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Fathers' Early Contributions to Children's Language Development in Families from Low-income Rural Communities

Nadya Pancsofar

Nadya Pancsofar: pancsofa@tcnj.edu

School of Education, The College of New Jersey, P.O. Box 7718, Ewing, NJ 08628, 609-771-3150

Lynne Vernon-Feagans and The Family Life Project Investigators

School of Education, University of North Carolina, 301 Peabody Hall, CB #3500, Chapel Hill, 27599-3500, 919-843-5623

Lynne Vernon-Feagans: lynnevf@email.unc.edu

Abstract

This study utilized a large sample of two-parent families from low-income rural communities to examine the contributions of father education and vocabulary, during picture book interactions with their infants at 6 months of age, to children's subsequent communication development at 15 months and expressive language development at 36 months. After controlling for family demographics, child characteristics, as well as mother education and vocabulary, father education and father vocabulary during the picture-book task were related to more advanced language development at both 15 and 36 months of age. Only mother education, but not vocabulary during book-reading was related to children's later language. These findings support the growing evidence on the importance of fathers in understanding children's early communication and language development.

Over the last 30 years, there has been a steady increase in research studies that have included both mothers and fathers interactions with their children in understanding children's development. This greater emphasis on fathers has been rooted in the changing roles of fathers in the lives of their children, with increasing numbers of mothers into the workforce, less stereotyped roles of fathers, and increasing cultural and linguistic diversity of fathers (Cabrera, Tamis-LeMonda, Bradley, Hofferth, & Lamb, 2000; Gottman, 1998; Parke, 1995; Roopnarine, 2004). Research has largely moved away from unidimensional characterizations of fathers that focus on father presence or absence to a broader consideration of the many roles fathers play in the lives of children and families (Lamb & Tamis-LeMonda, 2004). However, the majority of these studies on fathers have been conducted with middle-class samples of preschool or school-age children (Coley, 2001). There is a need for more focused research that considers the possible contributions of both middle- and low-income resident fathers of infants and toddlers in their children's development. These very early childhood years are a time in which fathers might exert unique influence as their children rapidly acquire important foundational social, cognitive, and language skills (Coley, 2001; Nelson, 2004; Shonkoff & Phillips, 2000).

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The first three years of children's lives are characterized by rapid advances in all areas of development, including the acquisition of communication and language competence (Hoff, 2009; Mowder, 1997; Shonkoff & Phillips, 2000). Communication competence develops from early infancy, and includes children's communicative gestures and vocalizations to caregivers. Children's intentionality may underlie these early attempts at influencing the behavior and thinking of others (Hoff, 2009). More conventional oral language generally begins to appear with children's first expressive vocabulary at around one year of age and has been thought to be motivated by early communicative and intentional behaviors of children (Hoff, 2006) and as a way to express their thoughts and share experiences (Bloom, 1993; Snow, 1999). Children learn communication and language in their primary social contexts with caregivers who play an important role in the development of children's early use of language (Bruner, 1981; Snow, 1999; Snow, Burns, & Griffin, 1998). Environmental stimulation in the form of adult-child joint attention activities and characteristics of adult child-directed language have been related to children's later language development (Hart & Risley, 1995; Hoff, 2003; Snow, 1977; Tomasello, 1992). These studies have generally focused on mothers since they have been seen as the primary caregiver in most children's lives, however, research is beginning to recognize that across family SES and ethnicity, fathers play an important role in the lives of young children (Cabrera, Shannon & Tamis-LeMonda, 2007; Duursma, Pan, & Raikes, 2008; Lamb & Tamis-LeMonda, 2004). This study directly addresses this gap in the research by investigating the early contributions of biological resident fathers to their children's expressive communication and language development during infancy and toddlerhood in low-income communities.

Although father involvement and father presence in the home have been linked to better cognitive and school functioning for children (Coley, 2001; Duursma et al., 2008; Marsiglio, Amato, Day, & Lamb, 2000; Parke, 1996; Roopnarine, 2004; Yogman, Kindlon, & Earls, 1995), there is very little literature on the ways fathers contribute to their children's development. One means through which fathers may influence children's development is through their education or human capital, their possession of skills, knowledge and traits that facilitate achievement (Amato, 1998; Coleman, 1988). While surprisingly under researched, father education may be linked to child language development in important ways. Father education may provide material and social resources to young children and may contribute to the children's competency in acquiring communication and language skills. Father education has been linked to greater income, more stable hours of work, and more benefits (Booth & Crouter, 1998). Father education may also influence the quality and quantity of father-child interactions (Ahmeduzzaman & Roopnarine, 1992; Coley & Chase-Lansdale, 1999; Gavin et al., 2002; Yogman et al., 1995). As has been found in research on mother education (Hoff, 2006), father education may make important contributions to child language development even within low-income communities.

Theory and research suggest that fathers also influence child language development through proximal processes, such as father-child language interactions (Bronfenbrenner, 1979; Bronfenbrenner & Morris, 1998). Proximal processes during early childhood may be an important mechanism through which infants receive information about how to use symbol systems such as language or gestures to communicate with others in their social world. For many contemporary families, this process occurs with multiple caregivers, often including mothers and fathers. Characteristics of father-child interactions may be related to early cognitive and language development in ethnically diverse low-income families (Roopnarine, 2004; Tamis-LeMonda, Shannon, Cabrera, & Lamb, 2004). In particular, the language used by fathers in interactions with young children may positively impact early language development.

During the first three years of children's lives, fathers may make important contributions to their children's language development through education and language input. However, very few, if any studies have considered these father contributions to children's language development, particularly in families from low-income and ethnically diverse communities. A closer look at the extant literature further informs this study by suggesting possible links between father education and language input to child language development.

