Parent-infant/toddler interactions and early literacy skills

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Parent-infant/toddler interactions and early literacy skills

by

Beverly June Dodici

A dissertation submitted to the graduate faculty
in partial fulfillment of the requirements for the degree of
DOCTOR OF PHILOSOPHY

Major: Human Development and Family Studies (Early Childhood Special Education)

Program of Study Committee:
Dianne C. Draper, Co-major professor
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Ames, Iowa
2002

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has met the requirements of Iowa State University

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Co-major Professor

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For the Major Program
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ABSTRACT

This study focused on the relationship between parent-infant/toddler interactions and early literacy skills for families living in low-income households. Twenty-seven families participated in this longitudinal study. Videotapes of parent-infant/toddler interactions participating in "simulated" daily experiences were made when the child was 14-, 24-, and 36-months-old. These tapes were coded on a scale rating child language, parent language, emotional tone, joint attention, parental guidance, and parental responsivity, all behaviors that have been related previously to later skill development in children. These parent-infant/toddler scores were then compared with early literacy skills, measured the spring prior to kindergarten entry. Parent-infant/toddler interactions related strongly to early literacy skills of receptive vocabulary, symbolic representation, and phonemic analysis, but not to rhyming or alliteration skills. In addition, the parent-infant/toddler interactions better predicted early literacy skills than did a parent-report regarding home literacy experiences. Implications for families, early childhood educators and programs, as well as researchers, are presented.
INTRODUCTION

The purpose of this study was to investigate the relationship between parent-infant/toddler interactions, from families living in poverty, and early literacy skills. Videotaped parent-infant/toddler interactions were coded to facilitate the comparison of parent-child interactions with later developing early literacy skills. In addition, the predictive relationship between parent-infant/toddler interactions, measured when the children were 14-, 24-, and 36-months-old, and a parent report regarding early literacy experiences when the children were approximately 54-months-old and early literacy skills was analyzed. This analysis evaluated which measure better predicted early literacy skills prior to kindergarten entry. If early parent-child interactions predicted early literacy skills as well as parent reports completed when the children were 54-months old, then earlier interventions related to early literacy skills could potentially be implemented. A final area of exploration was analysis of parent-infant/toddler interactions during three different simulated activities: frustration, teaching and play. This analysis was done to investigate if parent-infant/toddler interactions from one simulated activity related as strongly to early literacy skills as did parent-infant/toddler interactions from all three simulated activities combined. It should be noted that for the purpose of this study, early literacy skills included symbol/letter identification, receptive language, phonemic analysis, rhyming and alliteration skills. Early literacy experiences included activities such as time spent reading today or yesterday, visits to the library, enjoyment of reading, and when children were first read books.

A low-income sample was selected for this study because of the many developmental risks that children from low-income households face. Of special interest was literacy development. Children living in low-income homes generally have fewer opportunities to hear books read aloud on a regular basis, an experience known to support language growth (Zill, Collins, West, & Hausken. 1995). This may be related to the fact that often parents living in poverty do not have a high school diploma, have difficulty with reading, or are illiterate. It has been estimated that as many as 20% of adults in the US do not have a high school diploma and 13% cannot read (National Assessment of Educational Progress, 1985). It is quite probable that these percentages disproportionately represented by people living in poverty. In addition, it has been shown that parental attitudes and beliefs regarding reading...
strongly influence children’s perceptions of reading and literacy (Baker, Serpell, & Sonnenschein, 1995). Thus, simply asking low-income parents to read to their children on a regular basis may be an ineffective technique to improve children’s reading skills, as a large percentage of these parents may dislike and/or avoid literacy activities. In addition, many parents from low-income homes may be unaware of the potential benefits of reading to their children, and therefore have little motivation to engage in literacy activities at all with their children.

It can be assumed, however, that nearly all parents do engage in some form of communication and teaching activities with their children. It may be important, therefore, to better understand the connections between “everyday experiences” and early literacy skills. Daily parent-infant/toddler interactions may provide fruitful opportunities for early childhood interventions that could have a direct impact on later child development. In order to explore this relationship, this author evaluated parent-infant/toddler interactions during research conditions similar to situations that most families are likely to experience on a daily basis: a frustration situation, the opportunity to teach a novel task to a child, and the opportunity to engage in unstructured play using various age appropriate toys. These results may provide parents and early interventionists with additional techniques that stimulate early literacy skills, beyond book reading.

Objectives

Objectives for this project were to 1) examine the relationship between parent-infant/toddler interactions measured at 14-, 24-, and 36-months and early literacy skills assessed the spring before the child was age-eligible for kindergarten; 2) evaluate whether parent-infant/toddler interactions measured at 14-, 24-, and 36-months, or a parent report regarding early literacy experiences taken when the child was approximately 54-months, better predict early literacy skills; and 3) evaluate parent-infant/toddler interactions from three different simulated activities to determine if one activity predicts early literacy skills as well as all three simulated activities combined. The research questions, variables used, and hypotheses for this study are presented in Table 1.
Table 1. Research questions/variables/hypothesis

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<tr>
<th>Research Question</th>
<th>Variables and Measures</th>
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<td>What is the relationship between parent-infant/toddler</td>
<td>Predictors</td>
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<td>interactions and early literacy skills for children from</td>
<td>Parent-infant/toddler</td>
<td>PPVT-3</td>
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<tr>
<td>low-income families?</td>
<td>Interaction</td>
<td>WJ-R</td>
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<td></td>
<td>Coding System</td>
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<td>PICS Scores</td>
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<td>Do parent-infant/toddler interactions at 14, 24, &amp; 36-months</td>
<td>Predictors</td>
<td>Outcomes</td>
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<td>or a parent-report about early literacy experiences, at ~54-</td>
<td>-Stony Brook</td>
<td>PPVT-3</td>
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<td>months of age, better predict early literacy skills?</td>
<td>Family Reading</td>
<td>WJ-R</td>
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<td>Scale (SFRS)</td>
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<td>-PICS scores</td>
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<td>activity predict early literacy skills as well as parent-</td>
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Information and insights provided by these analyses could provide implications for early intervention programs serving low-income families, such as Early Head Start. More general suggestions for parents and practitioners about “daily experiences” and how they can be used to enhance early literacy skills were also gleaned from this study. In addition, results
from this study should stimulate additional research regarding parent-infant/toddler interactions and later cognitive and global developmental skills.
REVIEW OF RELATED LITERATURE

How do infants, toddlers and children learn what they learn? This question has plagued child developmentalists and psychologists for years. In this study, the idea that infants, toddlers and children learn from their parents follows the same ideas that the sociocultural perspective of child development proposes. A sociocultural perspective of child development emphasizes that children learn many skills through adult-child interactions, and this perspective served as the theoretical basis for this study.

The idea that children learn from their interactions with adults, however, is not a novel idea. In the 1920s and 1930s, Lev Vygotsky (1986) theorized that social interactions are fundamental elements for cognitive development. Furthermore, he proposed that child development is guided by interactions with adults within the cultural context of society. In other words, children learn from their interactions with people in the community around them. Barbara Rogoff (1990) added to Vygotsky’s theories and proposed that the development of skills requires the interaction of two parties, a teacher (typically adult) and a learner (typically child), which she describes as an apprenticeship-type relationship. Given the focus of this study, parent-child interactions and later skill development, the sociocultural perspective and theories proposed by Vygotsky and Rogoff laid the groundwork for this study and guided how parent-child interactions were assessed throughout this study.

Specifically, this study explored how parent-infant/toddler interactions influenced early literacy skills for children from low-income households. As noted in the previous paragraph, Vygotsky theorized that social and cognitive development are guided by interactions and experiences with more skilled individuals, often parents or other adults. He proposed the concepts of “zone of proximal development,” which is defined as the difference between a child’s actual ability and his or her potential aptitude for problem solving; and “scaffolding”, which relates to the more knowledgeable individual with whom the child is interacting sensitively providing appropriate support for the child to complete a task or gain knowledge (Vygotsky, 1986). It is quite likely that elements of zone of proximal development and scaffolding might be seen when parents are trying to teach their children new skills. These concepts were very appropriate to this study, since one component of this study analyzed how parents taught their children a novel task.
Beyond these concepts and also related to this study, Rogoff's expansion of Vygotsky's concepts and definitions also apply. By introducing the idea of guided participation, which focuses more on adult-child interactions during day-to-day activities as opposed to learning that occurs in more structured teaching situations, Rogoff (1990) proposed that guided participation occurs during everyday experiences. While parents are doing chores, talking on the phone, caring for their children, or doing any number of other daily activities, their children are learning how to interact, communicate and problem solve. These types of "daily activity" interactions were also analyzed in this study. Parent-child interactions during frustration and play situations were observed and analyzed, and elements of guided participation were used in the operational definitions for this study. With the ideas that children learn from their parents and that parent-child interactions influence development, this review now moves into areas of concern that may exist for children, specifically for children from low-income households.

It has been demonstrated consistently that children who live in low-income households are at risk for scoring lower on measures of intelligence and experiencing academic difficulties (Ceci, 1996; Gottfried, 1984; Sameroff, Seifer, Baldwin & Baldwin, 1993). It has also been shown that children growing up in low-income households are more likely to have difficulty learning to read, when compared with children in middle-income households, and these differences may be evident as early as kindergarten (Dickinson & Snow, 1987). As early as the 1960's, our country began national programs and interventions in an effort to help preschool children from low-income households have an "even start" when they entered school. However, it has been suggested that interventions implemented after children are 3-years-old, especially for children living in low-income households, may have limited impact on later cognitive or other developmental skills due to the cumulative effects of experiences during the first three years of life (Hart & Risley, 1995).

This concept of limited effectiveness of interventions after the age of three is further supported when one considers research related to brain development. Neuroimaging techniques have been used to show that infants' brains are actively engaged and processing the complexities of the world even before birth. Researchers have also used neuroimaging to show that, in the very short time from birth to age two, significant amounts of dendritic
growth occur. Dendritic growth is stimulated by sensory and motor experiences. In other words, dendritic growth, or lack of dendritic growth, is influenced by the experiences infants encounter during everyday activities. Moreover, the level of dendritic growth during the first two years of life influences the number of dendritic paths that will remain and the number of dendritic paths that will die (Greenough, Black, & Wallace, 1987). This is of concern because dendritic paths influence the rate and speed at which mental processes occur. In other words, the number of dendritic paths influence the rates of processing and other skills related to cognitive development. The concept of “use it or lose it” truly applies here. It appears that if children are not cognitively stimulated early in life, they may have limited cognitive abilities resulting in delayed or lowered cognitive skills, as well academic deficiencies. Based on the fact, provided via neuroimaging, that young brains are actively processing various stimuli (Greenough et al., 1987), coupled with the possibility that interventions after the age of three may have limited impact on later development (Hart & Risley, 1995), the importance of high quality early parent-infant/toddler experiences becomes even more critical.

In addition to the concerns noted about the level of neurological growth that occurs as a result of experiences that infants and toddlers encounter and its possible impact on later development, researchers have also shown strong relationships between early academic skills and later academic success (Adams, 1990; Cunningham & Stanovich, 1997; Juel, 1988; Slavin, Karweit, Wasik, Madden, & Dolan, 1994). The levels of literacy and language skills that children have at kindergarten and first grade strongly predict school achievement and completion of high school many years later (Cunningham & Stanovich, 1997). In a thorough review of empirical studies regarding predictors of academic success, it was found that academic success, defined as completing high school, is reasonably predicted by children’s reading levels in third grade (Slavin et al., 1994). More specifically, Juel (1988) demonstrated that children’s reading skills at the end of first grade correlated significantly ($r = .88$) with their reading skills in high school. Furthermore, based on her thorough review, Adams (1990) stated that preschool phonological awareness may be the greatest predictor of success in learning to read. Based on these findings, it becomes evident that effective early
literacy activities and interventions are critical to later reading development and overall academic success.

Given the relationship between early academic skills and later school performance, our knowledge of infant neurological development, and the risks that children from low-income families face, it seems imperative that early childhood experiences, especially for children from low-income families, be evaluated in an effort to identify where and how effective interventions relevant to literacy can be implemented. A substantial number of researchers have focused their studies on early parent-infant/toddler interactions and social (Ainsworth, Blehar, Waters, & Wall, 1978; Barnard, 1997), cognitive (Dickinson & Tabors, 2001; Estrada, Arsenio, Hess, & Halloway, 1987), and language (Beckwith & Rodning, 1996; Hart & Risley, 1995) development, so it would appear that this is a logical place to begin. Furthermore, Vygotsky (1986) and Rogoff (1990) theorized that social interactions are fundamental elements of cognitive development and learning. Given that children primarily interact with their parents, or primary caregivers, for much of their first three years of life, it seems appropriate to evaluate the relationship between parent-infant/toddler interactions and early literacy skills.

