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Parenting Predictors of Cognitive Skills and Emotion Knowledge in Socioeconomically Disadvantaged Preschoolers

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Abstract

This study examined the concurrent and longitudinal associations of parental responsiveness and inferential language input with cognitive skills and emotion knowledge among socioeconomically disadvantaged preschoolers. Parents and 2- to 4-year-old children (mean age = 3.21 years; *N*=284) participated in a parent-child free play session, and children completed cognitive (language, early literacy, early mathematics) and emotion knowledge assessments. One year later, children completed the same assessment battery. Parental responsiveness was coded from the videotaped parent-child free play sessions, and parental inferential language input was coded from transcripts of a subset of 127 of these sessions. All analyses controlled for child age, gender, and parental education, and longitudinal analyses controlled for initial skill level. Parental responsiveness significantly predicted all concurrent cognitive skills as well as literacy, math, and emotion knowledge one year later. Parental inferential language input was significantly positively associated with children's concurrent emotion knowledge. In longitudinal analyses, an interaction was found such that for children with stronger initial language skills, higher levels of parental inferential language input facilitated greater vocabulary development, whereas for children with weaker initial language skills, there was no association between parental inferential language input and change in children's vocabulary skills. These findings further our understanding of the roles of

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parental responsiveness and inferential language input in promoting children's school readiness skills.

Keywords

early childhood; parenting; school readiness; language development; emotion knowledge

During early childhood, children exhibit variation in their development of early cognitive and social-emotional skills, which sets the stage for individual differences in school readiness as well as later academic performance (Duncan et al., 2007; McClelland, Acock, & Morrison, 2006; National Early Literacy Panel, 2008). Contextual factors have been shown to be crucial in the early development of cognitive and social-emotional skills. For example, family income and socioeconomic status (SES), child care quality, and aspects of parenting during early childhood have each been shown to be positively related to early development and school readiness (Cutting & Dunn, 1999; Denham et al., 2012; Mistry, Benner, Biesanz, Clark, & Howes, 2010; Pungello et al., 2009). Moreover, parenting has been consistently found to be a robust early childhood predictor of school readiness and to be a mechanism through which many contextual factors, such as SES, influence child development (Hoff, 2003; Lengua, Honorado, & Bush, 2007; Lugo-Gil & Tamis-LeMonda, 2008). Despite our knowledge of the general association between parenting quality and school readiness, associations between specific parenting factors and early cognitive and social-emotional skills remain poorly understood.

The current study examined the unique contributions of specific parenting dimensions to growth in school readiness skills across the late toddler period and early preschool period among socioeconomically disadvantaged children. We focused on the roles of parental responsiveness and inferential language input because these parenting factors are theoretically expected to be important contributors to early cognitive and social-emotional development. Given our low SES sample, our study was equipped to shed light on the associations between parenting and school readiness in children at risk for difficulties in early cognitive and social-emotional development.

The Importance of Early Cognitive and Social-Emotional Skills

A range of early cognitive skills are important to children's school readiness and later academic success, including language, emergent literacy, and emergent math skills (Duncan et al., 2007). Children's early language skills include a variety of expressive and receptive abilities such as understanding and responding appropriately to different word and sentence structures and breadth of vocabulary (Chapman, 2000). These skills have been found to predict later reading achievement (Muter, Hulme, Snowling, & Stevenson, 2004; Roth, Speece, & Cooper, 2002). During early childhood, the ability to understand and manipulate the sound units of language (phonological awareness) and understand that print carries meaning and how books and print work (print knowledge) also represent foundational skills for later reading (Catts, Fey, Zhang, & Tomblin, 1999; National Early Literacy Panel, 2008; Storch & Whitehurst, 2002). Children employ these skills as they learn to use letter-sound correspondences to decode printed text and as they begin to comprehend text (Kendeou, van

den Broeck, White, & Lynch, 2009). In addition, emergent mathematics skills, such as understanding of numbers and operations, geometry, patterns, and measurement predict later mathematical competence in the elementary grades (Duncan et al., 2007).

A wide range of social-emotional skills are also important to children's successful transition to school (Bierman et al., 2008; Coolahan, Fantuzzo, Mendez & McDermott, 2000). One crucial early social-emotional skill, emotion knowledge, refers to the ability to recognize and label emotion expressions and to connect emotion expressions with their situational causes (Bierman et al., 2008). The acquisition of emotion knowledge during the preschool years contributes to adaptive social-emotional functioning in a school setting (Denham et al., 2003; Denham, 2006; Garner & Waajid, 2008; Shields et al., 2001). Children who are able to read the emotional expressions of others accurately and predict a likely emotional reaction in a given social situation can use this information to negotiate interpersonal relationships with teachers and peers (Izard et al., 2001).

The cognitive and social-emotional skills that predict academic success start to develop as early as infancy and toddlerhood, making it important to understand the predictors of early cognitive and social-emotional development, even many years prior to school entry. Multiple lines of research suggest that aspects of parenting quality, including responsiveness and cognitive stimulation, may shape young children's cognitive and social-emotional development (e.g., Lugo-Gil & Tamis-LeMonda, 2008).

Parental Responsiveness and Early Development

Parental responsiveness (also termed *sensitivity* or *sensitive responsiveness*) refers to a parenting style characterized by warm acceptance of children's needs and interests and attunement and contingent responding to children's cues. Parental responsiveness is theorized to foster a secure parent-child attachment relationship and keep emotions and stress reactivity at manageable levels, which in turn allows the child to explore the environment and engage in learning activities (Ainsworth, Blehar, Waters, & Wall, 1978; Bowlby, 1982). Parental responsiveness may also support cognitive development by allowing the child to take the lead and make choices, which may promote self-efficacy and support children's autonomy in problem-solving activities (Grolnick & Ryan, 1989).

In line with theory, empirical evidence suggests that parental responsiveness during early childhood may play an important role in early cognitive development (Landry, Smith, Swank, Assel, & Vellet, 2001; NICHD Early Child Care Research Network, 2001). Specifically, parental responsiveness has been found to influence language development (Pungello et al., 2009; Tamis-LeMonda, Bornstein, & Baumwell, 2001) and emergent literacy and math (Hirsh-Pasek & Burchinal, 2006).

