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Abstract
The contributions of mothers' and children's oral language to children's school readiness were longitudinally examined among 75 low-income mothers and children. When children were 36 months, mothers' and children's lexical diversity, mothers' wh-questions, and children's PPVT-III scores were assessed from play interactions. At pre-kindergarten, mothers and children shared a personal narrative, and various aspects of mothers' and children's narratives were coded. Children were assessed on their knowledge about print, letter-word identification, mathematical skills and sustained attention, and scores were combined into a single factor of school readiness. Structural equation analyses yielded two pathways to school readiness. Mothers' wh-questions and lexical diversity predicted children's PPVT-III scores at 36 months, which in turn predicted children's school readiness. Mothers' 36-month lexical diversity predicted mothers' narrative prompts, which related to children's narrative contributions. Children's narrative contributions in turn predicted school readiness. Mother-child conversations support the school readiness of children from low-income backgrounds.

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Introduction

School readiness is among the nation's top priorities, and parents, educators, practitioners and policymakers are all stakeholders in research on the early precursors to children's academic success. School readiness is a multi-dimensional construct that was defined in the National Education Goals Panel (1991) report as consisting of five major components: language use, cognition and general knowledge, physical health and well-being, social and emotional development, and approaches to learning. The Head Start Child Outcomes Framework (2001) expanded these five components to areas of literacy, mathematics and creative arts (e.g. Bredekamp, 2004). These many components are key to children's successful transition to kindergarten and the elementary school years (e.g. Hemmeter et al., 2006; Scott-Little et al., 2006).

Of particular importance is research on the foundations of school readiness in children from economically disadvantaged backgrounds, since achievement gaps in school readiness persist (e.g. Rock and Stenner, 2005; Bredekamp, 2004; Ramey and Ramey, 2004; Lee and Burkham, 2002). Between 2000 and 2008, the number of children who were living in poverty in the USA increased by 21%. Fourteen million children currently live in poverty (National Center for Children in Poverty, 2010), with 22% of children under six years of age residing in low-income households (National Center for Children in Poverty, 2010).

Children who grow up in poverty encounter numerous risks that may adversely affect emerging literacy competencies, such as vocabulary size and oral discourse skills (e.g. Gassman-Pines and Yoshikawa, 2006; Fiorentino and Howe, 2004; Dickinson and McCabe, 2001; Snow et al., 1998). On average, children from low-income households have fewer language and literacy experiences than their more advantaged peers, including opportunities to engage in oral conversations and shared book reading with their parents (e.g. Hoff, 2006; Dickinson and McCabe, 2001; Hart and Risley, 1995; Heath, 1994). Consequently, these children tend to have smaller vocabularies (Hart and Risley, 1995) and enter first grade with fewer vocabulary words than children from more resourced families (e.g. Biemiller and Slonim, 2001; White et al., 1990). They also tend to recount less coherent narratives (e.g. Peterson et al., 1999) and display delays in production, recall and comprehension of stories (e.g. Benson, 1997; Feagans and Farran, 1994).

Nonetheless, children from low-income backgrounds have the opportunity to develop age-appropriate literacy skills with proper environmental support

(e.g. Burns et al., 1999). In particular, much research highlights the role of children's early language environment in promoting emergent literacy (e.g. Roskos and Christie, 2004; Dickinson and McCabe, 2001; Teale and Sulzby, 1987). For instance, young children who are exposed to more diverse parental speech have opportunities to both hear and practise language, and to respond to a variety of open-ended questions; diverse speech refers to the use of different forms of language across various communicative functions, such as the asking of questions and prompting play (e.g. Tamis-LeMonda et al., 2007; Camaioni et al., 1998; Hampson and Nelson, 1993). Children who actively engage in shared conversations typically demonstrate more sophisticated oral language skills (e.g. Haden et al., 2009; Huebner and Meltzoff, 2005; Arnold and Whitehurst, 1994). Additionally, after participating in shared-reading intervention programmes that emphasized dialogic reading in terms of shared conversations, co-constructed stories and a highly interactive dialogue between two conversational partners (i.e. an adult asked a variety of open-ended questions and expanded on the child's language; the child provided information about the topic), preschool children from low-income families improved their expressive language skills (e.g. Lonigan and Whitehurst, 1998; Whitehurst, Arnold et al., 1994) and showed gains in print concepts and early writing (e.g. Whitehurst, Epstein et al., 1994), which are key ingredients for children's emergent literacy and school readiness. Children who begin kindergarten with more refined narrative skills may be at an advantage educationally over children who enter school with less developed narrative skills (e.g. Zevenbergen et al., 2003).

However, studies on the early correlates of school readiness in children from diverse low-income backgrounds are scarce, especially those that track children and families longitudinally. Here we address this gap by examining different features of mother-child everyday conversational exchanges at two child ages in relation to children's emergent literacy and school readiness. This work is grounded in social-cultural theory (e.g. Nelson, 2003; Bruner, 2002; Brockmeier, 2001; Vygotsky, 1978), which highlights the importance of social interactions in children's construction of knowledge. During interactions with other people, including dyadic play and interactions around personal narratives, young children learn about their world and come to develop a sense of self as embedded within a larger socio-cultural context (e.g. Caspe, 2005; Nelson and Fivush, 2004; Fivush and Haden, 2003; Bruner, 2002; Brockmeier, 2001; Fivush, 2001; Lemmon and Moore, 2001; Melzi and Nelson, 2001; Melzi, 2000). Drawing from Vygotsky (1986), social-cultural theory helps to describe the process of children's learning in

the context of everyday social experiences, including language exchanges with others.

