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Predictors of maternal language to infants during a picture book task in the home: Family SES, child characteristics and the parenting environment☆

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Abstract

This study investigated the contribution of child characteristics and parenting environment to the relationship between family SES/demographic characteristics and maternal language to infants.1157 children were drawn from a representative sample of 1292 infants born to mothers in rural Appalachian counties and rural counties in southern minority U.S. communities. Mothers and their 6–8 month old babies were videotaped at home while talking about a wordless picture book. Mothers' language output and complexity were analyzed. Child temperament, age, and parenting environment (knowledge of child development and observed mother–child engagement) were predictors of maternal language. Furthermore, their inclusion reduced the magnitude of the association between demographic characteristics and maternal language. Tests of mediation suggested that the parenting environment partially mediates the relationship between SES/demographic characteristics and maternal language. Findings are discussed with respect to identifying proximal processes that explain how SES may exert its influence on the language of young children.

Keywords

Maternal language; Infancy; SES; African American; Parenting; Picture book task

1. Introduction

The link between SES and children's early development has been established through a myriad of studies (Duncan, Brooks-Gunn, & Klebanov, 1994; Hart & Risley, 1995; Liver, Brooks-Gunn, & Kohen, 2002; NICHD Early Child Care Research Network, 2005a, b,c; Vernon-

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Feagans, 1996) that have found children from low SES families have poorer cognitive, language, and social skills in comparison to children from higher SES families. These studies have established the link between SES and child outcomes, although most of these studies did not contain representative samples of families and/or were not able to disentangle SES from ethnicity. The finding that child language and verbal ability are linked to SES has been consistent across a variety of studies. Many studies have examined possible family influences that might underlie SES differences and could be more causally linked to the children's language abilities. The language mothers use in interactions with their children has been the focus of much of this research, which suggests that mothers from lower SES backgrounds may use less language and a less rich vocabulary when interacting with their children than mothers from higher SES backgrounds (Hammer & Weiss, 1999; Hart & Risley, 1995; Hoff, 2003; Hoff-Ginsberg, 1991; Raviv, Kessenich, & Morrison, 2004).

At present, it is still unclear what factors may influence the SES-related differences in maternal language. Studies have not examined the possible processes within the child and home that might help explain the relationship between SES and maternal language to their infants. Although urban and suburban children have been the focus in most studies, it is also important to understand these relationships in a rural sample where poverty rates are higher, resources on parenting are more difficult to access, and where children may be more influenced by parenting behavior because of the geographic isolation of many families (Evans & English, 2002; Fish & Pinkerman, 2003; O'Hare & Johnson, 2004; Vernon-Feagans, Head, & Kainz, 2004). In one of the few studies of rural children, Fish and Pinkerman (2003) found that rural low SES children were at risk for language delays. They found that children's early language was not different from normative populations on standardized measures but that by 4 years of age and prior to kindergarten entry, their skills were much lower than the normative population. They also found that within their low income Anglo American sample, early maternal facilitation and sensitivity in infancy, along with other contextual variables, predicted children's language at 4 years of age and prior to kindergarten.

More studies are now needed that focus on a representative sample of diverse families with respect to SES and ethnicity so that we can examine the individual differences in parental language that might be important for very young children. The purpose of this paper is to examine how infant characteristics, parent characteristics, and parenting style might mediate the relationship between SES/demographics and maternal language to infants in a large representative sample of rural families.

1.1. SES, ethnicity and maternal parenting style

Family SES, including lower levels of parental education and family income, is the most consistent demographic variable linked to poorer child language development. Generally, children from lower SES families have been found to have a more restricted vocabulary, lower ability to answer complex questions, and lower overall use of language with others (Dollaghan et al., 1999; Feagans & Fendt, 1991; Fenson et al., 1994; Hoff, 2003; Hoff & Tian, 2005; Hoff-Ginsberg, 1991). Given this literature, there has been a growing need to investigate possible processes that underlie SES and ethnicity links to children's language. Generally, the literature has explored two proximal maternal processes that link SES and/or ethnicity to children's language outcomes: maternal language and maternal parenting style. These two constructs were examined in the present study, with maternal parenting style hypothesized as the major mediator of maternal language.

1.1.1. Maternal language as a mediator of child outcomes—Recent studies have examined the link between SES and maternal language and child outcomes (Bornstein, Haynes, & Painter, 1998; Hart & Risley, 1995; Hoff, 2003; Hoff-Ginsberg, 1991; NICHD Early Child

Care Research Network, 2005a,b,c; Rowe, Pan, & Ayoub, 2005). Although the present study did not focus directly on child outcomes, it is important to understand the aspects of maternal language that have been linked to child outcomes to provide a rationale for the maternal language measures used in this study.

Hoff (2003) examined 63 mother/child dyads longitudinally from 20 months of age. All children began at the same language level but had mothers with either a high school education or a college education. At age 28 months the children of the college educated mothers had gained significantly more vocabulary than the children of the high school educated mothers. This difference was linked to a longer Mean Length of Utterance (MLU) in the college educated mothers. Bornstein et al. (1998) found a pattern that was somewhat consistent with Hoff's finding in a larger sample of 126 European American children at 20 months of age from middle to upper middle SES. Bornstein et al. found that SES was related to maternal vocabulary, and in turn mother vocabulary was related to child vocabulary. In another study of 57 mother/child dyads from 14 to 36 months of age, maternal vocabulary diversity and total language output were predicted by maternal education, verbal skills and depression (Rowe et al., 2005). Hart and Risley (1995) found that mothers' vocabulary was linked to child vocabulary over time, with low-income mothers using a less varied vocabulary and their children becoming progressively further behind their middle class counterparts in size of vocabulary over time. Thus, both maternal language output measures such as vocabulary and language complexity appear to be important aspects of maternal language and both have been related to family SES and also linked to child language.

These studies were not able to disentangle ethnicity from SES because they compared low-income parents, who were also predominantly African American parents, to middle class parents who were predominantly Anglo American parents. Only one small intensive study of 36 mothers and their 3 to 6 year old children was able to address the SES and ethnicity issue (Lawrence & Shipley, 1996). Nine middle class and nine working class Anglo American families and nine middle class and nine working class African American families were included in the study. Language data were collected in the home on two separate visits, including a picture identification task at each visit, a free play session, and conversation during a family meal. The groups were similar in the level and form of parental labeling during the picture identification task. African American mothers and working class mothers each provided fewer utterances, more directives, generally shorter utterances and provided fewer labels during the picture identification task. When controlling for the amount of speech, the differences between the groups were diminished. An analysis of vernacular features of English used by the mothers suggested that the differences between the groups may have been a function of their assimilation to the mainstream culture. For instance, mothers who used the fewest number of vernacular features, both Anglo American and African American mothers, were the mothers with the longest utterances and the most labels. In summary, mothers in lower SES families talked less to their children, produced shorter utterances, and a less rich vocabulary when talking with their young children.