Parent-child interactions and child development

Vast amounts of empirical data have been gathered to examine the relationships between parent-infant/toddler interactions and language and/or cognitive development (Akhtar, Dunham, & Dunham, 1991; Beckwith & Rodning, 1996; Bornstein & Tamis-LeMonda, 1989; Dickinson & Tabors, 2001; Dunham & Dunham, 1992; Dunham, Dunham, & Curwin, 1993; Estrada, Arsenio, Hess & Holloway, 1987; Hart & Risley, 1995; Jones & Adamson, 1987; Landry, Smith, Miller-Loncar & Swank, 1997; NICHD Early Child Care Research Network, 1999; Saxon, 1997; Tamis-LeMonda & Bornstein, 1994; Tomasello & Farrar, 1986; Tomasello & Todd, 1983; Walker, Greenwood, Hart & Carta, 1994). Researchers have demonstrated consistently that parent-child interactions related to positive language and cognitive development contain elements of joint attention (Akhtar et al., 1991; Dunham & Dunham, 1992; Dunham et al., 1993; NICHD Early Child Care Research Network, 1999; Saxon, 1997; Tomasello & Farrar, 1986), parental responsivity (Adamson & Bakeman, 1984; Bornstein & Tamis-LeMonda, 1989; NICHD Early Child Care Research
Network, 1999), positive emotional tone (Estrada et al., 1987; Hart & Risley, 1995; NICHD Early Child Care Research Network, 1999), and appropriate parental guidance or scaffolding (Adamson & Bakeman, 1984; Hart & Risley, 1995; Jones & Adamson, 1987; NICHD Early Child Care Research Network, 1999). Most of these researchers, however, have evaluated parent-infant/toddler interactions beginning at 6-months of age and related them to early developmental skills, for example at 24-months, demonstrating relatively short-term developmental impacts (Akhtar et al., 1991; Pappas-Jones & Adamson, 1987; Saxon, 1997; Tomasello & Farrar, 1986). Other researchers have focused on parent-child interactions and later language and cognitive development, but only included populations of children over the age of three (Dickinson & Tabors, 2001; Estrada et a., 1987). Still others have focused on specific populations, such as pre-term infants (Beckwith & Rodning, 1996), or on specific developmental periods, for example, between the ages of 6-months and 40-months, not evaluating later language development (Landry et al, 1997).

These researchers' findings, therefore, leave a gap in the knowledge about parent-infant/toddler interactions and early literacy skills. Only one set of researchers focused on the long-term effects of parent-infant/toddler interactions, beginning when the children were 7- to 36-months old and relating these skills to later language and cognitive development (Hart & Risley, 1995; Walker et al., 1994). In their studies, however, the researchers only considered the predictor variables of child language with outcomes of reading and academic success in early elementary school (Walker et al., 1994), ignoring many other significant parent-child interaction variables, or did not measure intermediate outcomes at the early elementary grades (Hart & Risley, 1995).

This research study was undertaken in an attempt to provide information regarding how parent-infant/toddler interactions are related to early literacy skills. The literature review presented here and in the next sections examines current understanding of parent-child interaction and its relationship to later skill development. It also highlights various characteristics of parent-child interactions that are typically analyzed and presents elements of children's home experiences that have been found to relate to later reading development. An empirical basis for the coding system developed for the current study is also provided and
the coding system, in turn, is related to early literacy skills. Finally, justification for the early literacy skills considered important to later reading development are reviewed.

**Specific characteristics of parent-child interactions**

A number of characteristics of parent-child interactions have been found to relate consistently and positively to language and cognitive skills. The National Institute of Child Health and Human Development (NICHD) stated that “supportive, warm, and engaged parent-child interactions are associated with the child’s emerging competencies in social, cognitive, and linguistic domains throughout early and middle childhood” (p. 1399, 1999). Thus, the specific characteristics of supportive, warm and engaged parent-child interactions that are taken from empirical studies will be discussed in further detail.

*Characteristics of supportive and warm interactions*

**Responsivity.** Maternal responsivity is defined as a mother’s prompt, contingent, and appropriate behaviors in response to a child’s actions (Bornstein & Tamis-LeMonda, 1989). Bornstein and Tamis-LeMonda’s cross-cultural study, completed with families from the United States and Japan, revealed that maternal responsivity toward 4- to 5-month old infants related to children’s competencies at age 4. Further, they found that Japanese mothers’ responsiveness toward 4 to 5-month olds, significantly predicted toddlers’ vocabulary skills at 2 ½ years of age ($r=.43, N=24, p<.01$). A limitation of this study, however, is that only one aspect of parent-infant interactions, responsivity, was evaluated.

**Sensitivity.** Parental sensitivity is the degree to which parents adapt to children’s needs and abilities (Beckwith & Rodning, 1996). Beckwith and Rodning evaluated maternal sensitivity toward pre-term infants during parent-infant interactions in a laboratory setting when the infants were 13- and 20-months-old and the relationship of these interactions with later social, language and cognitive development. They found statistically significant correlations among maternal sensitivity, child engagement, and dyadic fit (the extent to which the mother and child meshed), and later language and social skills (Beckwith & Rodning, 1996).

Specifically, when measured at the age of 36-months, children’s expressive and receptive language skills were significantly correlated with the dyadic verbal reciprocity measured when the children were 13-months-old ($r=.49, N=51, p<.01$, expressive and $r=.40$,...
Furthermore, at the age of five, children's scores on the Rubin Social Problem Solving tasks, a series of pictures that represent social dilemmas that might occur in a child's life, significantly correlated with early parent-child characteristics measured at 20-months of age. Infant engagement ($r = .41, N=51, p<.01$), maternal sensitivity ($r = .46, N=51, p<.05$), and dyadic verbal reciprocity ($r = .39, N=51, p<.05$) at 20-months, correlated significantly with the Rubins measure, taken at 60-months of age. However, it was noted that no significant correlations existed between the early parent-child characteristics and 5-year-old cognitive skills (Beckwith & Rodning, 1996). Although these authors demonstrated a relationship between parental responsiveness and later language development and social skills, they did not include any measures of early literacy skills, important factors related to later school success. In addition, this study was limited to the populations of pre-term infants, although the authors proposed that the characteristics of parental sensitivity and responsiveness, and their relationships to later language and social development, may well apply to all infants, not just pre-term populations (Beckwith & Rodning, 1996).

Although defined slightly differently across studies, both responsivity and sensitivity have been related consistently to positive child outcomes. In general, researchers have shown that as a mother's responsivity and sensitivity increase, a child's social, cognitive, and language skills increase as well (Barnard, 1997; Beckwith & Rodning, 1996; Bornstein & Tamis-LeMonda, 1989; Lamb-Parker, Boak, Griffin, Ripple, & Peay, 1999; Landry et al., 1997).

**Emotional tone.** The emotional tone, or affective aspect, of parent-child interactions has also been found to relate to child development (Barnard, 1997; Estrada et al., 1987; Hart & Risley, 1995; Lamb-Parker et al., 1999; Pianta & Egeland, 1994). Positive statements, comments, praise, smiles and laughter, nurturing embraces or touches, and limited negative comments or yelling are some of the parental behaviors that have been related to positive child outcomes (Barnard, 1997). Specifically, various researchers have demonstrated that the affective characteristics of the parent-child relationship have a direct association with a child's school readiness (Lamb-Parker et al., 1999) and intelligence (Estrada et al., 1987).
Moreover, researchers have shown that the level of positive affective parent-child interactions is influenced by a family's socioeconomic status. In their longitudinal study, Hart and Risley (1995) found that children living in low-income households heard twice as many prohibitions as affirmative statements from their parents than did children living in middle and upper income households. The lasting effects of these negative comments, made by parents to their children, were also reported, as a significant relationship was found between the proportion of prohibitions a child heard in their first years of life and their later cognitive and language abilities. Specifically, feedback tone, which included affirmations and prohibitions, had a significant correlation ($r=.58, N=42, p<.01$) with a child's cognitive skills at age 3, and a significant correlation ($r=.64, N=42, p<.01$) with scores on the Test of Language Development at age nine (Hart & Risley, 1995). These researchers' longitudinal results help demonstrate the significant impact that early parent-infant/toddler interactions have on later academic success.

**Characteristics of parent-child engagement**

**Joint attention.** Joint attention, the amount of time a parent and child are mutually focused on a single object or activity (Tomasello & Farrar, 1986), is a main element of parent-child engagement. A plethora of researchers have demonstrated that joint attention plays a significant role in language and skill development (Akhtar et al., 1991; Bakeman & Adamson, 1984; Dunham et al., 1993; Harris, Jones, Brookes, & Grant, 1986; Landry et al., 1997; Saxon, 1997; Tomasello & Farrar, 1986; Tomasello & Todd, 1983). In general, these researchers have revealed that children are more likely to acquire novel words and skills when their parents are less directive, and attend to and focus on what the children have in their focus, versus having to change their attention to a different, adult-selected object, not currently in their focus.

More specifically, Tomasello and Farrar (1986) proposed an attentional-mapping hypothesis, which argues that lexical development is facilitated by episodes during which a parent or adult follows the existing attention of the child, resulting in a joint-attentional state. They tested their hypothesis in an experimental study. Children, aged 2-years-old, were presented four novel items that the experimenter verbally labeled while (a) the child was attending to it (follow-in condition), or (b) the child was engaged with other objects (direct
Two weeks later, the children returned and completed a comprehension task, that included the novel words presented at the initial session. Tomasello and Farrar (1986) found that the children in the follow-in condition were more likely to learn the novel object labels, having a 64% success rate on the comprehension task, which was significantly better than the direct condition children, who had a 36% success rate on the comprehension task ($t(9)=2.41, p<.05$). However, limitations to the study, which included confounding variables such as the number of times the child was exposed to the novel label and the child’s level of motivation to learn the novel word, prompted further research in this area.

In an effort to control for the number of times a child heard a novel label and motivation, Dunham and his colleagues (1993) completed a study with attention-following (AF) and attention-switching (AS) groups using trained experimenters working with children 18-months of age in a play situation. While the child engaged in play, the experimenter labeled a novel object “dodo”, but used a set of different responses for either the AF or AS conditions. For the AF condition, the experimenter imitated the child’s actions while playing and only labeled the novel item (“That’s a dodo.”) when the child initiated and attended to the “dodo”. Contrasting this, in the AS condition, the experimenter did not imitate the child’s actions, but rather activated the dodo toy after the child’s response or interaction to other toys, labeling the novel item, “That’s a dodo”, regardless of the child’s interest or attention. After completing the sessions, seven of the 14 infants in the AF group comprehended the novel label, as opposed to two of the 14 infants in the AS group ($X^2(1, N=28)=4.09, p=.04$). Dunham et al (1993) concluded that, after controlling for motivation and frequency of exposure to the novel word, attention-switching strategies had a significantly negative impact on early word learning, supporting the attentional-mapping hypothesis proposed by Tomasello and Farrar (1986).

In summary, these three characteristics of parent-child interactions, supportiveness, warmth, and engagement, have been identified and related empirically to positive child development throughout early and middle childhood. There are, however other variables that have been related to positive early parent-child interactions and later language development. Specifically, the amount of talk parents use with their children and the guidance style used by
parents have also been demonstrated to relate to later language and cognitive development (Hart & Risley, 1995; Walker et al, 1994).

**Characteristics of parental language and guidance**

*Parental talk.* Children from low-income families are less likely to have conversations with adults, and are exposed to fewer words than children from higher income families (Snow, Tabors & Dickinson 2001). In a review of literature, Snow and her colleagues (1998) found a strong, consistent relationship between the amount of time a child talks with a parent or adult and later literacy skills. Furthermore, using data from an extensive longitudinal study, Hart and Risley (1995) found that the number of words parents said to their children per hour was significantly related to children’s language ($r=.73$, $N=42$, $p<.001$) and cognitive skills ($r=.53$, $N=42$, $p<.001$) at age 3, and expressive language at age 9 ($r=.59$, $N=42$, $p<.001$). Walker and her colleagues (1994) found that children’s vocabulary at age 3 significantly predicted their school achievement levels (reading and spelling) in kindergarten through third grade ($r=.43-.63$, $N=32$, $p<.05$). Researchers have found consistently that the amount of time children engage in conversations with adults may be one of the most influential variables relating to later skill development (DeTemple, 2001; Hart & Risley, 1995; Rush, 1999). Given these results, the characteristic of parental talk seems important when considering elements that influence parent-infant/toddler interactions and early literacy skills.

*Parental guidance.* The concepts of zone of proximal development, scaffolding (Vygotsky, 1986) and guided participation (Rogoff, 1990) relate to the idea of parental guidance style. Parental guidance style has been defined as the relative amount of prompting that a child experiences, or how often the child is asked rather than told what to do (Hart & Risley, 1995). In parent-infant/toddler interactions, this may include various strategies in which the parent provides more control and structure through increased information and less choice (Landry et al., 1997), depending on the child’s skill levels. The degree of guidance is based on the utterances parents use and can be categorized by the responses their utterances prompt. Directive statements demand prompt action (ex: "Get your coat on."), while questions or suggestive statements ask for a response (ex: "Can you get your coat on?"). The first allows for no choice, while the latter allows the child to choose whether or not to put on
the coat. A third type of utterance used by parents, informative statements (ex: "It's cold outside."), give limited or no direction and allow a child to use the information in whatever way he or she chooses. Following the last example, the child may ignore the informative statement and go outside without a coat, or the child may choose to put on a coat.