Language experiences at three years of age

At about three years of age, children begin to use language as a 'representational system' (Curenton and Justice, 2004; Haden, 2003; Nelson, 1996), and display advances in their vocabularies and communicative skills that enable them to contribute increasingly to conversations with other people (e.g. Fivush et al., 1987). At this time, two aspects of mothers' language that may especially facilitate children's oral language skills include wh-questions (i.e. who, what, where, why, which, when or how) and lexical diversity (i.e. the number of different word forms or meanings mothers express while talking with their children). Wh-questions are more challenging than yes/no questions or imperatives (e.g. Rowe et al., 2004), since they help guide the sequence of events during conversational exchanges and require children to recall, organize and express specific information in response to mothers' enquiries (e.g. Seidl et al., 2003; Valian and Casey, 2003; Tamis-LeMonda et al., 2001; Fivush, 1997). Mothers who ask more wh-questions have children with more advanced language skills (e.g. Rowe et al., 2004; Bloom and Tinker, 2001; Tamis-LeMonda et al., 2001; Bornstein et al., 1999; Snow, 1999; Baumwell et al., 1997; Huttenlocher et al., 1991).

In addition to the use of wh-questions, mothers' lexical diversity supports children's language and literacy development. Mothers' use of unique words during interactions with their children reflects the general range of words they use, and is found to promote children's early language development (e.g. Huttenlocher et al., 2007; Snow et al., 2007; Huttenlocher et al., 2002; Snow, 1999; Camaioni et al., 1998; Huttenlocher et al., 1998; Tamis-LeMonda and Bornstein, 1994; Hampson and Nelson, 1993; Longobardi, 1992), as well as later literacy skills and school achievement (e.g. Snow et al., 2007; Tabors et al., 2001; Snow, 1999 1983).

Language experiences at pre-kindergarten

The preschool period is marked by a number of advances in children's language skills that pave the way for later school achievements (e.g. Dickinson et al., 2003; Aram and Levin, 2001; Shatil et al., 2000; Reese, 1995; Hudson and Shapiro, 1991; Snow, 1991). In addition to growth in grammar and vocabulary, preschool children are better able to contribute independently

to conversations that they share with their parents (e.g. Fivush et al., 1987). These independent contributions move beyond the here and now to include references to past events, thereby encouraging children to engage in 'decontextualized language' (e.g. Bruner, 2002). Decontextualized language is speech about the past or future that reveals information about abstract (or non-immediate) situations or events (e.g. Bates et al., 1979; Bredekamp, 2004; Curenton and Justice, 2004; McGillicuddy-DeLisi and Sigel, 1991; Volterra et al., 1979). Decontextualized oral language skills are essential for school readiness, later reading development (e.g. Dickinson, 1991) and overall school achievement (e.g. Snow and Dickinson, 1990).

Personal narratives, one type of oral discourse, are verbalized stories about past experiences (e.g. Nelson and Fivush, 2004; Newcombe and Reese, 2004; Reese and Fivush, 1993; Uccelli et al., 1999) that are central to children's cognitive, language and social-emotional development, and thus to overall school readiness (e.g. Beals, 2001; Dickinson and McCabe, 2001). At about four years of age, children begin to have a more permanent long-term sense of self in the context of personal narratives, suggesting that preschoolers develop the capacity to connect their 'past self' to their 'present self', a critical pre-requisite for autobiographical memory (Fivush, 2001; Nelson and Fivush, 2004).

Such personal narratives encourage the practice of decontextualized language, decoding and meaning-making of experiences (e.g. Bruner, 2002; Rosenkoetter and Barton, 2002; Snow, 1983; Snow and Dickinson, 1990). Practice with personal narratives also fosters children's skills to communicate oral stories coherently, which are important to children's smooth transition into kindergarten (e.g. Fiorentino and Howe, 2004; Williams et al., 2002).

Adult social partners scaffold children's abilities to remember and report past events in meaningful ways (e.g. Berko Gleason and Melzi, 1997; Fivush, 1991; Melzi and Caspe, 2005; Nelson, 2003). Research, conducted primarily with European American middle-income families, indicates that parents foster children's narrative development by engaging in a 'process of coauthorship' (Wahler and Castlebury, 2002: 303).

However, there is appreciable variation in mothers' narrative styles (e.g. Haden et al., 1997; Reese and Farrant, 2003; Reese and Fivush, 1993; Reese et al., 1993). A common finding in many of the first studies in this area is that there may be two distinctive styles of reminiscing in mothers (e.g. Fivush and Fromhoff, 1988; McCabe and Peterson, 1991; Newcombe and Reese, 2004; Reese and Farrant, 2003; Reese and Fivush, 1993; Reese et al., 1993). Mothers who use a highly elaborative narrative style tend to

provide many details to build on their children's responses, and have children who provide richer details of past experiences compared to children whose mothers are less elaborative (e.g. Haden et al., 1997; Reese and Farrant, 2003; Reese and Fivush, 1993). In contrast, mothers with a paradigmatic narrative style, in which there is greater emphasis on relating facts or knowledge in a more 'scientific' rather than storytelling form (e.g. Bruner, 1986, 2002), do not consistently follow their children's responses and often repeat their own questions, hence offering limited opportunities for children to contribute independently to the story (e.g. Reese and Farrant, 2003; Reese and Fivush, 1993). Follow-up research suggests that although mothers are generally elaborative in their storytelling styles, the extent to which they display the typical characteristics of this elaborative style varies (e.g. Fivush et al., 2006). For example, mothers vary in the amount of description or number of details that they offer their children to expand upon their narrative contributions. Moreover, cultural differences in narrative styles do exist (e.g. Melzi, 2000), highlighting the need to expand this work to mothers of different ethnic and economic backgrounds. For example, in one study, Central American mothers who engaged in personal narratives with their preschoolers tended to become 'active listeners' during storytelling while their children narrated, whereas European American mothers' styles tended to focus on 'co-narration' and together shared experiences with their children; these findings suggest a relation between mothers' elicitation styles and socialization goals for their young children (e.g. Melzi, 2000).