Mother and Father Education related to Child Development

Maternal education has consistently been a powerful predictor of children's development, especially in the area of early language development (Hart & Risley, 1995; Hoff, 2006; Hoff, Laurensen, & Tardif, 2002; Hoff-Ginsberg, 1998). These studies have found that higher levels of mother education are associated with more advanced language development and that mothers with higher levels of education talk and interact more with their children in ways that are related to more advanced child language development in comparison to less educated mothers. Interestingly, very little research has considered how father education relates to children's early language development.

Of the limited research on fathers, there is some suggestion that fathers with more education may engage in more involved caregiving and socialization and more harmonious parenting interactions with young children than fathers with less education (Ahmeduzzaman & Roopnarine, 1992; Coley & Chase-Lansdale, 1999; Gavin et al., 2002; Woodworth, Belsky, & Crnic, 1996; Yogman et al., 1995). In a recent study of low-income families with two- and three-year-old children, Duursma et al. (2008) found that fathers were more likely to frequently read to their child if they had a high school diploma. In another recent study of Head Start fathers and their children, Cabrera et al. (2007) found that father education was positively associated with children's language at 24 and 36-months of age. These studies highlight father education as a potentially important factor in early child language development.

Mother and Father Language Input

Previous research on the associations between parental language input to young children and child language development has focused on mothers. Research on maternal language input has indicated that the amount of talk mothers direct to their children is positively associated with their children's gains in linguistic abilities (Huttenlocher, Haight, Bryk, Seltzer, & Lyons, 1991). In particular, the diversity of maternal vocabulary has predicted children's later language development and literacy in middle- and low-income families (Bornstein, Haynes, & Painter, 1998; Hart & Risley, 1995; Hoff-Ginsberg, 1991; Pan, Rowe, Singer, & Snow, 2005; Weizman & Snow, 2001). These studies have measured mother language input in a variety of contexts, including toy play, mealtime, and book activities.

Far fewer studies have considered paternal language input to young children and this extant literature is much more limited in terms of family diversity and context of family interactions. While research highlights the important role fathers play in families from low-income communities, there is a dearth of information on paternal language input in low-income and minority families. Among the few studies in this area, Rowe, Coker, and Pan (2004) compared fathers and mothers language input in toy play and book activities in a sample of rural low-income Caucasian families with 2 year-old children. They found that mothers and fathers did not differ on the amount of talk, the diversity of vocabulary or the complexity of language, but fathers did use more language that presented conversational challenges to their children. Roopnarine, Fouts, Lamb, and Lewis-Elligan (2005) considered a sample of African American families from lower, middle and upper SES backgrounds. They intensively followed the daily routines of these families who had 3 to 4-month old infants. They found that across social class, mothers were more available to their infants and fed them more, while fathers vocalized more

and were more affectionate with their infants, when examined in proportion to caregiver presence. These findings suggest that mothers and fathers may use language differently and each may have unique or different influences on children's later development.

In one of the only studies to consider the contributions of father language input to child language development, Pancsofar and Vernon-Feagans (2006) investigated the associations between mother and father language input and children's language development in a sample of Caucasian, middle income, dual-earner two-parent families. They found that fathers language input made a significant and unique contribution to their children's later expressive language development. Specifically, fathers who used more different words in their interactions with their children at 24 months had children with better expressive language skills at 36 months of age. Father contributions to children's language development held even after controlling for parental level of education, quality of childcare, and the same aspects of maternal language input to these young children. While the findings of this study suggest a positive relationship between father vocabulary and child expressive language development, the generalizability of these findings are limited, as they considered only Caucasian, middle income mothers and fathers interacting with their children in a triadic free play scenario. It is necessary to build upon this research to consider the role of paternal vocabulary in child language development using more diverse samples of children, within other dyadic contexts of parent-child interactions, such as book activities. It may also be important to look at mother and father language input in interactions with children at younger ages during infancy before the onset of language at which point children are preverbal and parent talk is less tightly linked to child language competence.

Mother and Father Book-reading Context

One context that has been used consistently in obtaining mother and child language has been the joint book-reading situation (Ninio & Bruner, 1978). The language and scaffolding that mothers use in this situation has been linked to children's later language and literacy skills (Neuman, 1997; Payne, Whitehurst, & Angell, 1994). Researchers have demonstrated that maternal book-reading interactions enhance children's vocabularies (Ninio, 1983; Senechal, LeFevre, Hudson, & Lawson, 1996), expose children to print and literacy conventions, and stimulate meta-linguistic awareness (Bus, van Ijzendorp, & Pellegrini, 1995; Dickinson, De Temple, Hirschler, & Smith, 1992; Snow & Ninio, 1986). When reading to their young children, parents set up joint routines (Ninio & Bruner, 1978), and within these routines, parents ask a high percentage of questions (Anderson-Yockel & Haynes, 1994), adjust their teaching strategies, and produce more abstract utterances and questions as their children become more proficient in participating in the interactions (Ninio & Bruner, 1978; Pellegrini, Perlmutter, Galda, & Brody, 1990; van Kleeck, Gillam, Hamilton, & McGrath, 1997).

Although there is a large literature on mother language in the book-reading context, there is much less literature on father-child book-reading. Of the studies that have been done, researchers have found very few differences between mothers and fathers, although most of these studies have been done with small samples of middle income Caucasian families. Studies of mother and father book-reading found no differences between mother and father verbal behaviors, including types of verbalizations, strategies, and level of abstract language (Blake, Macdonald, Bayrami, Agosta, & Milian, 2006; Pellegrini, Brody, & Sigel, 1985; van Kleeck, et al., 1997). In a study of two-year-olds, Conner, Knight, and Cross (1997) examined possible mother-father differences but only found that mothers were more contingent during the book-reading interactions.