1.1.2. Maternal parenting style as a mediator of child language development—

Studies also have examined the role of maternal sensitivity and stimulation in the home as another possible mediator between SES and child language. Findings from these studies show the importance of both maternal sensitivity and stimulation for children and their possible roles as a mediator of maternal language. For example, Morissett, Barnard, Greenberg, Booth, and Spieker (1990) examined possible mediators between environmental risk (SES and mother's psychological functioning) and children's performance on a language test at 36 months in a sample largely comprised (90%) of low SES Anglo American mothers and children. They reported that dyadic involvement in the form of positive stimulating mother/child language interactions at 1 year of age was an important mediator of the relationship between risk and

children's language performance at 36 months. Another study explored maternal sensitivity and cognitive stimulation from the HOME assessment (Raviv et al., 2004). These investigators reported that maternal sensitivity and cognitive stimulation were partial mediators of the relationship between SES and child language. They speculated that these behaviors were proxies for maternal language stimulation. This speculation about the relationship between sensitivity/stimulation and maternal language was directly examined in the research reported in the current paper.

This research review suggests that mothers' language and observed parenting style may be important mediators of children's language development that account in large part for the relationship between SES and children's language. However, the question of whether a stimulating parenting environment serves as an important mediator of the relationship between SES and maternal language has not been directly investigated.

1.2. Other possible predictors of maternal language

1.2.1. Maternal characteristics—Few studies have examined maternal characteristics as correlates of maternal language. Bornstein et al. (1998) examined correlates of mothers' vocabulary as it related to the children's vocabulary. Although SES was related to mother's vocabulary and in turn to child vocabulary, there were some indirect effects on the mother's vocabulary, including maternal verbal intelligence and maternal knowledge of child development. Mothers who were more verbal themselves and also had a better knowledge about children's early development talked more to their own children. This suggests that these maternal characteristics partially mediated the relationship between maternal education and child language.

A number of studies have shown a close relationship between mastery and maternal mental health. Mastery is the hypothetical control one feels over life events now and in the future. These studies have shown that the feeling of hopelessness that is associated with a low sense of mastery is related to depressive symptoms, especially in low-income women whose lives are often perceived as out of their control (Lachman & Weaver, 1998; Pudrovska, Schieman, Pearlin, & Nguyen, 2005). Further, Nievar and Luster (2006) found that lower levels of mastery in a sample of African American families were related to fewer positive interactions with their children. Finally, Mistry (2003) reported that a sense of mastery was positively related to optimal parenting behavior and in turn to higher cognitive test scores for children. Thus, there is some evidence from these studies to suggest that mastery may play a role in the way mothers interact and talk to their children.

1.2.2. Child characteristics—Although most of the research on predictors of child language has focused on demographic or psychological factors of the mothers, individual differences in the children contribute to adult language as well. Many of the studies of language have been criticized because they do not measure the potential bidirectionality of effects, such that children can influence the way mothers talk to their children and mothers can influence the way children talk. This criticism is especially true of studies of children who are already talking and who probably influence parental child-directed talk in important ways (Raviv et al., 2004). Although the present study focused on infants who were not yet talking, infant characteristics may influence parental language through the child's temperament, age or sex. Although no studies have examined the direct link between child temperament and maternal language, some studies suggest that there might be an influence of child characteristics on maternal language. For instance, in a study of maternal reminiscing, Lewis (1999) found that mothers who perceived their children as more sociable used less repetitive language during reminiscing. In addition, Laible's (2004) examination of preschool children's temperament revealed that children's attachment security and socioemotional competence were related to

mothers' discourse behavior during reminiscing about the child's past behavior. Children who were perceived as more reactive and as having more effortful control had mothers who elaborated more during the conversations.

In summary, the literature suggests a number of maternal and child characteristics that might underlie the relationship between SES and maternal language. More proximal factors such as maternal depression/mastery, knowledge of child development, and child temperament might affect parent/child interactions but there are no large scale studies with diverse, representative samples that have examined these set factors. There are also no large scale studies that have examined the possible mediating effect of the maternal parenting style in understanding the link between SES/ethnicity and parental language.

1.3. Aims of the present study

The purpose of the present study was to examine, in a large representative sample of families, the proximal variables — beyond distal constructs such as SES and demographic characteristics of mothers — that predict maternal language to infants. Specifically we were interested in examining whether child characteristics and maternal psychological characteristics were important in predicting maternal language in the presence of the distal SES and demographic variables. In addition, we were particularly interested in examining the possible mediating role of the parenting environment, including engaged parenting and knowledge of child development, in understanding the relationship between SES/demographics and maternal language to infants. Fig. 1 depicts these expected relationships graphically. Because of the representative sampling frame, and given some indication of the possible different relationships between predictors and outcomes in African American and non-African American families, we examined whether ethnicity was a moderator of the parenting environment in predicting maternal language.

2. Method

2.1. Sample and design

The Family Life Project (FLP) was designed to study families who lived in two of the four major geographical areas of high rural poverty among children (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. The FLP adopted a developmental epidemiological design. Complex sampling procedures were used to recruit a representative sample of 1292 children whose mothers resided in one of the six counties at the time of the child's birth, with low-income families in both states and African American families in NC being oversampled. African American families were not oversampled in PA, as the target communities were at least 95% non-African American. Given logistical constraints related to obtaining family income data in the context of hospital screening, family income was dichotomized (low vs. not low) solely for purposes of recruitment but was not used in analyses. Families were designated as low income if they reported household income as less than or equal to 200% of the federal poverty threshold for a given household size, use of social services requiring a similar income requirement (e.g., food stamps, WIC, Medicaid), or if the head(s) of the household had less than a high school education.

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 infants in the three target PA counties and provided 89% coverage of all infants born to residents of target counties. PA hospitals were sampled because the number of infants 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 infants 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 7 days per week over the 12-month recruitment period spanning September 15, 2003 through September 14, 2004 using a standardized script and screening protocol.

