Research Network & Duncan, 2003). This was beyond the scope of this article and it is a matter of consideration for future research.

We believe that our results have important policy implications in light of the finding that family income effects were relatively small and mediated by parenting quality. First, not unlike previous research in this area (Yeung et al., 2002), our results imply that programs aiming solely at supplementing family earnings may not have a strong impact on child cognitive development. In contrast, programs that offer a combination of cash assistance and services designed to improve the quality of parenting may be more effective in promoting cognitive development outcomes among low-income children during the important years that precede entry to school.

Second, our results support services focused on enhancing parents' resources beyond income alone. Strengthening the quality of parenting should also include services aimed at improving family literacy and education, reducing parental stress, and providing high-quality child care. Of all measures in the model, mothers' WJ scores were the strongest

predictors of parenting and mothers' education strongly predicted both parenting quality and children's Bayley MDI scores.

In closing, the resources that parents bring to their families satisfy a number of needs in the family, one of them being support for the development of children. Thus, supplementing family income or providing parents with employment and child care services might not be enough to improve low–income children's development outcomes (Morris, Duncan, & Rodrigues, 2007). Children's participation in preschool education intervention programs and efforts to support positive parenting in low-income households are also vitally important to preparing children for later entry to school.

Notes

1. Detailed information on the instruments used in the EHS study, on how the data were collected, and on other studies based on the EHS database can be found in Administration of Children and Families, Office of Planning, Research, and Evaluation (2007) and Mathematica Policy Research Inc. (2007).
2. Among the children included in our sample (N = 2,089), those who had missing data on child outcomes (Bayley, 1993) were more likely to be male, to have mothers with lower levels of education and income at baseline, and to be living in the Midwest and less likely to be living in two-parent households. Mothers who had missing data on parenting quality at any age were more likely to be living alone at baseline, to be Black, to be less educated, to have lower income levels at baseline, and to be living in the Midwest. Participants who had missing data on income per capita were more likely to be mothers of firstborns, to be Black, to be living with their mother and other adults at baseline, to be younger, to have lower levels of education and income at baseline, and to be living in the Northeast and the Midwest.
3. The norming sample of the BSID–III was a national, stratified random sample of 1,700 children aged 1–42 months. For the MDI, the average Cronbach's alpha across age groups was .88 and interrater reliability was .96.
4. We also estimated alternative specifications of the model in which the three parenting constructs (supportiveness, quality of the home environment, and sensitivity and regard in challenge tasks) were included separately. We found that each parenting task/assessment contributes to children's cognitive development at 14, 24, and 36 months to a similar magnitude. In addition, these model specifications did not adjust to the data significantly better than the specification that used the parenting quality composite. Therefore, we concluded that the use of a parenting quality composite did not conceal differential contributions of the individual tasks. Results from estimations of alternative specifications of the model are available from the authors upon request.
5. Estimates of the disturbances of parenting quality and child outcomes, of the unanalyzed associations (or observed correlations) between the family resources variables, and of the paths between background factors and parenting are available from the authors upon request.
6. The reported statistical significance of the estimates of indirect effects presented in Table 8 is based on bootstrap standard errors, obtained from the bootstrap option available in MPlus.

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