Only one study (Duursma, Pan, & Raikes, 2008) was identified that examined father book-reading in a low-income sample, but only father reported book-reading was used. This study of Early Head Start families found that while fathers reported reading less often overall than

did mothers, almost half of fathers read to their children on a frequent basis. Father-reported book-reading frequency predicted children's later PPVT scores only for fathers who had at least a high school education, but was not a significant predictor for fathers with less than a high school education. Because the authors did not have information about the exact nature of book-reading by either fathers or mothers, they concluded that more research was needed that examines the book-reading styles of both mothers and fathers in low-income samples. Thus, further studies are needed to understand the actual language that fathers in low-income and ethnically diverse families use during book-reading context as well as to understand whether father language contributes to young children's development.

Demographic factors and child characteristics associated with child language development

Although not of specific interest in this study, there are possible contributions to child language development in low-income communities that we must also take into consideration as control variables in understanding the influence of fathers and mothers on their children's language. The literature consistently links child care exposure, geographic location, and family financial circumstances to children's language development. The amount of hours per week children spend in nonfamilial childcare has been linked in the literature to children's early social and communicative development (Hubbs-Tait et al., 2002; NICHD Early Child Care Research Network, 2002, 2003; Votruba-Drzal, Coley, & Chase-Lansdale, 2004). Geographic location was an important aspect of the sampling design of this study and has been linked to parental language use in other published research using Family Life Project data (Vernon-Feagans et al., 2008). While regional differences in parent talk have not been extensively studied, it may be an important component of the culture of living in different places. Ethnographic studies, such as Heath (1983), suggest that different communities, even within the same region, have different cultures of adult and child talk.

Studies of early language development need to control for effects of family income. Lower levels of family income have been associated with many negative outcomes for children, including chronic health problems, behavioral problems, and poor academic achievement (Evans, 2004). A substantial body of research has documented that children living in poverty are at risk for developmental delays across language and cognitive domains (Korenman, Miller, & Sjaastad, 1995; McLoyd, 1998; NICHD Early Child Care Research Network, 2005). In particular, research indicates that young children living in poverty have below average scores on standardized measures of language development during preschool years (Fish & Pinkerman, 2003; Raviv, Kessenich, & Morrison, 2004). Given the risks to healthy development faced by children from low-income communities, research on father contributions to early development must control for the potential impact of family financial circumstances.

Lastly, studies of language development should be cognizant of the role of child characteristics in language development, such as child temperament and birth order. Child birth order has been linked with children's early vocabulary competence, with first-born children demonstrating some advantages over later born children in language development (Bornstein, Leach, & Haynes, 2004; Hoff-Ginsberg, 1998). Child temperament has been linked to child language development and parent child-directed talk (Laible, 2004; Lewis, 1999; Vernon-Feagans et al., 2008). Laible (2004) found that mothers of preschool children elaborated more during language tasks with their children when their children demonstrate more negative reactivity. Recently, the authors of this study examined factors that predicted maternal vocabulary using the full dataset from which this sample was drawn (Vernon-Feagans et al., 2008). The authors found a significant relationship between child temperament and the vocabulary used by mothers in this sample during infancy. These studies suggest that research on parent talk should account for the variability in child characteristics during early childhood.

Summary

The limited body of research on father contributions to language development suggests that father education and language input may be linked to language development during early childhood. Specifically, literature suggests that higher levels of father education and more sophisticated and stimulating father language input during early childhood may be related to more advanced child communication and language skills (Cabrera et al., 2007; Pancsofar & Vernon-Feagans, 2006). However, it is necessary to extend this research to consider contributions of these father characteristics during infancy to subsequent communication and language development for more diverse groups of fathers, including those from low-income communities, and to look more carefully at dyadic contexts of parent-child interactions, such as book activities. In addition, it is important to understand whether father characteristics predict children's language, even after controlling for maternal language input and education.

This study aims to answer the following research question: What are the contributions of fathers via education and vocabulary during infancy to children's early communication development at 15 months and expressive language development at 36 months in families from low-income communities? To better understand the unique associations between father characteristics and child language development, this study controls for the effects of family demographics, child characteristics, as well as mother characteristics. It was hypothesized that even after controlling for key demographic, child, and maternal characteristics, father education and vocabulary use in book activities with their 6-month-old children would be positively associated with child communication development at 15 months and with child expressive language development at 36 months. This study is unique in that it includes father-child language interactions in a dyadic picture book context during infancy with ethnically diverse families from low-income communities.

Method

Sample and Design

These data come from the Family Life Project (FLP; Vernon-Feagans et al., 2008). The FLP was designed to study families who lived in two of the four major geographical regions of the U. S. with the highest child poverty rates (Dill, 1999). Specifically, three counties in Eastern North Carolina and three counties in Central Pennsylvania were selected to be indicative of the Black South and Appalachia, respectively. All counties had poverty rates (below 200% poverty level) of around 50% for children under 5 years of age. The FLP adopted a developmental epidemiological design. Complex sampling procedures were used to recruit a representative sample of 1,292 infants born to mothers who resided in one of six rural low-income counties, oversampling for African American families in NC, and oversampling for poverty in both regions.

In PA, families were recruited in person from three hospitals. These three hospitals represented a weighted probability sample (hospitals were sampled proportional to size within county) of seven total hospitals that delivered babies in the three target PA counties and provided 89% coverage of all babies born to residents of target counties. PA hospitals were sampled because the number of babies born in all seven target hospitals far exceeded the number needed for purposes of the design. In NC, families were recruited in person and by phone. In-person recruitment occurred in all three of the hospitals that delivered babies in the target counties. Phone recruitment occurred for families who resided in target counties but delivered in non-target county hospitals. These families were located through systematic searches of the birth records located in the county courthouses of nearby counties. At both sites, recruitment occurred seven days per week over the 12-month recruitment period spanning September 15, 2003 through September 14, 2004 using a standardized script and screening protocol.