Parental responsiveness has also been found to predict aspects of early social-emotional development (Landry et al., 2001; Razza & Raymond, 2013; Stams, Juffer, & van IJzendoorn, 2002). With regard to emotion knowledge in particular, effects of parenting constructs similar to parental responsiveness have been found. Higher parent-child attachment security has been associated with more advanced emotion knowledge in the preschool years (De Rosnay & Harris, 2002; Greig & Howe, 2001; Laible & Thompson,

1998; Ontai & Thompson, 2002; Raikes & Thompson, 2006). Also, parents and family environments rated as being high in emotion socialization (e.g., those modeling the expression of positive emotion, showing high levels of emotional responsiveness, encouraging children's own emotional expression, and discussing emotional events) have more affectively competent children (Denham & Kochanoff, 2002; Perlman, Camras, & Pelphrey, 2008). Higher levels of parental responsiveness may lead to more shared experiences around emotion regulation which give the child opportunities to learn about emotion in a supportive context (Raikes & Thompson, 2006).

Parental Inferential Language Input and Early Development

Parental language input is an important general area of parenting that is associated with children's early cognitive and social-emotional development. Parental language input is theorized to facilitate children's development of cognitive reasoning skills needed to learn about reading, math, and emotions (Snow, 1991). One aspect of parental language input is the quantity of language spoken to the child, which has been found to support language development across multiple studies (Chapman, 2000). Recent evidence suggests the importance of considering not just the quantity of input, but the qualities of input associated with stronger language growth (Huttenlocher et al., 2010; Rowe, 2012).

One quality of language input that is of increasing interest to investigators of young children's linguistic and cognitive development is *inferential language* input. Oral language spans a continuum from literal to inferential levels of cognitive demand. Literal discourse includes talk about objects and events that can be directly perceived in the immediate environment, whereas inferential discourse addresses more decontextualized topics such as talk about the past or future or hypothetical or abstract situations that are not part of the immediate environment (Blank, Rose, & Berlin, 1978; Sigel, 1999). Although literal input is thought to be quite important early in life to ensure a strong foundation of language and vocabulary skills, parental inferential language may need to increase as children develop in order to support inferential reasoning skills needed to learn school readiness concepts (van Kleeck, 2008).

Toddlers and preschoolers are increasingly able to understand and produce inferential language, suggesting that the early years are an important period for children to experience inferential parent talk. Between 24 and 36 months children produce inferential talk such as pretend play, past tense verbs, and “why” questions (Paul, 2001). Experimental evidence shows that 24-month-olds demonstrate predictive understanding of causal relations (Sobel & Kirkham, 2006) and that their understanding of causal relationships can be significantly enhanced when adults provide simple, verbal explanations about how objects function (Bonawitz, Horowitz, Ferranti & Schultz, 2009). As children develop, their inferential reasoning capacities become more adult-like with 3-year-olds making accurate relevance inferences about adults’ ambiguous communication (Schulze, Grassmann, & Tomasello, 2013) and 4-year-olds using past events to accurately reason about a character's future-oriented thoughts, emotions, and decisions (Lagattuta & Sayfan, 2013).

Observational research shows that parents typically provide a combination of literal and inferential language input with increasing proportions of inferential talk as children move from the toddler to the preschool ages. For example, in everyday home activities, 1.5-year-olds hear about 2% inferential utterances whereas 3.5-year-olds hear 9% inferential talk (Rowe, 2012). In shared book reading with 3.5- to 4.0-year-olds, middle-class parents tend focus on inferential topics in 20-40% of utterances (Hammett, Van Kleeck, & Huberty, 2003; Hindman, Connor, Jewkes, & Morrison, 2008; van Kleeck, Gillam, Hamilton, & McGrath, 1997).

Individual differences among parents in their use of inferential language with toddlers and preschoolers may relate to variability in children's school readiness skills. Several studies show that higher levels of inferential language, such as past and future talk during mealtimes and pretend talk during play, predict later vocabulary skills (Katz, 2001; Snow & Beals, 2006). Decontextualized, cognitively stimulating parental language input with toddlers and preschoolers during everyday routines and toy play also predict children's later reading comprehension, decoding, and mathematics skills (Cook, Roggman, & Boyce, 2011; Dieterich, Assel, Swank, Smith, & Landry, 2006). A narrow type of inferential language, that is parental talk about emotions, predicts preschoolers' later emotion knowledge (Ontai & Thompson, 2002; Salmon et al., 2013).

Vygotskyian theories of cognitive development suggest that language input must be matched to the developmental level of the child in order to be beneficial (Vygotsky, 1978). Inferential language, which places higher cognitive demand on the child than literal language, may support development when children have higher language skills. Some research suggests differential effects of inferential adult talk such that younger children or children with weaker initial language skills benefit more from lower proportions of inferential talk, whereas children with strong initial skills profit from higher proportions of inferential talk (Reese & Cox, 1999; Zucker, Justice, Piasta, & Kaderavek, 2010). Research is needed to understand the extent to which higher levels of parental inferential talk support a range of school readiness skills in young preschoolers from low-SES backgrounds.

Current Study

The goal of the current study was to examine the concurrent and longitudinal associations between specific parenting factors and school readiness outcomes in socioeconomically disadvantaged preschoolers. To address this goal, during the winter of the academic year when children were enrolled in childcare programs, parents and 2- to 4-year-old children (mean age = 3.21 years) participated in a free play session with a standard set of toys, and children's cognitive skills (language, early literacy, and early math) and emotion knowledge were measured. Approximately one year later, children again completed assessments of their cognitive skills and emotion knowledge. Parental responsiveness and inferential language were coded from videotapes of the parent-child free play sessions.

We examined concurrent and longitudinal associations to understand the potential effects of these parenting variables on children's current functioning as well as on growth in their skills over time. We expected these parenting factors to be associated with child outcomes both

concurrently and longitudinally. More specifically, based on previous research, we hypothesized that parental responsiveness would be positively associated with children's cognitive skills and emotion knowledge. We also expected that higher levels of parental inferential language would promote children's cognitive skills and emotion knowledge because, to some extent, all of these domains require inferential, decontextualized cognitive processes. However, previous research suggests that the benefits of parental inferential language may be greater for children with higher initial skill levels. Therefore, in our longitudinal analyses, we also tested interactions between the level of parental inferential language and children's initial skills to consider possible differential growth. By using a longitudinal design, we were able to gain a greater understanding of whether these parenting factors may play causal roles with regard to children's school readiness outcomes.