In turn, children's narrative skills may be central to their school readiness and later academic success. For example, children's language skills during the preschool years predict later reading and spelling competence (e.g. Aram and Levin, 2001; Dickinson and Tabors, 2001; Dickinson et al., 2003; Shatil et al., 2000). In one study, preschoolers who developed narratives that were more chronologically organized had higher scores in language competence (receptive vocabulary) and school readiness (a readiness to learn questionnaire) than did children with narratives that were less coherent (Fiorentino and Howe, 2004). Children who are unable to produce coherent narratives may be at greater risk from academic challenges upon entering formal school (e.g. Fiorentino and Howe, 2004).

Conversational pathways to school readiness

In light of the importance of children's language experiences in the years prior to kindergarten, the current study focused on mother-child conversations during shared play (at 36 months) and shared narratives (at pre-kindergarten)

in relation to children's school readiness (at pre-kindergarten) in an ethnically diverse sample of 75 mother-child dyads. Specifically, we sought to describe the ways in which earlier and later measures of mother-child conversations relate to children's school readiness skills.

Figure 1 presents a conceptual model of pathways to children's school readiness. In this work, we focus on a subset of school readiness skills, namely, emergent literacy, early mathematics and inhibitory control (e.g. Bredekamp, 2004; Head Start Child Outcomes Framework, 2001). At 36 months, it was hypothesized that mothers' early language would relate to children's early language (Paths 1 and 2). Over time, the language that mothers spoke to their 36-month-olds was expected to predict children's school readiness at pre-kindergarten directly (Path 7), as well as indirectly through children's language at 36 months (Paths 1 to 8; 1 to 9 to 6). Indirect paths were also expected from measures at 36 months through mothers' or children's narratives (Paths 10 to 5; 11 to 6; 10 to 3 to 6). It was hypothesized that children's early language at 36 months would directly predict their school readiness at pre-kindergarten (Path 8), as well as indirectly through mothers' and/or children's narratives (Paths 12 to 5; 12 to 3 to 6) and through children's own early language (Paths 9 to 6). In terms of predictors at pre-kindergarten, mothers' and children's narratives were expected to relate to one another (Paths 3 and 4), and mothers' narratives were expected to predict
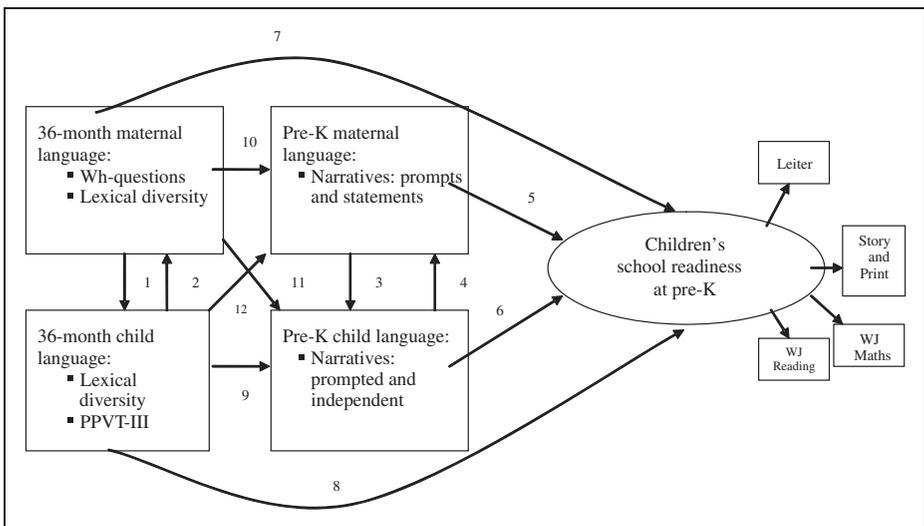

Figure 1. Conceptual model of 36-month and pre-kindergarten mother and child predictors of children's school readiness at pre-kindergarten.

children's school readiness directly (Path 5) and/or indirectly through children's own narrative skills (Paths 3 to 6).

Method

Participants

Participants were 75 mother-child dyads (40 mother-son, 35 mother-daughter), drawn from a local site of the national Early Head Start Research and Evaluation Project. Early Head Start, which originated in 1995, is a federally supported programme for families from low-income backgrounds with infants, toddlers and pregnant women; Early Head Start programmes support the healthy growth of the child and family as a unit (e.g. Love et al., 2005). When families for the larger evaluation study sought assistance on parenting and child care services through local community agencies, they were offered the opportunity to participate in the national study. Mothers were informed that their participation was voluntary, and that they had the right to withdraw at any time. All families were of low-income status, federally defined by eligibility for Assistance for Families and Children (i.e. federal support offered for families from economically impoverished backgrounds who are in need of assistance). The following criteria were met for inclusion in this investigation: (1) mothers and their children spoke predominantly English in their homes; (2) mothers and their children had data available at both 36 months and pre-kindergarten; and (3) children did not have any known developmental disabilities (from mothers' report during home visits).

The mothers' age averaged 19.52 years (SD = 6.89) at the time of their child's birth. They came from diverse racial backgrounds: African American (n = 47), Latino (n = 19) and Caucasian or mixed ethnicity (n = 9). Forty-three mothers had some high-school education, 10 mothers had graduated from high school, and 22 mothers had some education beyond high school. Children averaged 36.46 months (SD = 1.83) at the time of the 36-month home visit and 60.32 months (SD = 3.55) at the time of the pre-kindergarten visit (the spring or summer before kindergarten). Children's age was controlled in all analyses, given the rapid gains in children's language at this time.