Families were visited in their homes seven times over the child's first three years of life by project staff who lived in the same counties as the families and who were matched on ethnicity with the families. Through 36 months, the FLP experienced just 2% attrition.

Analysis Sample

In the FLP, mothers were the first point of contact and families were considered enrolled in the study with maternal consent and participation obtained at the 2-month visit. Biological residential fathers of the enrolled families were invited to participate in the study at 6-month home visits, and fathers participated in the study in 85% (518/613) of the two-parent families. Fathers were considered residential if they cohabitated in the household at least 3 nights per week. About half of the children in this sample (51%) were male. Table 1 presents information about the background characteristics of families in this study.

Families included in this study differed somewhat from families in the larger FLP study, including single mother families and two-parent families in which fathers chose not to participate. Specifically, families included in our analysis sample had higher income-to-needs ratios and higher levels of parent education than families in the larger study. Our analysis sample also included a lower percentage of African American families. When compared to families in which biological resident fathers opted not to participate in the study, our sample was also less geographically isolated on average. When compared to families in which fathers did not reside in the home, mothers in our sample were more likely to be older and employed, however, children in our sample spent fewer hours on average per week in child care.

Procedure

Data presented here were collected during 2 ½ hour home visits, when children were 6, 15, and 36 months of age. Two separate visits were conducted within 2 weeks of each other when children were 6 and 36 months of age. Only one home visit was conducted at 15 months. Visits were conducted by two home visitors who simultaneously collected a variety of data from the families, including interviews, questionnaires, parent-child interactions, and child-based tasks.

All interviews and questionnaires in the FLP were computerized. Thus, home visitors and respondents entered all interview and questionnaire responses into laptop computers, thereby expediting the transfer of data from remote data collection sites to a centrally located data processing center. Each caregiver completed the K-FAST literacy screener (Kaufman & Kaufman, 1994), which was then used to determine whether parents could read questionnaires independently. The K-FAST is a brief, nationally normed assessment of adult and adolescent adaptive skills. The reading subtest of the K-FAST taps into literacy skills that are required for daily living such as understanding common symbols and comprehending basic written phrases. The K-FAST reading subtest has been correlated with other standardized measures of adult literacy development (Flanagan et al., 2007). The scores for the K-FAST have been normed by age groups. The normed score for 15 years of age was the reference point for determining if participants would have the option of reading questionnaires on their own. Parents reading at a high school reading level (or beyond) were given the opportunity to complete questionnaires on their own, whereas those who read below a high school reading level had questionnaires read to them.

The specific task from which parent language input variables were obtained was a picture book task in the home during the 6-month visit. A wordless picture book was chosen so parents with low literacy skills would still be able to talk to their child about the book. Parents were asked to sit in a comfortable chair or couch with their child. Parents were given high-quality wireless microphones that were attached to their clothing. All sessions were recorded with a DVD camera to be used for transcription. Home visitors gave the parent the wordless picture book

and then provided the following instructions: “This is a wordless picture book activity for you and [infant’s name]. Please go through the book with your child as you normally would. So we can hear what you are saying try not to whisper if possible. When you and [infant’s name] are through, just let me know.” The book *Baby Faces* (1998) was used for both mothers and fathers. This book was modified so that it contained no words. This wordless picture book contained a picture of a baby face on each page, with each baby showing a different emotion. Parents were given time to go through the book and familiarize themselves with the pictures before beginning the activity. The home visitors were told to end the session after 10 minutes if the parent had not signaled he/she had finished before that point.

Measures

Demographic control variables—In this study, efforts were made to control for demographic factors that may be linked to child language development, such as state of residence, hours per week spent in child care, family income-to-needs ratio, and ethnicity. Demographic data on the families were initially collected at the time of the child’s birth and updated at each home interview if information had changed. Detailed information was gathered on education, jobs, race/ethnicity, and child care arrangements of household members. From these home interviews, the following demographic control variables were derived: state (PA=1, NC=0), hours/week in childcare, and ethnicity (African American = 1, non-African American = 0).

At each home visit, primary caregivers also provided detailed information about all household income provided by any member of the household. The FLP adopted the approach taken by Hanson, McLanahan, and Thomson (1997) of basing household income on anyone who resides in the household, not simply those people related by blood, marriage, or adoption. People were considered to be co-residents if they spent three or more nights per week in the child’s household. At each visit, the mother completed a household grid that contained information about each person residing in the household. Household annual income was comprised as a sum of the mothers reported annual income, the fathers reported annual income, annualized contributions of all of other the people included in the household grid, and all other sources of income, including unemployment insurance, worker’s compensation, social security retirement, other pension, cash income from welfare, child support, interest/dividend income, rental income, alimony, regular help from relatives, and regular help from friends. This annual household total income figure was then divided by the federal poverty threshold for a family of that particular size and composition (thresholds vary based on number of adults and children) to create the income-to-needs ratio. For these data, the income-to-needs ratio was calculated using the family income information collected at home visits and the 2004 poverty threshold values.

Child characteristics—Measures of child characteristics included child birth order, and child distress. Child birth order (first born = 1; not first born =0) order was derived from home interviews. Child distress was measured using the Infant Behavior Questionnaire (IBQ; Rothbart, 1981), a measure of temperament designed for parent report. A 60-item version of the measure was utilized by the FLP. IBQ items are rated on a 7-point Likert scale, and have been shown to represent five different aspects of temperament, including Approach, Fear/Distress to Novelty, Distress to Limitations, Duration of Orienting, and Recovery from Distress. For this study, child distress was measured using the distress to limitations subscale. This subscale was selected because it is conceptually a strong indicator of child distress, and analytically, it contained the least missing data and was most normally distributed. Reliability for this measure in this study was .77.