The concept of parental “directiveness” has been found to inhibit a child’s vocabulary consistently (Harris et al, 1986; Landry et al, 1997; Nelson, 1973; Pappas-Jones & Adamson, 1987; Tomasello & Todd, 1983), and would seem to relate to parental guidance styles. However, further review of these studies revealed that in most instances, parental directiveness referred to times during which the parent was directing the child’s activities, versus following the child’s lead and appeared to contain characteristics more similar to joint attention. To avoid confusion and maintain mutually exclusive definitions, the descriptions put forth by Hart and Risley (1995) and Landry and her colleagues (1997) will be used in this study. To further support the idea that parental guidance style is a separate and significant element of parent-child interactions, researchers have shown that the level of parental guidance style used prior to age 3 significantly related to expressive ($r=.71, N=42, p<.001$) and receptive ($r=.77, N=42, p<.001$) language skills when the child was 9-years-old (Hart & Risley, 1995). Moreover, parental guidance styles prior to the age of three were more highly correlated with children’s expressive and receptive language skills at the age of nine, than were children’s cognitive skills, as measured by the Stanford-Binet, at the age of three ($r=.64, N=42, p<.001$) (Hart & Risley, 1995).

With this review, it becomes clear that numerous characteristics of parent-child interactions are strongly related to language and cognitive skills, and in some cases, correlate with developmental skills years later. However, investigations are limited in that none of the studies related the parent-infant/toddler interactions to early literacy skills.

Assessing parent-infant/toddler behaviors

Macro- versus micro-analyses

Analyses of behaviors are typically completed in one of two manners. Microanalyses analyze small increments of behaviors, frequently breaking behaviors into tally counts of the observed behavior(s). Macroanalyses focus on overall, global impressions of behaviors, often rating behaviors using likert-like scales, with ranges of low to high. The Parent-
infant/toddler Interaction Coding System (PICS) (Dodici & Draper, 2001) employs a macroanalytic system. Many previous examinations of parent-child interactions have completed microanalyses on transcribed conversations between children and their parents, evaluating the number of words used, mean length of utterances, type of words used (nouns, verbs, modifiers, etc.) and types of questions used (Akhtar et al, 1991; Harris et al, 1986; Hart & Risley, 1995; Jones & Adamson, 1987; Tamis-LeMonda & Bornstein, 1994; Tomasello & Farrar, 1986; Tomasello & Todd, 1983). However, researchers have shown macroanalyses to provide valid and reliable measures of parent-child interactions (Barnard, 1997; Estrada et al., 1987) and overall home environments (Bradley, Caldwell, & Rock, 1988).

Two well established and frequently used macroanalysis instruments include the Home Observation for Measurement of the Environment- HOME (Caldwell & Bradley, 1984), an instrument used to measure children's home environments, and the Nursing Child Assessment Teaching Scales- NCAST (Barnard, 1994), an instrument used to assess parent-child interactions during teaching activities. In a thorough review of multivariate longitudinal investigations, Gottfried (1984) found that investigators who used the HOME consistently reported moderate to moderately high levels of internal reliability, and moderate levels of stability across months and years. The NCAST scales have been used extensively to assess parent-child interactions and have demonstrated good internal consistency and test-retest reliability for total scores and most subscores (Barnard, 1994). These two macroanalysis systems have proven very useful in early childhood development research.

Furthermore, Estrada and her colleagues (1987) employed a macro-analysis instrument to assess the relationship between mother-child affect and later child development skills. Mother-child affect was measured when children were 4-years old, and cognitive functioning was measured when children were 12 years old. Parent-child interactions in an unstructured 10-minute game session, followed by a sorting task were rated by observers using a scale that measured global categories of responsiveness, flexibility, warm concern, acceptance, emotional displays of affect, and punitiveness, as opposed to measuring frequencies of specific behaviors. In addition, the mothers completed the verbal section of the Weschler Adult Intelligence Scales (WAIS) to measure their intellectual skills. The
affective relationship ratings, taken from the parent-child interactions when children were 4-years-old, were significantly associated with measures of school achievement ($r=.47$, $N=47$, $p<.001$), measured when the children were 12-years-old. However, the affective relationship ratings were not associated with maternal IQ ($r=.15$, $N=47$, $ns$), SES ($r=.16$, $N=47$, $ns$) or the child’s gender (Estrada, et al. 1987). This study further demonstrates the usefulness of macroanalysis instruments when evaluating parent-child interactions.

These two particular instruments, HOME and NCAST, plus the Estrada et al. (1987) study, demonstrate the strength and usefulness of macroanalysis tools, giving support to the macroanalysis approach of the PICS. The goal of the PICS is to capture the overall quality of the parent-infant/toddler interactions and evaluate how these characteristics relate to early literacy skills.

**Comparison of PICS and CIRCLE-2**

The Code for Interactive Recording of Caregiving and Learning Environments-2 (CIRCLE-2) (Atwater, Montagna, Creighton, Williams, & Hou, 1993) is a computerized scale that has been used to evaluate children’s interactions with their caregivers in their natural environments. The individual variables in the PICS include many of the salient variables described in the previous literature review, as well as parallel the various components of the CIRCLE-2. The CIRCLE-2 provides a comprehensive ecobehavioral assessment of a child’s learning environment and is used with real-time parent-child interactions. Information gathered using the CIRCLE-2 has demonstrated statistically significant correlations among one-to-one talk, words used, and functional manipulation of materials and pre-reading skills, as well as sharing, positive feedback, and functional manipulation of materials, and early literacy skills (Rush, 1999).

The CIRCLE-2 targets two factors, Caregiver and Child. The Caregiver factor includes: “Vocal Responses”, that assesses characteristics such as positive/negative feedback, expansion/repetition/extension, one-to-one vocalizations, request for language or action, and no vocal behavior; and “Involvement in child’s activity”, that assesses characteristics such as sharing, close supervision, no adult involvement. The Child factor includes: “Social behavior”, that assesses smiling/laughing, words or sign language used, vocalizations, gestures, and social attending; and “Engagement”, that assesses cooperating,
pretend play, functional manipulation of materials, tantruming, and non-compliance. The CIRCLE-2 variables include elements of joint attention, responsivity, parental guidance, parental talk, and emotional tone, which are all variables included in the PICS. Given these similarities, it would appear that, in addition to the empirical basis for the PICS scale, the CIRCLE-2 also supports the variables used in the PICS.

Literacy experiences in the home

Another variable to consider when evaluating factors that influence children's early literacy skills is the area of literacy experiences within their homes. Researchers have conducted ethnographic studies measuring the literacy experiences that young children have in their homes (Purcell-Gates, 1996; Purcell-Gates & Dahl, 1991). In these studies, the researchers spent the equivalent of 7 days in the homes of families observing the focus children who were between the ages of 4 and 6, and their literacy interactions. Based on these extensive hours of observation and recording, the researchers concluded that children who enter kindergarten knowing more about print and its function in the world were generally more successful with formal literacy instruction in school, performed better on achievement tests, and were judged as better readers and writers by their teachers (Purcell-Gates & Dahl, 1991). However, ethnographic studies such as these are costly, typically involve a small sample, and may have limited generalizability. Therefore, scales that are less invasive and less costly have been developed to capture elements of children's home environments that may relate to later reading skills.

For example, making direct observations of children's home environments using scales, such as the HOME (Caldwell & Bradley, 1984), researchers have found strong relationships between households rich in literacy experiences (e.g., reading materials, exposure to writing, conversational speech) and later reading success (for review see Gottfried, 1984). Other researchers have used parent-questionnaires to evaluate children's home literacy experiences.

An example of a parent questionnaire that has been used to evaluate children's home literacy experiences is the Stony Brook Family Reading Survey (SFRS) (Whitehurst, 1993). The SFRS is a 52-question parent interview that measures a variety of family variables on a four point scale. Nine of the questions specifically focus on the home literacy environment,
and investigators have shown relationships between the frequency of reading experiences, as measured by this scale, and language measures, for children from low-income households (Payne et al., 1994; Rush, 1999).

Specifically, Rush (1999) observed children and families from low-income households for one hour during typical daily activities using the CIRCLE-2, which was described in the previous section. After the observation, parents were asked to complete the nine questions taken from the SFRS. Within a week, children were tested at their preschool programs on various outcome measures that included the PPVT-R and a letter identification measure. Rush found that the nine questions of the SFRS used in her study, which were the same nine questions used in this study, correlated significantly with the PPVT-R ($r = .61$, $N=39$, $p<.01$) and a letter naming task, similar to the Letter-Word Recognition subtest of the WJ-R, ($r = .48$, $N=39$, $p<.01$).

Payne and his colleagues (1994) found that a canonical literacy environment score, a derived score which included the nine questions used in the Rush study as well as the current study, correlated significantly with the PPVT-R ($r = .42$, $N=323$, $p<.001$). In both the Rush and Payne et al. studies, the SFRS was completed by the mother when the child was between the ages of 48-and 66-months, similar to the ages of the children in this study, and related to skills that were assessed within a month of survey completion. Furthermore, in both of the studies, significant relationships between the SFRS and early literacy skills remained, even after controlling for maternal IQ, education, and SES. Given the significant correlations between literacy experiences at home and early literacy skills demonstrated by these researchers, it seems important to include a measure of children's literacy experiences at home in this study.

Based on the review of research that identifies early literacy skills, the focus of this review moves into the area of important predictors and outcome variables related to early literacy skills.

Variables related to early literacy skills

*Variables that predict early literacy skills*

As presented in the review above, many characteristics have been considered important factors when evaluating parent-child interactions and their relationships to later
developmental skills. Instruments and/or coding systems to evaluate the quality of parent-child joint attention (Akhtar et al., 1991; Bakeman & Adamson, 1984; Dunham et al., 1993; Saxon, 1997; Tomasello & Farrar, 1986), language usage (Hart & Risley, 1996; Walker et al., 1994), and emotional tone (Barnard, 1997; Estrada et al., 1987; Pianta & Egeland, 1994), as well as the level of parent responsivity (Beckwith & Rodning, 1996; Bomstein & Tamis-LeMonda, 1989) and guidance styles (Hart & Risley, 1995) have been used to predict early child language, cognitive, and developmental skills. For the purpose of this study, the Parent-infant/toddler Interaction Coding System (PICS) (Dodici & Draper, 2001), an instrument that incorporates elements of parent and child language use, emotional tone, joint attention, parental guidance style, and responsiveness, was used to assess the quality of parent-infant/toddler interactions during activities completed when the children were 14-, 24-, and 36-months-old.

The Stony Brook Family Reading Survey (SFRS) (Whitehurst, 1993) is another measure that has been used (Payne et al. 1994; Rush, 1999) to evaluate and describe early literacy experiences in a child’s home. This instrument involves a parent-report form that includes questions regarding parental and child literacy habits. The SFRS has been shown to have a high degree of association with early literacy and vocabulary measures (Payne et al, 1994; Rush, 1999). Given this relationship, it seems appropriate to include a measure of children’s home literacy experiences as a predictor variable when evaluating early literacy skills; therefore, the SFRS was used to assess each child’s home literacy environment when the child is approximately 54-months old.

**Variables that measure early literacy skills**

Researchers have demonstrated consistently that a strong vocabulary facilitates children’s reading by helping them attach meaning to words they encounter in print (Adams, 1990) and that early vocabulary development is strongly associated with later reading ability (Dickinson & Tabors, 2001; Hart & Risley, 1995; Walker et al. 1994). Therefore, measuring a child’s vocabulary at the preschool level would appear to be an integral part of assessing early literacy skills as they relate to later reading development. A measure commonly used to assess a child’s vocabulary level is the Peabody Picture Vocabulary Test: Revised (PPVT-R) (Bornstein & Tamis-LeMonda, 1989; Dickinson & Tabors, 2001; Estrada et al., 1987;
Hart & Risley, 1995; Payne et al., 1994; Rush, 1999). Given the relationship between vocabulary and later reading skills, it seems important to include a child's vocabulary skills as an outcome of this study. Therefore the PPVT-III was used to measure each child's vocabulary skill when he or she was approximately 54-months old.

