

THE IMPACT OF PARENT AND CHILD RESPONSIVENESS ON THE
ASSOCIATION BETWEEN PRINTED MATERIALS IN THE HOME AND
CHILD LANGUAGE DEVELOPMENT

BY

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Abstract

Research evidence indicates that both the physical and social environments in children's homes impact their ability to develop language. These factors, however, are rarely considered simultaneously nor is the combined impact of multiple levels of the child's environment often investigated in a single study. The current study considered the direct influence of access to printed materials in the home, child responsiveness, and parental responsiveness on language development two time points in a sample of 71 mother-child dyads. Printed materials were measured using a combination of observation and maternal report. Child and parent responsiveness were measured during an observation task and child language development was measured using the Preschool Language Scale. It was hypothesized that each of these variables would positively predict language development when the child was 10 and 24 months old. The possible moderating effects of both parental and child responsiveness on the association between printed materials and child language development was also investigated. Although the hypotheses were not supported, implications, such as the inclusion of subtypes of parental responsiveness and the need to study these associations within diverse samples are discussed.

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The Impact of Parent-Child Interactions on the Association Between Printed Materials in the Home and Child Language Development

One of the crucial prerequisites of human success is the development of language. For children, the ability to use language to communicate is intricately linked to the development of healthy emotional functioning (Baltaxe & Simmons, 1988), cognitive skills (Hohm, Jennen-Steinmetz, Schmidt, & Laucht, 2007; Rescorla, 2005), and meaningful interpersonal relations (Horowitz, Jansson, Ljungberg, & Hedenbro, 2006). For children from low-income homes, however, the expected gains in language skills are impeded by exposure to less than optimal environments (Hart & Risley, 1995). The picture is further complicated by the finding that some children from low-income homes have language skills similar to those children who do not experience economic adversity (Masten, 2001). The variety of outcomes is puzzling and suggests that the association between income status and language ability is not straightforward. The purpose of the proposed study is to examine how qualities of the home environment in low-income status homes influence language development in children.

Although the focus of the present study is on how the environment impacts language development, clearly language skills evolve from a complex process and are determined by both biological and environmental factors.

Biological influences

At the most basic level, the ability to develop language is related to several chromosomes provided by the child's parents (Smith, 2007). Bishop (2006) stated

that specific language impairment is likely “caused by the interaction of several genes together with environmental risk factors” (p. 218).

Beyond genetics, a myriad of biological factors are likely related to language development (e.g., brain development, neurological functioning; Shafer, Ponton, Datta, Morr, & Schwartz, 2007). Most biological factors, however, are likely to depend upon environmental factors to determine their level of influence. For example, one study found that socioeconomic factors (i.e., parental education, parent occupation, and the family’s income-to-needs ratio) moderated the association between reading-related brain activity and phonological language skills (Noble, Wolmetz, Ochs, Farah, & McCandliss, 2006). Specifically, a strong association between brain activity and phonological language skills was present for children from lower socioeconomic homes, whereas a weaker association between the two was found for children from higher socioeconomic homes. The greater degree of variability in phonological skills found in children from high-income homes indicates that the environment found in these homes may moderate the association between brain activity and phonological language skills.

Evidence also suggests that language difficulties in toddlerhood are more likely to persist for children from low-income homes (e.g., Walker, Greenwood, Hart, & Carta, 1994), whereas they are more likely to be resolved for children from middle or high-income homes (La Paro, Justice, Skibbe, & Pianta, 2004). Moreover, there is evidence that children who start out with poorer language development fall farther and farther behind their peers over time (Hebert, Swank,

Smith, & Landry, 2004). The demonstrated discrepancy between the language outcomes of children exposed to low-income home environments and those of children exposed to middle- or high-income home environments, as well as the finding that some children in low-income homes do as well as those growing up with more resources (Masten 2001), has led researchers to investigate how specific characteristics of those environments differ.

Environmental influences

Early Intervention Programs. One of the ways researchers and interventionists have sought to study the impact of the environment on children's language development is via early intervention programs. Some well-known early intervention programs were developed to determine whether children from low-income homes could benefit from intensive services delivered earlier than traditionally offered when children were school-aged (e.g., Ramey & Campbell, 1991). Interestingly, when both middle-income and low-income families were included in early intervention programs, only those from low-income homes tended to benefit in the areas of language and cognitive ability, while no difference was found between middle-economic status children who participated or did not participate in the intervention (Geoffroy, Cottrell & Verleysen, 2007; Murray, Fees, Crowe, Murphy, & Henriksen, 2006). It may be that the environment of the intervention program was so similar to the kinds of stimuli found in the homes of children from middle-economic backgrounds that the intervention did not provide a significant change or improvement from the typical

experience of middle-income life. In contrast, the environment of these programs may provide a qualitative change from the daily environment of low-income homes by providing a setting in which more physical and social resources were available that promoted language skills.

Available Materials. The difference in learning tools (i.e., toys, printed material) available in low-income homes, especially books and magazines, compared to high-income homes and early intervention centers is well documented. Bradley and colleagues (1989) found that home environments that can be distinguished by varying levels of income also vary in the kinds of materials available in the home that tend to promote language development. For example, children from low socioeconomic status (SES) groups were much less likely than children from high SES groups to encounter “highly enriched” experiences at home (i.e., significant parental involvement and responsiveness, play and learning materials).

Indeed, other research shows that children from low-income homes visit libraries less frequently (Federal Interagency Forum on Child and Family Statistics, 2000), have fewer learning toys at home (Duncan, Brooks-Gunn, & Klebanov, 1994; Smith, Brooks-Gunn, & Klebanov, 1997), and have fewer books at home (Sherman, 1994) than children from middle- or high-income homes. Similarly, Feitelson and Goldstein (1986) found that in neighborhoods with poor school performance, most kindergarteners did not own any books, whereas in neighborhoods where youth school performance was good included

kindergarteners who each owned an average of 54 books. Some research indicates that access to printed materials, such as the number of books in the child's home and how often the child visited the library, was associated with language development in a sample of four-year-olds (Payne, Whitehurst, & Angell, 1994). Research also indicates that the number of books in a child's home was positively associated with a variety of child language assessment scores (Whitehurst, Arnold, Epstein, Angell, Smith, & Fischel, 1994). Additional research, however, is needed to determine the generalizability of these findings and whether investigations with younger children would produce similar results so that intervention efforts can be targeted to the earliest possible time in children's development for maximum benefit.

Parent-Child Interaction. Another important facet of a child's environment that has implications for language development is the nature of the interactions between the child and adults. Among all of the individuals with whom the child may interact, it is the relationship with the child's parent, that is, mother-child interactions that has received the most research (e.g., Evans, 2004; Fish, Amerikaner, & Lucas, 2007; Hart & Risley, 1995; Landry, Swank, & Smith, 2006). In general, findings from these studies suggest that the quality of these interactions, particularly the level of maternal responsiveness, has a substantial influence on the child's subsequent language development.

For example, one context for interaction often studied is shared, or joint, book reading. Studies have indicated that shared book reading is positively associated

with language development (Aram & Biron, 2004; Aram & Levin, 2002; Weigel, Martin, and Bennett 2006), and that how parents interact with the child during shared book reading is associated with changes in child language development (Whitehurst, et al., 1994). Whitehurst and colleagues implemented an intervention in which parents in an experimental group were taught milieu teaching strategies, (i.e., asking open-ended questions, making expansions, and responding positively to children's comments), and educated on the activity's potential developmental importance. Parents in the control group were instructed to read with their children as they typically would. At the nine month post-test assessment, the children in the experimental group continued to demonstrate gains in verbal ability compared to children in the control group.

Results from another investigation indicated that more parental warmth, a part of responsiveness, was associated both with more auditory comprehension, or receptive language, and with expressive language in children (Fish et al., 2007). In contrast, maternal restrictiveness, that is, interfering with children's activities and exploration of the environment, was negatively associated with language development (Landry, Smith, Miller-Loncar, & Swank, 1997; Landry, Smith, Swank, Assel, & Vellet, 2001), indicating that less responsive parenting behaviors are associated with poorer child language development.

The results indicate that it is not simply the activity in which parents and their children engage (i.e., reading) that impacts children's language development but specific parent behaviors (i.e., parent responsiveness and engagement) while

reading that may be the agent of change. Therefore, it may be more important to understand how parents interact with their children rather than simply encouraging specific activities when seeking to understand children's language development.

Research has also indicated that changes in parental responsiveness predict changes in language development. For example, Landry, Swank, and Smith (2006) found that when families were provided an intervention to increase parental responsiveness, both maternal responsiveness and child's language development improved, whereas neither variable increased in the control group, implying that it was the change in responsiveness that caused the change in child language. Van den Boom (1994) also found that maternal responsiveness can be changed through skill-based intervention and that these changes remain when children were followed to 42 months, which was 2.5 years after the intervention had ended (van den Boom, 1995). Recent literature also indicates that such interventions can be easily and effectively delivered through the internet with similar results (Baggett, et al., 2010). Taken together with additional research (e.g., Akai et al., 2008; Landry et al., 2008; Mahoney & Perales, 2005; Mahoney, Perales, Wiggers, & Herman, 2006), these studies illustrate that certain types of parenting behaviors appear to facilitate language development, while others appear to impede language development and that these parental behaviors are highly amenable to intervention. This evidence is further supported by a meta-analysis that indicated a moderate effect size, ($d = 0.33$, $p < .001$), for

interventions targeting parental responsiveness (Bakermans-Kranenburg, van IJzendoorn, & Juffer, 2003).