Parent education—Mother education and father education in years were derived from the home interviews conducted independently by mothers and fathers at 6-month visits.

Parent language samples—The software, Systematic Analysis of Language Transcripts (SALT: Miller & Chapman, 1985) was used to transcribe all of the DVDs of the picture book activities. The picture book activity commenced when the parent was given the book and the instructions for the task had ended. The activity ended when the parent signaled the coder that the activity was completed. Highly trained research assistants transcribed the language directed to the child during the session. Transcribers underwent an extensive training process conducted by a senior graduate student, who spent 1 year learning SALT conventions and developing a training manual. The training process for transcribers included transcribing 20 training transcripts that were then reviewed by the senior graduate student, who watched the DVDs while following the transcript to assure accuracy in recording what was said, as well as proper use of transcription conventions. As an ongoing check, this review process continued regularly with all transcribers periodically transcribing the same DVDs and discussing them at weekly research group meetings to ensure consistency in transcription.

A measure of parent vocabulary was derived from the transcripts when children were 6 months old. Mother and father number of different word roots were calculated using SALT software. This was determined on the basis of unique free morphemes. Omitted and unintelligible words were not included. Variations in the words were not counted as separate root words. For instance, *talk* and *talked* would be considered the same root word. This variable is a measure of the number of different words used by parents during their interaction with their infants, and indicates the overall lexical diversity during the picture book activity.

Book activities varied in length, and it was important to also measure the total time parents spent interacting with their children. Transcribers recorded the beginning and end times of the language interaction as part of the transcription process. Total time in seconds was calculated using SALT software, and measured the total amount of time parents spent interacting with their children in the book activity.

Communication and Symbolic Behavior Scales—Child communication skills at 15 months were measured using Infant-Toddler Checklist from the Communication and Symbolic Behavior Scales Developmental Profile (CSBS: Wetherby & Prizant, 2002), a screening and assessment tool. The Infant-Toddler Checklist was designed to be used with children ages 6 to 24 months and can be utilized independently of the other components of the CSBS. Mothers completed the Infant-Toddler Checklist, rating their children in seven areas: Emotion and Eye Gaze, Communication, Gestures, Sounds, Words, Understanding, and Object Use. Results were summarized by adding raw scores for each area and creating three composite scores and a Total score. The Total raw score was summed from all seven raw scores. Normative data for the Infant-Toddler Checklist is presented in 1-month intervals and is based on 1,891 children from culturally diverse groups. Total Standard scores were based on a mean of 100 and a standard deviation of 15. The Total Standard Score for each child at 15 months was used in this study.

Wetherby, Allen, Cleary, Kublin, and Goldstein (2002) report the reliability of the CSBS Infant-Toddler Checklist as the stability of results over time. The research examined how the performance of the components of the CSBS Infant-Toddler Checklist changed over an interval of approximately 4 months when testing the same children. Using paired *t*-tests, Wetherby et al. found that there were no significant differences in the standard scores obtained at each time point. Internal reliability for the CSBS total communication score in this sample was .67.

Preschool Language Scale—The Preschool Language Scale Fourth Edition (PLS-4; Zimmerman, Steiner, & Pond, 2002) was administered by home visitors in the child's home at 36 months. The PLS-4 is a norm-based measure of children's language skills, from birth to age 6. The PLS-4 yields two subscale measures: auditory comprehension and expressive communication. Only the expressive language subscale of this test was administered in the FLP. This subscale measured how well the child communicated with others. Expressive communication tasks varied by child age. Infant and toddler tasks initially assessed rudimentary aspects of expressive language, such as the ability to make sounds of pleasure, and later involved tasks that required the child to demonstrate verbally an understanding of language concepts, such as plural tense. Test-retest reliability for this age group has been found to be .82 for expressive language, and internal consistency estimates have been found to be .91 for expressive language (Zimmerman et al., 2002).

Results

Descriptive statistics were run on each variable, and prior to estimating each model, outliers and influential cases were identified. Three cases had extreme Cook's D values and studentized residual values and were deleted from the analysis sample. Means and zero-order correlations for the variables used in these analyses are presented in Tables 1 and 2. On average, mothers used just over two more different words in book interactions with their infants than did fathers, and book interaction data was largely similar across mothers and fathers. A review of these correlations as well as variance inflation factors demonstrated that there were no issues of multicollinearity in the data.

In order to test our hypotheses and gain a better sense of the unique associations between father education and vocabulary during infancy to children's early communication development at 15 months and expressive language development at 36 months, we conducted hierarchical linear regression analyses for each of the outcome variables: child communication skills at 15 months and child expressive language skills at 36 months. Before the regressions were conducted, all independent variables were standardized to have a mean of zero, and dummy variables were coded for cases with missing data for the independent variables (see NICHD Early Child Care Research Network & Duncan, 2003, for details). The dummy variable had a value of 1 if data were missing and 0 otherwise. By assigning the mean value of the predictor to the individuals with missing data, coefficients were then estimated for each predictor using the data from individuals without missing data (this is analogous to full information maximum likelihood in structural equation modeling). This missing data technique was applied only for missing mother and father transcript data as well as missing data on child distress. There were incomplete transcript data for 37 fathers and 14 mothers, and missing data for two children on the IBQ measure. There were no missing data on any other independent variables.

