Cognitive Development

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

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Economists and developmental psychologists have long been concerned with the factors that promote positive developmental outcomes in children. However, their lenses 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, Rao & Greenwood, 1999; Becker, 1964 and 1991). In comparison, developmental psychologists emphasize social capital, especially parenting quality, as a core influence on children development (Rodriguez, Tamis-LeMonda, & Spellman, 2005; Tamis-LeMonda, Bornstein & Baumwell, 2001). To date few studies have integrated economic and developmental perspectives (but see NICHD & Duncan, 2003; Yeung, Linver, & Brooks-Gunn, 2002), and those that do rarely document 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 three years. To this end, we examined 2,089 low-income families and their children who participated in the Early Head Start Research and Evaluation Study. Children in this study 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. In particular, we asked: How do parenting quality and other dynamic parental resources influence child cognitive development outcomes at 14, 24, and 36 months? What are the reciprocal effects between parenting quality and child outcomes across these early ages?

We examine the issues of interest using structural equation modeling. In the model, family resources influence child outcomes both directly and indirectly (through parenting quality) at each age (14, 24, and 36 months). Parenting quality is assumed to directly affect child 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 outcomes at 24 and 36 months to past child outcomes. We hypothesized that reciprocal effects between children and parents occur. Thus, we included lagged effects from children's performance at each age to parenting quality at the adjacent age, and vice versa. We used mothers' and children's demographic characteristics at baseline as control variables in the analyses of parenting quality and child outcomes.

Results suggest that family economic resources and parenting quality uniquely contributed to children's cognitive development at 14, 24 and 36 months, as well as across the three ages. The effects of family economic resources on cognitive outcomes were fully mediated by parenting quality at each assessment. At 24 and 36 months, parenting quality related uniquely to children's cognitive development, even after controlling for earlier measures of parenting quality, economic resources, and child performance. Lagged effects between children's cognitive outcomes and later parenting quality maintained above other measures in the model. These findings indicate continued bidirectional influences between children and parents after taking background factors and economic resources into account.

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Cognitive Development in Children from Low-income Families: A Preliminary Analysis of Problem-Solving Skills

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Problems solving skills such as self-regulation, inhibition, working memory, planning, strategy use, and cognitive flexibility are necessary to achieve academic success. These broad skills, referred to as executive functions, serve as the foundational skills for learning in academic environments. Variations in the early learning experiences provided in home environments may place children from low-income families at an increased risk for delayed development of executive functioning skills and, given the critical role that executive functions play in cognitive functioning, it seems likely that delayed development of these important skills may result in academic difficulties. The primary goal of this study is to investigate whether children from low-income families exhibit poorer performance on measures of cognitive development using a problem solving task.

The current sample consists of 110 kindergarteners (48 low-income & 61 high-income) from varying socioeconomic levels. To assess executive functioning, children were presented with 30 Tower of London (TOL) problems on laptop computers (Shallice, 1982). Participants were given 60 seconds to arrange three colored balls. Problem difficulty ranged from 3-moves to 7-moves (e.g.a 3-move problem requires 3 balls to be moved on the start board to match the goal board). The 30 problems were presented in 3 sets of 10 problems to allow for the assessment of performance across the 3 sets.

Children's receptive intelligence was measured with the Peabody Picture Vocabulary Test III to allow for a measure of children's ability to understand and interpret language (Dunn and Dunn, 1997). Additionally, children's heart rate was measured as a physiological indicator of problem difficulty.

Results indicate that problem solving skills, specifically executive functioning skills, are not as refined in low-income children as compared to high-income children which may impair their ability to function in the classroom. Low-income children solved fewer problems correctly and these problems took them longer to solve and were solved less efficiently. However, covarying for PPVT scores statistically reduced much of the effect of income on children's performance. Although it is possible that success with the task is dependent on receptive vocabulary, it is likely that controlling for receptive vocabulary may actually be taking away real income group differences in that income status is tightly intertwined with vocabulary. Higher overall heart rate variability in low-income children may suggest lower sustained attention/motivation for these children. Heart rate variability results on the final set of problems suggest low-income children continued to require more attention on difficult problems whereas high-income children did not.
Given that low-income children had poorer executive functioning skills, it may be assumed that these children could benefit from early executive skills training where they are taught the importance of listening to the rules, inhibiting inappropriate behaviors, and planning how they will accomplish tasks. Thus, the results of this study have implications for the inclusion of

executive skills training in early intervention programs. It is probable that improvement in these basic cognitive skills of children from low-income families will be evident in their overall academic success and thus, give them a chance to succeed.

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False-belief Understanding and Social Competence: A Reciprocal Relation in Early Childhood

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During the preschool years, children acquire false-belief understanding (FBU); that is, they realize that people, including themselves, can believe things that are untrue. Although it is possible that FBU promotes social competence (SC), it is also likely that SC stimulates FBU (Watson, Nixon, Wilson, & Capage, 1999). The present study explores these possibilities by modeling the reciprocal relation between FBU and SC using longitudinal data from two cohorts of Head Start children.