For children in low-income homes, exposure to maternal responsiveness may be less frequent than in high-income homes. For example, research has indicated that parents in low-income homes seem to have a greater difficulty engaging in language-promoting parenting behaviors when interacting with their children, specifically demonstrating lower levels of responsiveness (Hart & Risley, 1995). How responsive a parent is to his or her child is not solely the product of the parent's individual characteristics or parenting style and likely depends in part, on the characteristics and behavior of the child.

Child Characteristics

The above literature presents a strong case for the impact of the quality of the parent-child interaction, specifically responsiveness, on language development (e.g., Evans, 2004; Fish et al., 2007; Landry, et al., 2006). In addition to the influence of parental behavior, child characteristics are associated with language development. One such characteristic is the child's current language use. For example, Hart and Risley (1995) found that child vocabulary during the parent-child interaction predicted later child language development, as did Walker et al. (1994). Landry and colleagues (1997) coded several levels of child communication, namely gestures, vocalizations, and words, and found these to be predictive of child language development. Similarly, Morisset, Barnard,

Greenberg, Booth, and Spieker (1990) found that the child's rate of communication predicted later child language development.

Research has also indicated a consistent association between children's ability to attend to the same object as a parent (joint attention) and children's language ability. For example, Morales and colleagues (2000) demonstrated an association between joint attention and vocabulary, as have others (e.g., Carpenter, Nagell, & Tomasello, 1998; Tomasello & Farrar, 1986; Tomasello & Todd, 1983). Additionally, a child's joint attention skill has been associated with conversation length (Tomasello & Farrar, 1986) and communicating with gestures (Carpenter et al., 1998).

Other child characteristics, measured outside of the parent-child interaction, have also been demonstrated to predict child language development. For example, children's ability to regulate their affect (Horowitz, Irwin, Briggs-Gowan, Bosson Hennan, Mendozze, & Carter, 2003; Irwin, Carter, & Briggs-Gowan, 2002; Qi & Kaiser, 2004) is positively associated with language development in toddlers and preschool-aged children. Further, some characteristics of temperament (i.e., positive and negative emotionality) are associated with language development (Dixon & Smith, 2000; Morales et al., 2000).

Furthermore, child temperament impacts the effect of parental responsiveness when measured during the parent-child interaction. Karrass and Braungart-Rieker (2003) found that child distress to novelty moderated the association between maternal responsiveness measured when children were 12 months old and child

language development. Specifically, parental responsiveness only positively predicted language development when children displayed low levels of distress. The authors postulated that children must be willing to explore their environment before parents can support their efforts to do so. Furthermore, child responsiveness has been shown to influence maternal responsiveness (Bornstein, Hendricks, Haynes, & Painter, 2007).

Social Transactional Model of Language Development

The above studies (Bornstein et al., 2007; Karrass & Braungart-Rieker, 2003; Landry et al., 1997) illustrate the importance of viewing the development of language as a reciprocal process between two human agents, each influencing the behavior and impact of the other. The social transactional model of language development posits that children's and parents' characteristics and behavior influence each other while each also independently influences the child's language development (Sameroff & Chandler, 1975; Sameroff & Fiese, 2000). For example, the child's temperamental characteristics of sociability and positive affect may influence the level of reinforcement a parent receives when interacting with that child, which may influence the quantity and quality of those interactions. Parental characteristics such as education level, positive affect, and availability, may also influence the quality and quantity of parent-child interactions (Sameroff & Fiese, 2000). Over time, these differences in interactional style build into drastically different histories of experience for children (Hart & Risley, 1995;

Warren & Walker, 2005). It is the totality of these histories, in large part, that are thought to result in differences in language ability for children.

Current Study

The current study was designed to investigate the association of printed materials available in the home, parental responsiveness, and child responsiveness during the parent-child interaction and child language development. By including only low-income families, the present study provided important information on how differential exposure to specific environmental characteristics (i.e., printed materials, parental responsiveness, and child responsiveness) within a similarly low-income sample was related to language development in children. It is likely, based on previous research, that the amount of printed materials available in the home would predict children's language development (Federal Interagency Forum on Child and Family Statistics, 2000; Feitelson & Goldstein, 1986; Payne et al., 1994; Whitehurst et al., 1994). It is also likely that child language development would be predicted by both parent and child responsiveness during the parent-child interaction.

Furthermore, based on the social transactional model of language development, it is likely that these influences work in tandem, so that printed materials are only predictive of language development when child and parent behaviors are taken into account, as these variables serve as a proxy for how parents are likely to support their children's use of these materials. Few studies have considered printed materials, parental responsiveness, and child

responsiveness simultaneously to investigate the possibility of a synergistic effect, particularly in children under the age of two (as reviewed by Richman & Colombo, 2007). By including variables associated with the child's physical environment, social environment, and personal characteristics, the current investigation extends the current literature by considering the interaction of several characteristics of the child's developmental context in predicting language development.

Hypotheses

Based on the above justification and to expand other research with preschool-age children (Payne et al., 1994), the first hypothesis was that the number of printed materials available (i.e., personal books, magazines, newspapers, and library books) would be positively associated with language development at both the 10 month and 24 month time points. It was expected that more access to printed materials would be associated with higher scores on a standardized language assessment when children were 10 and 24 months old.

Because previous literature indicates that the quality of the parent-child interaction is associated with children's language development in samples including multiple income classes (e.g., Hart & Risley, 1995; Landry et al., 1997, 2001, 2006, 2008), the second hypothesis was that parent responsiveness in the parent-child interaction would be positively associated with child language development when children were both 10 and 24 months old.

Child responsiveness is less well understood than parent responsiveness, (Bornstein et al., 2007; Karrass & Braungart-Rieker 2003). Because these studies have shown a strong association between child and parent responsiveness, child responsiveness was expected to have the same association with child language development as parent responsiveness. That is, child responsiveness was hypothesized to be positively associated with language development when children were 10 and 24 months old.

In children's lives, multiple variables coexist and simultaneously influence language development. Depending on the variables and the context, the influence of one variable may alter the influence of another, creating a situation in which one variable is moderated by another, as suggested by the social transactional model of language development. Given that parent-child interactions occur within the context of the physical environment, part of which is printed materials, the quality of the parent-child interaction, as measured by both parental and child responsiveness, may moderate the association between printed materials and language development. This is particularly likely given that infants and toddlers can only interact with printed materials in a limited fashion without adult support. Finally, because of this possibility, the fourth hypothesis was that a highly responsive parent-child interaction will protect, or moderate, the relation between printed materials and the child's development of language at two time points in development, 10 and 24 months. Although the moderation of parent and child responsiveness on the impact of printed materials on language development is

expected to be apparent at a single time point (10 months), it is likely that small daily impacts may accrue over time to predict later language development (24 months) more strongly than concurrent language development. Additionally, because children have had a longer period of time in which to develop language at 24 months than at 10 months, children in the 24-month age group should display a greater variety of language ability than children in the 10-month age group. That is, the expected association between predictor variables and child language development might be more evident when children are older.

Method

Participants

The sample consisted of 71 mother-infant dyads assessed as part of a larger study investigating the effectiveness of an intervention designed to prevent physical abuse and neglect in a high-risk sample (Baggett, Noria, Guttentag, Lanzi, et al., 2007). For the larger study, families were randomly assigned to either a control condition (i.e., families received parenting literature and referrals to community agencies) or an intervention condition (i.e., families received the resources provided to the control group, responsiveness training, child development information, and loving touch instruction; Akai et al., 2008). In the current study, 60.3% of families were in the control group, while 39.7% were in the intervention group. The intervention continued until children were 36 months, so intervention families (39.7% of the sample) were actively engaged in the intervention at both data collection points. All families who had not been lost to

attrition in the larger study when children were 10 and 24 months were included in the present analyses. Children were assessed at several time points (i.e., one month, four months, 10 months, 16 months, 24 months, and 36 months). The data for the present study represents the information collected at the 10 month and 24 month old time points. Selecting these two time points allows for the comparison of a time in children's development when they are just beginning to use language and a time when their language skills are becoming more complex.

Inclusion criteria required that the mother be between the ages of 15 and 35 at the child's birth, had not graduated from high school before the child's birth, and had no more than one other child under five years old. Further details regarding additional inclusion criteria of the larger study can be found in Appendix A.

The following demographic information was collected when children were 10 months old. Families were primarily low-income families. Specifically, 94.4% used the Women Infants and Children (WIC) program and 40.8% were enrolled in Temporary Aid for Needy Families (TANF). Mothers were mostly unemployed (63.4%) and, of those working, 38.5% were working part-time. Some were also enrolled in school (47.9%), with 37.8% being enrolled in high school. Living situations were often unstable for these families, with 54.9% having moved since the baby's birth and 26.8% having experienced homelessness. Mothers were most commonly single (66.2%) and 1.4% reported being divorced. Seven percent of mothers were married. On average, mothers were 21 years old, with a range of 16 to 35 years. Of note, 22.5% of the sample was 18 years old or younger.