Another area of early literacy that has been highly related to later reading success is phonological awareness. Phonological awareness refers to the conscious ability to attend to and manipulate individual phonemes that make up speech, allowing the reader to "crack" the spelling-to-sound code (Snow et al., 1998). Phonological awareness has been assessed by measurements that include evaluating children's rhyming, blending, segmentation and deletion skills in preschool and early elementary school (Kaminski & Good, 1998). Adams (1990) reported that preschool phonological awareness may be the greatest determinant of later reading success. In addition, researchers have proposed that it may be possible to teach phonological awareness and that this could possibly mediate the effects of SES on reading success (Kaminski & Good, 1998). In some instances, phonological awareness measures reveal that children who are more skilled at manipulating syllables, rhymes, or phonemes more quickly learn to read, and this relationship is present even after SES has been partialed out (Lonigan, Burgess, Anthony & Barker, 1998; Rush, 1999); however these results may change as children age and more advanced word decoding skills become necessary (Lonigan et al., 1998; Raz & Bryant, 1990). Regardless of this caution, researchers have demonstrated consistently that phonological awareness skills play a critical role in early reading skills, and it therefore seems essential to evaluate this area when considering the early literacy skills of children who live in poverty. To assess phonological awareness skills in this study, rhyming, alliteration, and phonemic analysis skills were assessed, as researchers have demonstrated that these tasks predict later reading performances (Bryant, MacLean, Bradley, & Crossland, 1990; Lonigan et al., 1998).

In summary, this review presented aspects of parent-child interactions and their relationship to later skill development. It also reviewed researchers' findings indicating that interventions after the age of three may have limited effect on children's development. With these issues highlighted, the first research question for this study focused on early parent-child interactions and their relationship to early literacy skills, as this specific type of
relationship has yet to be evaluated. The second research question attempted to determine if parent-infant/toddler interactions could predict early literacy skills as well as a parent report completed when children were approximately 54-months-old. If parent-infant/toddler interactions predicted early literacy skills as well as later parent reports, then interventions could be implemented earlier, if needed. Finally, this study questioned whether one simulated activity could predict early literacy skills as well as three simulated activities do. If this were the case, then practitioners could potentially observe one, short parent-infant/toddler interaction and make recommendations regarding interactions and/or interventions which may influence early literacy skills.

Purpose of the study

In this exploratory study, the author investigated the relationship between parent-infant/toddler interactions and early literacy skills. In addition to exploring this relationship, the author examined whether parent-infant/toddler interactions at 14-, 24-, and 36-months, or a parent report about literacy experiences, completed when the child was approximately 54-months of age, better predicted early literacy skills. Finally, the author explored the predictive relationships between the parent-infant/toddler interactions in different simulated daily activities and early literacy skills.

Currently, there is scant information regarding the direct relationships between parent-infant/toddler interactions and early literacy skills. One area of parent-infant/toddler interaction that seems worthy of examination is “daily activities” to see what influence these activities have on early literacy development. Given that many parents who live in low SES environments may not have the time, desire, and/or ability to read to their children, an activity that has been found to enhance later reading development (Snow et al., 1998), alternative ways to enhance early literacy skills need to be explored. Implications for early interventionists working with low-income families, as well as stimulating further research in this area were two hopeful outcomes for this study.

Research questions and hypotheses

The following are specific research questions and hypotheses addressed in this study:

1. What is the relationship between parent-infant/toddler interactions and early literacy skills for children from low-income families?
Hypothesis: Children with more positive early parent-infant/toddler interactions will have better early literacy skills.

It has been demonstrated empirically that children of parents who provide elements of joint attention (Adamson & Bakeman, 1984; Akhtar et al., 1991; Dunham et al., 1993; Harris et al., 1986; Saxon, 1997), responsivity (Beckwith & Rodning, 1996; Bornstein & Tamis-LeMonda, 1989), appropriate guidance strategies (Hart & Risley, 1995; Vygotsky, 1986), numerous one-to-one conversations (Hart & Risley, 1995; Snow et al., 1998), and positive affect (Hart & Risley, 1995; Lamb-Parker et al., 1999; Pianta & Egeland, 1994) develop better language and cognitive skills. Therefore, it was hypothesized that children who experienced more positive interactions with their parents would have better early literacy skills.

2. Do parent-infant/toddler interactions at 14-, 24-, and 36-months, or a parent-report about home literacy experiences, reported at approximately 54-months of age, better predict early literacy skills?

Hypothesis: Parent reports regarding home literacy experiences will better predict early literacy skills than parent-infant/toddler interactions at 14-, 24-, and 36-months.

It has been demonstrated empirically that the SFRS correlates highly with early literacy skills (Payne et al., 1994; Rush, 1999). However, since parent-infant/toddler interactions have not been evaluated and related to early literacy skills, I may be able to offer new evidence through this study, as the effects of the interactions that children experience in their first three years of life have a significant impact on later language skills (Hart & Risley, 1995; Walker et al., 1994). If it were demonstrated that parent-infant/toddler interactions predicted early literacy skills as well as, or better than parent reports completed when children were 54-months-old, then interventions related to early literacy could potentially take place when the children were younger.

3. Do parent-infant/toddler interactions from one simulated activity predict early literacy skills as well as parent-infant/toddler interactions from all three simulated activities combined?
Hypothesis: Parent-infant/toddler interactions from one simulated activity will relate as strongly to early literacy skills as do parent-infant/toddler interactions from three simulated activities.

Previous researchers have demonstrated that parent-child interactions are generally consistent over time (Hart & Risley); however, parent-child interactions across tasks have not been evaluated. Given the Hart and Risley findings, that behaviors are consistent over time, it was also thought that parent-infant/toddler interactions would be consistent across simulated activities as well.
MATERIALS AND METHODS

Participants and sampling

Subject of study

The focus of this study was the relationship between parent and infant/toddler interactions and early literacy skills.

Participants

Participants in this study were families who a) had a child born between September 16, 1995 and September 15, 1996, b) were income eligible for Early Head Start (EHS) services at that time, and c) were enrolled in the EHS National Evaluation study within a year after their child was born. The families who were included in this study were part of a larger longitudinal study conducted by Iowa State University, Mathematica Policy Research, Inc., and the Early Head Start National Research Consortium.

At the time of recruitment, families were randomly assigned into either a treatment or control group. Families in the treatment group received Early Head Start services, while families in the control group did not receive Early Head Start services, but could secure other early child and/or family support services in their communities if they chose to do so. Analyses comparing the treatment and control group were completed for this study.

All participants in this study completed annual child assessments and parent interviews when their children were approximately 14-, 24-, and 36-months of age. A similar follow-up assessment was completed the spring or summer prior to the children's age-eligibility for kindergarten. A total of 27 families met the criteria for this study; 13 of the children assessed were male (48%) and 14 were female (52%). The maternal age ranged from 15 to 34 years, with a median of 23.5 years (SD=5.03). Table 2 presents additional demographic information for the total sample, including ethnicity and level of maternal education.

Assessment instruments

All predictor and outcome variables and covariates are presented in Table 3. Two assessment instruments served as predictor variables for this study. The Parent-infant/toddler Interaction Coding Scale (PICS) (Dodici & Draper, 2001) was used to assess the quality of parent-infant/toddler interactions, and the Stony Brook Family Reading Survey
Table 2. Demographic characteristics of study participants

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Number of participants</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ethnicity</td>
<td></td>
<td></td>
</tr>
<tr>
<td>White, non-Hispanic</td>
<td>27</td>
<td>100%</td>
</tr>
<tr>
<td>Maternal Education</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5th – 8th grade</td>
<td>1</td>
<td>4%</td>
</tr>
<tr>
<td>11th grade</td>
<td>1</td>
<td>4%</td>
</tr>
<tr>
<td>High School (or GED)</td>
<td>12</td>
<td>44%</td>
</tr>
<tr>
<td>Some college/no degree</td>
<td>11</td>
<td>41%</td>
</tr>
<tr>
<td>Bachelor’s Degree</td>
<td>2</td>
<td>7%</td>
</tr>
</tbody>
</table>

(SFRS) (Whitehurst, 1993) was used to assess the home literacy environment of the children.

Several measures were used to assess children’s early literacy skills. The Peabody Picture Vocabulary Test-3rd edition (PPVT-III) (Dunn & Dunn, 1997), the Woodcock-Johnson Test of Achievement- Revised (WJ-R) (Woodcock & Mather, 1990) Letter-Word Identification subtest, and the Test of Language Development-Primary: Third Edition (TOLD-P:3) (Newcomer & Hammill, 1997) Phonemic Analysis subtest were used to assess receptive language skills, symbolic recognition, and segmentation, respectively. The scores for these measures were reported in standard scores: PPVT-III and WJ-R (mean=100, s.d.=10); TOLD-3 (mean=10, s.d.=3) subtests. Individual Growth and Development Indicators (IGDIs) (Early Childhood Research Institute on Measuring and Growth and Development, 1998; McConnell, Priest, Davis, & McEvoy, in press) of Rhyming and Alliteration were used to assess the children’s rhyming and alliteration skills. The number of correct responses given during a two-minute time period was the score reported for these measures.

Covariate measurements included the Woodcock-Johnson Test of Achievement-Revised (WJ-R) Picture Vocabulary subtest (Woodcock & Mather, 1990) to assess maternal vocabulary skills, and the MacArthur Communicative Development Inventories-II (CDI) (Fenson et al., 1993) to assess children’s vocabulary at 24-months of age. The number of correct responses was the score reported and used in this study for the WJ-R Picture
### Table 3. Measures used

<table>
<thead>
<tr>
<th>Name of Instrument</th>
<th>Purpose of Instrument</th>
<th>Level of Measurement</th>
<th>Age at testing</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Predictor Variables</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Parent-infant/toddler Interaction Coding System (PICS)</td>
<td>Evaluated quality of parent-infant/toddler interactions</td>
<td>Continuous (zero is meaningful)</td>
<td>14-, 24-, 36-months</td>
</tr>
<tr>
<td>Stony Brook Family Reading Scales (SFRS)</td>
<td>Evaluated children’s home literacy experiences</td>
<td>Continuous (zero is meaningful)</td>
<td>Spring or summer prior to kindergarten</td>
</tr>
<tr>
<td><strong>Outcome Variables</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Peabody Picture Vocabulary Test-3rd edition (PPVT-3)</td>
<td>Assessed child’s receptive vocabulary skills</td>
<td>Continuous (x=100, s.d.=10)</td>
<td>Spring or summer prior to kindergarten</td>
</tr>
<tr>
<td>Woodcock-Johnson Tests of Achievement-Revised (Reading Inventory)</td>
<td>Assessed child’s pre-reading skills</td>
<td>Continuous (x=100, s.d.=10)</td>
<td>Spring or summer prior to kindergarten</td>
</tr>
<tr>
<td>Test of Language Development-3 (Phonemic Analysis subtest)</td>
<td>Assessed children’s phonemic awareness skills</td>
<td>Continuous (x=10, s.d.=3)</td>
<td>Spring or summer prior to kindergarten</td>
</tr>
</tbody>
</table>
Table 3. (continued).

<table>
<thead>
<tr>
<th>Name of Instrument</th>
<th>Purpose of Instrument</th>
<th>Type of variables produced</th>
<th>Age at which instrument was used</th>
</tr>
</thead>
<tbody>
<tr>
<td>Individual Growth and Development Indicators- IGDIs (Rhyming and Alliteration)</td>
<td>Assessed children's phonemic awareness skills</td>
<td>Continuous (zero is meaningful)</td>
<td>Spring or summer prior to kindergarten</td>
</tr>
</tbody>
</table>

**Covariates**

<table>
<thead>
<tr>
<th>MacArthur Child Development Inventories (CDI)</th>
<th>Assessed children’s expressive vocabulary skills</th>
<th>Continuous (zero is meaningful)</th>
<th>Parent interview at 24- month assessment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Woodcock-Johnson Tests of Achievement- Picture Vocabulary</td>
<td>Assessed parent’s vocabulary skills</td>
<td>Continuous (zero is meaningful)</td>
<td>Parent interview at 24- month assessment</td>
</tr>
</tbody>
</table>

Vocabulary and the CDI scales. Maternal age, taken from the time of enrollment was also included as a covariate. Maternal education was considered as a covariate, but given the limited amount of variability, this variable was not included.

Explanations for each of the assessment instruments, beginning with descriptions for the predictor variables, followed by descriptions of the outcome variables, and ending with a description of variables that may be considered covariates, follow.

**Predictor Variables**

**Quality of parent-infant/toddler interactions.** The Parent-infant/toddler Interaction Coding Scale (PICS) (Dodici & Draper, 2001) (Appendix A) was used to evaluate videotaped parent-infant/toddler interactions. The interaction sessions were recorded when the children were 14-, 24-, and 36-months old, and included three simulated daily
experiences: a frustration task, a teaching task, and a semi-structured play task. PICS were coded for each of the three tasks, at each of the three assessment times (14-, 24-, and 36-months).

The PICS scale includes six variables: infant/toddler language (the amount of age appropriate language demonstrated by the infant/toddler), parent language (the amount of developmentally appropriate language the parent used with the infant/toddler), emotional tone (positive or negative, including verbal comments), joint attention (the amount of time the parent and infant/toddler were looking at/interacting with the same thing), parental guidance (ratio of informative versus directive statements used by the parent when interacting with the infant/toddler), and parental responsiveness (degree the parent responded to the child’s cues). These variables were rated on a 5-point scale (1-5). Scores for each of the six variables were summed into one subscale score for two of the simulated tasks (Frustration and Teaching), while the scores for the three Play tasks were averaged to provide one subscale score for the Play tasks. In turn, these three subscale scores were summed into a composite score for the overall parent-infant/toddler interaction. Possible scores could range from 18 (barring no “not applicable” ratings) to 90, with lower scores reflecting poorer parent-infant/toddler interactions and higher scores reflecting more developmentally appropriate interactions.