In total, FLP recruiters identified 5471 (57% NC, 43% PA) women who gave birth to a child during the recruitment period, 72% of which were eligible for the study. Eligibility criteria included residency in target counties, English as the primary language spoken in the home, and no intent to move from the area in the next 3 years. Of those eligible, 68% were willing to be considered for the study. Of those willing to be considered, 58% were invited to participate. Invitations for participation were based on screening information related to income and, in NC, ethnicity. Of those invited to participate, 82% ($N = 1292$) of families completed their first home visit, at which point they were considered enrolled in the study. The current study was based on 1157 respondents who (1) were re-interviewed at a second home visit, when target children were approximately 6–8 months of age and (2) who completed the picture book task and whose DVD of the task allowed a quality transcription. Although all mothers were the primary caregivers at the child's birth, at each visit to the child's home we designated the biological mother as the primary caregiver if she lived with her child. If the biological mother did not live with the child, then the person who had legal custody of the child or who lived with and cared for the child on a regular basis was designated the primary caregiver. Most (99.8%; 1155/1157) of the primary caregivers were female and most (99.3%; 1149/1157) of all caregivers were biological mothers of children. The remaining primary caregivers included foster parents (1/1157), grandparents (6/1157), or another adult relative (1/1157).

Sixty percent of caregivers were non-African American and 40% were African American. Consistent with the demographic characteristics of the counties from where they were recruited, the vast majority of African American families came from the NC site. Although most caregivers (81%) had a minimum education of a high school degree (including GED) or better, only 14% of caregivers had a 4-year college degree (or better). Slightly fewer than half of all caregivers were married and living with their spouse (48%). An approximately equal number of caregivers were single (46%). The remaining 6% of caregivers were separated, divorced, or widowed. On average caregivers were 26 ($SD = 5.9$) years old at the time of the visit, and their children were 7.7 ($SD = 1.4$) months old. Half of the children were male.

Finally, on average four persons lived in each household, with a mean income-to-needs ratio of 1.83 (an income-to-needs ratio of 1.0 corresponds to federal poverty line). Because of the overwhelming number of caregivers who were biological mothers, we refer to caregivers as mothers throughout this report.

2.2. Procedure

Most of the data presented in this study were collected at the second of a series of 2 1/2 h home visits, when children were on average 6–8 months of age. The first visit was usually scheduled close to the child's 6 month birthday and the second visit was usually 2 to 4 weeks later. Two home visitors visited the families for each visit. Two home visitors simultaneously collected a variety of data from the families, including interviews, questionnaires, primary and secondary caregiver–child interactions, and child-based tasks. All interviews and questionnaires in the Family Life Project (FLP) were computerized. Thus, interviewers 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. At each assessment, new primary caregivers completed the KFAST literacy screener (Kaufman & Kaufman, 1994). Primary caregivers (mothers) reading at an 8th grade reading level (or above)

were given the opportunity to complete questionnaires on their own (86% sample), whereas those who read below an 8th grade reading level had questionnaires read to them.

Information from a picture book task in the home was the primary source of maternal language variables. The mother was asked to sit in a comfortable chair or couch with her child and was given the book *Baby Faces* (DK Publishing, 1998). This wordless picture book contains a picture of a baby face on each page, with each baby showing a different emotion. The mother was told to go through the book with the infant and to let us know when they were finished. Thus, the time of the picture book session varied considerably. The home visitors were told to end the session after 10 min if the mother had not signaled she was finished at that point. At the 6–8 month visit no picture book session lasted as long as 10 min. The mother wore a high quality wireless microphone and the session was recorded with a DVD camcorder.

To evaluate maternal behavior during play interactions with infants during the 6–8 month home visit, dyads were seated on a blanket and read a set of instructions. For this task, a standard set of toys was placed on the blanket for mother and child to use. Mothers were instructed to interact with their children as they normally would if they were playing with them during some free time on a typical day. The task lasted 10 min and was recorded using a DVD camcorder for later coding.

2.3. Predictor variables

2.3.1. Demographic data—The 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. At each home interview time point, detailed information was gathered on household composition, including all people who presently lived in the home, household income that included income from anyone who lived in the household of the family, as well as demographic information on education, and jobs, of household members.

At each home visit, the mothers provided information about their household income. The Family Life Project 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 spend three or more nights per week in the baby's household. At each visit, the mother completed a household grid that contained information about each person residing in the household. From the interview data household income was computed as the sum of the following:

1. Primary respondent's annual income as reported in the interview.
2. Secondary respondent's annual income if available.
3. The sum of the annualized contributions to the household of all the people in the household grid other than the primary and secondary respondent.
4. The sum of all the amounts of other sources of income. This included unemployment insurance, worker's compensation, social security retirement, other pension, cash income from welfare, SSI, child support, interest/dividend income, rental income, alimony, regular help from relatives, regular help from friends, educational grants without any required pay back, and other income.

Using this information, an annual household total income figure was created and 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/needs ratio. For these data, the income/needs ratio was calculated using the 2004 poverty threshold values. These data were collected at the 6–8 month visit.

2.3.2. Mastery—The Mastery Scale (Pearlin & Schooler, 1978) is a 7-item measure designed to determine the extent to which an individual regards one's life-chances of being under one's own control in contrast to being fatalistically ruled (e.g., “I have little control over the things that happen to me”). Items are scored on a 4-point Likert Scale, ranging from *Strongly Disagree* to *Strongly Agree*. The Cronbach's alpha on the Mastery Scale in this study was .69. This measure was obtained at the 2-month visit. Mastery has been linked to depression in several studies that included low-income families (Lachman & Weaver, 1998; Pudrovska et al., 2005).

2.3.3. Maternal knowledge of infant development—The Knowledge of Infant Development Inventory (KIDI; MacPhee, 1981) is a 75-item measure to assess adults' knowledge of typical child development and parenting of infants from birth to 2 years of age. The Family Life Project used a short version of this measure that had 20 items. This measure was administered to the mother at the 2-month visit. Responses to KIDI items are scored as correct (2), incorrect (0), or not sure (1). The criterion for correct answers comes from the research literature. We used the Accuracy score, which corresponds to the proportion of correct answers out of those attempted. Information on test–retest reliability was collected by administering the KIDI 2 weeks apart to a sample of 58 mothers in North Carolina, yielding a coefficient of .92. The internal consistency (alphas) of the KIDI Accuracy score in the Family Life Project sample was .63.

2.3.4. Temperament—The Infant Behavior Questionnaire (IBQ; Rothbart, 1981) is a measure of temperament designed for parent report. A 60-item version of the measure was utilized by the Family Life Project. IBQ items are rated on a 7-point Likert scale. The items have been demonstrated to represent five dimensions or aspects of temperament labeled Approach, Fear/Distress to Novelty, Distress to Limitations, Duration of Orienting, and Recovery from Distress. Internal reliability coefficients for these subscales ranged from .48 to .87 for the 6 month data collection. A composite score, indicating child negative temperament was created from the scales that indicated *child distress*. This composite was created by taking the mean score of three individual subscales including distress to limitations, distress to novelty, and rate of recovery from distress (reverse scored). The internal reliability coefficient was .58. This measure was administered to the mother during the 6–8 month visit.