Analyses were conducted while controlling for variables that have been found to correlate with early developmental skills, such as children's age, gender, and parental education (Garner & Waajid, 2008; Hoff, 2003). Given the expected continuity in children's developmental skills over the one-year period, we also controlled for initial levels of these skills in our longitudinal analyses. In addition, we controlled for verbal skills in our analyses predicting emotion knowledge (Cutting & Dunn, 1999; Salmon et al., 2013).

This study is unique in examining these questions among children exposed to socioeconomic adversity. Because these children are at risk for problems with school readiness, it is especially important to understand the factors that might relate to their early development. This study also extends previous research by examining the roles of parental responsiveness and inferential language with regard to growth in a range of school readiness skills, including language skills, literacy, math, and emotion knowledge, during a transitional period when children are entering preschool.

Method

Participants

Sample characteristics—Participants in the present study were 2 to 4 years of age at time 1 (mean age at time 1 = 3.21 years; 48% male), and 78% of children were African American. They were from families in Houston, Texas (53%) and Tallahassee, Florida (47%). On the parent questionnaire, 28% of parents reported having a high school diploma or a lower level of education, 45% of children came from single-parent households, and 62% of parents reported their marital status as ‘never married’, ‘divorced’, or ‘separated’. None of the children had any significant visual/auditory impairments or cognitive/language deficits. Full descriptive statistics for child and family characteristics are presented in Table 1.

Recruitment—Childcare centers were recruited across three years (cohorts) for a large, two-site childcare center-based intervention project (Landry et al., 2014). Databases from the Texas Department of Family and Protective Services and Florida Department of Children and Families were used to recruit childcare centers in which 50% of children in the center used federal or state childcare subsidies to attend. One classroom per center was invited to participate, and informed consent was obtained from childcare teachers. After

obtaining informed consent from parents, approximately eight children were randomly selected from each classroom to participate in the study. Classrooms were randomly assigned to one of three conditions: responsive teaching intervention, responsive teaching plus explicit social-emotional classroom activities intervention, or business-as-usual control. Results indicated that children in the interventions outperformed control children in areas of social and emotional development, although the groups did not differ in terms of cognitive skills (language, literacy, and math; Landry et al., 2014). Given that the current study was not focused on intervention effects, intervention status was examined for inclusion as a covariate in main analyses.

Parent participation rate—Of the 429 total child participants in this childcare center-based intervention study at time 1 (see procedure below), approximately 307 parents (72% of the child sample) completed the parent questionnaire and parent-child free play session. Multilevel logistic regression indicated that the likelihood of parent participation in the study was *not* significantly associated with child age, gender, race/ethnicity, time 1 language skills, time 1 early math, site, cohort, or intervention status, F(1-2, 404-416)=.08-2.15, *ns*. However, parents of children with higher early literacy and emotion knowledge at time 1 were more likely to participate in the study (b= .31-.35, SE = .13-.14, t(405-415)=2.43-2.48, p<.05, odds ratio = 1.01-1.04).

Attrition—Of the 307 child participants with parent-report and parenting data, approximately 209 (68%) had follow-up (time 2) data. Selective attrition analyses indicated that child age, gender, race/ethnicity, parental education, parent marital status, number of parents in the household, time 1 language skills, time 1 early literacy, time 1 early math, time 1 emotion knowledge, site, cohort, and intervention status did not significantly predict the likelihood of having follow-up data, F(1-2, 276-306)=.03-1.57, *ns*.

Procedure

Assessments were conducted by trained, certified examiners over two academic years. In the middle of the first academic year (usually in January; time 1 or T1), parents completed the parent questionnaire and a videotaped parent-child free play session at the childcare center and children participated in assessments of their language skills, early literacy, math, and emotion knowledge. During the free play sessions, parents and children were presented with a standard set of toys (Fisher Price Little People castle play set with figurines, a Play-Doh Fun Factory molding toy, two 5-ounce cans of Play-Doh, and a set of wooden blocks) and asked to play as they normally would for 10 minutes. Most of the parents who participated were the mothers of the children (91%), but some were fathers (7%), grandmothers (1%), and grandfathers (1%).Supplemental analyses showed no effects or differences as a function of who played with the child; in this study, all will be referred to as parents. Approximately one year later, toward the end of the subsequent academic year (February-April; time 2 or T2), children again completed assessments of their language skills, literacy, math, and emotion knowledge.

Measures

Parental responsiveness—Parental warm acceptance and responsiveness/flexibility were coded from videotapes of the parent-child free play sessions (284 out of 307 videotaped free play sessions were available for coding due primarily to video recording or transfer errors). Parents were rated for warm acceptance and responsiveness/flexibility on 5-point scales (higher values indicate greater warm acceptance or responsiveness/flexibility) for the 10 minutes of play. The rating scales were adapted from scales developed by the third author and used extensively in previous research (e.g., Landry et al., 2001). Ratings of warm acceptance were based on the following indicators: positive affect (smiles, positive tone of voice), praise, encouragement, physical affection, acceptance of child's needs and interests, and lack of negativity toward the child. Ratings of responsiveness/flexibility were based on the following indicators: consistent involvement, prompt and appropriate responses to child signals, following child's lead, expanding on child's play interests, and absence of controlling behavior. Four coders spent three weeks in training with a master coder to achieve reliability, and coding was completed over a 6-week period during which all coders were supervised to monitor drift and reliability. Inter-rater reliabilities (ICCs) computed for approximately 50% of the sample were .73 and .74 for warm acceptance and responsiveness/flexibility, respectively. Parental warm acceptance and responsiveness/flexibility were highly correlated (r=.74) and therefore were standardized and averaged to create a composite measure of parental responsiveness.

Parental inferential language input—Caregiver speech to the child was transcribed from the videotaped free play sessions. The unit of transcription was the utterance, defined as a sequence of words that represents a complete thought and is marked by a pause, change in intonation (rising or falling) or change in conversational turn. Transcription was conducted by trained research assistants at one research site and all transcripts were verified by a research assistant at another research site. Any disagreements were marked and resolved by this second individual who verified all transcripts, resulting in 93% agreement. Due to funding constraints, only 45% (127 out of 284) of the free play videos were transcribed and only from cohorts 1 and 2. Multilevel logistic regression indicated that there were no significant differences between transcribed and un-transcribed participants in child age, gender, race/ethnicity, language, literacy, math, emotion knowledge, parental education, site, or intervention condition, F(1-2, 263-272)=.02-1.02, *ns*.