For PICS coding, each videotaped parent-infant/toddler interaction was divided into 3-minute intervals and observed by a trained research assistant. Each 3-minute interval was watched a minimum of two times, or until the research assistant could confidently assign a rating for each of the six variables. A separate Video Rating Sheet (Appendix A) was used for each simulated activity (Frustration, Teaching, Play); each rating sheet listed the six variables and provided a space for required justification of the given score. A final Case Report sheet, which listed the three subscale scores and the composite score (Appendix A), was generated for each videotaped parent-infant/toddler interaction.

Inter-rater reliability levels were completed on over 25% of the tapes coded for this study. Inter-rater agreement within one-point was set as an acceptable criterion. All ratings, including the subvariables of child language, parent language, emotional tone, joint attention, parental guidance, and parental responsivity, the subtasks of Teaching, Frustration and Play,
and the overall PICS score, were included in the inter-rater reliability analyses. Overall, inter-rater reliability criteria was at or above 85% for the tapes used in this study.

**Preschool reading experiences.** The Stony Brook Family Reading Scale (SFRS) (Whitehurst, 1993) was originally a 52-question parent interview that asked parents to answer questions related to their children's reading interests and habits, as well as their own reading habits. An adapted form of the SFRS was used for this study, which included nine questions from the SFRS that have been used previously to measure family literacy activities (Payne, et al 1994; Rush, 1999) (Appendix B). This subset of items has been deemed adequate for describing early literacy experiences in the home (Payne, et al 1994). The following items were assessed: frequency of shared book reading, number of books in the home, age at which reading to the child began, number of minutes spent reading to the child yesterday, child's interest in reading, frequency of library trips, and caregiver's enjoyment of reading. Parents completed the SFRS at the pre-kindergarten assessment and responses on the SFRS were summed to create a total score for each participating family.

Scores from the SFRS have correlated strongly with early literacy and vocabulary in previous studies (Payne et al., 1994; Rush, 1999). Specifically, a canonical literacy score that included the questions used in this study that were taken from the SFRS correlated with the PPVT-R ($r=.42, N=323, p<.001$) (Payne et al, 1994). Furthermore, the same nine questions used in this study correlated with the PPVT-R and a letter identification task, similar to the WJ-R Letter-Word identification subscale ($r=.61, N=39, p<.01; r=.48, N=39, p<.01$), respectively (Rush, 1999).

**Outcome Variables**

All outcome variables were gathered during the spring or summer prior to the child being age-eligible for kindergarten as part of the EHS National Research Consortium Longitudinal Evaluation, unless otherwise indicated.

**Child vocabulary skills.** Child vocabulary skill levels, which have been found to be related to pre-reading skills (Dickinson & Tabors, 2001; Hart & Risley, 1995), were measured using the Peabody Picture Vocabulary Test-3rd edition (PPVT-III) (Dunn & Dunn, 1997). The PPTV-III presented the respondent with four black and white pictures on an easel like, flip chart. During this individually administered assessment, the evaluator
asked the respondent to point to a target picture when presented with three distracters. The test-retest reliability for children ages 4-6 to 4-11 is .95, while the test-retest reliabilities for children age 5-0 to 5-5 and 5-6 to 5-11 are .93; all reliabilities are reported for standard score equivalents (Dunn & Dunn, 1997). Correlations between the PPVT-III and the Weschler Intelligence Scale for Children- Third edition (WISC-III) range from .82 to .92, with slightly higher correlations with the Verbal IQ scores than with Performance IQ scores (Dunn & Dunn, 1997).

**Pre-reading skills.** The Woodcock-Johnson Test of Achievement- Revised (WJ-R) (Woodcock & Mather, 1990) Letter-Word Identification subtest was used to assess each child's pre-reading and reading skills. The Letter-Word Identification subtest of the WJ-R scales required a child to identify rebus-like pictures, which represented a familiar pictured item. The test also assessed letter and word identification. The test-retest reliability for the WJ-R Letter-Word Identification subtest has been reported as .92 for children age 4 years old, and .96 for children age 6 years old (Woodcock & Mather, 1990). The WJ-R has a .52 correlation with the PPVT-R, for children ages 2-6 to 3-7 and a .83 correlation for the WJ-R Broad Reading and Wide Range Achievement Test- Revised (WRAT-R)-Reading section for children 9-years-old (Woodcock & Mather, 1990).

**Phonological awareness skills.** The Test of Language Development-Primary: Third Edition (TOLD-P:3), (Newcomer & Hammill, 1997) Phonemic Analysis subtest evaluated children's awareness of discrete sound segments and was used to assess segmentation, a component of each child's phonological awareness skills. Children were presented auditorally with 14 compound words, one at a time, which they were then asked to repeat. The child was then asked to say the word without the beginning or ending word, depending on the prompt given by the evaluator as per protocol. The Phonemic Analysis subtest is included in the outcome variables in an effort to assess early literacy skills that involve manipulating phonemes in language. The Phonemic Analysis subtest, however, is a newly added supplemental scale, and no reliability or validity measures are reported in the technical manual at this time. Internal consistency reliabilities are reported for the other subtests and average .90, while stability reliability (test-retest) for all composites fall above .80 (Newcomer & Hammill, 1997). Criterion-related validity for the TOLD-3 has been
broken down into individual subscale correlations with other instruments, except for one test. The Test of Auditory Comprehension of Language (TACL) had a .79 correlation with the total score of the TOLD-2.

In a further effort to assess phonological awareness skills, Individual Growth and Development Indicators (IGDIs) (Early Childhood Research Institute on Measuring Growth and Development, 1998; McConnell at al., in press) of Rhyming and Alliteration were used. The rhyming task required children to point to one of three colored pictures that rhymed with the target picture, while the alliteration task required children to point to one of three colored pictures that started with the same beginning sound as the target picture. Each set of four pictures was presented separately on a 5x8 piece of laminated tag board, with the target picture on the top and the three choices equally spaced below. These visual stimuli were paired with scripted directions from an examiner to point to the one that “sounds the same” or “starts with the same sound”. The children were presented with two teaching tasks, and then completed as many cards as possible within a two-minute time period; the number of correct and incorrect responses was recorded. The sum of the number of correct responses given by the child in the two-minute time period is the score typically used for IGDI measurements (Dickerson & Snow, 1987; Priest, electronic communications, 2002; Rush, 1999) and this approach was used in this study as well.

Reliability and validity for the IGDIs used in this study are being created; an article regarding this issue is in press at this time (McConnell et al., in press). To date, these instruments have been used with a diverse population. However, as they are developmental indicators, not norm-referenced instruments, reliabilities and validities are created for a specific population of interest, as opposed to the overall population.

**Covariates**

Past researchers have shown that numerous variables covary with a child’s level of developmental skills. An attempt was made to assess and control for as many covariates as possible in this study. Variables that may have been found to influence a child’s early literacy skills include: SES; maternal age, education, and vocabulary abilities, which are often used to represent intellectual levels; a child’s early vocabulary skills; services or programs that families may receive.
Demographic information. Demographic information, specifically maternal age, education level and SES may influence a child's development. Given that the sample for this study was taken from low-income families, this variable was already controlled to an extent. In addition, the limited variability in the education level of the mothers in this study make it appear that this variable would not significantly covary with outcome variables. However, maternal age may have influenced a child's development and was used as a covariate in this study. Maternal age was computed by subtracting the child's date of birth from the mother's date of birth.

Parental verbal skills. Parental vocabulary skills may also influence children's language development. In an effort to control for this possible covariate, the mother's expressive language skills were measured, using the Woodcock-Johnson Test of Achievement- Revised (WJ-R) (Woodcock & Mather, 1990) Picture Vocabulary subtest, when the child was 24-months old. Concurrent reliabilities for the WJ-R, for ages 17 and above, are .68 with the PIAT-Reading Composite; .57 with the Wide Range Achievement Test- Revised (WRAT-R) Reading; and .49 with the Kaufman Test of Educational Achievement (KTEA) Reading composite.

Child language skills. Since children's language skills have been found to be consistent over time, the MacArthur Communicative Development Inventories (CDI) (Fenson et al. 1993) was completed by the parent at the 24-month birthday related assessment. This score served as a covariate; it measured children's language skills at the age of 24-months and was compared with their language skills assessed at the pre-kindergarten sessions. The CDI, a parent report, measures language development in children from 3- to 30-months. Parents were instructed to identify words, from a list of one hundred words, that they had heard their child use. The CDI has been shown to yield highly reliable and valid scores, with internal consistency coefficients in the high 0.90s (Fenson et al, 1993).

Data collection procedures

Data were collected from each participating family in their home around the children's 14-, 24-, and 36-month birthdays, as well as the spring or summer prior to the fall the children were age-eligible for kindergarten. All data were collected as part of the EHS National Evaluation Study and made available to the author. The PICS was coded for the
current study. Individual child and parent assessments, parent interviews, and a videotaped parent-infant/toddler interaction occurred during each visit. All families who participated in this study completed a parent interview and child assessment, called birthday related assessments, as well as a videotaped parent-infant/toddler interaction around the time the child was 14-, 24- and 36-months old. At the 24-month assessment, the mothers completed the MacArthur Communicative Development Inventories-CDI (Fenson et al., 1993) to assess their children's language skills at that age. Also during the 24-month birthday related assessment, each mother or caregiver completed the Woodcock-Johnson Test of Achievement- Revised (WJ-R) (Woodcock & Mather, 1990) Picture Vocabulary subtest.

In addition, parent-infant/toddler interactions were videotaped at each birthday related assessment. The parent-infant/toddler interaction involved three separate activities: a frustration task, a teaching task, and a semi-structured play task. During the frustration task, which occurred at the 14- and 24-month assessments, a scenario was presented, dependent on the child's age. For the 14-month assessment, the mother was asked to sit approximately 6-8 feet behind the infant and draw a picture of her family, while the infant was secured in a high chair. The mother was instructed that she could interact with the child in whatever manner she wanted, but she could not give the infant anything or take the infant out of the seat. During the 24-month assessment, a set of keys or a toy was placed approximately 2-feet in front of the child and the parent. The parent was informed that the toddler should not touch the keys or toy, but that was the only limitation. No additional directions were given for either scenario. These two scenarios were selected to simulate frustrating situations commonly encountered during daily activities. The frustration tasks were scheduled to last for 4 minutes, unless the infant or toddler became inconsolable, at which time the activity was terminated by the evaluator. There was no frustration task at the 36-month birthday related assessment. Instead, the frustration task was replaced with a parent-child selected activity, which lasted for 5 minutes.

For the teaching task, mothers were given the choice of teaching their infants or toddlers to either stack blocks or point to body parts in a book (14-months), or sort blocks by color or point to clothing articles in a book (24-months). These tasks lasted for 4 minutes. At the 36-month assessment the children were given an age appropriate puzzle, followed by a
more challenging puzzle provided after the first was completed, or after 3-minutes had elapsed, whichever came first. Parents were instructed to allow their toddlers to attempt the puzzles alone at first, but help them when they felt it was appropriate. The total amount of time for this task could have been up to 6-minutes, 3-minutes per puzzle; however, the parents could end any of the teaching tasks when they felt it was appropriate.

For the play activity, the parents and children were given three separate cloth bags containing toys. Each bag was marked with a 1, 2, or 3. The parents were instructed to play with their children as they wished, but to start with bag one, move onto bag two, then to bag three. No other instructions were given. The bags contained age appropriate toys; bag one contained an age appropriate book; bag two contained a small stove top with pots, pans and utensils for the 14- and 24-month assessments, and a toy cash register and plastic grocery items for the 36-month assessment; bag three had a plastic boat with chunky, colored animals for the 14- and 24-month assessments, and Lego blocks at the 36-month assessment. This task lasted for 10 minutes.

After each birthday related assessment was completed, caregivers were provided a gift certificate for a department store as a gesture of appreciation for their participation in the study. No assessments of the children were completed between the children's third birthday and the spring prior to kindergarten entry. However, brief "tracking" interviews were completed with the parents over the phone approximately every 6 months, in an effort to maintain contact with families who participated in the study.

The spring or summer prior to the children being eligible for kindergarten, a "follow-up" assessment and interview was completed with each family. During the follow-up assessment, children completed various subtests of standardized assessments, including the PPVT-III, WJ-R, and TOLD-3, as well as non-normative-referenced measurements. Parents were interviewed, using a protocol that included many questions similar or identical to questions they had been asked in previous interviews, as well as novel questions. Again, interviews and assessments were completed in the families' homes, and lasted from approximately one and one half to two hours. Parents were provided with a gift certificate to a local department store as a gesture of appreciation for participating in this part of the study.
All data were coded with a 7-digit identification number. No names were included on the testing protocols.