On average, children were 10.72 months at the time of the 10-month assessment, with a range of 9.6 to 13.9 months ($SD = 0.75$), and 50.6% were boys. The majority of families were African American/Black (78.7%), with the remainder being European American/Caucasian/White (7.9%), Hispanic (6.7%), Multiracial (2.2%) and Biracial (2.2%). The remaining 2.2% did not report their ethnicity. The demographic data are presented in Table 1.

Table 1. Sample Demographic Data

Variable	Response	Frequency	Percent
WIC Used	Yes	67	94.4
TANF Used	Yes	29	40.8
Employed	Yes	25	36.6
In School	Yes	63	47.9
Moved since baby's birth	Yes	68	545.9
Experienced Homelessness	Yes	48	26.8
Marital Status	Single	47	66.2
	Divorced	1	1.4
	Married	5	7.0
Child Gender	Boys	36	50.6
	Girls	35	49.4
Ethnicity	African American	56	78.7
	European American	5	7.9
	Hispanic	4	6.7
	Multiracial	2	2.2
	Biracial	2	2.2

WIC = Women Infants and Children; TANF = Temporary Aid to Needy Families

Measures

Demographic Data

Demographic data (i.e., ethnicity, gender, (WIC) and (TANF) use, number of children and adults in the home, employment status) was taken from the larger study's existing database. All variables were reported by the mother. Further

information regarding the measurement tools used to gather demographic data are in Appendix B.

Printed Materials

To measure the number of types of printed materials available in the home, a collection of items from a variety of measures given at the 10-month assessment point were collected and considered for inclusion in a measure developed for the current investigation. Some items (i.e., the use of written parenting resources, receiving baby books as gifts, number of adult books in the home, newspaper and magazine subscriptions, and public library use) were taken from the Family and Maternal Life History Interview, Part 2, a measure designed for the present investigation. Details about this measure are located in Appendix C. Other items (i.e., the presence of toys for music and literature, reading materials present, the child having at least three books of his or her own, and at least 10 books of any type present) were taken from the HOME (Caldwell & Bradley, 1984). The remaining items (i.e., the observed presence of books, magazines, and newspapers) were taken from the Assessment of the Physical Environment (Polansky, Chalmers, Bittenwieser, & Williams, 1978). Each of these 13 items were scored by project staff as 'yes' (one point) or 'no' (zero points). An exploratory factor analysis was conducted to determine which of these possible 13 items had strong convergent validity and best reflected an underlying construct of Printed Materials in the home. As discussed in detail below, nine of these items

loaded onto a single factor. Therefore, the resulting scale has a possible range of zero to nine. Cronbach's alpha for this scale was .59.

Child Language Ability

To measure overall language development, the Preschool Language Scale, Fourth Edition (PLS-4; Zimmerman, Steiner, & Pond, 2002) was administered to each child. The PLS-4 is a measure for children ages 2 days to 6 years, 11 months that provides norm-referenced scores of auditory comprehension, expressive communication, and an overall language score. The assessment's manual reports internal reliability as .67 for the Auditory Comprehension scale, .73 for the Expressive Communication Scale, and .81 for the Total score for children ages 9 to 11 months. For children 24 to 29 months, the assessment manual reports internal reliability as .91 for the Auditory Comprehension scale, .93 for the Expressive Communication Scale, and .96 for the Total scale. Because the Total scale reported the highest rate of internal reliability for 10 month old children, this scale was used in the analyses for that age group. For 24 month old children, however, the assessment protocol was shortened and only the Expressive Communication scale was administered. Therefore, for analyses related to the 24 month age group, the Expressive Communication scale was used.

Parent and Child Responsiveness

Common measurements of parent-child interaction tend to be time intensive, (Akai et al., 2008), which can be cumbersome for families and unrealistic for practicing clinicians. Best practices in the field of early childhood indicate that

assessments best serve the needs of families and interventionists when they take little time to complete can be administered frequently to evaluate intervention effectiveness, occur within the context of natural routines, and involve familiar caregivers (Greenwood, Carta, Baggett, Buzhardt, Walker, & Terry, 2008). A tool meeting these criteria for assessing the parent-child interaction is the Indicator of Parent-Child Interaction (IPCI; Baggett & Carta, 2007). This tool is a 10-minute observation involving four routines and which assesses both parent and child behaviors. Such a tool makes it possible to incorporate both participants of the parent-child interaction simultaneously when determining the impact of the quality of the parent-child interaction on child language development in a way that would be more useful to clinicians in the field when they seek to change the parent-child interaction by targeting both child and parent behavior. Other strengths of the IPCI are that low-income families were included in its development (Baggett, Carta, & Horn, 2003) and that it provides information on how a variety of behaviors within the interaction between both parents and children. The present study employs the IPCI to assess both parent and child responsiveness and how each relates to child language development.

The IPCI's four tasks are listed here in the order of administration: Free Play (four minutes), Book Looking (two minutes), Distraction Task (two minutes), and Dressing (two minutes). Because the Distraction Task is only intended for children older than 12-months, it was not included in IPCI administrations for this

sample of 10-month-old infants. The remaining three sections of the IPCI are described briefly below. Full descriptions are available in Appendix D.

Free play. The parents are given standard instructions indicating they can play with their child in whatever way they wish. Parents may use toys that they have at home or play games with their children (e.g., peek-a-boo or tickling).

Book Looking. Parents are again given standard instructions prior to the Book Looking segment of the IPCI asking them to “look” at the books with their children. Parents are given two standard books and they can use either one or both of the books in any way they like.

Dressing. Parents are given a final set of standard instructions indicating that they can change any part of their child’s clothes in a way that is similar to how they get their child dressed each morning.

Distraction: Parents are asked to pretend an attractive toy with a tape recorder intermittently playing music is something dangerous or otherwise inappropriate for children. They were then asked to do whatever they would normally do to keep their child away from this “dangerous object.”

The IPCI assesses the quality of the parent-child interaction in four domains: Caregiver Facilitators, Caregiver Interruption, Child Engagement, and Child Reactivity/Distress. Caregiver Facilitators includes five items (i.e., Conveys Acceptance/Warmth, Uses Descriptive Language, Follows the Child’s Lead, Maintains/extends the Child’s Interest, and Uses Stress-Reducing Strategies).

Caregiver Interruption includes three items (i.e., Criticism/Harsh voice, Restrictions/Intrusions, and Rejects Child's Bid for Attention). Child Engagement includes three items (i.e., Positive Feedback, Sustained Engagement, and Follow Through). Finally, Child Reactivity/Distress includes three items (i.e., Irritable/Fuss/Cry, External Distress, and Frozen/Watchful/Withdrawn). Each item is rated on a four-point Likert scale. Definitions of each IPCI item are listed in Appendix C. Scores are created by computing percentages summing the individuals' ratings within a domain, dividing them by the total possible points, and then multiplied by 100. Therefore, each IPCI administration results in four domain scores- two representing caregiver behaviors and two representing child behaviors. For the purposes of this study, however, the two parenting domains (Caregiver Facilitators and Caregiver Interrupters) were combined by reverse coding the Interrupter items and adding them to the Facilitator items, creating an overall measure of Parental Responsiveness with a Cronbach's alpha of .55. Higher scores indicated high rates of positive parenting behaviors and low rates of negative parenting behaviors. Similarly, the two child domains (Child Engagement and Child Reactivity/Distress) were combined by reverse coding the Reactivity/Distress items and adding them to the Engagement items, creating an overall measure of Child Responsiveness with a Cronbach's alpha of .46. Higher scores indicated high rates of positive child behavior and low rates of negative child behavior. The resulting variables Parenting Responsiveness and Child Responsiveness were used in the analyses.

The IPCI demonstrated concurrent validity with measures of parenting attitudes and interactions, sensitivity in detecting children with social-emotional concerns, and adequate test-retest and inter-rater reliability (Baggett & Carta, 2007). Furthermore, the IPCI has demonstrated validity by differentiating between a group of families at-risk for poor parent-child interactions and a group of families that were not at-risk (Indicator of Parent-Child Interaction (IPCI) Technical Soundness, 2009). Inter-rater reliability for the present study was computed for each domain using scores from 20% of the IPCI observations. Overall reliability between the two raters was 90%, with agreement on all individual IPCIs out of those double coded for reliability purposes falling below 86%.

Procedure

The sample for the current study was drawn from a larger study investigating the effectiveness of an intervention designed to prevent child abuse and neglect in a sample at high-risk for these outcomes. Risk factors included failing to obtain a high school degree, and seeking prenatal care from clinics with sliding fee scales or programs for adolescent mothers. Additional recruitment and procedural information for the larger study may be found in Appendix A. The current study employed data collected at the 10-month and 24 month assessments, and families were compensated \$50 at each time point. The assessment was conducted in two sessions, Part A and Part B, each of which lasted approximately one and half to

two hours, and were conducted by trained research assistants. All measures were scored by trained research assistants.

Results

Preliminary Statistics

Power analysis conducted using G*Power-3 indicated that computing the primary analyses (i.e., hierarchical multiple regression) with the current sample size, there was approximately a 98.30% chance of finding significant results with a large effect size, a 71.18% of finding significant results with a medium effect size, and a 12.59% chance of finding significant results with a small effect size (Faul, Erdfelder, Lang, & Buchner, 2007).