We used two codes to eliminate non-play-related utterances that were: (a) inaudible, vague filler (e.g., *Umm*; *Oh*) or simple affirmations/negations (*Yes*; *Ok*; *No*), and (b) utterances that strictly related to managing/praising the child's behavior (e.g., *Wanna sit closer?*; *Good job*) or disciplining the child (e.g., *Talk quietly*). All remaining play-related utterances were coded as to whether they represented literal or inferential language input (codes adapted from Blank et al., 1978; van Kleeck et al., 1997). We used a mutually exclusive coding system with four levels, two representing literal levels and two inferential levels. Level 1 talk focused on salient perceptual information such as labeling objects or actions or asking children to repeat a word simple sentence or follow a simple direction (e.g., *That is an apple*). Level 2 talk selectively focused on parts of perceptually available information such as describing characteristics of objects, recall questions or two-step directions (e.g., *Let's*

make a big apple; What color is that?). Level 3 talk required reordering or inferring such as connecting to past events, talking about feelings and cognition, pretend play, or providing a summary (e.g., *You think she wants to ride the horse; I like that strawberry*). Level 4 talk required reasoning and analysis such as predicting, explaining cause/effect or defining a word's meaning (e.g., He flies so he doesn't have to walk down the stairs; You have to push here to make it come out). For coding levels, agreement was 86%, with ongoing drift checks by the second author. For analyses, the frequency/proportion of literal utterances referred to all level 1 and 2 utterances, and the frequency/proportion of inferential utterances referred to all level 3 and 4 utterances.

Oral language—The English version of the Preschool Language Scale–4th Edition (PLS-4; Zimmerman, Steiner, & Pond, 2002) Auditory Comprehension subtest was used to assess complex receptive language development (T1 only). The Auditory Comprehension subtest focuses on skills considered to be important precursors to language development, such as attention to speakers and appropriate object play, as well as comprehension of basic vocabulary, concepts, and grammatical markers. Test developers report test-retest reliability (mean, 6 days) ranging from .85 to .95 and internal consistency (Cronbach's α) ranging from .91 to .94 for 2- to 4-year-old children (Zimmerman, Steiner, & Pond, 2002). In the current sample, Cronbach's α was .82.

At T2, children completed the Expressive One-Word Picture Vocabulary Test (EOWPVT; Brownell, 2000), an assessment of their expressive vocabulary skills, and the PLS-4 was not administered. The EOWPVT measures children's ability to correctly label an action or concept. Examinees are presented with stimulus pages containing an individual color picture and asked to correctly label each drawing. Internal consistency (Cronbach's α) for 2- to 5-year-olds ranged from .93 to .95 (Brownell, 2000). In the current sample, Cronbach's α was .86.

Early literacy—The Print Knowledge and Phonological Awareness subtests from the Test of Preschool Early Literacy (TOPEL; Lonigan, Wagner, Torgesen, & Rashotte, 2007) were used to evaluate early literacy skills. The Print Knowledge subtest (36 items) assesses letter knowledge and letter-sound correspondence in both a multiple choice and free response format. In addition, children's knowledge of book and print concepts (e.g., title of a book, discriminating letters or words) is assessed. Internal consistency (Cronbach's α) of the Print Knowledge subtest in this sample was .86 and .93 at T1 and T2, respectively.

The Phonological Awareness subtest (27 items) includes 12 elision items and 15 blending items. The elision items require children to remove a sound from a word to make a new word (e.g., “Point to snowshoe without snow” and “Say playground without ground”). The blending items require children to combine word sounds to make a new word (e.g., “What word do these make: Hot – dog?” and “What word do these sounds make: F – ox?”). Each subsection begins with items utilizing a multiple-choice response format and moves to items requiring free responses. To ensure that children understand the tasks, the elision and blending sections each include four practice items on which children receive feedback to their responses. Cronbach's α for the Phonological Awareness subtest was .87 and .86 at T1

and T2, respectively. The early literacy score that was used in analyses was the sum of the raw scores on the Phonological Awareness and Print Knowledge subtests.

Early mathematics—A downward extension of the Child Math Assessment (CMA-DE; Starkey, Klein, & Wakely, 2004) was used to evaluate the mathematical knowledge of children in the project. The CMA-DE is comprised of 16 tasks (with multiple problems per task) that assess informal mathematical knowledge in the areas of number, arithmetic, space and geometry, measurement, and patterns. Good reliability for preschool children has been reported (i.e., Cronbach's alpha = .84 at the beginning of the school year; Starkey et al., 2004). Cronbach's α was in the acceptable range for the current sample (T1: .72; T2: .74). The early math score used in analyses was the percent of items that were scored as correct.

Emotion knowledge—Emotion knowledge assessment procedures originally designed by Izard (1971) were adapted by Bullock and Russell (1985) in order to allow the task to be used with children younger than age 3. This was accomplished by only using core emotions that 2- to 4-year-old children are developing the ability to identify (e.g., happy, sad, angry, scared; Widen & Russell, 2008). Prior to the start of the current project, the items were piloted and deemed appropriate for low-income 2- to 4-year-olds. We assessed expressive, receptive, and situational understanding of emotions. Expressive emotion knowledge was assessed with eight items showing pictures of children's faces depicting a happy, sad, angry, or scared expression and asking how each child felt (e.g., “Tell me how this child feels.”). Items were scored correct or incorrect (range: 0-1). Receptive emotion knowledge was measured with 20 items by showing a page with photos of two children's faces depicting different emotional expressions, and asking the child to point to the photo representing a particular emotion (e.g., “Show me which one is happy.”). Items were scored correct or incorrect (range: 0-1).

To assess situational emotion knowledge, children were read 12 everyday vignettes that would elicit a particular emotion while presented with four faces showing different emotions. After hearing the story, the child was asked to point to the emotion of how the child protagonist felt. Children received two points for each correct response, zero points for each incorrect response, and one point (partial credit) for emotions with correct valence (range: 0-2). For each task, the total score was the average score across items. Because expressive, receptive, and situational emotion knowledge were highly correlated (T1: .52 - .64; T2: .53 - .65), scores were standardized and averaged to create an emotion knowledge composite, which was used in analyses. Internal consistency (Cronbach's α) for the emotion knowledge composite was .81 at both T1 and T2.

Child and family characteristics—Parents reported on their child's lunch program at the childcare center and indicated free, reduced, regular, or N/A. Parents also indicated the educational attainment of the first and second main caregivers (in 90% of cases, first main caregiver was the mother; see Table 1) on a 10-point scale ranging from 1=middle school to 10=doctorate. For analyses, parent education categories were translated into approximate years of education. For two-caregiver households, the higher level of education was used.