Interviewers and assessors

All data collected for the EHS National Evaluation study were collected by research assistant graduate students and other individuals employed by the research project at the university. People who interviewed the parents were trained and certified on interview protocols prepared by MPR. These individuals were called interviewers. People who assessed the children were trained and certified on the testing materials and were called assessors. Each interviewer/assessor passed certification procedures, maintained by MPR, which were based on a common certifier's review of videotapes of the interviewer/assessor administering the interview and/or assessment materials. The certification procedure ensured that standard data collection procedures were used during each assessment.

Research assistant training and reliability for PICS

Seven undergraduate research assistants, who were blind to any information about the families, the research questions and the hypotheses, coded the participants' videotapes using the PICS. Prior to viewing any study materials, all research assistants agreed to and signed a confidentiality statement. The research assistants received intensive training, which included 4 to 6 two-hour group training sessions and approximately 6-8 hours of independent work, including reading assigned materials and independent practice coding. During the group training sessions, non-participant videotapes were viewed in order to practice the PICS, which in turn helped clarify some of the operational definitions used in the PICS. These group discussions led to some alterations of the PICS definitions, which were reflected in the PICS protocol. A total of approximately 20 hours of training was completed by each research assistant prior to coding any actual participant videotapes. In addition, research assistants were required to code independently two tapes at or above 85% reliability, when compared with the authors' ratings, in order to be assigned tapes to code. Research assistants were required to have at least 85% of their responses within one point of the author's ratings on the training tapes. The 85% reliability level was based on each individual subvariable score. Given the PICS had 5 subtasks that were rated, with six subvariables rated in each, there were 30-items to be rated in total. Therefore, tapes that had less than 26 items within
one-point of the other coder fell below the 85% reliability level. This same system was used to determine inter-rater reliability throughout the study.

After reliability was established, research assistants were closely supervised when coding tapes. A PICS author was always available to answer questions or clarify issues when the research assistants were coding tapes, if necessary. Each research assistant was randomly assigned 15 videotapes. In total, 81 participant videotapes were coded, although two 36-month tapes could not be coded because the audio was unintelligible. Twenty-three tapes, or 28% of the tapes, were randomly selected to be re-coded by a separate research assistant to ensure inter-rater reliability levels above 85%. If reliability for a tape fell below 85%, the two coders, PICS author, and the other research assistants reviewed the tape at the weekly research meeting until consensus was reached. In total, six of the 23 reliability tapes fell below the 85% inter-rater reliability levels and were reviewed and re-coded by the author and research assistants during the weekly research meetings. Overall, inter-rater reliability was above 85% for all tapes used in this study.

Variables and data analyses

All variables and data analyses were presented in Table 3. The standardized assessment instruments (PPVT-III, WJ-R, TOLD-3) were completed as per manual instructions; age appropriate starting points were used and scoring was completed based on standardized scoring procedures, except for where noted below.

**Parent-infant/toddler Interaction Coding System**

The Parent-infant/toddler Interaction Coding System (PICS) was rated and scored by separate, trained research assistants. As per the PICS instructions, if a frustration task was terminated by the assessor or if there were no parent-child interactions, N/A was marked for the entire frustration task, and these ratings were then entered into the data system as (-9), not applicable. In cases where a parent made six or fewer comments or statements to their child during the 3-minute coding period, a zero was scored for Parental Guidance, indicating that the parent did not make enough comments or statements during the 3-minute period to accurately determine if the parent comments were mostly informative or directive.

The sums of each task, Frustration, Teaching and the mean of the three Play sessions, were added together to form a composite score. However, in order to deal with missing data,
from terminated activities or inaudible videotapes, a mean score for each birthday related assessment was computed by averaging the scores of each of the tasks (frustration, teaching and play) together. For example, if a frustration score was missing from the 14-month scores because the task was terminated, the average of the teaching and play tasks were substituted into the equation and a 14-month mean score was created. This assured that terminated tasks or inaudible tapes did not lower participants’ scores. Mean scores were created for each of the 14-, 24-, and 36-month tasks. An overall PICS Mean score was created by averaging the mean birthday related assessment scores together. The mean scores were selected for use in the analyses for two reasons. First, averaging the scores provided a way to include cases that had missing data. Second, using the overall PICS Mean score allowed for a quick and meaningful comparison with the other birthday related mean scores.

Stony Brook Family Reading Scale

The Stony Brook Family Reading Scale (SFRS) was scored by summing the responses of forced-choice response items, (questions 1, 4, 6, 8, and 9); a score of (1) equaled the most positive response and a score of (4) equaled the least favorable response; scores of (2) and (3) followed respectively. It should be noted that item 9 was reversed scored. On open ended items, (questions 2, 3, 5, and 7), ranges were created with similar Likert-type ratings. If a family responded that they began reading to their child, question number 2, between the ages of 0- and 6-months, they received a score of (1); between 7- and 12-months, a score of (2); between 13- and 18-months, a score of (3) and after 19-months, a score of (4). If a family responded that they read to their child yesterday (question number 3) more than 20 minutes, a score of (1) was given, between 10-19 minutes, a score of (2), between 1-9 a score of (3), and less than one-minute a score of (4). For question number 5, how many minutes does your child look at books alone, a score of (1) was given for responses over 45 minutes, a (2) was given for 20-44 minutes, a score of (3) was given for 10-19 minutes, and a score of (4) was given for less than 9 minutes. With respect to question number 7, how many minutes do you spend reading, a score of (1) was given for responses over 45 minutes, a score of (2) was given for responses between 30 and 44 minutes, a score of (3) was given for responses between 15 and 29 minutes, and a score of (4) was given for responses less than 14 minutes. These ranges were created based upon the distributions of
the sample for this study, as there is no formal scoring protocol for the open-ended questions on the SFRS (Whitehurst, 2001, electronic communications).

**Individual Growth and Development Indicators**

The Individual Growth and Development Indicators (IGDIs) were scored by summing the number of correct responses a child made within the two minute assessment.

**MacArthur Communicative Development Inventories (CDI)**

Parents indicated which of 100-target words their children used at the 24-month birthday assessment; the target words were taken from the MacArthur Communicative Development Inventories (CDI). The sum of the words the child had used, according to the parent, was calculated for the purpose of this study.

**Woodcock-Johnson Test of Achievement- Parent interview**

Mothers completed an assessment of their vocabulary skills during the 24-month birthday related assessment. The Woodcock-Johnson Test of Achievement- Revised (WJ-R) Picture Vocabulary subtest was used to measure the parents’ expressive language skills. As per the protocol for the EHS National Evaluation parent interview, parents were first administered items 29-36. If the parents’ responses were correct for items 29-34, the assessor continued testing until 6 consecutive items were missed, and then the assessment was terminated. If the parents did not correctly respond to items 29-34, the assessor continued testing backwards, until 6 consecutive items were correctly answered. The sum of the correct responses was computed for this study.

**Data analysis**

To answer research question number one, *What is the relationship between parent-infant/toddler interactions and early literacy skills for low-income families?*, multiple regression analyses were completed using the overall PICS Mean scores, the 14-, 24-, and 36-month mean scores and the early literacy measurements (PPTV-3, WJ-R, TOLD-3, IGDIs).

To answer research question two, *Do parent-infant/toddler interactions at 14, 24, & 36-months, or a parent report regarding literacy habits, at approximately 54-months of age, better predict early literacy skills?*, regression analyses were performed using the overall PICS
Means score and the overall SFRS, and the early literacy measurements (PPTV-3, WJ-R, TOLD-3, IGDIs).

Analyses to answer research question three, Do parent-infant/toddler interactions from one simulated activity predict early literacy skills as well as parent-infant/toddler interactions from three simulated activities?, involved multiple regression analyses using the averaged subscale scores for the three different simulated daily activities completed at 14-, 24-, and 36-month (yielding one score for the Frustration, Teaching, and Play tasks) and the overall PICS mean scores with early literacy measurements (PPTV-3, WJ-R, TOLD-3, IGDIs).
RESULTS AND DISCUSSION

Results are presented in five subsections. First, descriptive statistics for all predictive, outcome, and covariate variables are presented. The second subsection provides explanations for the covariates used and not used in this study. Each of the last three sections addresses a research question and presents results of correlation matrices or regression analyses. For research question 1, What is the relationship between parent-infant/toddler interactions and early literacy skills for children from low-income families, the 14-, 24-, 36-month and overall PICS Means were entered into a correlation matrix with the outcome variables. For research question number 2, Do parent-infant/toddler interactions at 14, 24, & 36-months, or a parent-report regarding early literacy experiences, at approximately 54-months of age, better predict early literacy skills, the overall PICS Means and the SFRS were regressed on the outcome variables. For research question number 3, Do parent-infant/toddler interactions from one simulated activity predict early literacy skills as well as parent-infant/toddler interactions from three simulated activities, scores of the Frustration, Teaching, Play tasks and overall PICS Means were regressed on the outcome variables, but due to multicollinearity, they were also entered into a correlation matrix to provide further information.

Descriptive statistics

Descriptive statistics, for all variables including mean scores, standard deviations, and ranges, are presented in Table 4. The 14-, 24,- and 36-month PICS subscale scores were each averaged to create individual birthday related mean scores (14-, 24-, and 36-month PICS mean scores). The 14-, 24,- and 36-month frustration, teaching and play task scores were each averaged to create subtask mean scores. The overall PICS Mean score was created by averaging the 14-, 24-, and 36-month PICS mean scores. This allowed for cases that had missing data to be included in the analyses. Higher scores indicated more favorable parent-child interactions.

Responses for the SFRS were summed, as per the scoring guidelines presented in the methods section; lower scores indicate more favorable home reading experiences. Because of this coding scheme, correlations with the SFRS were negative. Mean scores for the WJ-R and PPVT-3 were reported as standard scores, based on a normative mean of 100 and
Table 4. Mean and Standard Deviations

<table>
<thead>
<tr>
<th>Predictor</th>
<th>Mean (S.D.)</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>PICS Means</td>
<td>21.80 (2.01)</td>
<td>17.20-25.97</td>
</tr>
<tr>
<td>14-month PICS means</td>
<td>20.72 (3.18)</td>
<td>15.00-27.50</td>
</tr>
<tr>
<td>24-month PICS means</td>
<td>22.42 (2.64)</td>
<td>15.00-28.00</td>
</tr>
<tr>
<td>36-month PICS means</td>
<td>22.15 (2.64)</td>
<td>16.00-26.00</td>
</tr>
<tr>
<td>Frustration Task means</td>
<td>19.00 (3.11)</td>
<td>13.67-24.50</td>
</tr>
<tr>
<td>Teaching Task means</td>
<td>20.93 (2.50)</td>
<td>13.43-26.50</td>
</tr>
<tr>
<td>Play Task means</td>
<td>22.86 (2.01)</td>
<td>18.78-26.22</td>
</tr>
<tr>
<td>SFRS</td>
<td>17.88 (4.71)</td>
<td>10.00-30.00</td>
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<tr>
<td>Outcomes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>WJ-R Letter-Word Identification</td>
<td>93.00 (11.53)</td>
<td>72.00-115.00</td>
</tr>
<tr>
<td>PPVT-3</td>
<td>99.69 (11.06)</td>
<td>72.00-126.00</td>
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<tr>
<td>TOLD-3</td>
<td>8.84 (2.98)</td>
<td>4.00-14.00</td>
</tr>
<tr>
<td>IGDI Rhyming</td>
<td>7.23 (5.28)</td>
<td>1.00-20.00</td>
</tr>
<tr>
<td>IGDI Alliteration</td>
<td>3.85 (2.73)</td>
<td>0.00-10.00</td>
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<tr>
<td>Covariates</td>
<td></td>
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</tr>
<tr>
<td>Maternal Age</td>
<td>23.90 (5.88)</td>
<td>16.00-38.00</td>
</tr>
<tr>
<td>Maternal Language Skills</td>
<td>39.86 (3.96)</td>
<td>32.00-49.00</td>
</tr>
<tr>
<td>CDI</td>
<td>60.13 (25.06)</td>
<td>9.00-98.00</td>
</tr>
</tbody>
</table>

standard deviations of 10. The TOLD mean scores were based on a normative average of 10 and standard deviation of 3. Mean scores on the IGDIIs (Rhyming and Alliteration) were reported in terms of the total number of items answered correctly during a 2-minute testing period. Mean scores for the parental language skills (WJ-R) were based on the sum of the correct responses given by the parent. The CDI, parent reported child language skills at 24-months, were reported in terms of the summed words the parents reported their children knew from a list of 100 words.
Covariates

Treatment versus control groups. T-tests were completed on all predictor variables to analyze treatment and control differences. Results are provided in Table 5.