First, to determine which of the 13 possible items could be included in a measure of Printed Materials in the home, an exploratory factor analysis was conducted. Based on the recommendations of Costello and Osborne (2005), the principal axis factors method was used to allow for data's violations of the assumptions of normality (i.e., binomial variable) and a direct oblimin rotation method was used to allow for correlation among factors. Initially, the statistical software (SPSS) was allowed to suggest how many factors existed within the data. This resulted in a four factor solution. However, Costello and Osborne (2005) also advocate for employing the scree test, in which a graph of the factor's eigenvalues is examined to find the natural break in the data and considering the number of eigenvalues above the break point to be a better indication of the number of factors existing in the data than the software's estimation. The scree

plot indicates that a one-factor solution was most appropriate, since there is a single data point above the break. Therefore, another EFA was computed, specifying a one-factor solution and a minimum loading value of .32. The resulting factor explained 33.31% of the variance and loadings of the remaining nine items ranged from .37 to .86 (See Table 2).

Table 2: Printed Materials Factor Loadings for Included Items

Item Included	Loading
Child has three or more books of his/her own	.86
Child has toys for literature and music	.85
Parent reports owning at least one child or adult book	.72
Parent was given books, pamphlets, or guides about parenting	.65
Parent was given baby books	.53
Reading material was present and visible	.53
Parent had a library card	.50
Someone in the household subscribed to a magazine	.46
Books were observed in the home	.37

Second, the means, ranges, and standard deviations of the study variables were computed and are presented in Table 3.

Table 3. Study Variable Means, Ranges and Standard Deviations

Variable	Mean	Range	Standard deviation
Printed Materials	6.77	0-9	1.49
Parent Responsiveness	59.83	33.33-91.67	13.00
Child Responsiveness	79.97	55.56-100.00	10.68
10 mo Child Language	102.97	66-128	13.78
24 mo Child Language	92.39	33-118	15.13

Third, to determine if demographic variables (i.e., WIC use, TANF use, parental education) significantly influenced performance on the primary variables of interest (i.e., Parental Responsiveness, Child Responsiveness, Child Language, and Printed Materials), Several one-way analysis of variance tests (ANOVAs) were conducted. All ANOVAs were nonsignificant, indicating that no demographic variables influenced scores on the other variables. Another ANOVA was then computed to test whether control/intervention group classification influenced the primary variables. This analysis indicated that group membership was significantly associated with parent responsiveness ($F = 5.04, p < .05$), with parents in the intervention group demonstrating higher levels of responsiveness than parents in the control group. Therefore, group status was included as a control variable for all analyses that included the variable of parent responsiveness. Lastly, when scoring the IPCIs, it was noted that a large portion (42.3%) of the administrations failed to include the Dressing Task. Therefore, an additional One-way ANOVA was computed to determine if Parental Responsiveness or Child Responsiveness scores differed significantly between administrations including the Dressing Task and administrations that did not. This analysis indicated that there were no significant differences between these groups.

Primary Analyses

To address the first three hypotheses, Pearson correlations were conducted (See Table 4). The first hypothesis, that printed materials available in the home would be positively and significantly correlated with child language development,

was not supported. The second hypothesis, that parental responsiveness would be positively and significantly associated with child language development, was also not supported. The third hypothesis, that child responsiveness would be positively and significantly associated with child language development, was also not supported. The only significant correlation noted was that parent responsiveness during the parent-child interaction was positively and significantly associated with child responsiveness during the parent-child interaction, $r^2 = .43$, $p < .01$.

Table 4: Intercorrelations among Study Variables (N=71)

	Printed Mat.	Parent Resp.	Child Resp.	10mo Child Lang.
Written Mat.	---			
Parental Resp.	-.08	---		
Child Resp.	-.09	.43**	---	
10mo Child Lang.	.17	.09	-.06	---
24mo Child Lang.	.03	.11	.26	.08

* $p < .05$, ** $p < .01$,

To address the fourth hypothesis, that parental and child responsiveness during the parent-child interaction moderates the association between printed materials in the home and child language development, interaction variables were created using the residual centering technique (Lance, 1988). In this technique, one variable (i.e., printed materials) is regressed on the other (i.e., parenting behavior or child behavior) and the residual is then used as the interaction term. This procedure is intended to eliminate colinearity that occurs between the two main effect variables used to create the interaction terms. A hierarchical multiple

regression analysis was then conducted. Group status was added in the first step as a control variable, then printed materials was added to the second step of the model, parental responsiveness was added to the third step of the model, child responsiveness was added to the fourth step of the model, and the interaction terms (i.e., printed materials X parental responsiveness) and printed materials X child responsiveness) were added to the fifth step of the model. However, due to the level of co-linearity between the interaction variables and the main effect variables, the interaction variables could not be included. Therefore, the final model included printed materials in the first step of the equation, the second step included parental responsiveness, and the third step included child responsiveness (See Table 5). Because the interaction terms could not be included, the hypothesis that parental and child responsiveness would moderate the association between printed materials and child language development at 10 months was not supported.

Table 5. Hierarchical Regression Analysis for Ten Month Child Language Development

Variable	B	SE B	β	ΔR^2	ΔF
10 month Child Language					
Step 1				0	.00
Group Status	.11	3.76	.00		
Step 2				.02	.87
Group Status	.18	3.77	.01		
Printed Materials	1.35	1.44	.12		
Step 3				.01	.75
Group Status	1.18	3.94	.04		
Printed Materials	1.44	1.45	.13		
Parental Responsiveness	-.12	.14	-.11		
Step 4				.00	.14
Group Status	1.49	4.06	.05		
Printed Materials	1.57	1.50	.15		
Parent Responsiveness	-.16	.17	-.15		
Child Responsiveness	.08	.21	.06		

*p<.05, **p<.01,

Finally to address the fifth hypothesis regarding the moderating effect of child and parental responsiveness on the association between printed materials and child language development at 24 months, a hierarchical regression was run using the same predictor variables as the above analysis, but with the outcome being child language development at 24 months. Again, due to collinearity, the interaction terms could not be added to the model, and this hypothesis was not supported (see Table 6).

Table 6. Hierarchical Regression Analysis for 24 Month Child Language Development

Variable	B	SE B	β	ΔR^2	ΔF
24 month Child Language					
Step 1				.02	.93
Group Status	-4.73	4.92	-.14		
Step 2				0	.02
Group Status	-4.70	4.97	-.14		
Printed Materials	-.31	1.99	-.02		
Step 3				.03	1.43
Group Status	-6.28	5.12	-.19		
Printed Materials	-.13	1.75	-.01		
Parental Responsiveness	.24	.20	.18		
Step 4				.04	1.75
Group Status	-3.97	5.37	-.12		
Printed Materials	.67	1.84	.06		
Parent Responsiveness	.6	.24	.05		
Child Responsiveness	.38	.29	.24		

*p<.05, **p<.01,

Discussion

The purpose of the present study was to examine how qualities commonly found in low-income homes influenced language development in children.

Aspects of both the physical and social environment were considered because

previous research indicates that both features of a child's world can have an impact on how that child develops language. Evidence suggests that variables within the physical environment, such as the presence of books within the home and access to local libraries (Payne, et al., 1994; Whitehurst, et al., 1994), facilitate language development, as does the presence of social aspects of the environment, such as parent (Evans, 2004; Fish et al., 2007; Hart & Risley, 1995; Landry et al., 2006, 2008) and child (Bornstein, et al., 2007) responsiveness. Specifically, it was hypothesized that the presence of printed materials in the home and the level of child and parental responsiveness during parent-child interactions would predict language development as measured using a standardized assessment. Also, it was hypothesized that, because toddlers are dependent on those older than themselves to benefit from printed materials, child and parental responsiveness would both moderate the association between printed materials and language development, measured at both 10 months and 24 months old. Although the hypotheses were not supported, the results of the present study provide some important considerations for the field and evidence for the need to re-evaluate some conceptually accepted notions in the literature.

Methodological Considerations

Although these results are inconsistent with much of the previous literature, several methodological considerations may help to illuminate why this occurred. First, the current study used exploratory factor analysis to create a measure of printed materials in the child's home. The items in this measure were included

based on existing literature regarding their association with language development (e.g., Payne et al., Whitehurst et al., 1994) and shared a significant amount of variance, indicating an underlying construct. It was expected that items like the presence of baby books in the home and family access to the library, each associated with language development in other investigations (e.g., Payne et al., 1994; Whitehurst et al., 1994), would together explain more variance in language development than they had done individually in previous studies. In the present sample, however, the created Printed Materials measure was not associated with language development. It is unclear if the absence of association is attributable to a true lack of relation between printed materials and child language development at 10 or 24 months of age or if the measure included in this study simply did not adequately represent the presence of printed materials in the home. Furthermore, given this particular sample of families, the printed materials measure may not have accurately reflected children's access to printed materials, regardless of the presence of such materials in homes. For example, because families often moved in with relatives for periods of time (K. Baggett, personal communication, July 20, 2009), the printed materials in the home may not have belonged to the child or parents and so may have been off-limits to the child. If this were the case, items would have been marked as present on the printed materials measure but would still have been unavailable to the child. Because of their low-income status, families were also frequently eligible for early intervention programs, such as Early Head Start. The current study did not measure the exposure children might

have had to printed materials in these environments, another reason why the printed material measure may not have appropriately reflected children's access to printed materials.