2.3.5. Maternal sensitivity and engagement—Free play interactions were coded by independent coders who were unaware of the study's hypotheses. Seven subscales were used to evaluate maternal behavior during the free play task. These qualitative ratings have been used in previous studies to assess the quality of parent–child interaction during the 10 min free play sessions (Cox, Paley, Burchinal, & Payne, 1999; NICHD Study of Early Child Care, 1999) and include: sensitivity/responsiveness, detachment/disengagement, positive regard, intrusiveness, animation, stimulation of development, and negative regard. Coders rated each of these seven areas on a 5-point Likert scale where 1 = Not at all characteristic and 5 = Highly characteristic. Coders were trained to reliability using selected video recorded free play episodes that had been previously coded by criterion coders. Approximately 30% of the parent codes were double-coded, that is, the final scores were reached by consensus between 2 coders. Each coding pair maintained an interrater reliability rating of .80 or higher.

Factor analyses guided overall composite scores for *maternal sensitivity* and for *positive engagement*. The composite for *maternal sensitivity* was created by taking the mean scale scores for sensitivity/ responsiveness, intrusiveness (reverse scored) and negative regard (reverse scored). This captured maternal emotional valence with her child. The composite for *maternal positive engagement* was created by summing the reverse coded detachment/ disengagement, and the positive regard, animation, and stimulation of development scale scores. This composite score represented the mother's cognitive stimulation and positive

involvement with her child. Composites were standardized to $M = 0$ and $SD = 1$ in order to facilitate interpretation.

2.4. Maternal language output and complexity

The DVD picture book sessions between the mother and the child were transcribed using the Systematic Analysis of Language Transcripts (SALT; Miller & Chapman, 1985) software. A senior graduate student who spent 1 year learning SALT conventions and developing a training manual trained the transcribers. Transcribers learned the specific conventions of SALT using this training manual. Training lasted at least 3 months as transcribers learned the conventions and definitions of codes while they transcribed many DVDs. At the end of this time coders transcribed 20 training DVDs that were reviewed by the senior transcriber to make sure that all transcription conventions were used. As an ongoing check, transcripts were regularly reviewed by the senior transcriber, and any issues were discussed and resolved at weekly research group meetings to ensure consistency in transcription. Each SALT transcript yields numerous language variables that are created by the software program. Although there were many possible variables from the SALT transcripts, we chose those that were both conceptually important and not highly correlated with each other. Four maternal language variables were selected that represented maternal language output and complexity during the picture book task. These were the *Total Time*, the *Total Number of Different Word Roots*, the *Average Mean Length of Utterance (MLU)*, and *Total Morphological Markers*.

The *Total Time* was defined as the number of seconds each mother interacted with her child during the picture book task. Timing commenced when the mother had been given the book and the instructions for the task had been delivered. The end of the task was the time point when the mother signaled the home visitor that the activity was completed. The three other language variables were derived from the SALT transcription. The *Number of Different Word Roots* represented the mother's diversity of vocabulary during the task. This was determined on the basis of unique free morphemes (word roots) across the entire picture book session. Repetitions and variations in the words were not counted as separate root words. For instance, ‘talk’ and ‘talked’ would be considered the same root word (omitted and unintelligible words were not included). *Mean Length of Utterance* (MLU) in morphemes was a general measure of the complexity of language used by the mothers and was calculated by dividing the total number of utterances by the total number of morphemes. *Total Bound Morphemes* was a measure of the use of morphological markers. In English these morphological inflections are usually added to the end of words in order to indicate markers such as tense, plural, and contractions.

Principle components (PCA) and exploratory factor (EFA) analyses suggested that two factors optimally accounted for the covariation in these items (PCA eigenvalues 2.38, .96, .44, .21). The first and second eigenvalues accounted for 60% and 24% of variation in the data, respectively. An EFA model with an oblique (promax) rotation forcing the extraction of two factors suggested that *Total Time* spent during bookreading and the *Total Number of Different Word Roots* loaded on a factor that we labeled *Maternal language output* because it reflected the total amount of time and the total number of different words the mother used during the task. MLU and Total Bound Morphemes loaded together on a second factor that we labeled *Maternal language complexity* because it indexed the number of morphemes per utterance as well as morphological markers used as grammatical markers. The correlation between factors was .65. Descriptive statistics, including bivariate correlations among the four original variables, and factor loadings from the 2-factor EFA solution are summarized in Table 1.

3. Results

3.1. Analysis strategy

We conducted two hierarchical linear regression analyses to investigate how child characteristics and the maternal parenting environment contribute to maternal language output and maternal language complexity, beyond that accounted for by SES and demographic control variables. In both analyses, family *SES* variables (*income-to-needs ratio, mother high school education*, *mother college education*) were entered in the first step as predictors of maternal language output and as predictors of maternal language complexity. The second step consisted of *demographic control* variables, specifically *state of residence* (PA or NC), *mother ethnicity* (African American or non-African American), and *number of people living in the household*) as predictors. The third step consisted of *child characteristics* (*child sex*, *age*, *child distress*) and the fourth step consisted of the *maternal parenting environment* (maternal *mastery*, *knowledge of infant development*, *age*, and *maternal sensitivity* and *engagement*). The last step consisted of interaction terms, including: maternal/ethnicity × parenting sensitivity, maternal ethnicity × parenting engagement, and maternal ethnicity × KIDI. We were interested in the contribution of each step in accounting for variance in the two maternal language variables, and also whether the magnitude of the association between family SES variables and maternal language variables was reduced in the presence of more proximal child and parental factors. The sample size decreases in some analyses because of problems with DVD quality and infant distress that rendered the session unable to be coded.

In order to formally test whether the parenting environment, including maternal knowledge (KIDI) and behavior (sensitivity, engagement), mediated the relationship between maternal education/demographics and maternal language output and maternal language complexity, we tested whether the product of coefficients from (1) maternal education to parenting knowledge and behavior and (2) from parenting knowledge and behavior to maternal language output and complexity was different than 0 (i.e., Sobel test of mediation). Parenting environment mediation is evidenced to the extent that the product of coefficients is significantly different than 0. Because the focus was on tests of both the combined effects (i.e., KIDI, sensitivity, engagement effects considered jointly) and unique effects (i.e., KIDI, sensitivity, engagement effects considered individually) of parenting environment, we adopted the framework developed by Preacher and Hayes (in press), which is implemented in their freely distributed SAS Macro. Fig. 1 depicts our model of the relationships between predictors and maternal language.