Statistical Analyses

A path model was examined with pathways from parental responsiveness and inferential language predicting T1 language, literacy, math, and emotion knowledge. In the same model, longitudinal pathways tested the hypothesis that parental responsiveness and inferential language input contribute to growth in (T2) language, literacy, math, and emotion knowledge (accounting for initial [T1] levels of functioning in each area). Age, gender, and parental education were included as predictors of the T1 and T2 outcome variables (as described in the Preliminary Analyses section below). T1 outcomes were allowed to inter-correlate with each other, and T2 outcomes were allowed to inter-correlate with each other. We also examined whether parental inferential language input interacted with T1 skill levels to predict T2 skill levels and retained only significant interactions in the final model.

Path analyses were conducted using Mplus version 7 (Muthén & Muthén, 1998-2012). Models were estimated using full information maximum likelihood (FIML), which maximizes the likelihood of missing values based on observed data (Jelicič, Phelps, & Lerner, 2009). FIML yields more statistically reliable standard errors compared to other methods of accounting for missing data (e.g., mean imputation, listwise deletion; Enders, 2001, 2010). The path model was evaluated for overall fit using the chi-square, root mean square error of approximation (RMSEA), comparative fit index (CFI), and standardized root mean squared residual (SRMR). Good-fitting models are traditionally indicated by non-significant chi-squares; however, with larger samples, it is possible to get significant chi-squares even for models that fit the data well (Bentler & Bonett, 1980). An RMSEA ≤.06, a CFI ≥.95, and an SRMR < .08 indicated good model fit (Hu & Bentler, 1999).

Because children were nested within childcare centers, we accounted for the non-independence of observations in our analyses (Raudenbush & Bryk, 2002). Multilevel modeling captures the correlations across children (level 1) within childcare centers (level 2) through the estimation of random effects. Intra-class correlations **(**ICCs) indicated that from 8 to 26% of the total variation in children's school readiness outcomes was attributed to differences between childcare centers. Cluster size analyses indicated that there was an average of 4.6 children per childcare center (*SD*=2.04; range: 1-9) in our total sample (*N*=284 children from 60 childcare centers) and an average of 4 children per childcare center (*SD*=1.98; range = 1-8) in our sample of children with parent talk data (*N*=127 children from 32 childcare centers).

Results

Preliminary Analyses

We identified covariates by examining correlations of child age, gender (1=female; 0=male), race/ethnicity, parental education, parental marital status (currently married, not currently married), number of parents in the household, intervention condition, site, and cohort with predictor and outcome variables. Child age, gender, and parental education were associated with predictor and outcome variables (see Table 3). Parental responsiveness differed by race/ethnicity, with African American children experiencing lower parental responsiveness than Caucasian/White children, $F(2,263) = 7.33$, $p<.001$. Race/ethnicity was not associated

with the proportion of parental inferential language or any of the child school readiness outcomes, $F(2,74\text{-}231) = .18\text{-}2.12$, *ns*. Although we initially included race/ethnicity as a covariate in the main analyses, it was not significant in any of the models and was therefore removed. Parent marital status, the number of parents in the household, site, and cohort were not associated with parental responsiveness, inferential language, or any of the school readiness outcomes, $F(1\text{-}2, 119\text{-}264)=.23\text{-}2.07$, *ns*. Thus, child age, gender, and parental education were included as covariates in all analyses.

In the intervention impact study (Landry et al., 2014), intervention effects were found for emotion knowledge (at T1) such that children in the two intervention groups did not differ from each other but had higher emotion knowledge than children in the control group. Thus, intervention status was included as a dichotomous covariate in analyses of emotion knowledge (1=either intervention condition, 0=control).

Descriptive Statistics

As shown in Table 2, parents tended to demonstrate moderate levels of both warm acceptance and responsiveness/flexibility, but the full range of the 5-point scale was observed in this sample. The average parent produced 99.59 play-related utterances during a 10-minute free play session, corresponding to about 10 play-related utterances per minute. However, there was substantial variability across parents with total play-related utterances ranging from 24 to 198. On average, 34% of parental play-related utterances were inferential whereas 66% were literal. Children's language, literacy, math, and emotion knowledge scores improved from T1 to T2.

The zero-order correlations between the study variables are shown in Table 3. Children's cognitive skills and emotion knowledge showed considerable stability from T1 to T2, and both parental responsiveness and inferential language correlated positively with children's T1 and T2 cognitive skills and emotion knowledge. Given that the total quantity of parental language input was not significantly related to child outcomes ($r = -.02$ to .11, *ns*), this variable was not included in the main analyses. Higher levels of parental responsiveness were associated with a greater proportion of parental inferential language. Parental education was significantly positively associated with parental responsiveness but not significantly associated with parental inferential language input.

Parental Responsiveness Predicting Child Outcomes

The final path model was a good fit to the data: $\chi^2(74)= 186.98$, $p<.001$, RMSEA = .05, CFI = .95, SRMR = .06. (Because the chi-square statistic is sensitive to sample size, it is possible for the chi-square to be significant even when the model is a good fit to the data.) The results for this path model are presented in Figure 1. The standardized partial regression coefficients represent each parenting factor's unique contribution to each school readiness outcome, once the contribution of all other factors in the model has been accounted for.

Concurrent—T1 parental responsiveness significantly predicted T1 language, literacy, and math after controlling for age, gender, parental inferential language input, and parental education (see Figure 1). T1 parental responsiveness was marginally associated with T1

emotion knowledge after controlling for age, gender, parental inferential language input, parental education, and intervention status.

Longitudinal—T1 parental responsiveness significantly predicted growth in child emergent literacy, math, and emotion knowledge from T1 to T2 after accounting for age, gender, parental inferential language input, and parental education as well as initial (T1) levels of these skills. T1 parental responsiveness did not significantly predict growth in T2 language skills.

Parental Inferential Language Input Predicting Child Outcomes

Concurrent—As shown in Figure 1, T1 parental inferential language input was significantly associated with T1 emotion knowledge after accounting for age, gender, parental responsiveness, and parental education. T1 parental inferential language input was marginally associated with T1 language skills and not significantly associated with T1 emergent literacy or math.