Procedures

Home visits were conducted by teams of research assistants when children were 36 months and during the spring or summer before kindergarten. Visits at 36 months included a 10-minute semi-structured, videotaped

mother-child play session and the Peabody Picture Vocabulary Test (PPVT-III; Dunn and Dunn, 1997). During the play session, mother-child dyads were presented with a standard set of age-appropriate toys in three separate bags (bag 1: a book, *The Very Hungry Caterpillar*; bag 2: a cash register with coins, a credit card and play food; bag 3: a container of Lego blocks). In this study, at 36 months, mothers were asked to begin with bag 1 and to finish with bag 3. They were asked to ignore the researcher and play as they typically would. This particular paradigm was derived from the coding of mother-child play sessions at 15, 24 and 36 months, based on the Child-Parent Interaction Rating Scales for the Three-Bag Assessment (Brady-Smith et al., 2000). This scale rates six mother and three child behaviours and is based on the original NICHD Study of Early Child Care 15-, 24- and 36-month Mother-Child Interaction Rating Scales for the Three Boxes Procedure (Owen et al., 1993) and the original Manual for Coding Freeplay − Parenting Styles from the Newark Observational Study of the Teenage Parent Demonstration (Brooks-Gunn et al., 1992). The present examination adhered to this three-bag procedure developed for the larger national study. The national protocol required the presentation of the same toys to all mother-child dyads in the same order so as to minimize variation among mothers that might be due to playing with different toys or toys presented in a different order.

Visits at pre-kindergarten (60 months) included a videotaped mother-child two-minute personal narrative and a battery of standardized child assessments. Among the child assessments, children were administered the Modified Story and Print Concepts using Margaret Wise Brown's *Good Night Moon* (Mason and Stewart, 1989), the Woodcock-Johnson Tests of Achievement, Letter-Word Identification and Applied Problems (Woodcock and Johnson, 1989), and the Leiter International Performance Scale − Revised (Cognitive Social Subscale) (Roid and Miller, 1997). For the personal narrative, the research assistant told mothers: 'We'd like you to get [child] to tell us about something exciting that's happened recently. It could be a family outing, a birthday celebration, or any unusual event that involved [him/her].' If the mother and child completed their narrative before the end of one minute, the research assistant said: 'You still have a little more time. Have you told us everything about [exciting event]?'

Data sources

Demographics. Mothers' age at the time of their child's birth, mothers' ethnicity, mothers' years of education and children's gender and age were obtained from mother interviews.

Mother and child language at 36 months. Mothers' and children's language from the 10-minute play interaction was transcribed from the videotapes using a standardized format, Codes for the Analysis of Human Language (CHAT), and utterances were analysed using programs available through the Child Language Data Exchange System (CHILDES; MacWhinney, 2000). Utterances were the unit of transcription and were defined as talk by one conversational partner that was bounded by a transition in the partner, a change in intonation, or a pause of more than two seconds (e.g. MacWhinney, 2000; Miller and Chapman, 1993; Roberts, 2001). Only vocalizations between mother and child (not to the researcher) were transcribed and analysed. Each transcript was then verified for accuracy at least two weeks after the original transcription. Specifically, the coder re-coded the transcript, checking for accuracy, within a time frame of about two weeks from the original transcription date. If any errors were discovered, they were corrected by the coder and the transcript then became final after this second pass.

Assessment of language at 36 months. Mothers' different word types were obtained from the transcripts. The diversity of mothers' words or word forms (i.e. lexical diversity) was generated within CHILDES (McKee et al., 2000). In addition to lexical diversity, mothers' questions were defined as open-ended prompts for information (e.g. 'What's in the bag?'). Interrogative utterances beginning with 'who', 'what', 'where', 'why', 'which', 'when' or 'how' all qualified as questions. The diversity of children's words or word forms (i.e. lexical diversity) was also calculated. In addition to this standard language outcome, each child received a score on the Peabody Picture Vocabulary Test-III at 36 months as part of his or her language outcome. Raw scores were converted to standardized scores based on published norms.

Mother-child personal narratives at pre-kindergarten. Similar to mother-child language at 36 months, mother-child personal narratives at pre-kindergarten were also transcribed verbatim using the standardized format dictated by CHAT, available through CHILDES (MacWhinney, 2000). Utterances were defined as talk by one conversational partner that was bounded by a transition in the conversational partner, a change in intonation, or a pause of more than two seconds (e.g. MacWhinney, 2000; Miller and Chapman, 1993). Only vocalizations between mother and child (not to the researcher) were transcribed and analysed. Each transcript was then verified for accuracy at least two weeks after the original transcription. As at 36 months, the coder revisited the original transcript in order to check for accuracy in transcription. Errors were corrected during this second pass, resulting in the final transcript for analyses.

Assessment of language at pre-kindergarten. For narratives, the coding scheme that was implemented in this study was based on the canonical narrative structures of Western societies, which include six traditional narrative elements: setting, participant, event, description, evaluation, and appendages, or marked opening/ending (e.g. Labov and Waletzky, 1967; Reese and Fivush, 1993). A *setting* referred to a time or place in which the event occurred (e.g. 'We were in Florida.'). A *participant* described the individual(s) or character(s) in the story (e.g. 'My brother was there.'). An *event* referred to the specific actions that made up the structure of the story (e.g. 'We got ice cream at the store.'). A *description* referred to descriptive or detailed information surrounding the past event (e.g. 'The ice cream was chocolate.'). An *evaluation* referred to an utterance in which feelings and emotions were reported (e.g. 'That was funny.'). Finally, an *appendage* was defined as an utterance that marked either the start or the end of the narrative about the past experience (e.g. 'The end.'). Only utterances related to the past event were coded, and all codes were mutually exclusive. If the narrative utterance was not clear or unintelligible, it was not coded.