3.2. Preliminary descriptive statistics

Descriptive statistics for the predictor variables and the maternal language variables used in the hierarchical regressions are presented in Table 2. Most mothers had a high school degree; few had a college degree and 40% were African American. The average income/needs ratio was 1.83, suggesting success in oversampling for poverty but also the reality of poor rural counties in North Carolina and Pennsylvania. In order to examine bivariate relationships between the predictor variables and maternal language variables, mean differences were tested for the dichotomous variables and correlations were computed for the continuous variables. These are also presented in Table 3. All predictor variables except for child sex and household size were significantly related to the maternal language variables.

3.3. Regression analyses predicting maternal language output and predicting maternal language complexity

Table 4 presents a summary of the results of the hierarchical regression analyses conducted on maternal language output scores and on maternal language complexity scores. The results of each step in the regression are included for each outcome variable with a summary of the

regression analyses at the end of Table 4. *Family SES* variables, entered in step 1, predicted 6% of the variability in *maternal language output*, $F = 25.61$, $p < .0001$ (left portion of Table 4). Specifically, mothers with a high school education (including GED) or higher ($b = .28$, $p < .0001$), as well as mothers with a four-year college degree or higher ($b = .44$, $p < .0001$), provided more language output relative to mothers who had less than a high school education. Family *income-to-needs ratio* did not make a unique contribution above and beyond the effects of maternal education ($b = .02$, $p = .36$).

Demographic control variables were entered in step 2 and accounted for an additional 3% of the variability in maternal language output, $\Delta R^2F = 12.49$, $p < .001$. Pennsylvania (PA) mothers exhibited greater levels of language output than did their North Carolina (NC) counterparts ($b = .07$, $p < .0001$). Nonetheless, as is summarized in Table 4, *maternal education* variables continued to be significant predictors, and the magnitude of their effects were largely unchanged after consideration of the control variables.

Child characteristics were entered in step 3 and predicted an additional 1% of variability in *maternal language output*, $\Delta R^2F = 2.92$, $p = .03$. Children who were rated as highly distressed by their mothers received less maternal language output than did children who were not rated as highly distressed ($b = -.11$, $p = .008$). Once again, as is summarized in Table 4, *maternal education* variables continued to be significant predictors of *maternal language output*, and the magnitude of their effects was largely unchanged in the presence of child variables.

The *maternal parenting environment* scores were entered in step 4 and predicted an additional 12% of the variability in maternal language output, $\Delta R^2F = 34.54$, $p < .0001$ (see Table 4). The relationship between higher *KIDI* scores (indicating more knowledge about child development) and *maternal language output* ($b = .05$, $p = .07$) approached significance. Mothers scoring higher on *positive engagement* during mother–child free play interactions provided more language output ($b = .34$, $p < .0001$). *Maternal ethnicity* also emerged as a significant predictor in the presence of these parental characteristics, such that African American mothers provided more language output than did non-African American mothers ($b = .29$, $p < .0001$). However, this pattern of association is counter to the bivariate relationship in which African American mothers provided less language output compared to non-African American mothers (see Table 3). The change in the direction of this association is indicative of a suppression effect and is not interpretable. With the inclusion of the parenting environment variables, the high school education effect was no longer significant ($b = .04$, $p = .53$), and the effect of a four-year college degree or higher was appreciably reduced relative to its initial effect ($b = .23$, $p = .006$). This pattern of results is consistent with the notion that the parenting environment mediated the relationship between SES and *maternal language output*. The final model, including all predictors, accounted for 21% of the variability in maternal language output, $F = 22.00$, $p < .0001$.

The *interaction terms* between maternal ethnicity and the two observed parenting variables (*sensitivity*, *engagement*), as well as the *KIDI* were entered in the last step and did not predict any additional variability in *maternal language output*, $\Delta R^2F = .70$, $p > .10$ (see Table 4). None of the individual interaction terms (maternal ethnicity × KIDI, maternal ethnicity × sensitivity, maternal ethnicity × engagement) were significant predictors of *maternal language output*.

A formal test of the *parenting environment as a mediator of maternal language output* was conducted to address the issue of whether maternal knowledge and behavior mediated the observed relationships between maternal education and language output. As previously noted, the inclusion of maternal parent environment variables resulted in a reduction of the magnitude of the effects of high school and college education as predictors of language output. In the formal test of mediation, there was evidence that parental knowledge and behavior jointly

mediated the effect of high school education on parental language output, $z = 4.95$,$p < .0001$. However, the outcome of this analysis suggests that the effect was entirely due to parental engagement, $z = 4.69$, $p < .0001$, as neither parental sensitivity nor knowledge of child development were significant predictors of mothers' language output, zs = .42 and 1.63 respectively, ps $\geq .10$. Taken together with the fact that the main effect of high school education was no longer significant in the last step of the hierarchical regression model, these results are indicative of complete mediation.

Parental knowledge and behavior also jointly mediated the effect of maternal college education on parental language output, $z = 4.30$, $p < .0001$. However, once again this effect was entirely due to parental engagement, $z = 4.10$, $p < .0001$, as neither parental sensitivity nor knowledge of child development were significant predictors of maternal language output, zs = .46 and 1.58, respectively, ps $\geq .11$. Taken together with the fact that the main effect of maternal college education continued to be a significant predictor in the last step of the hierarchical regression model (described above), these results are indicative of partial mediation.

3.4. Regression analysis predicting maternal language complexity

The right portion of Table 4 also presents the results from the regression predicting *maternal language complexity*. *Family SES* variables were entered in step 1 and predicted 8% of the variability in *maternal language complexity*, $F = 32.69$, $p < .0001$. Greater maternal education (high school or greater: $b = .17$, $p = .008$; four-year college degree or higher: $b = .45$, $p < .0001$) and higher family income-to-needs ratios ($b = .05$, $p = .005$) were associated with greater language complexity.

Demographic control variables were entered in step 2 and accounted for an additional 3% of the variability in *maternal language complexity*, $\Delta R^2F = 13.82$, $p < .001$. Whereas mothers in PA provided greater language complexity relative to their NC counterparts, $b = .19$, $p = .0019$, African American mothers provided less complex language relative to their non-African American counterparts, $b = -.16$, $p = .01$. With the inclusion of these control variables, the effect of family *income-to-needs ratio* was no longer significant, $b = .02$, $p = .26$. However, *maternal education* effects remained significant and largely unchanged (high school or greater: $b = .16$, $p = .01$; four-year college degree or higher: $b = .41$, $p < .0001$).