Another concern is the internal reliability of the measures. The printed materials, parent responsiveness, and child responsiveness scales all had low Cronbach's alpha coefficients. As discussed by Smith, Fischer, and Fister (2003), however, this may not indicate problems with the scale. Although a high alpha coefficient indicates a high level of covariance among the scale items, it can also indicate a scale with too narrow of a focus, measuring only a single "facet" of a broader construct (Smith et al., 2003). Scales that are limited to a single facet of a construct intended to measure the whole construct may demonstrate little variability, with all participants either scoring very low or very high, therefore having limited predictive value. In the case of the printed materials measure, the exploratory factor analysis (EFA), which indicated that all of the included items loaded on a single factor, suggesting that the items shared a significant portion of variance. A low alpha coefficient in this instance, combined with the EFA results, may reflect a cohesive scale with items measuring different facets of the underlying construct. Although each item measures a different aspect of printed materials in the home, each may measure a facet of a single underlying construct.

In the case of the IPCI's measurement of parent and child responsiveness, there is evidence of the IPCI's concurrent validity, sensitivity, test-retest reliability, and inter-rater reliability (Baggett & Carta, 2007). Each item, however,

is *intended* to measure a different facet of responsiveness. Conceptually, therefore, it would not be expected that either the parent responsiveness measure or the child responsiveness measure would have high alpha coefficients. Again, the arguments of Smith and colleagues (2003) indicate that Cronbach's alpha coefficient is not always an appropriate tool to assess the validity of a measure, particularly one intended to measure a broadly defined construct such as the IPCI. The evidence of the IPCI's validity and reliability described above support the premise that alpha coefficients are indeed inappropriate in this case and not necessarily indicative of an invalid measure of parent and child responsiveness.

One of the advantages of the present study was the effort to capture language at the earliest possible interval of development. Clear evidence suggests that typically developing children begin using intentional communication between eight and nine months of age (see Bates, 1979 for a review; McLean, 1990) and so the design of the present study, measuring communication skills at 10 months of age, provided the earliest possible attempt to capture early language skills. It is possible, however, that associations demonstrated with children with more advanced language development are not present at earlier stages of development. For example, there is evidence that the use of prelinguistic babbling and vocalizations (e.g., Calandrella & Wilcox, 2000; McCathren, Yoder, & Warren, 1999), symbolic play (e.g., Laasko, Poikkeus, & Lyytinen, 1999; McCathren, Warren, & Yoder, 1996), and gestures, such as pointing, (e.g., Brady, Marquis, Fleming, & McLean, 2004; Calandrella & Wilcox, 2000; McDuffie, Yoder, &

Stone, 2005; Watt, Wetherby, & Shumway, 2006) each predict later language ability and serve an important function in the development of language. Knowing when certain associations begin to appear will inform intervention efforts in choosing optimal timing of programs and supports.

Direct observation of the child during the parent-child interaction has been used as an alternative measure of language development in previous literature (Hart & Risley, 1994; Walker et al., 1994). When considering how qualities of the parent-child interaction impact language development, however, measuring both parent responsiveness and child language in the same context may lead to shared variance due to unmeasured timing or situational variables rather than due to a true association between the variables of interest. Although using traditional standardized assessments, as in the present study may have some benefit, they can also be insensitive in detecting delays, as noted by Brady and colleagues (1999). Also, the United States Agency for Healthcare Research and Quality (2002) investigated whether scores on standardized assessments predicted later language impairment and found that such assessments were unable to do so. No one method is perfect, therefore, it is important to measure the same construct in different ways to best determine true associations.

It is possible that low statistical power is responsible for the lack of significant findings. Low power, however, appears an unlikely cause of the current investigation's results because there were no trends toward significance observed in any correlation. Power would be a more likely explanation if p-values

approached the value of 0.05 needed for statistical significance, rather than remaining close to one, as in the present investigation.

Another area of methodological considerations is that associated with characteristics of the sample under investigation. Most studies of child language primarily include middle economic status (e.g., Karrass & Braungart-Rieker, 2003; Olson et al., 1992; Tamis-LeMonda et al., 2001), and European American families (e.g., Bornstein et al., 2007; Frank-Masur et al., 2005; LaParo et al., 2004; Morrisset et al., 1990; Tamis-LeMonda et al., 2001), although there are notable exceptions (e.g., Hart & Risley 1995; Morrisset et al., 1990; Raviv et al., 2004). Hart and Risley, for example, compared the language development of a group of low-income families to a group of middle and upper income families, including both African Americans and European Americans in each group, to measure how language related to the way in which parents interacted with children. They found that the ways in which parents responded to children predicted children's language development in both groups. Similarly, Raviv and colleagues (2004) found an association between parental responsiveness and child language in a sample with a wide variety of SES, but with only 10% of families describing themselves as African American.

The evidence above that an association between parent responsiveness and child language development occurs across the economic spectrum led to the hypothesis that similar associations would be found in the current sample, also composed primarily of low-income families. However, the sample included in the

Hart and Risley (1992) study included families composed primarily of two-parent homes, with the youngest mother being 21 years of age. These family characteristics are markedly disparate from the high number of single parents (66.2%) and teenage mothers (22.5%) in the current sample, which may explain the lack of similar or significant results. Some evidence suggests that single mothers interact differently with their children than do mothers in dual parent homes. Blake, MacDonald, Bayrami, Agosta, and Milian (2006), for example, measured mothers' language use during a joint book reading activity and found that single mothers used a smaller proportion of comments than did mothers from dual parent families, but the same proportion of all other measured verbalizations (i.e., labeling, questioning, directing, attention getting, feedback, speaking for toys, imitating). These authors also found that the correlation between parental verbal input and child language use was the same across family status groups. Additionally, Webster-Stratton (1989) found differences between single mothers and mothers in supportive marriages in that single mothers gave more commands, made more negative statements, were more negative physically, and asked more questions when interacting with their children than mothers in supportive marriages.

The inclusion of teenage mothers (22.5% of the sample) deserves special consideration. For example, there is evidence that children of teenage mothers are at increased risk for poor cognitive and behavioral outcomes, developmental delays, and poor academic achievement compared to children of adult mothers

(see Brooks-Gunn & Furstenberg, 1986, for a review; Jaffee, Caspi, Moffitt, Belsky, & Silva, 2001). Jaffee and colleagues (2001) also indicated that this increased risk is due to both maternal factors associated with becoming a teenage mother and with consequences associated with having a child at such a young age, many of which are also present in the current sample, (e.g., low education, low income, recurrent caregiver and residence changes, and single parenthood). Furthermore, it has been demonstrated that the level of parental responsiveness explains differences in child language ability between groups of teenage and older mothers, not social background or child characteristics (Keown, Woodward, & Field, 2001). Because of the multitude of risk factors faced by the current sample, it may seem remarkable that children were performing, on average, as expected. It is possible that despite the risk, the mothers in the present sample benefited from another, unmeasured protective factor(s) as well, which counteracted or moderated the effect of potential risk on their children's language development.

Although research may document some differences in parent-child interaction in families of differing SES, this finding is not consistent and moreover, it is not clear why differences may exist. It may be that these more proximal family variables (i.e., teen motherhood and single-parenthood) are more directly related to language development. Indeed, several characteristics, such as maternal education, nutrition, and parenting variables are associated with several child outcomes, including language development (Evans, 2004).

Another way in which the current sample differs from those included in previous research are that the larger study from which these data were taken was an investigation of the effectiveness of a child maltreatment prevention intervention, and recruited families were believed to be at-risk for child maltreatment and other negative child outcomes. Furthermore, the sample was characterized by persistent poverty (as indicated by WIC and TANF use), unemployment (63.4%), and homelessness in the first 10 months of the baby's life (26.8%). Taken together, the sample may have included many children who had multiple, and sometimes inconsistent, caregivers in addition to their biological mothers, a variable not controlled in the present study and likely different from the experiences of most children included in previous investigations (K. Baggett, personal communication, July 20, 2009). Because the amount of time spent with other caregivers was not controlled, it is uncertain how interactions with adults or older children may have impacted children's language development. As a field, care must be taken when attempting to draw meaningful conclusions such that we do not overstate the extent of our knowledge or assume that associations consistently demonstrated in a group of families with certain characteristics can be generalized to families with differing characteristics.

Construct Definition

When seeking to place new results within the context of existing literature, it is vital to understand the degree to which operational definitions of the same construct vary across investigations. For example, although two studies may both

measure parental responsiveness, if no aspects of their operational definitions overlap, the two studies may either be measuring different aspects of the underlying construct or two different constructs entirely, despite identical construct labels.

Because neither parental nor child responsiveness was associated with language development in the current study, previous literature was reviewed to determine how the current operational definition of responsiveness might have differed from those used in existing research. In much of the literature, researchers reported what scale they used, but failed to describe how these scales coded parental responsiveness, particularly whether nonverbal behavior or verbal behavior was included (e.g., Bornstein et al., 2007; LaParo et al., 2004; Morisset et al., 1990; Raviv, Kessenich, & Morrison, 2004), although all of these investigations found that parental responsiveness predicted child language development. Parental responsiveness was also found to be associated with child language development when it was operationally defined as including solely verbal parental behaviors (e.g., Giralametto, Bonfacio, Visini, Weitzman, Zoccon, & Steig Pearce, 2001; Olson, Bates, & Kaskie, 1992; Paavola, Kunnari, & Moilanen, 2005; Tamis-LeMonda, Bornstein, & Baumwell, 2001). However, when researchers code verbal and nonverbal responsiveness separately, a more complex picture emerges.