Mothers' utterances were further classified as either prompts or statements. From these data, mothers' narrative diversity, or the number of distinct narrative elements expressed, was calculated for prompts (referred to as mothers' narrative prompts) and statements (referred to as mothers' narrative statements). Mothers' narrative diversity scores ranged from 0 to 6 for both prompts and statements. Inter-rater reliability was calculated using Cohen's kappa for mothers' prompts and statements (Cohen, 1960). Kappa values were excellent ($\kappa = .98$ for both).

Children's language was also coded for use of the same six narrative elements. These six elements were considered to be important for preparing children for literacy and narrative experiences in the context of formal classroom environments. Again, only narrative talk was coded, and all codes were mutually exclusive. Children's utterances were further classified as either responses to their mothers' prompts or as independent contributions (i.e. children added new information to the narrative that was not prompted).

Children's narrative diversity, or the number of distinct narrative elements expressed, was calculated for responses (referred to as children's prompted narrative elements) and independent contributions (referred to as children's independent narrative contributions). Children's narrative diversity scores ranged from 0 to 6 for both prompted elements and independent contributions. Inter-rater reliability was calculated using Cohen's kappa for children's

prompted responses and independent contributions (Cohen, 1960). Kappa values were excellent ($\kappa = .95$ for both).

To summarize, mothers' and children's narratives were coded for four variables that were based on the number of different narrative elements: (1) mothers' narrative prompts; (2) mothers' narrative statements; (3) children's prompted narrative elements; and (4) children's independent narrative contributions.

In terms of school readiness scores, four standardized assessments were obtained at pre-kindergarten: the Modified Story and Print Concepts (Mason and Stewart, 1989); two subscales of the Woodcock-Johnson Tests of Achievement, Letter-Word Identification and Applied Problems (Woodcock and Johnson, 1989); and the Leiter International Performance Scale – Revised (Cognitive Social Subscale) (Roid and Miller, 1997).

The Story and Print Concepts measure preschool children's book knowledge (sum score of 0 to 5) and book comprehension (sum score of 0 to 6). Book knowledge refers to children's familiarity with various features of books (e.g. children are asked to point to the title of the book and to explain what the author does after the researcher points to the author's name), whereas book comprehension refers to children's comprehension of the story's plot (e.g. children are asked to recall the content of the story and explain why things happen in the story). Both book knowledge and book comprehension are critical elements of early literacy skills. In this study, a composite story and print awareness score was created that reflected the children's sum score of book knowledge and comprehension (range from 0 to 11). The Woodcock Johnson Letter-Word Identification test measures children's emergent literacy and pre-reading skills through symbolic learning and reading identification. The Applied Problems tests measure children's numeracy and early maths skills. Both Letter-Word Identification and Applied Problems are standard assessments of children's school readiness. Finally, the Leiter Performance Scale (Cognitive Social Subscale) measures children's sustained attention to a repetitive task and to details.

Results

Descriptives are presented for variables at 36 months (Time 1) and pre-kindergarten (Time 2), followed by bivariate associations within and across the two ages. Structural equation modelling was used to test associations with children's school readiness outcomes at pre-kindergarten. Prior to analyses, demographic variables (i.e. children's ages at 36 months and

pre-kindergarten, children's gender, mothers' age at the time of their children's birth, and mothers' education and ethnicity) were examined in relation to mother and child variables. Only two of the associations were significant. Mothers' age related to mothers' lexical diversity at the 36-month assessment, such that older mothers displayed a greater variety of words ($r = .28$, $p < .05$). Comparisons of African American mothers and mothers who were Latino or Caucasian/mixed ethnicity indicated that African American mothers ($M = 13.81$) asked more wh-questions than mothers from Latino and Caucasian/mixed ethnicity backgrounds ($M = 6.07$) at 36 months ($t = 2.16$, $p < .01$).

Descriptive statistics

Descriptives of all measures are presented in Table 1. All variables were normally distributed and characterized by substantial variation. For example, at 36 months, at one extreme, a child expressed 26 different word forms, whereas at the high end, another child expressed over 100 word forms. PPVT-III scores ranged from a score of 40 (more than two SD below the mean of 100), to a score of 104. Similarly, one mother expressed 70 different word forms, whereas at the other extreme, one mother expressed over 300 word forms. Finally, one mother did not ask any questions, whereas at the high end, one mother asked over 50 questions.

In terms of narrative diversity, some children expressed no prompted and no independent narrative elements, whereas others expressed 5 of a possible 6 (prompted) and 4 of a possible 6 (independent). Mothers prompted between 0 and 5 narrative elements and stated between 0 and 6 elements. Paired t tests indicated that mothers contributed a greater diversity of narrative elements ($M = 3.08$) than their children ($M = 2.69$) ($t = -3.61$, $p < .001$), suggesting maternal scaffolding for unique narrative elements.