In this study, we were interested in assessing the unique contributions of father education and language input to child language after controlling for the same maternal characteristics. Therefore, we employed a hierarchical modeling approach that allowed us to enter father characteristics as a single final block in our regression analyses, after we considered demographic, child, and maternal contributions. For each regression model, demographic (state of residence, hours/week in childcare, income-to-needs ratio, ethnicity) and child characteristics (distress, birth order) were entered in the first step of the regression to control for these potential influences on child language. The second step consisted of maternal variables measuring education, time spent with the picture book and vocabulary when children were 6-months old. The third step consisted of paternal variables, including education, time spent with the picture book and vocabulary when children were 6-months old. Table 3 presents the results of the hierarchical regression analyses predicting child communication skills at 15 months and child expressive language development at 36 months.

Model predicting communication at 15 months

In the hierarchical regression analysis predicting child communication skills at 15 months, demographic and child control variables were entered in Step 1. Family income-to-needs ratio, birth order, and child distress were significantly associated with child communication at 15 months. Family income-to-needs ratio had a positive relationship with children's communication development, with children in families with higher income-to-needs ratios demonstrating more advanced communication skills at 15-months of age ($\beta = .15, p = .002$). First born status was associated with more advanced communication development ($\beta = .09, p = .049$). Child distress was also positively related to children's communication development with more highly distressed children demonstrating more advanced communication skills ($\beta = .12, p = 0.006$).

Mother variables were entered in Step 2 and did not significantly contribute to the model predicting child communication skills at 15 months. The addition of father variables in Step 3 significantly contributed to the model ($\Delta R^2 F = 3.10, p = 0.015$). Father vocabulary was the only paternal variable to make a significant independent prediction to child communication ($\beta = .17, p = 0.004$). When fathers used a more diverse vocabulary in interactions with their infants at 6 months of age, their children developed more advanced communication skills at 15 months. The final model, including all predictors, accounted for 7% of the variance in child communication scores at 15 months ($F = 3.48, p < 0.0001$).

Model predicting expressive language at 36 months

Demographic control variables were entered in Step 1 in the hierarchical regression analysis predicting child expressive language skills at 36 months. As in the previous model predicting child communication development, family income-to-needs ratio was significantly associated with child expressive language development at 36 months. Family income-to-needs ratio had a positive relationship with children's expressive language development, with children in families with higher income-to-needs ratios demonstrating more advanced expressive language skills at 36-months of age ($\beta = .26, p < 0.0001$). Child ethnicity was negatively associated with child PLS scores with African American children scoring lower than non-African American children ($\beta = -.19, p = 0.0004$), while time spent in child care was positively associated with child PLS scores, with children who spent more hours per week in childcare at 6 months scoring higher on the PLS at 36-months of age ($\beta = .10, p = 0.03$).

Mother variables were entered in Step 2, and were found to contribute significantly to the model predicting child expressive language development ($\Delta R^2 F = 7.57, p < 0.0001$). Specifically, mother education was positively associated with child expressive language development, with children of more highly educated mothers demonstrating more advanced expressive language development at 36 months of age ($\beta = .25, p < 0.0001$).

The addition of father variables in Step 3 significantly contributed to the model ($\Delta R^2 F = 3.12, p = 0.015$). Father education was positively associated with child expressive language development with children of more highly educated fathers demonstrating more advanced expressive language development at 36 months ($\beta = .11, p = 0.042$). Father vocabulary at 6 months made a significant independent prediction to child expressive language development ($\beta = .12, p = 0.027$). When fathers used a more diverse vocabulary in interactions with their infants at 6 months of age, their children demonstrated more advanced expressive language skills at 36 months. The final model, including all predictors, accounted for 18% of the variance in child expressive language scores at 36 months ($F = 8.42, p < 0.0001$).

Discussion

This study examined the contributions of fathers during infancy to children's communicative skills and language development during the first three years of life, and found that father education and vocabulary use with their 6-month old children during a picture book session were significantly related to child communication development at 15 months and later child language development at 36 months of age. These relationships were found even after controlling for key family demographic factors, child characteristics, as well as maternal education and language input during infancy. This study is unique in that it utilized language transcript data of both mother and father picture book interactions with their infants in the home environment and measured child language/communication outcomes at two different time points in early childhood. This study was based on a large sample of biological resident fathers that were diverse across SES and racial groups. This research supports previous work with middle-class fathers (Pancsofar & Vernon-Feagans, 2006) and extends this growing body of work on the role of fathers in children's development by considering father characteristics during infancy in families from more diverse communities.

The results of this study regarding father vocabulary suggest that when fathers used a more diverse vocabulary in interactions with their infants, children had more advanced communication skills at 15 months and more advanced expressive language development at 36 months, even when controlling for mother language input and education. These findings suggest that father language input when children are as young as 6 months may be important in understanding children's language development even two and half years later. The parent language data at 6 months were generally devoid of the confounding influence of child language on parental language since the children were not talking or even gesturing at 6 months. Therefore, parent language data at this early timepoint may be a more pure measure of father vocabulary, as it is largely free from dependencies on child language. Further, measures of father vocabulary at 6 months may serve as an indicator of the continued language input provided by fathers to their young children over the first few years of life.

This study builds upon a growing body of research examining the impact of father-child interactions on early development (Kelly, Smith, Green, Berndt, & Rogers 1998; Magill-Evans & Harrison, 1999; Yarrow et al., 1984). Few previous studies with sound methodological designs have considered the contributions of father-child interactions on children's language development (Pancsofar & Vernon-Feagans, 2006; Tamis-LeMonda et al., 2004). These studies have found that across diverse groups of fathers, high-quality father interactions with children during the toddler years contributed to more advanced child language development at 3 years of age. This study extends the findings of these previous works to specifically consider father vocabulary to infants during picture book interactions as it relates to very early communication and language development during the first three years of life. Further, this study helps to answer some of the questions raised by the Duursma et al. (2008) study that used parent report of book-reading. It appears that father language during picture book activities may be important to measure in trying to understand father contributions to children's language development, even though it appears from other studies that fathers may read less often to their children than do mothers.