For example, Frank-Masur, Flynn, and Eichorst (2005) found that behavioral responsiveness predicted vocabulary when children were between the

ages of 10 and 13 months, that verbal responsiveness predicted vocabulary when children were between the ages of 13 and 17 months, and that both types of responsiveness predicted vocabulary when children were between 17 and 21 months in a sample of European American families. Furthermore, Yoder, McCathren, Warren, and Watson (2001) reported that nonverbal responsiveness was only associated with communication when the child's initial level of communication was not controlled, whereas verbal responsiveness was associated with the child's communication, even when controlling for the initial level of communication. Another investigation also found that responsiveness when children were six and 13 months old, defined as having both verbal and nonverbal components, did not predict language ability when children were six and eight years old, but that verbal responsiveness measured when children were 24 months old predicted language ability at both six and eight years of age. Using the IPCI, the current investigation combined both verbal and nonverbal aspects of responsiveness into one measure and was measured at 10 months of age. The current results are consistent with the finding that responsiveness measured in infancy did not predict later language development (Yoder et al., 2001). There appear to be multiple types of parental responsiveness, each having unique associations on language development that depend on the child's developmental level, which creates a complex interaction between different parental behaviors that impact children differently at different ages. Because the IPCI did not distinguish between verbal and nonverbal responsiveness, it is possible that the

impact of these distinct constructs was clouded by combining them into a single measure. Furthermore, evidence that different aspects of parental responsiveness (i.e., verbal and nonverbal responsiveness) measured at different time points impact child language in different ways implies that measuring responsiveness at one time point (e.g., 10 months) may not accurately predict language development at a later time point (e.g., 24 months).

In the current investigation, the IPCI was used to measure responsiveness, combining both verbal and nonverbal aspects of responsiveness into a single measure. Of note, only one item on the IPCI (i.e., descriptive language) required a verbal response to receive credit. All other credit could be gained through either verbal or nonverbal behavior. For example, a parent could follow his or her child's lead, another item on the IPCI, by either verbally responding to a child's action or by physically responding, such as moving a toy into the child's reach when the child signals interest in the toy. Anecdotally, few parents received any credit for using descriptive language, the sole verbal-only item. Similarly, credit for the item of warmth was more likely to be given for affectionate touch rather than giving the child a verbal praise. It appears that, in this sample, the ICPI may have primarily measured nonverbal responsiveness and therefore, based on limited literature (Frank-Masur et al., 2005; Yoder et al., 2001), it is more difficult to predict whether this measure would be associated with language development than if the IPCI had more clearly measured verbal responsiveness.

Limitations and Future Directions

Although the present findings are important, they are not without limitations. Of primary importance are those associated with the child's exposure to unmeasured, caregivers, and to other possible sources of printed materials. Additional research should consider the combined impact of multiple caregivers on children's development, especially in situations in which these caregivers are likely to change repeatedly, such as in populations of low-income families. Such research could also assess the child's exposure to printed materials in all environments, rather than solely in the place the family currently calls home.

Another possible limitation is that the current investigation used a new measure of printed materials, making it impossible to differentiate between a lack of association between it and other variables due to measurement error and a lack of association that reflects a true failure to capture the construct. Future research could seek to investigate the validity and reliability of the printed materials measure or include a measure, such as that used by Richman and Colombo (2007), which has established adequate psychometric properties. Although it was created by exploratory factor analysis as well as based conceptually on previous literature, it would be helpful to conduct a confirmatory factor analysis using a different sample to determine if this measure truly draws upon an underlying construct or was anomalous to the current sample.

Furthermore, the composition of the current sample is different in a variety of aspects from many of the samples used previously in language development

research. Therefore, these results may not be comparable to those in existing literature because of the vast differences in the samples involved. It would be beneficial for future research to include families that differ on a few, but not as many, characteristics from the majority of existing study samples. In this way, the impact of each individual sample characteristic on the association between parental responsiveness and language development could be investigated independently. For example, investigating the impact of multiple family moves while controlling for variables such as SES and ethnicity might be possible if middle-class residency-stable families were compared with families who moved frequently due to job demands, such as military families. Many of the environmental characteristics found in the current sample, however, (e.g., low income, frequent moves, inconsistent caregivers, low education) often occur in constellation and it would likely be difficult to parse out the variance associated with each risk factor individually. Alternatively, because these factors tend to co-occur, understanding their combined impact might be more helpful rather than determining how much variance in child language development is caused by each individually, as this more closely reflects the actual experience of families.

Finally, future research on parental responsiveness should carefully delineate the measurement approach to parental behavior in the parent-child interaction. Because there is evidence that verbal and nonverbal responsiveness impacts children's language development in different ways (Yoder et al., 2001) and at

different times (Frank-Masur et al., 2005), it is important that research clearly differentiate between verbal and nonverbal parent responses.

Conclusion

The current study investigated how aspects of the social and physical environments of low-income homes impacted the language development of children. Although the hypotheses were not supported, the present results provide several insights. First, accurately defining the construct under study is crucial to ensure the comparability of research results. The study of parental responsiveness began with a single construct, but current evidence indicates the presence of two distinct constructs- verbal and nonverbal responsiveness. As research progresses the conceptualization of responsiveness will likely need to be further refined. As more information becomes available, measurement tools will need to adapt as well to accurately reflect what we now understand as separate constructs. A next step with which to build upon the present study's results would be to re-code the IPCI sessions, first only coding the verbal components of each item and then coding solely the behavioral component of each item. It is likely that different associations would emerge as the two responsiveness constructs are differentiated. Forthcoming research on responsiveness should be clear as to which construct, verbal responsiveness or nonverbal responsiveness is under study.

The current results also highlight the reality that conclusions the field has drawn regarding language development using measures must be considered for their appropriateness with each sample. For example, to measure printed materials

in the home, when that home belongs to relatives instead of the family involved in the study, observation may not be appropriate as what is seen is not necessarily accessible to the child. Each assessment tool must be re-validated when used with samples that did not compose a significant portion of the normative sample.

Similarly, novel samples may introduce unexpected confounds. In the current study, the presence of other caregivers was not measured and accounted for when investigating associations between parenting behaviors and child outcomes. It is likely that other confounds or procedural difficulties may arise when navigating an unfamiliar group, such as samples typically excluded from mainstream research.

Lastly, additional research is needed in the areas of parental and child responsiveness and how each relates to language development across infant and toddler development. Now that we are aware of two subtypes of responsiveness, the influence of each must be investigated from the earliest initiation of language development through the time when language development approaches completion. In particular, future empirical investigations should consider the different impacts of various types of responsiveness and how each may influence children's language development at multiple developmental time periods in samples at particular risk for less than optimal language development.

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Appendix A: Larger Study Procedures

Recruitment

At all sites, flyers were distributed to organizations serving low-income populations, including prenatal care clinics offering services on a sliding fee scale (including no payment) and two programs offering comprehensive services to adolescent mothers. Organization personnel were asked to distribute the flyers to all parents. Parents interested in participating in the study were asked to fill out forms indicating their willingness for research staff to contact them. These forms were collected by research staff and mothers were then contacted via phone. In cases in which the provided phone number was disconnected, a follow-up flyer was sent through the U. S. Mail. Out of 189 mothers indicating interest in the study, 21 were no longer interested when contacted by project staff, 71 were excluded based on established criteria, and 97 mothers consented to participate. During the initial phone conversation, a visit was scheduled in which research staff came to the family's home, the mother or her guardian signed the consent form, and a prenatal assessment was conducted. Further assessments were conducted when children were 2, 4, 6, 10, 16, and 24 months old. Families were compensated with \$35 at the initial assessment and this amount was increased by \$5 for each subsequent assessment.

Inclusion Criteria

Inclusion criteria for the larger study, in addition to those mentioned in the main document, were that the child had not been born prior to project staff

contacting the family, and that the mother had not miscarried. Of the 71 families excluded after the first wave of data collection, the majority (50.34%) were excluded due to project staff being unable to contact them either at all or before the baby's birth. For families that met these inclusion criteria prenatally, it was possible for them to be excluded after the baby's birth due to: the child having a significant disability, the child being in the NICU for 60 days or more, the child dying, the child being removed from the mother's home at birth, the mother receiving inpatient services for substance abuse or mental health concerns at the point of the child's birth, or the mother being homeless at the time of the child's birth. In all, eight families out of the initially enrolled 97 were excluded post-natally (8.25%).

Appendix B: Larger Study Measures

Ten-month Family and Maternal Life History Interview Part 1

This interview was created for the larger study and consisted of 64 open-ended questions. It was administered during Part A of the ten-month assessment. Information gathered through this questionnaire was extensive and included information concerning the interview's location, the mother's marital status, the mother and baby's living situation and whether this had recently changed, whether the mother and baby had been temporarily homeless since the baby's birth, the number of people in the home, employment, quality of the mother-father relationship, quality of the baby-father relationship, childcare, parenting resources used, baby sleep and eating patterns, maternal family planning practices, maternal drug use, maternal and baby healthcare access, baby health history, and baby's use and need of special services. For the purposes of this study, only information regarding maternal marital status, temporary homelessness, and employment will be used.

ECO-MAP

This is a measure completed in interview format with the mother and asked her to indicate the people and places in her community with which she had a connection (Castro, 1997, 1999). She was also asked to note what type of connection she had with each place (i.e., strong positive, tenuous, stressful, none but a wish to be connected, or none and no interest to be connected). For the

purposes of this study only the items indicating a connection or lack of connection with the WIC program and with the TANF program will be used.