Finally, children's scores for both the Woodcock Johnson Letter-Word Identification and Applied Problems ranged from two SD below the mean of 100 to about one SD above the mean. Children performed slightly lower on Applied Problems than on Letter-Word Identification. Children's Story and Print Concepts scores ranged from 1 to 11 (of a possible 11), with an average of 7.63. Children's scores on the Cognitive Social subtest of the Leiter Sustained Attention test ranged from 64 to 109, with an average of 94; 37% of children scored more than two SD below the mean of 100 and 63% scored within one SD above the mean. Exploratory factor analysis with varimax rotation was conducted on children's four standardized assessments

Table 1. Descriptive statistics for mother-child language at 36 months and pre-kindergarten

	M (SD)	Range
Language at 36 months		
Child language		
Lexical diversity (word forms)	74.51 (19.36)	26–117
PPVT-III	77.04 (12.94)	40–104
Total utterances	97.48 (31.38)	43–203
Maternal language		
Lexical diversity (word forms)	187.07 (52.36)	70–308
Wh-questions	10.92 (15.39)	0–53
Total utterances	177.03 (47.49)	60–296
Language at pre-kindergarten		
Child language		
Personal narratives		
Prompted narrative elements	2.68 (1.18)	0–5
Independent narrative contributions	1.37 (1.11)	0–4
Total utterances	15.81 (8.07)	0–37
Standardized assessments		
Woodcock Johnson, Letter-Word	99.56 (11.95)	70–128
Woodcock Johnson, Applied Problems	87.63 (16.23)	51–127
Story and Print Concepts	7.63 (2.59)	1–11
Leiter Sustained Attention Subtest	94.35 (8.75)	64–109
(Cognitive Social)		
Maternal language		
Narrative prompts	3.08 (1.09)	0–5
Narrative statements	1.95 (1.35)	0–6
Total utterances	38.06 (17.25)	2–87

Note. Mothers' narrative prompts and narrative statements, in addition to children's prompted narrative elements and independent narrative contributions, refer to narrative diversity. Narrative diversity for mothers was a score from 0 to 6, reflecting the possible number of distinct narrative elements they utilized. The same definition was applied for children's narrative diversity.

to obtain an overall school readiness score. Because the various measures of school readiness were calculated on different metrics, scores were z-transformed prior to factor analysis. One factor of children's school readiness skills emerged, with high loadings for all measures: WJ Letter-Word: .66; WJ Applied Problems: .78; Story and Print: .81; and Leiter: .68. The WJ Letter-Word

Table 2. Zero-order correlations between mother-child play at 36 months and mother-child narratives at pre-kindergarten

| | Mother-child narratives at pre-kindergarten | | | |
| | Mothers' narratives | | Children's narratives | |
	Prompts	Statements	Prompted	Independent
Maternal language at 36 months				
Lexical diversity	0.30**	0.13	0.28*	0.25*
Wh-questions	0.04	0.10	0.13	0.02
Child language at 36 months				
Lexical diversity	−0.14	0.18	0.08	0.02
PPVT-III	0.11	0.16	0.17	0.21[+]

$^+p < .10$, $^*p < .05$, $^{**}p < .01$

Note. Mothers' narrative prompts and narrative statements, as well as children's prompted narrative elements and independent narrative contributions, refer to narrative diversity.

measure accounted for 12% of the variance in the overall school readiness score; WJ Applied Problems accounted for 9%; Story and Print accounted for 20%; and Leiter accounted for 13% (with a total of 54% of the variance being explained). This factor score was utilized in subsequent analyses.

Correlations within and across 36-month and pre-kindergarten assessments. At 36 months, mothers' wh-questions and lexical diversity were unrelated ($r = .11$), as were children's lexical diversity and scores on the PPVT-III ($r = -.02$). Mothers who asked more wh-questions ($r = .42$, $p < .001$) and who had greater lexical diversity ($r = .33$, $p < .05$) had children with higher PPVT-III scores. Mothers' wh-questions and lexical diversity did not relate to children's lexical diversity ($r = .12$ and $r = .14$, respectively). At the pre-kindergarten assessment, mothers' narrative prompts and narrative statements were related ($r = .31$, $p < .01$). Children's independent narrative contributions were related to their prompted narrative elements ($r = .47$, $p < .001$). Mothers' narrative prompts related to both children's prompted narrative elements ($r = .64$, $p < .001$) and independent narrative contributions ($r = .31$, $p < .01$). Similarly, mothers' narrative statements related to children's prompted narrative elements ($r = .23$, $p < .05$) and independent narrative contributions ($r = .24$, $p < .05$).

Table 2 presents bivariate associations between mother-child play at 36 months and mother-child narratives at pre-kindergarten. Mothers' lexical diversity at 36 months was related to mothers' narrative prompts at pre-kindergarten. Mothers' lexical diversity was also related to children's

prompted narrative elements and independent narrative contributions at pre-kindergarten. Children's 36-month PPVT-III scores tended to relate to their independent narrative contributions at pre-kindergarten.

In terms of associations to the school readiness factor, children's earlier PPVT-III scores predicted later school readiness ($r = .40$, $p < .001$), as did children's independent narrative contributions at pre-kindergarten ($r = .29$, $p < .05$). Children's prompted narrative elements did not relate to school readiness ($r = .09$). None of the mothers' language measures at 36 months (i.e. wh-questions and lexical diversity) or at pre-kindergarten (i.e. narrative prompts and narrative statements) related to children's school readiness ($r = .01$, $r = .13$, $r = -.03$, $r = .02$, respectively).

Structural equation modelling

Structural equation analyses tested the conceptual model of the various predictors of children's outcomes at pre-kindergarten (Figure 1). Maximum likelihood estimates of the model coefficients were obtained through Amos 7 (Arbuckle, 2006). This analytic approach accounts for measurement errors (Kline, 1998; McCartney et al., 2006) and allows the examination of various paths of prediction as presented in the conceptual model (McCartney et al., 2006). Fit was assessed using the comparative fit index (CFI; Bentler, 1990), which reveals the degree to which the sample variances and covariances are reproduced by the conceptual model (e.g. McQueen et al., 2003). CFI values range from 0 to 1, with values above 0.90 representing a good fit. The root mean square error of approximation (RMSEA; Browne and Cudeck, 1993) ranges from 0 to infinite values; values less than 0.05 represent a good fit while values less than 0.06 represent acceptable fit (e.g. Soenens et al., 2006). Children's age and gender, as well as mothers' ethnicity and educational level, were controlled in the models.