Longitudinal—. There were no main effects of T1 parental inferential language input in the prediction of growth in language, emergent literacy, math, or emotion knowledge. However, an interaction between T1 parental inferential language input and children's T1 language skills predicted growth in children's language skills (see Figure 1). We examined this significant interaction effect by plotting the simple regression slopes of T2 language skills on T1 parental inferential language at low (−1 SD), medium (mean), and high (+1 SD) levels of T1 language skills (see Figure 2), and testing whether these simple slopes differed significantly from zero (Cohen, Cohen, West, & Aiken, 2003). T1 parental inferential language was significantly positively associated with children's T2 language skills in children with above average T1 language skills, $t(87) = 3.09$, $p<.01$, but not in children with average, $t(87) = 1.69$, *ns*, or below average T1 language skills, $t(87) = -.27$, *ns*.

Gender and Parental Education Predicting Child Outcomes

Gender and parental education also predicted child school readiness outcomes. Girls outperformed boys on measures of T1 language, T2 literacy, and T1 and T2 mathematics, $\beta = .06$ to .15. Higher parental education predicted higher scores across T1 and T2 school readiness outcomes,$\beta = .15$ to .27.

Discussion

The present study shows that specific measures of parenting quality relate to school readiness outcomes in young socioeconomically disadvantaged preschoolers. We found that parental responsiveness uniquely predicted a range of school readiness outcomes both concurrently and one year later, whereas parental inferential language input related more narrowly to language and emotion knowledge, with some associations depending on children's language abilities. These findings are important because they are consistent with theories that emphasize responsive parenting styles that scaffold children's autonomy and adaptive approaches to learning. Results of this study also shed light on the conditions in which higher proportions of inferential talk may be most beneficial.

Parental responsiveness was significantly positively associated with concurrent language, emergent literacy, and emergent math and marginally positively associated with concurrent emotion knowledge. Parental responsiveness also predicted growth in early literacy, early math, and emotion knowledge over a one-year period, after controlling for initial skill levels in each area. These results are consistent with previous studies showing associations between parental responsiveness and preschoolers' language and literacy (Landry et al., 2001; Tamis-LeMonda, Bornstein, & Baumwell, 2001). Thus, children's experiences with parental responsiveness during play interactions, or more broadly within the home environment, may be important to their language and literacy success as they begin preschool. This study also suggests that parental responsiveness plays a role in the development of early math skills, which have been found to be particularly predictive of later academic achievement (Duncan et al., 2007). In addition, parental responsiveness may facilitate the development of emotion knowledge, a skill that supports children's competence in social interactions with teachers and peers. This finding is consistent with previous research showing an association between attachment security and emotion knowledge (Raikes & Thompson, 2006).

Parental responsiveness may promote the development of early cognitive skills and emotion knowledge in several ways. Warm, sensitive, and contingent responding to children's cues may foster a secure parent-child attachment and regulate children's emotion and stress levels, allowing exploration, problem-solving, and engagement in learning activities (Landry et al., 2001). Shared experiences around emotion regulatory events may provide children with opportunities to learn about emotion in a supportive context. Encouraging children to take the lead and make choices during play interactions (while providing guidance and structure depending on the child's needs) may support autonomy and goal-directed behavior, promoting self-regulation and adaptive approaches to learning (Bernier, Carlson, & Whipple, 2010).

In a subsample of these parent-child dyads, we analyzed the quantity of total parental play-related utterances as well as a quality of this talk, namely whether each utterance required literal or inferential levels of cognitive processing. The quantity of parental language input was not significantly related to any of the child outcomes. This is consistent with recent longitudinal work indicating that the sheer volume of language input is important to children's vocabulary at 18 months, but that by ages 2 and 3 years, the quality of parent language input is a more predictive feature (Rowe, 2012). Parental inferential language input was significantly positively associated with concurrent emotion knowledge and marginally positively associated with concurrent language skills, after accounting for age, gender, parental responsiveness, and parental education. Parental inferential talk may relate to emotion knowledge development because it encourages children to develop inferential reasoning skills needed to understand emotion. In addition, parental inferential talk may support children's language skills by encouraging them to comprehend and produce inferential talk.

Longitudinally, there was a significant interaction between inferential input and initial levels of language skills in the prediction of vocabulary skills one year later. Higher proportions of parental inferential language were more beneficial to vocabulary skills for children with

stronger initial receptive language skills than children with weaker initial skills. These differential effects are consistent with previous findings that children with higher initial language skills can more quickly process and benefit from complex language input (Borovsky, Elman, & Fernald, 2012; Reese & Cox, 1999; Zucker et al., 2010). This result aligns with a Vygotskyian theory of cognitive development that optimal learning environments are tailored to the child's zone of proximal development (Rogoff, 1990; Vygotsky, 1978). Frequent parental inferential language input may present an appropriate challenge to children with higher language skills, facilitating their vocabulary acquisition, whereas it may be asking too much of children with lower language skills. This is not to say that inferential language input to children with relatively limited language skills is harmful, because young children are gradually building abilities to understand relevant aspects of complex speech (Fernald, McRoberts, & Swingley, 2001; Seidenberg, 1997).

Although early literacy and mathematics require some amount of decontextualized cognitive processing, a direct association between parental inferential language input and children's literacy and math outcomes was not detected. Future studies should examine whether there are indirect influences of parental inferential language on children's literacy and math via effects on children's language skills. Support for similar mediational models has been found in prior studies (Cristofaro & Tamis-LaMonda, 2012; Forget-Dubois et al., 2009). Further research is also needed to understand the optimal proportions of parental inferential language input at different stages of development.

In terms of practical implications, these results suggest that improving parental responsiveness in low-income families may facilitate the development of a broad range of school readiness skills. Ensuring rich language input may also be important, especially to children's language development, when matched to the skill level of the child. In line with this interpretation, interventions enhancing parenting quality in low-SES families have been found to bolster children's school readiness by prominently emphasizing responsiveness while also addressing the quality of language input (Landry et al., 2008). Although parenting quality is important, there are many other factors that contribute to school readiness difficulties in children from low SES families. Accordingly, early interventions should address factors such as child care quality and household stress in addition to parenting quality.

Other predictors were also found to relate to children's school readiness outcomes. Gender predicted language and early math outcomes such that females showed more advanced performance on these assessments but not on literacy or emotion knowledge measures. Prior studies have also yielded mixed results for gender across school readiness skills, with effects favoring girls when they are found (Matthews, Ponitz, & Morrison, 2009). In addition, parental education continued to be a significant predictor of school readiness outcomes after taking parenting quality into account. This result is in line with the notion that socioeconomic factors influence children's development via a range of proximal contexts, including home, school, and neighborhood quality.