Ten-month Family and Maternal Life History Interview Part 2

This interview was also created for the larger study and consisted of 20 open-ended questions. It was administered during Part B of the ten-month assessment. It included information regarding the use of written parenting resources, whether baby books had been received as gifts, the presence of printed materials in the home, maternal reading practices, the frequency of joint reading, activities done with the baby, television use, parenting stress, and parent problem-solving vignettes. For the purposes of this study, only information regarding books or other printed materials will be used as part of the measure of printed materials in the home.

Home Observations for the Measurement of the Environment (HOME) Inventory

The HOME (Caldwell & Bradley, 1984), is an observational measure of environmental components of the home. It consists 69 yes/no items within seven subscales (i.e., Daily Routines, Childcare, Toys and Books, Play, Outings, Physical Environment, and Interaction). Only items regarding the presence of literary toys and books will be used in this study as a part of the assessment of printed materials in the home.

Assessment of the Physical Environment

This observational measure was originally created by Polansky, Borgman, and DeSaix (1972), and was later modified to accommodate an urban sample

(Polansky, Chalmers, Bittenwieser, & Williams, 1978). For the purposes of the larger study, the principal investigators modified the scale to shorten it. Whereas it was previously 99 items, the revised form consisted of 47 yes/no questions and contained three subscales (Household Resources, Condition of Building, and Condition of Living Unit). For the purposes of this study, only items the presence of printed materials in the home will be used as a part of the printed materials measure.

Appendix C: Item Definitions of the Indicator of Parent-Child Interaction

Note: All definitions come verbatim from the ICPI Manual (Baggett, Carta, & Horn, 2003).

Caregiver Facilitators

Conveys Acceptance and Warmth (p. 22): The adult conveys acceptance and warmth through approval in any of the following ways:

- * Smiling at the child
- * Making a positive comment to or about the child
- * Providing gentle, affectionate touch
- * Agreeing with something the child has said
- * Indicating that the child's behavior is correct
- * Confirming what the child has just said
- * Thanking the child for something
- * Stating the child made a good effort, even if the task was not performed correctly

Watch for clear and appropriate signals of acceptance and warmth. If a parent gives a verbal and nonverbal message simultaneously, these messages must match and be positive to be an example of this item. A positive comment with a flat expression, frowning, or negative voice tone is not an example of Conveys Acceptance and Warmth. Smiling or laughing inappropriately (such as when a child is hurt, upset, engaging in unsafe behavior, or in a behavior that is not appropriate) is not an example of Conveys Acceptance and Warmth. Simply

holding or touching a child in the context of a general routine does not necessarily convey acceptance and warmth and therefore is not an example of this item.

Uses Descriptive Language (p. 24): This item includes adult descriptive comments that meet at least one of the following criteria:

- * The comment both labels and connects objects and actions (e.g., “The wheels go round”- **not** “Those are wheels.”).
- * The comment labels and connects nouns and adjectives (“There’s that furry brown bear.”)

The adult describes activities, objects and/or child’s behavior or feelings. This item does not refer to negatively descriptive statements about the child or child’s behavior (e.g., “That’s mean, don’t be a bad boy,” “You’re going to hurt yourself”, etc.). This could include the use of rhetorical questions as long as they do not have a negative connotation (e.g., “Are you holding your teddy bear?”). During the book activity, this item should be rated based on the parent’s use of descriptive language and imitation or expanding on the child’s interests. Simply reading, without any other descriptive comments to the child, is not an example of Uses Descriptive Language. Keep in mind that it is possible for adults to talk a lot but not use descriptive language. This is sometimes referred to as ‘impoverished talk’. Simply making sounds, repeating words, making brief statements that do not fit the above criteria are not examples of Uses Descriptive Language. Simply naming colors, counting, or naming objects in a room are not examples of Uses Descriptive Language.

Follows Child's Lead (p. 26): The parent follows the child's lead by noticing what interests the child and either comments on the child's interest or joins in the same activity without interrupting the child. However, the parent does not interrupt the child or redirect child's behavior. Follows the Child's Lead can occur in the context of routines in which the parent may be taking a more active role than in play. For example, the parent who notices and comments on the child's focus and what is happening during dressing can be an indicator that the parent is following the child's lead. However, this must be done in a non-intrusive manner to be an example of this item.

* The parent may introduce an activity and make suggestions, but the score for Follows the Child's Lead focuses on his or her behaviors of attending imitating, joining, turn-taking, and/or commenting on the child's interest.

* The parent may comment on what the child is doing. If the comment is descriptive, it would also be an example of Uses Descriptive Language. If in addition, the comment is positive and affirming of the child, it would also be an example of Conveys Acceptance and Warmth.

Maintains or Extends Child's Focus (p. 28): The adult introduces materials or interacts in a novel or interesting manner to maintain and/or extend the child's focus. The adult uses words, voice tone, facial expressions, and gestures in an interesting way to engage the child in a manner that maintains the child's focus or slightly extends the child's focus. Maintains or Extends Child's Focus is a higher order skill than simply Follows Child's Lead. To meet the definition of Maintains

or Extends Child's Focus, the adults' behavior must be interesting **and** not disrupt the child's focus of attention. Developmental appropriateness of the parent's behavior must be considered when rating this item. In order to rate this item as present, the behavior herein must be novel or interesting and it must be developmentally appropriate. Attempts to stimulate development that are far beyond the child's development level are **not** examples of Maintains or Extends Child's Focus. Keep in mind that what may be novel or interesting the first time it is introduced, may not continue to be novel/interesting when repeated. Watch for the adult to introduce new activities either when the child is not already showing interest in another activity or for the adult to introduce an activity that builds on the child's interest. Note: Simply introducing a new activity without consideration to the child's interest is not an example of Maintains or Extends Child's Focus. Requires scaffolding language (e.g., speaking in language that the child can understand but that still challenges him or her or helps him or her learn and grow).

Uses Stress Reducing Strategies (p. 29): * If the child shows distress/crying, the parent uses soothing behaviors that include providing a pacifier, cradling, or rocking. With an older child, parent behaviors would include gentle touch, words acknowledging child's feelings, and words of comfort/support. However, comforting words alone (without physical comfort) are not sufficient for an infant. Remember, words of comfort alone with an infant will affect the Warmth/Acceptance rating.

* If the child shows frustration/aversion cues, the parent responds by providing one of the following strategies: slowing pace, using softer voice, providing a brief pause in interaction, or with older infants using appropriate distractions. Early signs of distress include gaze aversion (turning face or eyes away when a parent is trying to get the child to look at her face or a toy), increased activity level, rapid breathing, or fussy sounds. Watch for the parent to respond immediately to these signals by slowing pace, using a softer voice, or becoming quiet. With older infants/children, parents may use distraction appropriately (e.g., helping the child become interested in another activity).

Simply introducing new toys or materials to a young infant (under 6 months) who is showing aversion or distress cues is not an example of appropriate distraction. Similarly, after attempting to introduce a new activity once or twice with an older infant or young child, repeating this behavior is not an example of appropriate distraction. General words of affection or comfort without steps to comfort are not examples of Stress-Reducing strategies. Instead, watch for slowing pace, using a softer voice, and with an infant providing physical comfort).

If the child does not show any aversion/frustration cues **or distress, then 'No Opportunity' (NA) should be checked. If the child shows aversion/frustration cues but not overt distress such as crying, then rate this item based on the parent's response to aversion/frustration cues. Follow the same principle if the child shows overt distress, but not the earlier signals of aversion/frustration. If the child shows

both aversion/frustration cues as well as distress and the parent engages in appropriate strategies to one of these (e.g., distress/crying) but not the other (e.g., aversion/frustration cues) and the parent had an opportunity to respond, this item should be rated less than a '3'.

Caregiver Interrupters

Uses Criticism or Harsh Voice (p. 31): For this item, as well as each of the interrupter items, consider both frequency **and** severity when rating Interrupters. **If there is a disparity between frequency and severity, use the higher score** to rate the item (e.g., single episodes of a parent calling a child a name, using a derogatory label, or making emotional threats such as “I’m going to leave you;” “I don’t want you any more;” or using anything more than the most mild physical force) should **automatically** be rated as a '3' due to severity even though it only occurs once. Watch for name-calling, sarcastic tone of voice, yelling, raised voice, or critical statements about the child. While parent behaviors directed to a child other than the target child are not usually scored, if the parent uses a harsh tone of voice with another child, do score it, because the target child was exposed to this parent behavior. Avoid trying to ‘interpret’ a parent’s meaning with this item. Enter a tally mark if you observe any of the behaviors listed. It is possible for a parent to make a very demeaning statement while laughing or dismissing the comment. Avoid looking for reasons to dismiss criticism or harsh voice. Instead, refrain from making a judgment about intent or meaning behind such statements and simply make a tally to note that it occurred. It can be helpful to consider the

parent's baseline voice tone with you and other adults. Using a flat or monotone voice without warmth is not an example of this item. There must be a criticism in words and/or a raised and harsh tone of voice.