Child characteristics were entered in step 3 and predicted an additional 2% of the variability in *maternal language complexity*, $\Delta R^2F = 10.41$, $p < .0001$. Older children ($b = -.07$, $p = .0002$) and highly distressed children ($b = -.12$, $p = .001$) received less *complex maternal language*. The effects of *maternal ethnicity* on *maternal language complexity* were no longer significant after child characteristics were entered into the model, $b = -.11$, $p = .09$. In contrast, *maternal education* remained significant and there were only slight changes in the presence of child characteristics, high school or greater: $b = .13$, $p = .04$; four-year college degree or higher: $b = .39$, $p < .0001$.

The *maternal parenting environment* characteristics were entered in step 4 and predicted an additional 9% of the variability in *maternal language complexity*, $\Delta R^2F = 25.63$, $p < .0001$. Older mothers provided less complex language, $b = -.01$, $p = .02$. Higher *KIDI* scores, which indicated more knowledge about child development, were associated with greater *maternal language complexity*, $b = .07$, $p = .01$. Mothers scoring higher on *parental engagement* during mother–child free play interactions provided more complex language, $b = .27$, $p < .0001$. With the inclusion of parental characteristics, the maternal high school education effect was no longer significant, $b = -.02$, $p = .71$, and the effect of a four-year college degree or higher was reduced relative to its initial level of effect, $b = .29$, $p = .006$. Like the analyses involving *maternal language output*, this pattern of results is consistent with the notion that the maternal parenting environment partially mediates the relationship between SES (especially mother's

education) and *maternal language complexity*. This final model, including all predictors, accounted for 22% of the variability in *maternal language complexity*, $F = 22.89$, $p < .0001$).

The *interaction terms* between maternal ethnicity and the two observed parenting variables (sensitivity, engagement), as well as self-rated knowledge of child development were entered in the last step and did not predict any additional variability in maternal language complexity, $\Delta R^2F = .43$, $p > .10$. None of the individual interaction terms (maternal ethnicity × KIDI, maternal ethnicity × sensitivity, maternal ethnicity × engagement) were significant predictors of maternal language complexity.

A formal test of the *parenting environment as a mediator of maternal language complexity* was conducted to address the issue of whether maternal knowledge and behavior mediated the observed relationships between maternal education and language complexity. Formal tests of mediation indicated parental knowledge and behavior jointly mediated the effect of high school education on parental language complexity, $z = 5.18$, $p < .0001$. This effect was found for both knowledge of child development, $z = 2.26$, $p = .024$, and for parental engagement, $z = 4.56$, $p < .0001$, but not for parental sensitivity, $z = -.32$, $p = .75$. Taken together with the fact that the main effect of high school education was no longer significant in the last step of the hierarchical regression model, these results are indicative of complete mediation. Parental knowledge and behavior also jointly mediated the effect of maternal college education on parental language syntax, $z = 4.18$, $p < .0001$. This joint effect was primarily due to parental engagement, $z = 3.87$, $p = .0001$. While the role of knowledge of child development was suggestive, this effect only approached the level of significance, $z = 1.90$, $p = .057$. There was no evidence that parental sensitivity was involved in predicting maternal language complexity, $z = -.33$, $p = .74$. Taken together with the fact that the main effect of maternal college education continued to be a significant predictor in the last step of the hierarchical regression model (described above), these results are indicative of partial mediation.

4. Discussion

This study helps to fill a significant gap in the literature by directly investigating, in a large and representative sample, a variety of child and parenting characteristics that accounted for maternal language beyond those accounted for by SES and other demographic variables. The data were collected when infants were between 6 and 8 months, thus minimizing the possible effects of child language skill on maternal language. Overall, the results suggest that infant temperament helped to explain maternal language to her infant and that parental knowledge, and especially observed parental engagement, mediated the relationship between family SES/demographics and maternal language output and complexity to her infant.

4.1. SES/demographic controls and maternal language

Many other studies have examined maternal education in relationship to the way mothers talk to their children (Bornstein et al., 1998; Hoff, 2003; Raviv et al., 2004, Rowe et al., 2005; Weizman & Snow, 2001). Mothers with lower education use less language, less varied language, and less complex language in talking with their children. Our study replicates these findings and underscores the importance of mother's education as an important distal predictor of maternal language. Both a high school and college education were found to be important in predicting maternal language output. However, when the maternal parenting environment was entered, education was much less important.

Many language studies rely on maternal education as a proxy for SES because it is often difficult to obtain reliable family income information. However, in the present study we were able to collect income information so we could use both an income/needs ratio and maternal education in defining SES. In the regression analysis predicting maternal language output,

income/needs was not related to maternal language output in the presence of maternal education even in the first step in the regression. In predicting maternal language complexity, income/needs was significant in the presence of maternal education in the first step in the regression but quickly disappeared as an important predictor when other demographic characteristics were considered. Although there are no studies that have looked at income in predicting maternal language, some studies have found that poverty is related to child outcomes (NICHD Study of Early Childcare, 2005a,b,c; Nievar & Luster, 2006). Since our study included both education and income, education may be the variable that is most important in understanding maternal behavior while poverty may have more pervasive effects on children's actual development. In addition, poverty may become more important for understanding mother's language as the children become toddlers and begin to talk themselves. Poverty may also exert influence indirectly as children get older because of poverty's relationship to resources, like books and literacy materials, which may be important in mother's talk to their children as they get older.

We included demographic control variables that defined the sampling design (state, ethnicity) and/or have been linked to family outcomes (family size). The variable that most consistently related to maternal language output was region of residence, with mothers in Pennsylvania talking more, even when other variables were considered/controlled. Region was not as strong a predictor of maternal language complexity as some other variables, becoming nonsignificant when SES, background demographic characteristics, and child characteristics were considered. Regional differences in maternal language have not been examined in previous studies, but 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 but there are no large scale studies that have documented regional differences in adult or child talk. Further studies that combine quantitative and qualitative methods might help elucidate the reasons for these differences. Besides place of residence, the two regions contained different proportions of African American families, with North Carolina having many African American families and Pennsylvania almost none. Although we analyzed both ethnicity and region effects, it is possible that these effects are due to the cultural differences that involve both region and ethnicity.