There were several limitations of this study that should be kept in mind when interpreting the results. We had different language measures at the initial time point and the follow-up

time point, moving from a global, receptive language measure at T1 to a more narrow vocabulary measure at T2. Although transcripts of the parent-child free play sessions were available for only a subset of the larger sample, we did not find any differences in child or family characteristics between the transcribed and non-transcribed participants. Thus, findings from the subsample may be representative of what we would have found using the larger sample. Although there was missing data due to attrition over the course of the study, there was no evidence of selective attrition. In addition, our parenting measures were based on a single parent-child free play session, and therefore the data only hold to the extent that parenting quality demonstrated during this session is representative of parenting demonstrated in everyday life. Finally, although we controlled for intervention status in our analyses, it is important to reiterate that children in the sample were assigned to different intervention groups.

Future studies should examine the effects of these parenting factors with respect to a broader range of early social-emotional skills, such as prosocial behaviors in the classroom (e.g., helping, sharing). This research would add to our understanding of the roles of these parenting factors in the development of social-emotional skills beyond emotion knowledge. In addition, future studies should investigate whether there are cultural differences in the way that parental responsiveness is manifested and the way this parenting style relates to children's development. Parental responsiveness may be beneficial to children's development under certain circumstances, and there may be variability across cultures in what is considered responsive (Bornstein et al., 1992).

In conclusion, this study found that parental responsiveness and inferential language input predicted school readiness skills in socioeconomically disadvantaged children entering preschool. Parental responsiveness supported the development of children's cognitive skills and emotion knowledge over a one-year period. Parental inferential language input provided greater longitudinal vocabulary benefits for children with higher initial language skills than those with lower initial skills. Therefore, interventions to ensure parental responsiveness during the transition from childcare into preschool may promote the development of a broad range of school readiness skills among children at socioeconomic risk. Interventions designed to enhance the quality of parental language input may be improved if matched to the initial skill levels of the child.

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Highlights

- We examined associations between parenting and school readiness in preschoolers
- Responsiveness significantly predicted cognitive and emotion skills one year later
- Inferential language input was associated with concurrent language and emotion skills
- There was an interaction between inferential language input and language skills
- Children with strong initial skills benefited from inferential language input

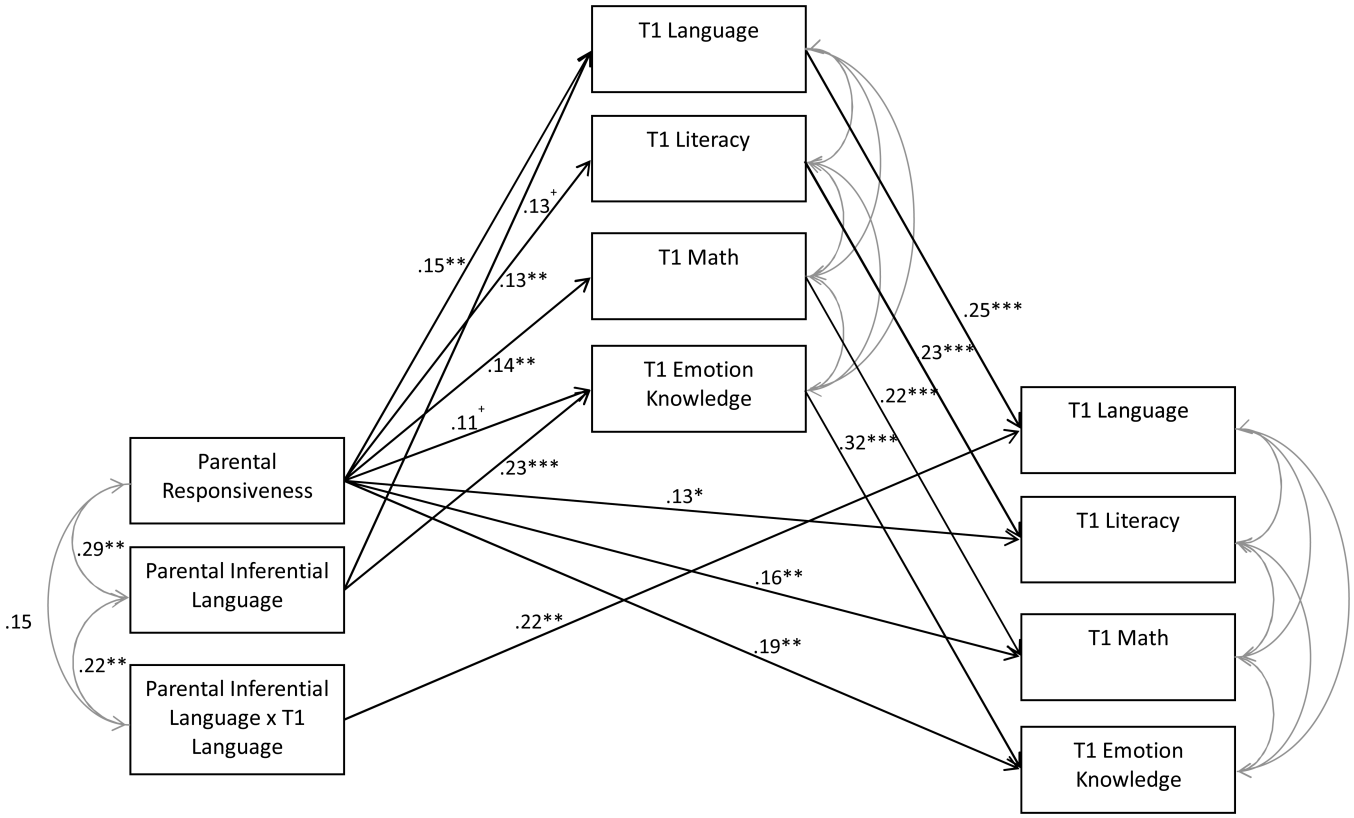

Figure 1.