<table>
<thead>
<tr>
<th>Variable (N)</th>
<th>Mean (SD)</th>
<th>Sig.(2-tailed)</th>
<th>Cohen's d</th>
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<tbody>
<tr>
<td>PICS Means</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(T=18)</td>
<td>21.58 (2.27)</td>
<td>.66</td>
<td>.18</td>
</tr>
<tr>
<td>(C=9)</td>
<td>21.97 (1.73)</td>
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<td></td>
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<tr>
<td>14-m. PICS</td>
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<td></td>
<td></td>
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<tr>
<td>(T=18)</td>
<td>21.04 (3.68)</td>
<td>.44</td>
<td>.32</td>
</tr>
<tr>
<td>(C=9)</td>
<td>19.97 (2.63)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>24-m. PICS</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>(T=19)</td>
<td>22.06 (3.03)</td>
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<td>.30</td>
</tr>
<tr>
<td>(C=9)</td>
<td>22.87 (1.88)</td>
<td></td>
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</tr>
<tr>
<td>36-m. PICS</td>
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<td></td>
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<tr>
<td>(T=16)</td>
<td>21.36 (2.76)</td>
<td>.14</td>
<td>.65</td>
</tr>
<tr>
<td>(C=9)</td>
<td>23.07 (2.44)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Frustration</td>
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<tr>
<td>(T=16)</td>
<td>18.71 (3.16)</td>
<td>.66</td>
<td>.05</td>
</tr>
<tr>
<td>(C=8)</td>
<td>18.56 (3.05)</td>
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<tr>
<td>(T=18)</td>
<td>20.72 (2.93)</td>
<td>.92</td>
<td>.18</td>
</tr>
<tr>
<td>(C=9)</td>
<td>21.19 (1.78)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Play</td>
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<td></td>
</tr>
<tr>
<td>(T=18)</td>
<td>22.64 (2.29)</td>
<td>.61</td>
<td>.21</td>
</tr>
<tr>
<td>(C=9)</td>
<td>23.09 (1.69)</td>
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<td></td>
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<td>SFRS</td>
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<tr>
<td>(T=19)</td>
<td>18.28 (5.28)</td>
<td>.53</td>
<td>.27</td>
</tr>
<tr>
<td>(C=8)</td>
<td>17.00 (3.21)</td>
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</tbody>
</table>

Based on the t-tests, there were no significant differences between the means of the treatment and control groups, with respect to predictor variables. A review of Table 5 reveals that the control group demonstrated slightly higher mean scores on all predictor variables but two, the 14-month PICS mean and the Frustration Subscale. It should be noted that the 36-month PICS mean score did approach statistical significance (p=.14), and the effect size for the 36-month scores was medium. No other comparisons approached statistical significance and all other effect sizes are small.
Zero-order correlations were completed for the 14-, 24-, and 36-month PICS mean scores of the treatment (T) and control (C) groups as a second way to examine possible differences between groups. Results are presented in Table 6.

<table>
<thead>
<tr>
<th>Variables</th>
<th>24-m. (T)</th>
<th>24-m. (C)</th>
<th>36-m. (T)</th>
<th>36-m. (C)</th>
</tr>
</thead>
<tbody>
<tr>
<td>14-m. (T)</td>
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<td></td>
<td></td>
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<tr>
<td>14-m. (C)</td>
<td></td>
<td>0.76*</td>
<td></td>
<td>0.03</td>
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<tr>
<td>24-m. (T)</td>
<td></td>
<td></td>
<td>0.44</td>
<td></td>
</tr>
<tr>
<td>24-m. (C)</td>
<td></td>
<td></td>
<td></td>
<td>0.28</td>
</tr>
</tbody>
</table>

Note: (T)= treatment group; (C)= control group. *p<.05.

Based on the information provided in Table 6, 14-month parent-child interactions correlated significantly with parent-child interactions at 24-months, for the control group only. There were no other significant correlations between the treatment and control groups. This means that parent-child interactions were not consistent over time and that non-significant amounts of later (24- and 36-month) parent-child interactions were correlated with earlier (14-, and 24-month) parent-child interactions for both treatment and control groups, except in the 14- and 24-month control group.

Based on the various analyses of the treatment and control conditions, only one statistically significant difference was found. Given the lack of statistically significant differences between the treatment and control groups, the fact that overall sample size for the study was small, and that the control and treatment groups were unequal in size, it was concluded that the two groups could be analyzed as one low income sample. Therefore, the comparison of treatment and control groups was not included in the following analyses.

Maternal age, maternal language, and child language (at 24-months). In an effort to assess other possible covariates, maternal age, maternal language, and parent-reported child language skills (at 24-months) were also analyzed. All three variables had near normal distributions and none correlated significantly with any of the outcome variables. Furthermore, when included in regression equations, maternal age, maternal language, and parent-reported child language skills (at 24-months) were consistently not significant.
predictors at the point of entry into regression equations. Therefore, these variables were not included in the regression analyses.

**Multicollinearity.** Zero-order correlations revealed significant correlations between the following variables: 14-month PICS means and overall PICS Means ($r=.50, N=27, p<.01$); 36-month PICS means and overall PICS Means ($r=.73, N=25, p<.01$); PICS Teaching means and PICS Frustration means ($r=.55, N=27, p<.01$); PICS Teaching means and PICS Play means ($r=.70, N=27, p<.01$); PICS Teaching means and overall PICS Means ($r=.84, N=27, p<.01$); PICS Frustration means and overall PICS Means ($r=.74, N=24, p<.01$); PICS Play means and overall PICS Means ($r=.93, N=27, p<.01$).

For the first research question, the overall PICS Means, 14-, 24-, and 36-month scores were entered into a correlation matrix. For the second research question, the PICS totals were entered into a regression equation with the SFRS; this analysis was not influenced by multicollinearity.

For the third research question, the Frustration, Teaching, Play and overall PICS Means scores were entered into a regression equation and it should be noted that multicollinearity did influence this analysis. Given this fact, t-ratios may be suppressed and there is less precision associated with the estimated coefficients (Schroeder, Sjoquist & Stephan, 1986); therefore, results should be interpreted with caution. Research question number three was further analyzed by putting the variables into a correlation matrix to determine which of the PICS scores most strongly related to the outcome variables.

**Predicting early literacy from PICS**

Research question number one was, *What is the relationship between parent-infant/toddler interactions and early literacy skills for children from low-income families?*. The overall PICS Means scores, as well as the 14-, 24-, and 36-month PICS mean scores were entered into correlation matrix with the PPVT-3, WJ-R, TOLD-3, and IGDIs. Results are presented in Table 7.

Analysis of the relationships between the PICS scores and the outcome variables revealed that the PPVT-3 significantly correlated with the 36-month PICS scores ($r=.63$), the overall PICS Mean ($r=.58$), and the 24-month PICS scores ($r=.47$). The WJ-R was significantly correlated with the 24-month PICS scores ($r=.51$) and the overall PICS Mean
Table 7. Zero-order correlations for PICS, 14-, 24-, 36-month scores and outcomes

<table>
<thead>
<tr>
<th></th>
<th>PICS Means (N)</th>
<th>PICS 14-m (N)</th>
<th>PICS 24-m (N)</th>
<th>PICS 36-m (N)</th>
</tr>
</thead>
<tbody>
<tr>
<td>PPVT-3</td>
<td>.58** (26)</td>
<td>.23 (26)</td>
<td>.47* (26)</td>
<td>.63** (25)</td>
</tr>
<tr>
<td>WJ-R</td>
<td>.50** (27)</td>
<td>.27 (27)</td>
<td>.51** (25)</td>
<td>.30 (27)</td>
</tr>
<tr>
<td>TOLD-3</td>
<td>.31 (25)</td>
<td>.05 (25)</td>
<td>.13 (25)</td>
<td>.48* (23)</td>
</tr>
<tr>
<td>Rhyming</td>
<td>.07 (26)</td>
<td>.10 (26)</td>
<td>-.20 (26)</td>
<td>.30 (24)</td>
</tr>
<tr>
<td>Alliteration</td>
<td>.31 (27)</td>
<td>.16 (27)</td>
<td>.25 (27)</td>
<td>.20 (25)</td>
</tr>
</tbody>
</table>

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

(r=.50), while the TOLD-3 was significantly correlated with the 36-month PICS scores (r=.48). No significant correlations were found between the PICS scores and the Rhyming or Alliteration tasks.

PICS versus SFRS predicting early literacy skills

To address research question number two, *Do parent/infant-toddler interactions at 14-, 24-, and 36-months, or a parent-report (SFRS) regarding literacy habits completed when the child is approximately 54-months-old, better predict early literacy skills*, the overall PICS Means and the SFRS scores were entered into a regression equation predicting the PPVT-3, WJ-R, TOLD-3, and IGDIs. The results are presented in Table 8.

Analyses of the predictive nature of the overall PICS Means versus the SFRS for the PPVT-3 revealed one variable added significant increments in the $R^2$-square at the point of entry, the overall PICS Means score. The overall PICS Means accounted for 33% of the variance in the residual score ($R^2=.57$). This means that for every one point increase on the overall PICS score, a child’s PPVT-3 score would be expected to increase 2.83 points. Based on this model, the SFRS did not predict the PPVT-3.

Analyses of the predictive nature of the overall PICS Means versus SFRS for the WJ-R revealed one variable added significant increments in the $R^2$-square at the point of entry, the overall PICS Means score. The overall PICS Means accounted for 24% of the variance in the residual score ($R^2=.49$). This regression also revealed that for every one point increase on the PICS Means, a child’s WJ-R score would be expected to increase 2.64 points.
Table 8. Regression of PICS Total and SFRS scores on outcome variables

<table>
<thead>
<tr>
<th>Variable</th>
<th>R</th>
<th>R²</th>
<th>Unstandardized Beta</th>
<th>F Change</th>
<th>p</th>
</tr>
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<tbody>
<tr>
<td>PPVT-3</td>
<td></td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>1. PICS Means</td>
<td>.57</td>
<td>.33</td>
<td>2.83</td>
<td>11.13</td>
<td>.01**</td>
</tr>
<tr>
<td>2. SFRS</td>
<td>.58</td>
<td>.33</td>
<td>-0.22</td>
<td>0.23</td>
<td>.64</td>
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<tr>
<td>WJ-R</td>
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<tr>
<td>1. PICS Means</td>
<td>.49</td>
<td>.24</td>
<td>2.64</td>
<td>7.59</td>
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<td>2. SFRS</td>
<td>.49</td>
<td>.24</td>
<td>0.01</td>
<td>0.04</td>
<td>.84</td>
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<td>TOLD-3</td>
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<tr>
<td>1. PICS Means</td>
<td>.28</td>
<td>.08</td>
<td>0.45</td>
<td>1.80</td>
<td>.16</td>
</tr>
<tr>
<td>2. SFRS</td>
<td>.31</td>
<td>.10</td>
<td>0.11</td>
<td>0.53</td>
<td>.48</td>
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<tr>
<td>Rhyming</td>
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<tr>
<td>1. PICS Means</td>
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<tr>
<td>2. SFRS</td>
<td>.05</td>
<td>.00</td>
<td>0.00</td>
<td>0.01</td>
<td>.92</td>
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<td>Alliteration</td>
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</tr>
<tr>
<td>1. PICS Means</td>
<td>.31</td>
<td>.10</td>
<td>0.48</td>
<td>2.58</td>
<td>.10</td>
</tr>
<tr>
<td>2. SFRS</td>
<td>.34</td>
<td>.11</td>
<td>0.00</td>
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<td>.52</td>
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</tbody>
</table>

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

Based on this model, the SFRS did not predict the WJ-R scores. Analyses of the predictive nature of the overall PICS Means versus the SFRS for all other outcome variables yielded results that were not statistically significant.

Tasks predicting early literacy skills

To address research question number three, *Do parent-infant/toddler interactions from one simulated activity predict early literacy skills as well as parent-infant/toddler interactions from all three simulated activities combined.* The Teaching, Frustration, Play and the overall PICS Mean scores were entered into a regression equation predicting the PPVT-3, WJ-R, TOLD-3, and IGDIs. The results are presented in Table 9. It should be noted that multicollinearity existed between these predictor variables, which influenced the results presented in the table.
<table>
<thead>
<tr>
<th>Variable</th>
<th>Teaching Task</th>
<th>Frustration Task</th>
<th>Play Tasks</th>
<th>PICS Means</th>
<th>Teaching Task</th>
<th>Frustration Task</th>
<th>Play Tasks</th>
<th>PICS Means</th>
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<td>.48</td>
<td>.53</td>
<td>.53</td>
<td>.20</td>
<td>.24</td>
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<td>.28</td>
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<td></td>
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<td>3.72</td>
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<td>5.25</td>
<td>1.01</td>
<td>0.98</td>
<td>0.06</td>
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<td>.66</td>
<td>.23</td>
<td>.26</td>
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<td>.43</td>
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<tr>
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<td>-3.96</td>
<td>-6.44</td>
<td>-15.24</td>
<td>28.39</td>
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<tr>
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<td>0.30</td>
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<td>-2.97</td>
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<td>0.14</td>
<td>1.24</td>
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<tr>
<td>Alliteration</td>
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<td>-0.43</td>
<td>1.26</td>
<td>4.30</td>
<td>2.80</td>
<td>0.97</td>
<td>0.10</td>
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</table>

*p<.05. **p<.01.
Analysis of the predictive nature of the Frustration, Teaching, Play and overall PICS Means and the outcome variables revealed that none of the three subtasks, nor the overall PICS Means added significant increments in the $R$-square at the point of entry when entered into the regression equations. This may be attributed to the multicollinearity that existed between these variables.