Figure 2 presents the results of the best-fitting model, based on running nested models and then reducing paths to create a parsimonious model with best fit. Thus, only significant paths to children's school readiness at pre-kindergarten are presented (CFI: .99; RMSEA: 0.00; $\chi^2 = 8.98$; $p = .44$). As indicated, mothers' wh-questions and lexical diversity at 36 months concurrently related to children's scores on the PPVT-III. Mothers' lexical diversity at 36 months predicted mothers' narrative prompts at pre-kindergarten. Mothers' narrative prompts concurrently related to children's independent narrative contributions at pre-kindergarten. Children's independent narrative contributions, as well as earlier PPVT-III scores, predicted school readiness.
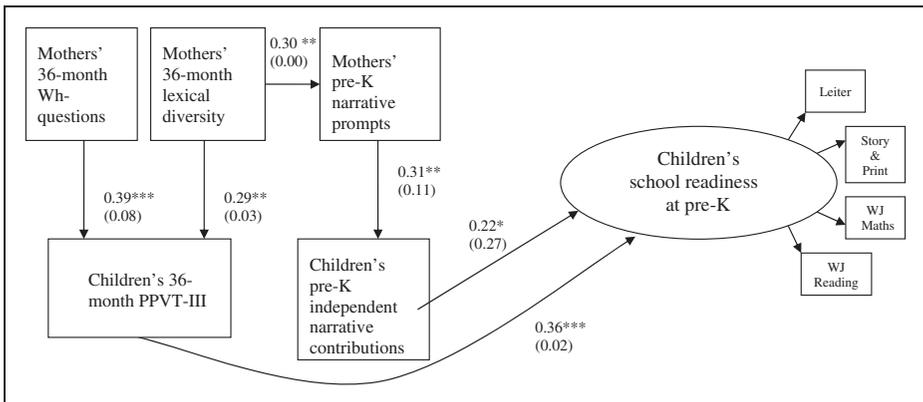
Figure 2. Best-fitting model of maternal and child predictors of children's school readiness at pre-kindergarten. *Note*. Standardized coefficient estimates are presented. Standard errors are provided in parentheses.

In summary, maternal language supported children's school readiness through two pathways. First, at 36 months, mothers' oral language predicted children's receptive vocabulary development, which in turn predicted children's school readiness. Second, mothers' 36-month lexical diversity predicted their narrative prompts, which in turn predicted children's independent narrative contributions; these narrative contributions predicted children's school readiness. The two pathways suggest the roles of mothers' language and children's early vocabulary development and later independent narrative contributions to children's school readiness skills.

Discussion

Children living in poverty are at risk of language delay and academic difficulties, although these risks are buffered in the context of supportive home language and literacy environments (e.g. Burns et al., 1999; Hart and Risley, 1995; Hoff, 2003; Rowe et al., 2004; Snow et al., 2007). Existing research indicates the importance of children's participation in oral discourse for school readiness and later academic achievements (e.g. Dickinson and McCabe, 2001). In the present longitudinal study, we aimed to advance an understanding of how mothers from low-income backgrounds promote their preschoolers' school readiness through conversational exchanges during both shared play and shared personal narratives.

Pathways to school readiness

Structural equation modelling indicated that maternal language supports children's developing language skills, which in turn are related to children's school readiness. At the 36-month assessment, mothers' lexical diversity and use of wh-questions related to children's early receptive language (PPVT-III), which predicted a composite score of school readiness comprising knowledge about print, receptive language, early mathematical skills and sustained attention. Also, mothers' early lexical diversity predicted mothers' later narrative prompts at pre-kindergarten. Maternal narrative prompts, unlike narrative statements, encourage children to reflect on and talk about core features of shared experiences, such as events, descriptions, participants, and so forth. These narrative prompts related to children's independent narrative contributions, which captured children's additions of new information to the ongoing conversation. As such, this research suggests that maternal prompts support children's skills to co-construct narratives with others, corroborating past research on the importance of mothers' requests for information in children's narrative development (e.g. Reese and Fivush, 1993). In contrast, mothers' statements did not relate to children's independent contributions or school readiness, and children's prompted narrative elements were not predictive either. Together, the significant pathways highlight the facilitative roles of mothers' wh-questions, lexical diversity and narrative prompts, and children's receptive and oral language skills, in school readiness.

Although the focus was on mother-child language exchanges at 36 months and pre-kindergarten, parent-child language interactions clearly affect children's emerging language skills well before these developmental periods (e.g. Pan et al., 2005; Tamis-LeMonda et al., 2001; Weizman and Snow, 2001). For example, book reading and other literacy-related activities in the first two years predict the language development (particularly vocabulary size) of children from low-income families (e.g. De Temple and Snow, 2003; Raikes et al., 2006; Rodriguez et al., 2009). As one example, mothers' early book reading at 14 and 24 months predicted children's early vocabulary development which in turn predicted later language skills, thereby creating a snowball effect that continued across early development (Raikes et al., 2006). Children's vocabulary size has been related to phonological awareness, a critical aspect of emergent literacy and school readiness (e.g. Dickinson and McCabe, 2001). Our finding, that mothers' language was related to children's 36-month receptive vocabulary, which then predicted children's school readiness at pre-kindergarten, exemplifies this snowball effect. These findings

underscore the need to examine reciprocal relations between children's home language experiences and vocabulary development across the infancy, toddler and preschool years.