It is somewhat surprising that in this study, there were no significant effects of maternal vocabulary on child communicative skills or language development. While numerous studies of mother language input have found links between maternal vocabulary and child language development (Bornstein et al., 1998; Hart & Risley, 1995; Hoff-Ginsberg, 1991; Pan et al., 2005; Weizman & Snow, 2001), another study that also included father language variables in triadic family free play interaction did not find effects for mother language (Pancsofar & Vernon-Feagans, 2006). In this study, the picture book interaction may have provided a good

context for measuring the general patterns of language interactions between fathers and children, however, this may not have been the case for mother-child interactions, particularly during infancy. At 24 months, 96% of families in this sample reported that their children looked at a book with someone daily or several times per week. While joint picture book activities are an important context for the study of mother and father language even within low-income rural communities, it may differ in significant ways from the other salient contexts of mother-child daily interactions. In a previous study of maternal language input to their toddlers in four different settings (book-reading, free play, mealtime, dressing), Hoff-Ginsberg (1991) found that of the four settings, maternal language during book-reading had the greatest lexical diversity and syntactic complexity. However, Hoff-Ginsberg cautioned that because linguistic properties of book-reading may be unique from other contexts of mother-child interactions, findings regarding maternal language input during book-reading and child language development may be of limited generalizability to other settings. Paternal language input has not been studied as carefully across different contexts, and perhaps the linguistic characteristics of father-child book-reading interactions are more similar to the characteristics of other father-child interactional settings.

Like many other studies that have considered mother and father language input, we also found similarities in the vocabulary used by mothers and fathers in book interactions with their infants (Blake et al., 2006; Pellegrini et al., 1985; vanKeeck et al., 1997). Yet, maternal language input did not predict children's language while father language input did. This may have been the case for a number of reasons. First, there is little information from this or other studies about what kind of vocabulary fathers used compared to mothers. There has been some suggestion in the literature that during book-reading tasks, fathers bring unique vocabulary and experiences that are not as contingent on what is in the book or what the child is doing/saying (Conner et al., 1997). This might be particularly salient in this study because the book was wordless and merely a series of baby faces expressing different emotions, allowing parents to develop their own perspective on the pictures. Mothers may have used more familiar words to children and fathers may not have, and the less contingency may actually help the child think beyond the task at hand and expand the child's language and vocabulary. The findings of this study suggest that the language of mothers and fathers may predict children's language differently, and further research should focus on these possible mother/father vocabulary differences. In addition, it may also be that the effects of maternal vocabulary on child language development may be best understood in conjunction with other characteristics of mother-child interactions in contexts that were not measured in this study.

Lastly, in interpreting our findings on parental language input, it is important to note several characteristics of the picture book task. In this study, the picture book interaction was the context used to elicit parent-child language samples. The book used in this interaction was wordless with pictures that drew for parent emotion talk. This book was chosen to be appealing to both mothers and fathers, and pilot studies were conducted to insure that parents in these communities found this picture book task to be relevant to their daily lives. Even with such careful measures in place, it is still possible that the language that parents used in these interactions may not have been typical of how they would read and discuss a book with written text. The characteristics of this particular book may have related differently to parental language for mothers and fathers, and it is not clear whether this context captured routine book-reading experiences for these children.

This study also considered the associations between father education and child language development and the results support previous work in this area (Cabrera et al., 2007). Specifically, higher levels of father and mother education were related to more advanced expressive language development at 36 months of age. It is interesting to note that for both mothers and fathers, education remained a predictor of child outcomes, even when included

with more proximal characteristics of language input. It may be necessary for future research to engage in a more detailed consideration of the meaning of mother and father education in the development of young children in low-income rural communities. In these communities, parent education may be related in differing ways to employment and childcare during children's infancy, as well as children's access to resources, such as libraries and book-reading.

In interpreting the results of this study, one should note that the addition of father characteristics to the model already containing demographic controls, child characteristics, and maternal characteristics explained only a small amount of additional variance in child language outcomes. This study was concerned with the unique variance explained by father characteristics and controlled for many more factors than typically considered in research on parent contributions to children's language development. It is of further note that these associations were between father characteristics at 6 months and child language development two and a half years later. However, these findings do suggest that while father education and vocabulary may be significantly associated with children's language development, there are many other important contributing factors influencing the development of young children living in low-income rural communities. Other important factors not considered in this study might include family relationships, parent employment factors, and neighborhood contexts, as well as more specific information about the life circumstances of the families in our study, such as reported frequency of book-reading by mothers and fathers, and the amount of time fathers spend interacting with infants. Future research on child language development should incorporate father education and vocabulary use in conjunction with these other elements of child ecologies.

It is also important to note that although this sample of children and families come from a representative sample of every baby born in six rural low-income communities over a one-year period, this study is not representative of all families living in low-income communities. Families with biological mothers and fathers in the household through the child's first two years of life included 56 % of the families in the larger FLP sample, with 67% of the non-African American families and only 25% of the African American families demonstrating this family composition. On average, this sample was more economically advantaged and had parents with higher levels of education than families in the larger FLP. The results of this study should be situated within the larger body of research on the diversity of fathering experiences within low-income communities. The prevalence of divorce, separation and single-mother households in low-income communities has been well-documented in the literature, particularly when considering African American families with young children (Cabrera et al., 2000; McLoyd, Cauce, Takeuchi, & Wilson, 2000). Considerable previous research has explored the roles of nonresidential fathers in the lives of children (Amato & Gilbreth, 1999; Anderson, Kohler, & Letiecq, 2005; Roy & Burton, 2007). However, biological resident fathers do reside in the households of young children in many low-income families, and these fathers have been largely ignored in the extant literature. The findings of this study suggest that in these families, the experiences and characteristics of fathers may be significantly associated with children's communication and language development during early childhood and highlight important areas for future research.