Effects of parental responsiveness and inferential language input on children's T1 and T2 school readiness outcomes. Standardized path coefficients for significant and marginally significant ($p < .10$) paths are shown. Covariates (e.g., child age, gender, parental education, and intervention status) and residuals are not shown. Coefficients for covariances between residual terms for the outcome variables are as follows: T1 language and T1 literacy, β=.53, $p<.001$; T1 language and T1 math, β=.45, $p<.001$; T1 language and T1 emotion knowledge, β=.52, $p<.001$; T1 literacy and T1 math, β=.48, $p<.001$; T1 literacy and T1 emotion knowledge, β=.45, $p<.001$; T1 math and T1 emotion knowledge, β=.46, $p<.001$; T2 language and T2 literacy, β=.33, $p<.001$; T2 language and T2 math, β=.35, $p<.001$; T2 language and T2 emotion knowledge, β=.40, $p<.001$; T2 literacy and T2 math, β=.42, $p<.001$; T2 literacy and T2 emotion knowledge, β=.36, $p<.001$; T2 math and T2 emotion knowledge, β=.36, $p<.001$. Parental responsiveness and inferential language input were measured at T1. $+p<.10$, $*p<.05$, $**p<.01$, $***p<.001$

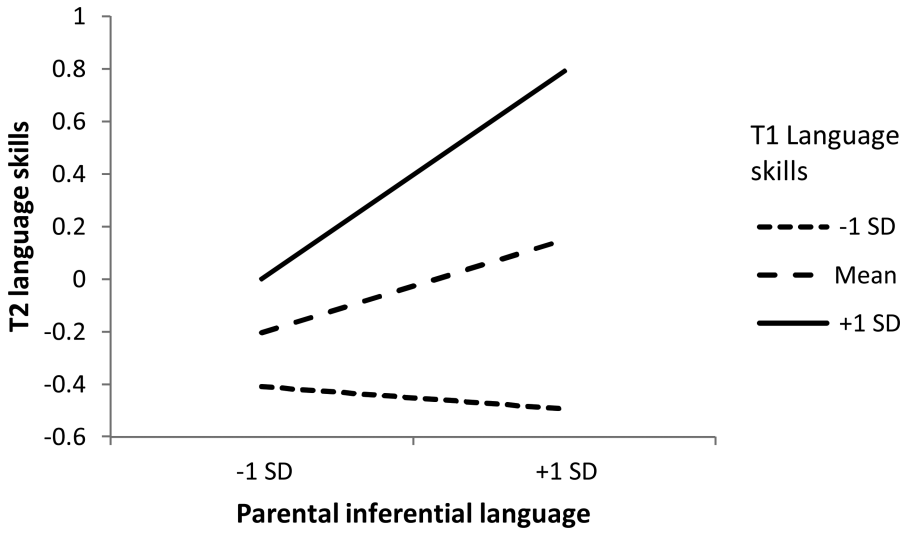

Figure 2.

Simple slopes of the association between parental inferential language and T2 language skills at low (−1 SD), medium (mean), and high (+1 SD) levels of T1 language skills.

Table 1

Sample characteristics

	%	n
Child gender (male)	48	308
Child race/ethnicity		299
African American	78	
Caucasian/White	8	
Hispanic/Latino	14	
First main caregiver's relation to child		305
Mother	90	
Father	5	
Grandmother	4	
Other	1	
First main caregiver marital status		307
Never married, divorced, or separated	62	
Married	38	
Single-parent household	45	304
First main caregiver education		305
High school diploma or less	28	
Some college	50	
Bachelor's degree or more	22	

	M(SD)	n
Child age (years) at time 1	3.21 (.54)	303
First main caregiver education (years)	13.59 (2.13)	305
Hours in childcare per week	40.42 (7.33)	278

Table 2

Descriptive statistics for parenting factors and child outcomes

	Time 1				Time 2			
	N	**M**	**SD**	**Range**	**N**	**M**	**SD**	**Range**
Parental warm acceptance	284	3.61	1.06	1-5	--	--	--	--
Parental responsiveness/flexibility	284	3.52	1.02	1-5	--	--	--	--
Parental total play-related utterances	127	99.59	36.12	24-198	--	--	--	--
Parental literal utterances	127	.66	.12	.38-.96	--	--	--	--
Parental inferential utterances	127	.34	.12	.04-.62	--	- -	--	--
Language[1]	265	38.92	7.98	12-59	209	36.74	13.09	0-86
Literacy	267	14.18	10.78	0-50	209	31.03	15.19	1-63
Math	266	26.62	17.75	0-85.42	208	38.14	19.84	0-88.50
Expressive emotion knowledge	273	.27	.29	0-1	203	.59	.30	0-1
Receptive emotion knowledge	267	.71	.20	.05-1	203	.87	.15	.35-1
Situational emotion knowledge	179	.82	.41	0-2	203	1.21	.39	0-2

Note. Variables for parental literal and inferential talk were the percentages of such utterances out of the total number of play-related utterances.

[1] At time 1, language was assessed using the PLS-4 Auditory Comprehension scale. At time 2, language (vocabulary) was assessed using the EOWPVT.

Table 3

Bivariate correlations among parenting factors and child outcomes

	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1. Age	--													
2. Gender	−.02	--												
3. Parental education	−.01	−.02	--											
4. Parental responsiveness	.08	.12*	.26***	--										
5. Parental total utterances	.01	−.06	.05	.15+	--									
6. Parental inferential talk	.33***	.07	.13	.29**	.39***	--								
7. T1 Language	.60***	.20**	.22***	.28***	.09	.37***	--							
8. T1 Literacy	.45***	.09	.32***	.22***	−.02	.18+	.65***	--						
9. T1 Math	.61***	.25***	.25***	.27***	.11	.32***	.71***	.65***	--					
10. T1 Emotion knowledge	.50***	.20**	.28***	.24***	.02	.39***	.71***	.60***	.70***	--				
11. T2 Language	.43***	.08	.30***	.21**	.02	.24*	.60***	.51***	.52***	.63***	--			
12. T2 Literacy	.49***	.17*	.31***	.28***	.05	.20+	.69***	.60***	.67***	.57***	.65***	--		
13. T2 Math	.60***	.24***	.21**	.30***	.06	.33**	.70***	.54***	.66***	.62***	.62***	.71***	--	
14. T2 Emotion knowledge	.45***	.17*	.30***	.33***	.07	.26*	.67***	.50***	.57***	.67***	.63***	.64***	.64***	--

Note. Child gender was coded 0=male, 1= female. The variable for parental inferential talk was the percentage of inferential utterances out of the total number of play-related utterances. Emotion knowledge was an aggregate of expressive, receptive, and situational emotion knowledge.

+ p<.10

* p<.05

** p<.01

*** p<.001

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