Participants included children from central Pennsylvania who were seen on two occasions, approximately one year apart. Cohort 1 included an analytic sample of 69 children (39 females, 30 males; average age at pretest = 5 years, 2 months) who were in preschool at Time 1 (T1) and kindergarten at Time 2 (T2). Cohort 2 included 53 children (21 females, 32 males; average age at pretest = 4 years, 2 months) who were in preschool at both T1 and T2. During each visit, children completed a battery of four false-belief tasks, which included the prototypical box task (Hughes, 1998), two subtasks of the peep-through book task (Gopnik & Astington, 1988), and the locations task (Astington & Jenkins, 1995). Children received a pass/fail (0/1) for each task and an aggregate score was created. Language ability (LA) was assessed at T1 using the Peabody Picture Vocabulary Test (PPVT-III; Dunn & Dunn, 1997). Teachers reported on children's social skills using the Preschool and Kindergarten Behavior Scales (PKBS; Merrell, 1994).

For Cohort 1, correlations suggested a reciprocal relation between FBU and SC. Hierarchical regressions assessed the unique contribution of false-belief to social development, and vice versa. Results of Model 1 support FBU as a predictor of SC. After accounting for age, LA, and SC at T1, FBU at T1 explained an additional 9% of the variance in T2 SC, R^2=.32,F(4, 64)=7.43, p≤.001. Results of Model 2 support SC as a predictor of FBU. After accounting for age, LA, and FBU at T1, SC at T1 explained an additional 14% of the variance in T2 FBU, R^2=.44, F(4, 64)=12.94, p≤.001.

For Cohort 2, correlations supported a longitudinal relation between SC at T1 and FBU at T2, τ(38)=.34, p≤.05. The lack of a significant relation between FBU at T1 and SC at T2 was not surprising given the poor false-belief performance at T1 (M=.55, SD=.71). Specifically, 23 children (43.4%) failed all four tasks, 16 (22.6%) passed one task, and 5 (9.4%) passed two tasks. A hierarchical regression assessed the unique contribution of social competence to false-belief understanding. After accounting for age, LA, and FBU at T1, SC at T1 explained an additional 7% of the variance in T2 FBU, R^2=.35,F(4, 33)=2.84, p≤.05.

Results suggest that the relation between FBU and SC is bidirectional across the preschool-kindergarten period; that is, both constructs significantly influence the other's development, making each of them critical to normative development. Results also support SC as a predictor of FBU across the preschool years. These findings highlight the importance of exploring associations between developmental domains more thoroughly during early childhood.

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Why Do Some Children Master Certain Skills While Others Do Not?

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Motivation, academic achievement, and cognitive development are three variables which have been individually scrutinized for many years (Bardouille-Crema, Black, and Feldhusen, 1986; Bridgeman & Shipman, 1978; Campbell, Pungello, Miller-Johnson, Burchinal, & Ramey, 2001; Carlton & Winsler, 1998). However, no study to date has ever used a time lag design to measure causal relationships between motivation, academic achievement, and cognitive development.
A total of 87 children, 68 from the Loudoun County Striving Towards Excellence in Preschool (STEP) Program and 19 from the George Mason University Child Development Center served as participants for this study. The age range of the children enrolled in both preschool programs was between 4 and 5 years old.

All children were tested (Time 1) on measures of Academic Achievement, Cognitive Development and Motivation. Subjects participated in six individual sessions to complete all indices including the Woodcock Johnson III Letter-Word Identification Scale and Applied Problems Scale; cognitive measures (Seriation and Oddity Principle task); and a Marble Dropping and Bean Bag Toss Task to measure motivation. Overall, this study found an increase from Time 1 to Time 2 in all developmental areas examined.

By Time 2, preschoolers spent more time and dropped more marbles in the Marble Dropping Task, indicating an increase in motivation. In addition, children scored more hits while moving around less on the Bean Bag Toss Task, indicating that by Time 2 children more accurately assessed their ability and where they needed to stand in order to score more hits.

For cognitive development the average scores also showed an increase which suggests the natural increase in cognitive development between Time 1 and Time 2 did occur.

Finally, for the academic achievement scales children also showed improvement by Time 2. More specifically, children were able to identify more letters, words and solve more problems by Time 2.

Although Fisher's Z scores did not show a significant difference between cross correlations for the relationship between motivation and cognitive development or cognitive development and academic achievement, a significant difference was found for the relationship between motivation and academic achievement.

In all instances there was a stronger positive relationship found between motivation at Time 1 and academic achievement at Time 2 than vice versa. These cross correlations suggest that increases or decreases in motivation cause increases or decreases in academic achievement. The difference between the cross correlations is significant for the one marble dropping task and the mathematics scale. This finding supports the conclusion that there is a causal relationship;

increases or decreases in motivation produce subsequent increases or decreases in academic achievement.

This study provides a foundation for the further study of causal relationships between motivation, cognitive development, and academic achievement. In particular, the relationship between motivation and academic achievement should be examined more thoroughly. In addition, researchers should continue the examination of these 3 variables using different types of measures to see what other causal relationships may exist.

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