4.2. Child characteristics and maternal language

Child variables were also a significant predictor of maternal language, especially for maternal language complexity. For example, mothers used less complex language when children were older. This has been shown in other studies, suggesting that as children begin to understand language, mothers reduce their MLU to be more attuned to their children's language level (Murray, Johnson, & Peters, 1990; Stern, Speiker, Barnett, & MacKaine, 1983). In addition, mothers who rated their children as more distressed produced less language output and also used less complex language in interaction with them; but these findings should be interpreted with caution since child variables only accounted for 1% of the variance in maternal language output and 2% of the variance in maternal language complexity. Even given this small effect, it does suggest that variables such as child temperament might partially explain mothers' language with their children. This may become more important as the children get older. In addition, there are other individual characteristics of children that can influence parents' language, such as the language level of the children. But in the present study, the effect of the child's language was somewhat controlled since the children were not talking yet. Future language studies should include variables like child temperament as an important correlate of parental talk to children.

4.3. Maternal parenting environment

There are a myriad of parent characteristics and processes that are important in understanding variation in maternal language. Although this study did not find the expected effect of maternal

mastery on maternal language, this may have been because of problems with our measure of child distress or because distress at age 6 months in this sample was not a factor in understanding the way mothers talk to their babies. On the other hand, mothers' knowledge of child development was related to maternal language complexity and the relationship of child development knowledge approached significance for maternal language output. Bornstein et al. (1998) reported similar findings in relationship to mothers' knowledge of child development in a sample of Caucasian middle to upper middle class mothers. Our results converge with those prior findings, making a strong case for the importance of mothers' knowledge about how infants develop as a possible important predictor of how mothers talk to their children across SES and ethnicity groups.

The most important variable in understanding maternal language output and complexity was the mother's engagement with her child during a free play session in the home. This process level observational variable was a composite that represented the mother's stimulation and engagement with her child. This result is consistent with findings that the quality of the home environment is an important mediator of the relationship between environmental risks, like SES and maternal mental health, and child language (Morissett et al., 1990; Raviv et al., 2004). It is also consistent with one of the few rural studies (Fish & Pinkerman, 2003), which found that maternal facilitation during a teaching task in infancy was related to children's language prior to kindergarten. Interestingly, maternal sensitivity was not a predictor of either maternal output or complexity in the present study. This may have been the case because maternal sensitivity was an index of the emotional and affective tone of the mothers during free play and might be more related to mother's socialization of prosocial and emotional aspects of the children's development (Early et al., 2002; Lehman, Steier, Guidah, & Wanna, 2002).

The maternal parenting environment as a whole, and particularly maternal engagement, appeared to mediate the relationship between SES/demographic controls and maternal language. Consistent with mediation, for both maternal language output and complexity the effect of maternal college education was nearly cut in half with the addition of the maternal parenting environment variables. The predictive power of a high school degree on maternal language output and complexity disappeared in the presence of the maternal parenting environment. In the formal tests of mediation, maternal engagement completely mediated the relationship between a high school education and maternal language output and complexity and partially mediated the relationship of a college education on maternal language output and complexity. Thus, this study provides evidence that when mothers are engaged with their children and providing a stimulating environment for interaction, this parental style variable mediates the relationship between SES, especially maternal education, and maternal language to infants.

4.4. Moderating effects of ethnicity on maternal language

Overall there were very few ethnicity effects that could be interpreted in this study. Whereas bivariate relationship between ethnicity and maternal language indicated that African American mothers exhibited less language output and less language complexity, the reverse pattern of results was observed in the final regression models, where being African American was associated with more output and increased language complexity. It is important to note that this apparent reverse effect only emerged in the fourth and fifth steps of the hierarchical regression models, when parenting composites were entered, and are indicative of suppression effects. There was no clear evidence that ethnicity moderated the effects of knowledge of child development or parenting in the prediction of outcomes. Collectively, these results suggest that while ethnicity was not an important variable in the prediction of maternal language output and complexity, it was correlated with income and parenting composites in complex ways that we were not able to disentangle in this study.

4.5. Summary and implications for parenting

In summary, this study adds new and important information about the predictors of maternal language in a diverse and large representative sample of mothers with young infants. We found evidence for a variety of distal and proximal maternal psychological variables in the prediction of maternal language. We also found that child characteristics, like child temperament, were somewhat important in predicting maternal language complexity, a finding that suggests that future studies need to measure child characteristics (beyond the child's language level). The mediating role of the quality of the observed maternal engagement in predicting maternal language was a central finding in this study and has the important implications for intervention. Results from this study suggest that responsive and supportive parenting during interactions with their children is an important predictor of the way mothers talk to their children. It follows that it is important to help mothers develop these interactive skills, which in turn may enhance their skills in talking more and in more complex ways with their children. This kind of intervention seems feasible, especially in comparison to directly teaching mothers to use more words and use more complex talk. Thus, an indirect route to increasing mothers' language by encouraging mothers to engage in productive play with their children is suggested.

Finally, these results contribute to a larger literature that has begun to document the proximal processes that may underlie associations between SES/demographics and maternal behavior; thus focusing our attention on the more malleable behaviors in the family that can affect children's development.

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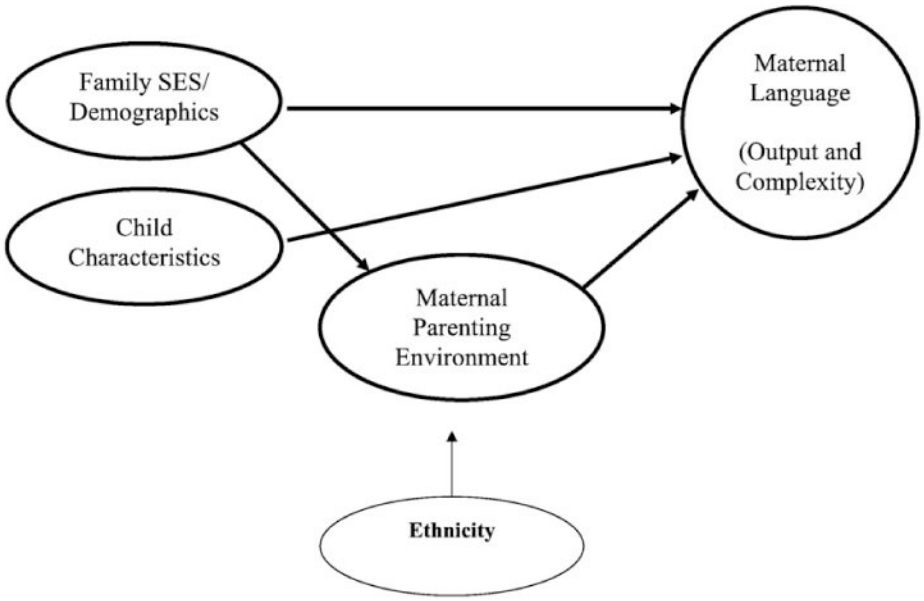

Fig. 1.
Predictors of maternal language output and complexity.