Uses Restrictions/Intrusions (p.32): Restrictions include statements such as “No, Don't, Stop, Quit”. They also include repeated vague warnings such as “Watch out,” “Be careful.” If you hear a vague warning once, disregard it. If you hear it more than once, make a tally for each time thereafter. Intrusions include taking things away unnecessarily, controlling child's movement unnecessarily, using physical discipline, or pushing objects in front of a child's face. Consider both frequency and severity. A rating of ‘3’ should be assigned if mild restrictions are used frequently. A rating of ‘3’ should also be assigned if only 1 restriction is observed but it is severe (e.g., slapping a child's hand, yanking a child away from a toy).

Rejects Child's Bid (p.33): This item includes words or gestures that parent uses (specifically in response to the child's search for support, help, or attention from the parent) that **explicitly** convey that the child is not to interrupt the parent or seek the parent's attention or physical support (e.g., motioning the child to go away from the parent or pushing the child away, saying “Not now,” or “I don't want to play with you,” pulling away from a child who is seeking a hug, or blatantly ignoring a child's request for help or attention). Another example of Rejects Child's Bid is if a parent taunts or teases a child with a toy, holding it out to the child and then withdrawing it when the child reaches for it. This should

only be coded in this category if the parent continues the behavior in the case of child distress. For example, if both the child and the parent are laughing, this is a turn-taking game instead of taunting. Remember to consider severity not simply frequency. One severe rejection would be scored a '3'. If the child does not seek the parent's attention or approval through gaze, vocalization, comment soft touch, approach, or smile (hence providing No Opportunity for the parent to respond), "No Opportunity" (NA) should be checked.

Child Engagement

Positive Feedback (p. 34): Child provides positive feedback to parent through positive social signals such as appropriate smiling or laughing, eye contact, vocalizing, words, or gentle touch. This item does **not** reflect a child passively looking at a parent who is not engaged with the child. In rare cases, a young infant may have no opportunity to provide positive feedback to the parent because the parent is physically unavailable (such as an infant lying on his or her back who cannot see the parent's face due to parent positioning). In rare cases, "No Opportunity" (NA) should be checked.

Sustained Engagement (p.35): Child engages in an activity for a sustained length of time. Consider both social and non-social engagement with toys or materials. For older infants and young children, the child must be **actively engaged** (e.g., reaching for, looking at/turning pages of a book, manipulating objects, etc.). This item does not include an older infant or child sitting passively watching others interact. **However, for very young infants, this item does**

include sustained visual attention to toys, materials, or face. Watch for at least 30 seconds of sustained attention to parent's face or materials. For every 30 second interval of sustained engagement, another tally mark should be made on the score sheet. Simply looking around a room is not an example of this item.

Follow Through (p. 36): When, and if, the parent attempts to engage the child or requests action, the child follows through by vocalizing, gesturing, or attempting the task. For very young children, follow through could include imitating a smile or vocalization of the parent. This item assesses the extent to which the child follows through or responds to the parent's attempt to engage the child. Watch for the child to follow a parent's instruction, follow through with a verbal request or a clear non-verbal cue that is paired with a verbal request or instruction.

Child Reactivity/Distress

Irritable/Fuss/Cry (p.37): This item reflects both clear signals or fussiness and crying and unclear, difficult-to-read signals. Watch for fussing, whining, crying, or signals that change quickly and may be difficult to understand. The child's signals may shift rapidly to whimpering, fussing, or crying with little warning. Note the child's body language, facial expression, and vocalizations when coding this item. Consider how the child recovers from stressors. Uncontrollable or inconsolable crying are examples of this item. Difficulty calming after a stressor is also an example of this item. If the child fusses or cries, even if it is due to clear environmental stressor, this should be reflected in the scoring. As soon as a

behavior for this item is observed, a tally mark should be made on the score sheet. For every 15 seconds thereafter that the behavior continues, another tally mark should be recorded. This will enable more accurate scoring for both occurrences and severity.

External Distress (p. 38): Child engages in a tantrum, or aggressive behavior (hitting, biting, kicking, throwing objects, spitting, head-banging, screaming, verbal or nonverbal social rejection, name-calling, derogatory language, or threats). Non-compliance alone (simply not following through) is **not** an example of externalizing behavior. Similarly, saying ‘No’ unless it is repeated and is combined with another behavior such as yelling or screaming is not an example of External Distress. This item does not include a child who simply turns eyes and/or head away from interaction or fails to follow the parent’s instruction.

Frozen/Watchful/Withdrawn (p. 39): Child startles, flinches, or pulls away from the parent or engages in frozen, watchful behavior without joining in the interaction. A child who is simply not engaged in an activity or whose attention shifts to an activity other than where the parent wants the child to focus is not an example of this item. Watch for behaviors such as flinching, pulling away, or looking with a frozen/watchful gaze. The behavior should give a clear impression of fear, uncertainty, or avoidance.

Appendix D: Printed Materials Measure

From the 10-Month Family and Maternal Life History Part 2

1. Has anyone (family, friends, health care provider, schools, not including people from the MBM program) given you books, pamphlets, or guides about parenting?
2. Has anyone given you baby books for your baby (other than the MBM program)?
3. About how many books would you say you have in your home that are written for adults not children?
4. Do you have a public library card?
5. Do you or anyone else in your household currently subscribe to any magazines or journals?

From the Assessment of the Physical Environment

6. Observed books

From the HOME

7. Reading material is present and visible
8. Child has toys for literature and music (at least one book and one musical instrument)
9. Child has three or more books of his/her own

Appendix E: Full IPCI Task Descriptions

Note: All descriptions come verbatim from the ICPI Manual (Baggett, Carta, & Horn, 2003).

Free Play

Materials: No material are required for this activity. However, if the parent and child wish to use toys or games, these should be available before the assessment begins.

Setting Up: Remember to set the timer for 4 minutes as soon as you give the instructions below.

Instructions: “Let’s get started by spending a few minutes with you and your child doing something together that you enjoy. This activity should be something that you and your child are both comfortable with and used to, and something that your child loves to do. Please feel free to move around as is comfortable for you and your child. You don’t have to sit in one place, but I’ll need to know what room you’d like to be in so that I can move along with you. Sometimes parents talk or play games without toys, sometimes parents just sit with their children, and sometimes children like to play with a favorite toy. Whatever you and (child’s name) normally do that makes (child’s name) smile, laugh, or have fun is what I want to see. Feel free to stay with an activity or change activities as you would like. Attend to any needs your child might have during this time just as you normally would.”

Note: The purpose of this activity is to encourage the parent and child to engage in whatever activity they enjoy and to be as non-restrictive as possible. It is important not to impose any structure on the parent above and beyond the instructions. Therefore, do not restrict the parent's and child's movement by asking them to stay in one place. Instead, encourage the parent to let you know if they would like to move simply so that you can stay with them. If the parent looks toward you during the assessment or engages in behavior that suggests s/he is concerned with being in view of the camera or needing to 'look good for the camera' (e.g., pulling child's arm in an attempt to position child in front of camera or saying 'stay here so they can see you' to the child), remind the parent that it is your job to move the camera around that you need the caregiver and child to do whatever they would like without worrying about the camera at all and to ignore the camera as much as possible.

Looking at Books

Materials: Books (Brown Bear, Touch and Feel Puppy, Fiesta)

Setting Up: Give the books to the parent. Remember to set the timer for 2 minutes as soon as you give the instructions below.

Instructions: "During the next few minutes, you and your child can spend a few minutes with these books."

Note: Do NOT ask the caregiver to 'read' to his or her child. This is very important for at least two reasons. First, parents who can not read or who are self-conscious about their reading ability, may shy away from interacting with their

child because of the instruction to ‘read.’ Second, some parents will interpret the signals for readiness the child might show. While this may happen spontaneously, the instructions were designed to avoid stimulating such an effect. If the parent gives verbal or nonverbal cues of discomfort with the task or tells you that s/he cannot read, encourage the parent that however s/he would like to use these books with the child is just fine and that you’re really interested in the interaction with books- not necessarily in reading. If the caregiver appears uncomfortable and looks to you for support or confirmation as to what is expected, paraphrase instructions and maintain a supportive stance, but do not make any specific behavioral suggestions to the parent.

Dressing Task

Materials: No materials are required if the parent wishes to take clothes off and put them back on (shirt, socks, and shoes). If parent wishes to put on a change of clothes, these will need to be available.

Setting Up: Remember to set the timer for 2 minutes as soon as you give the instructions below. In rare cases the dressing tasks, particularly with a young infant, may not last for 2 minutes. Simply note the time on the rating form. However, do not tell the parent the activity may be less than 2 minutes and do not curtail the dressing time for any reason other than the parent’s spontaneous completion in less time.

Instructions: “Let’s spend a few minutes now seeing what it’s like to get (child’s name) dressed in the morning with whatever clothes and/or changing

routine you use. Let's focus on changing shirt, socks, and shoes or a diaper if that's needed. It's fine to simply remove and then replace the same clothing or if you'd like to use a change of clothes, that's fine too. However you two normally go about dressing is what I'm interested in"

Note: After the final activity, dressing, end on a positive note. Point out something positive that you observed during the observation. If something positive was captured on video, replaying a brief section to point out the positive and encourage the caregiver's reflection can be helpful. If the activities were particularly difficult or stressful for the parent or child, acknowledge that and empathize with the parent. If the child is distressed, ask the parent what s/he thinks might help to soothe the child. If appropriate, explore basic needs (diaper change if this was not done during the session, bottle, food, rest, or activity that child especially enjoys, etc.). In rare cases the dressing task, particularly with a young infant, may not last for 2 minutes. Simply note the time on the rating on the rating form.