The coding system that was applied to shared narratives captures, at least in part, some of the oral literacy demands that children encounter as they make the transition to formal schooling. The six narrative elements that were assessed (event, description, setting, evaluation, participant and appendage) originated in traditional Western literary printed classics and are found in children's written stories in industrialized societies (e.g. Labov and Waletzky, 1967; Reese and Fivush, 1993). Homer's *Iliad* and *Odyssey* and Virgil's *Aeneid* are three model examples of classic Western printed documents that represent a typical narrative structure. In stories that are traditionally considered to be coherent, narrators express a conventional literary structure including time, place and character (e.g. Wahler and Castlebury, 2002). In particular, evaluations have been thought to mark the narrative's high point or climax, as the narrator reflects upon a meaningful experience (e.g. Labov, 1972; Labov and Waletzky, 1967; McCabe and Peterson, 1991; Peterson and McCabe, 1983, 1991). In the present study, across both prompted narrative elements and independent narrative contributions, over 90% of the children expressed both events and descriptions at least once, whereas only about one-third of children referred to settings or appendages at least once in their narratives. Specifically, over 80% of the mothers prompted for events and descriptions at least once, and about half of the children independently stated events and descriptions at least once. Whereas 69% of mothers prompted for evaluations at least once, only 19% of children independently made such evaluations at least once in their narratives. While approximately 30% of mothers requested participants and settings at least once, about 10% of children independently contributed these narrative elements at least once. Finally, 9% of mothers prompted for an opening or closing to the story at least once in their narratives, while 7% of children expressed this element at least once. Children who made one independent contribution to their narrative most commonly stated an event ('We went to the zoo.'), whereas children who expressed 4 or 5 of the possible 6 narrative elements expressed an assortment, namely, events (e.g. 'We played soccer.'), descriptions (e.g. 'My birthday cake was strawberry.'), evaluations (e.g. 'I had so much fun!'), and participants (e.g. 'My older brother came with me.'). The use of these narrative elements in everyday language exchanges provides children with oral experiences using key features that distinguish both oral conversations and printed conventions in stories.

Limitations and future directions

Despite several strengths of this research, its limitations need to be considered. First, findings were based on a single play session and single shared narrative at each of two ages, which may have provided limited information about the variation that characterizes mother-child oral discourse in the preschool years. Nonetheless, even these brief observational periods yielded meaningful data that were linked to direct assessments of children's school readiness skills. Additionally, alternative measures of mother and child language could have been assessed at each of the two ages. For example, in the coding of narratives, it is possible to take a more thematic or content-based approach. Likewise, the variables that comprised school readiness focused on language and cognition; others have applied broader definitions of school readiness that include indicators of social-emotional development (e.g. Bowman and Moore, 2005) and executive functioning and self-regulation (e.g. Blair and Razza, 2007). Finally, although appropriate for language research, the sample size is somewhat small with respect to modelling pathways to school readiness over developmental time. Nonetheless, those pathways that were found were moderate to large in effect size, providing us with confidence that shared conversations with parents (here, mothers) are fundamental to certain literacy components of children's school readiness.

Further, prevention and intervention efforts for children who live in impoverished conditions are fundamental to providing optimal support for children and families. Early literacy programmes that encourage oral discourse, including the sharing of everyday conversations and past recollections, may be steps toward building on children's literacy skills (e.g. Peterson et al., 1999). Our findings align with studies of dialogic reading, in which adults encourage children to engage actively in storytelling by prompting for pieces of information through a variety of open-ended questions (e.g. Raikes et al., 2006; Whitehurst, Arnold et al., 1994; Whitehurst, Epstein et al., 1994; Whitehurst and Lonigan, 2002). In accord with these features of dialogic reading, early language and literacy intervention programmes may highlight the importance of maternal prompts and children's independent narrative contributions as a way to foster children's oral discourse skills, and in turn school readiness. In extending such findings to assist with the design of programmes, it is important to attend to the diverse cultural styles of narration that families from different ethnic backgrounds may exhibit (e.g. Caspe and Melzi, 2008; Champion, 2003; Champion et al., 1999; McCabe, 1999; Melzi, 2000; Melzi and Caspe, 2005; Melzi and Fernández, 2004). For example, we found that mothers from African American backgrounds used more

wh-questions than mothers from Latino and Caucasian/mixed ethnicity families during conversations with their three-year-olds. Others have found that mothers from Latino backgrounds used a less elaborative style (such as the use of descriptions and open-ended questions) when compared with mothers from African American and Caucasian backgrounds (Leyva et al., 2008). Although the statistical analysis of ethnic differences in mother-child oral exchanges was precluded by the relatively small sample size, culture certainly shapes everyday conversations and narratives (e.g. Caspe and Melzi, 2008; Champion et al., 1999; Guerra, 2008). Consequently, educators and practitioners should attend to the unique conversational styles of parents and children from diverse cultural backgrounds.

Conclusion

In closing, the present investigation advances knowledge on the role of early mother-child conversations in children's school readiness. Through daily conversations, such as play and personal narratives, children are exposed to a variety of word types and are challenged to respond to questions and construct meaning out of everyday experiences. By providing children with discourse opportunities, mothers and other members of children's social communities (e.g. fathers, siblings, teachers) encourage children's voices and foster their language and cognitive development. Just as in Homer's *Iliad* and *Odyssey* and Virgil's *Aeneid*, everyday parent-child conversations during shared play interactions and shared narratives enable children to express personal experiences and feelings. These conversations foster the language and literacy skills that enable children to meet the oral and written demands required in kindergarten and beyond.

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