Table 1

Maternal language variables and composites from the picture book task

Model	Model description	Correlations				Descriptive statistics			Factor loadings	
		1	2	3	4	*M* (*SD*)	Min	Max	Language output	Language complexity
1	Total time (in seconds)	1.0				162.10 (70.44)	.00	600.00	.80	-.20
2	Total number different word roots	.60	1.0			67.50 (28.84)	.00	172.00	.58	.39
3	MLU in morphemes	.05	.43	1.0		2.98 (.73)	.00	8.12	-.18	.68
4	Total bound morphemes	.40	.74	.42	1.0	4.97 (2.03)	.00	11.00	.33	.53

Notes. *N* = 1148–1157. A discrepancy in the *N* was due to the total time for the picture book session being generated by a computer during the home visit, while the actual transcription was used to calculate the other three variables. Other discrepancies were due to DVDs of poor quality, poor sound, etc that could not be transcribed. The correlations between vocabulary and maternal language and complexity and composite scores are .65 and .54, respectively.

Table 2

Descriptive statistics for predictor variables

Variable	*M*	%	*SD*
SES			
Less than high school (%)	-	19	-
GED/high school+ (%)	-	66	-
4-year college degree+ (%)	-	14	-
Income-to-needs ratio	1.83		1.71
Demographic controls			
State (PA) (%)	-	42	-
Maternal ethnicity (AA) (%)	-	40	-
Number in home	4.35	-	1.41
Child characteristics			
Child sex (male) (%)	-	51	-
Child age (mos.)	7.98	-	1.44
Child distress	3.02	-	.68
Maternal parenting environment			
Mastery	3.18	-	.44
KIDI	.81	-	.13
Maternal age (years)	26.36	-	5.90
Sensitivity	3.29	-	.69
Engagement	2.95	-	.84
Maternal language			
Output	-.00	-	.90
Complexity	.00	-	.84

Notes. *N* = 1122–1148; AA = African American.

Table 3

Descriptive statistics for predictor variables and maternal language variables

Predictor variables			Maternal language output		Maternal language complexity	
SES		***N***	***M* (*SD*)**	***t***	***M* (*SD*)**	***t***
Maternal education	Less than HS	222	-.31 (.80)	-5.77***	-.25 (.86)	-4.90***
	HS+	926	.07 (.90)		.06 (.83)	
	Less than college	983	-.08 (.88)	-7.43***	-.09 (.83)	-8.83***
	College+	165	.47 (.84)		.52 (.73)	
State location	NC	669	-.16 (.83)	-7.49***	-.16 (.86)	-7.70***
	PA	479	.23 (.93)		.22 (.77)	
Maternal ethnicity	Non-AA	687	.11 (.90)	5.04***	.16 (.79)	8.12***
	AA	461	-.16 (.86)		-.24 (.86)	
Child sex	Female	563	.01 (.88)	.56	.03 (.86)	1.00
	Male	585	-.02 (.91)		-.02 (.83)	
			Output Pearson *r*		Complexity Pearson *r*	
Income-to-needs ratio		1148	.16***		.22***	
Number of people in household		1148	-.02		-.06*	
Child age		1148	-.14***		-.23***	
Child distress		1140	-.17***		-.23***	
Mastery		1148	.08**		.15***	
KIDI		1148	.22***		.26***	
Mother age		1148	.16***		.11***	
Sensitivity		1122	.18***		.19***	
Engagement		1122	.42***		.40***	

Notes. College refers to a 4-year degree; NA = Non-African American, AA = African American. Independent *t*-tests are reported for the mean difference of maternal language output and complexity for each dichotomous predictor variable. Pearson correlations reported for maternal output and complexity for each continuous predictor variable.

* $p < .05$.

** $p < .01$.

*** $p < .001$.

Table 4

Summary of hierarchical linear regression analyses predicting maternal language output and complexity

	Language output					Language complexity				
	Step 1	**Step 2**	**Step 3**	**Step 4**	**Step 5**	**Step 1**	**Step 2**	**Step 3**	**Step 4**	**Step 5**
SES										
Maternal Ed. (HS+)	.28***	.27***	.23***	.04	.04	.17**	.16*	.13*	- .02	- .03
Maternal Ed. (4 year+)	.44***	.41***	.40***	.23**	.24**	.45***	.41***	.39***	.29***	.29***
Income-to-needs ratio	.02	.00	-.00	-.02	-.02	.05**	.02	.01	.00	.00
Demographic controls										
State (PA)	-	.35***	.34***	.33***	.33***	-	.19**	.06	.05	.05
Maternal ethnicity (AA)	-	.05	.10	.29***	.30***	-	-.16*	-.11+	.03	.03
Number in home	-	.01	.01	.00	.00	-	-.01	-.02	-.00	-.01
Child characteristics										
Child sex (male)	-	-	- .07	- .05	- .05	-	-	-.09	-.07	- .07
Child age	-	-	- .00	- .00	- .00	-	-	-.07***	-.07***	- .07***
Child distress	-	-	- .11**	- .08+	- .08+	-	-	-.13**	-.10*	- .10**
Maternal parenting environment										
Mastery	-	-	-	-.06	- .07	-	-	-	.05	.05
KIDI	-	-	-	.05+	.03	-	-	-	.07*	.07+
Maternal age	-	-	-	.00	.00	-	-	-	- .01*	- .01*
Sensitivity	-	-	-	.01	.03	-	-	-	- .01	- .00
Engagement	-	-	-	.34***	.32***	-	-	-	.27***	.24***
Ethnicity interaction terms										
Maternal ethnicity × KIDI	-	-	-	-	.05	-	-	-	-	- .00
Maternal ethnicity × sensitivity	-	-	-	-	- .03	-	-	-	-	- .01
Maternal ethnicity × involvement	-	-	-	-	.05	-	-	-	-	.06
Model F (df)	25.61*** (3, 1144)	19.44*** (6, 1141)	13.66*** (9, 1130)	22.00*** (14, 1099)	18.22*** (17, 1096)	32.69*** (3, 1144)	23.81*** (6, 1141)	19.52*** (9, 1130)	22.89*** (14, 1099)	18.90*** (17, 1096)
Adjusted R^2	.06	.09	.09	.21	.21	.08	.11	.13	.22	.21
Change F (df)	-	12.49*** (3, 1141)	2.92* (3, 1130)	34.54*** (5, 1099)	.70 (3, 1096)	-	13.82*** (3, 1141)	10.41*** (3, 1130)	25.63*** (5, 1099)	.43 (3, 1096)

Note. AA = African American.

+ $p < .10$.

* $p < .05$.

** $p < .01$.

*** $p < .001$.