Implications for the field of early childhood education and early intervention

Children's early communication skills and oral language development are an important focus of early intervention and early childhood education programs aimed at supporting school readiness (Bredenkamp & Copple, 1997; Dickinson & Tabors, 2001; Wasik, Bond, & Hindman, 2006). Perhaps because so much is known about the ways in which mothers contribute to children's early communication and oral language development, early childhood programs and intervention services generally focus their family involvement efforts on mothers (Brookes-

Gunn, Berlin, & Fuligni, 2000; Turbiville & Marquis, 2001). In recent years, there have been increased efforts to understand father participation in early childhood and intervention programs (Elder, Valcante, Yarandi, White, & Elder, 2005; Roggman, Boyce, Cookie, & Cook, 2002). This study supports such research with evidence that fathers are important figures in the ecology of young children living in two-parent households, across SES and racial groups. Education and intervention efforts to improve child language development should expand their focus to better include fathers of young children.

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Table 1

Descriptive statistics: Background characteristics, maternal and paternal language, and children's language at 15 and 36 months

	<i>n</i>	Mean	sd
Background characteristics			
State (PA = 1)	515	0.59	0.49
Hours per week in childcare	515	16.36	17.68
Income-to-needs ratio at 15 months	515	2.57	1.79
Ethnicity (African American = 1)	515	0.19	0.39
Mother age at 6-month visit	515	28.37	5.48
Father age at 6-month visit	515	30.86	6.30
Mother employment (employed = 1)	515	0.59	0.49
Father employment (employed = 1)	515	0.89	0.31
Total household size	515	4.27	1.20
Number of children under 18 in the household	515	2.13	0.50
Geographic isolation (mean distance in km to county assets)	502	5.76	3.72
Child characteristics			
Child distress IBQ subscale	512	3.31	0.78
Birth order (first born = 1)	515	0.35	0.48
Maternal education and language			
Maternal education in years	515	13.51	2.14
Mother time spent in book activity in seconds	500	171.36	73.36
Maternal number of different word roots	500	75.50	28.55
Paternal education and language			
Paternal education in years	515	13.26	2.12
Father time spent in book activity in seconds	477	179.46	80.08
Paternal number of different word roots	477	73.19	31.99
Child language			
CSBS total communication composite score at 15 months	514	102.80	14.88
PLS expressive language subscale at 36 months	486	101.67	16.63

Table 2

Correlation matrix for analyses predicting child communication at 15 months and child expressive language at 36 months

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1. CSBS 15 m	1.00	.29*	.08	.04	.19*	.17*	-.12*	.09*	.14*	.12*	-.01	.01	.08	.07	.16*
2. PLS 36 m		1.00	.03	.15*	.35*	.31*	-.18*	.01	.07	.37*	.09*	.17*	.32*	.02	.16*
3. State (PA = 1)			1.00	-.20*	.13*	.10*	-.51*	-.16*	.09	.16*	.09*	.15*	.20*	.13*	.12*
4. Hours per week in childcare				1.00	.28*	.21*	.13*	.05	.16*	.15*	-.06	-.04	.03	-.03	-.00
5. Income-to-needs ratio 15 m					1.00	.75*	-.22*	-.03	.27*	.58*	.03	.20*	.42*	-.01	.13*
6. Income-to-needs ratio 36 m						1.00	-.20*	-.04	.20*	.58*	.04	.21*	.46*	.01	.13*
7. Ethnicity (African American = 1)							1.00	.19*	-.13*	-.19*	-.03	-.11*	-.24*	-.15*	-.17*
8. Child distress								1.00	-.02	-.09	-.05	-.10*	-.10*	.04	-.04
9. Birth Order (first born = 1)									1.00	.06	-.04	.06	-.02	.04	.08
10. Maternal education in years										1.00	.17*	.36*	.60*	.04	.16*
11. Mother time book activity (seconds)											1.00	.65*	.13*	.25*	.23*
12. Mother number of different words												1.00	.29*	.19*	.32*
13. Paternal education in years													1.00	.09	.28*
14. Father time book activity (seconds)														1.00	.59*
15. Father number of different words															1.00

* $p < .05$.

Table 3

Summary of hierarchical linear regression analyses for models predicting child communication development at 15 months (n = 514) and child expressive language development at 36 months (n = 486)

Model		CSBS at 15 months	PLS at 36 months
Step 1: Demographic controls	F (R ²)	5.15* (.05)	11.57* (.12)
State (PA = 1)	B (se)	1.04 (1.54)	-2.32 (1.74)
Hours/week in childcare	B (se)	-0.00 (.04)	0.10* (.04)
Income-to-needs ratio	B (se)	1.26* (.40)	2.38* (.41)
Ethnicity (African American = 1)	B (se)	-3.01 (1.97)	-7.81* (2.17)
Child distress	B (se)	2.30* (.84)	0.73 (.94)
Birth order (first born = 1)	B (se)	2.78* (1.41)	-0.65 (1.55)
Step 2: Maternal characteristics	F (ΔR ²)	0.79 (.00)	7.57* (.04)
Maternal education	B (se)	0.32 (.39)	1.99* (.42)
Maternal time with book	B (se)	0.00 (.01)	0.01 (.01)
Maternal vocabulary	B (se)	-0.02 (.03)	0.02 (.03)
Step 3: Paternal characteristics	F (ΔR ²)	3.10* (.02)	3.12* (.02)
Paternal education	B (se)	-0.38 (.40)	0.89* (.44)
Paternal time with book	B (se)	-0.01 (.01)	-0.02 (.01)
Paternal vocabulary	B (se)	0.08* (.03)	0.06* (.03)

* $p < .05$.