Therefore, in an effort to evaluate research question number 3 in an alternate manner, zero-order correlations were completed for the Teaching, Frustration, Play and overall PICS means and the outcome variables. This was done in an effort to demonstrate which variable, either Teaching, Frustration, Play or overall PICS Means, most strongly related to the outcome variables. These results are presented in Table 10.

<table>
<thead>
<tr>
<th></th>
<th>PPVT-3</th>
<th>WJ-R</th>
<th>TOLD-3</th>
<th>Rhyming</th>
<th>Alliteration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overall PICS Means</td>
<td>.58**</td>
<td>.50**</td>
<td>.31</td>
<td>.07</td>
<td>.31</td>
</tr>
<tr>
<td>Teaching Tasks</td>
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<td>.43*</td>
<td>.20</td>
<td>.24</td>
<td>.42*</td>
</tr>
<tr>
<td>Frustration Tasks</td>
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<td>.16</td>
<td>.33</td>
<td>.19</td>
<td>.00</td>
</tr>
<tr>
<td>Play Tasks</td>
<td>.54**</td>
<td>.52**</td>
<td>.30</td>
<td>-.03</td>
<td>.36</td>
</tr>
</tbody>
</table>

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

Analysis of the correlation matrix revealed that the PPVT-3 was significantly correlated with the Teaching ($r=.44$), Frustration ($r=.43$), and Play ($r=.54$) subtasks, as well as the overall PICS Mean scores ($r=.54$). The overall PICS Means yielded the strongest relationship with the PPVT-3 ($r=.58$), and was comparable to the $R$ for the PPVT-3 and the PICS Means ($R=.53$), taken from Table 9.

The WJ-R was significantly correlated with the Teaching ($r=.43$), Play ($r=.52$), and overall PICS Means scores ($r=.50$). The Play task score yielded the strongest relationship with the WJ-R ($r=.52$), and was comparable with the $R$ for the WJ-R and the Play tasks ($R=.58$), taken from Table 9. The TOLD-3 and the Rhyming tasks were not significantly correlated with the Teaching, Frustration, Play or the overall PICS Means scores. The Alliteration task, however, was significantly correlated with the Teaching task scores ($r=.42$),
DISCUSSION

This study was completed to examine the relationship between parent-infant/toddler interactions and early literacy skills, for children from low-income households. Participants in this study were a sample of families who participated in the National Evaluation of Early Head Start (EHS). For the purpose of the National Evaluation of EHS study, approximately half of the families were randomly assigned to a treatment group and received EHS services, and the other families served as control families and did not receive EHS services. Four findings were relevant to this study and will be discussed further. First, there were no significant differences on any of the measures between the children and families who received EHS and those who did not receive this service. Second, it appeared that the Parent-infant/toddler Interaction Coding System (PICS) related to early literacy skills. Third, the PICS was a better predictor of early literacy skills than the Stony Brook Family Reading Scale (SFRS). Fourth, no one PICS subtask score predicted early literacy skills better than the overall PICS scores, but rather the Frustration, Teaching, Play and overall PICS means tended to relate similarly to the outcome variables. These findings will be discussed further in the following sections.

Treatment versus control

No statistically significant differences on any measures between the parents and children from low-income households who received EHS services and those families who did not receive EHS services were apparent. These results were based on predictor variables of parent-infant/toddler interactions measured at 14-, 24- and 36-months, and a survey regarding literacy experiences completed when the children were approximately 54-months-old, as well as outcome measures that were completed when the children were approximately 54-months-old. It was also noted that, with the exception of the 36-month scores, all effect sizes were small. The effect size for the 36-month scores was medium (Cohen’s d=.65). The 36-month treatment/control group comparison was also the only comparison that approached statistical significance levels (r=.14). This medium effect size and near significance
comparison hold promise that, at some ages, differences between treatment and control groups may possibly exist, and supports further investigation.

Several factors, however, may have contributed to the lack of outcome differences between treatment and control families in this study. First, the general goals of the EHS program should be considered. In EHS, each family selected their personal goals. Within this, "improving parent-child interactions" may not necessarily have been identified as a goal by each family, and therefore, may not have been addressed by the EHS provider. Furthermore, analyses of home based services have revealed that EHS providers engaged in limited amounts of direct modeling or coaching during home interventions (Peterson, McBride, & Readout, 2000). Therefore, home based services may have had a limited impact on improving parent-child interactions in the present study.

Furthermore, unequal treatment and control group sizes may have masked differences between the two groups in this study. Nine control families completed all four assessment components (14-, 24-, 36-month and pre-kindergarten assessments) during this 5-year longitudinal study, as opposed to 18 families in the treatment group. One must consider the characteristics of the control families who did not complete the four assessment components, or dropped completely out of the study. Perhaps the nine families who continued on with the study, completing all of the required assessment components, had different family interactions and characteristics from other control families who did not continue as control families for this study.

To further investigate the characteristics of the control families that were included in this study, an analysis of their income levels was completed. The mean annual income of the control families in this study at the pre-kindergarten assessment was $25,373 (n=9, SD=$10,974, range= $9,960-$42,000). The mean annual income of the treatment group, measured at the same time, was $19,666 (n=18, SD=$11,053, range=$6,000-$40,800). Although these income differences were not significantly different, it may be possible that the education, family support systems, parenting habits, and overall lifestyle characteristics of control families who completed the study differed from those of other families who did not continue as control families for this study. Following this same speculation, families who served as control families and did not complete the study may have been different from
control families who stayed the course. For example, the families who did not complete all of the assessment components may be families considered as living in "generational poverty" families, who have been living in low-income households for generations. These families may have lower levels of education, inconsistent or unstable family support systems, poorer parenting skills, and more "social risk factors", identified by Sameroff and his colleagues (1993) in their lifestyles. If a larger representation of control families had been included in this study, it may have been possible that some statistically significant differences between the treatment and control families could have been demonstrated.

Given that there were no significant differences between the treatment and control families on predictor or outcome variables, the data were pooled and the following results should be reviewed as representing low-income families in general, as opposed to experimental groups of treatment and control.

Parent/child interactions and early literacy skills

Results of this study showed that parent-infant/toddler interactions were significantly related to the early literacy skills of receptive vocabulary, symbolic representation, and phonemic analysis. The Peabody Picture Vocabulary Test-3rd edition (PPVT-3) scores were most strongly related to the 36-month PICS mean scores, and strongly related to the overall PICS Means scores and the 24-month PICS mean scores. The Woodcock-Johnson- Revised (WJ-R), Letter-Word Identification subtest scores were most strongly related to the PICS Means scores and the 24-month PICS mean scores, respectively. In addition, the 36-month PICS mean scores related to phonemic analysis skills as measured by the Test of Language Development-3, Phonemic Analysis subtest.

Contrasting the above mentioned scales that were significantly related to the PICS, the early literacy skills of rhyming and alliteration were not related to the PICS. The lack of significant relationship between the PICS and rhyming and alliteration may be have been influenced by the fact that there appears to be a floor effect with the rhyming and alliteration tasks for this population. The range of correct responses for the rhyming task included one and the range for the alliteration tasks included zero. Furthermore these scores, of one and zero, fell within two standard deviations of the mean, further indicating that the children assessed in this study by the rhyming and alliteration tasks did not perform as well as they
had on the other measures. The mean scores for the children in this study on the PPVT-3, WJ-R, and TOLD-3 were close to the norm referenced standard scores and deviations (see Table 4), indicating that the children in this study performed similarly to the overall population on those tasks. The "near average" performance for the children in this study on the PPVT-3, WJ-R and TOLD-3 may help explain why the PICS related to these measures and not the rhyming and alliteration IGDIs. Completing this study with a more diverse population may help to avoid a floor effect and, in turn, better evaluate if early parent-child interactions relate to rhyming and alliteration skills.

The relationship between parent-child interactions and early literacy skills found in this study extends previous researchers' findings regarding relationships between early parent-child interactions and later skill development. For example, mothers' responsiveness has been shown to correlate with later language development (Bornstein & Tamis-LeMonda 1989); joint attention has been shown to correlate with acquisition of words (Dunham et al, 1993; Tomasello & Farrar, 1986); and parental guidance has been shown to correlate with social development (Landry et al, 1997). These researchers demonstrated that parent-infant/toddler interactions were related to later developing skills, which was consistent with the results in the current study. However, it must be noted that in these previous studies, only one aspect of parent-child interaction was analyzed, as opposed to the six aspects that were included in the PICS.

Furthermore, it should be noted that the above mentioned studies measured skill development over only short periods of time. In one study (Tomasello & Farrar, 1986), adult-child interactions were analyzed, and then a week later language acquisition skills were assessed. This contrasted with the time-line in the current study and adds to the potential usefulness of the PICS. Parent-child interactions, observed when children were 24-months, related to language skills when children were approximately 54-months old. The 30-month difference, between when the interactions were observed and language skills were measured, represents time during which interventions could be implemented to change parent-child interactions, possibly influencing language skills at the pre-kindergarten level and beyond.

Some researchers have demonstrated a relationship between early parent-child interactions and skill development years later. Researchers found that the variety and amount
of words parents used with their children prior to the age of 3 related to receptive language skills at age nine (Hart & Risley, 1995). Others found that parent-child characteristics of maternal sensitivity, child engagement, and dyadic fit measured at 20-months influenced social development at 60-months (Beckwith & Rodning, 1996). In these studies, early parent-child interactions were related to skill development years later, which is consistent with this study as well.

Given the relationships between parent-child interactions prior to the age of three and children’s language skills at 9-year-old, it would be interesting to continue monitoring children from the current study, to determine if parent-infant/toddler interactions also related to language skills in the elementary grades. Also, level of social skills of the children from the current study could be obtained from their teachers, which would allow for analyses similar to the Beckwith and Rodning study to be completed. If a positive relationship between early parent-infant/toddler interactions and 9-year-old language and kindergarten social skills were found, then early interventions could be set in place in an effort to potentially influence later cognitive and social skills as well.

Parent/child interactions versus reported literacy experiences

The second hypothesis for this study, that the Stony Brook Family Reading Scale (SFRS) would predict early literacy skills better than the PICS, was rejected. In this study, the PICS predicted early literacy skills better than the SFRS did. The PPVT-3 and the WJ-R were significantly predicted by the PICS Means scores. The SFRS did not predict any of the early literacy skills measured in this study. Interestingly, these results directly contrast previous researchers’ findings (Payne et al, 1994; Rush, 1999). Furthermore, the correlations between the PICS and all outcome variables were higher than those between the SFRS and all outcome variables, and when compared with the Rush and Payne studies, the PICS correlated as highly or higher with the outcome variables than did the SFRS.

Specifically, Rush (1999) found significant correlations between the same nine questions, taken from the SFRS and used in her study and the present study, and the PPVT-R and a letter naming task, similar to the WJ-R subscale used in this study. In the Rush (1999) study, the SFRS correlated with the PPVT-R \( (r = .61, N = 39, p < .01) \) and the letter naming task \( (r = .48, N = 39, p < .01) \). In this study, the PICS correlated with the PPVT-3 and WJ-R
with $r$ of .57 and .49, respectively. Payne and his colleagues (1994) also found a significant correlation between a derived score from the SFRS, that included the nine questions used in the Rush study and the current study, and the PPVT-R ($r = .42, N = 323, p < .001$). In both the Rush and Payne et al. studies, the SFRS was completed at approximately the same time that the PPVT-R and other measures were completed, yet revealed similar or lower correlations among the predictor and outcome variables, when compared to the correlations in the current study. The correlations reported in the current study, which are as high or higher than the Rush and Payne results, suggest that the PICS has a strong relationship with early literacy skills. The fact that this relationship was demonstrated based on observations from children under the age of 3-years-old adds strength to the PICS instrument. The PICS, which was based on parent-child interactions prior to the age of three, was able to predict early literacy skills better than the SFRS, which was based on parent-reports at age 54-months. These results hold possible implications for earlier interventions related to early literacy skills.

Possible reasons for the differences between previous research and the current study are, however, puzzling. In both the Rush and Payne et al. study, the SFRS was completed by the mother when the child was between the ages of 48- and 66-months, similar to the time at which the form was completed in the current study. Furthermore, the populations were similar; all studies included low-income families who were involved in Early Head Start or Head Start programs. Sample size, however, may have played a role in the conflicting results. In the Rush study, the sample size was slightly larger ($N = 39$) than the present study, while in the Payne et al. study, the sample size was much larger ($N = 236$). Furthermore, in the Payne et al. study, results were based on a canonical literacy environment score, which may have influenced results as well.

The different findings noted between the current study and the Rush study may be influenced by the fact that the parent-infant/toddler interactions were observed and rated over a three-year period for this study, versus a one hour observation session that occurred when the children were between the ages of 48- and 66-months, as in the Rush study. The number of observations and the ratings that occurred, over a three-year time period versus one hour, may indicate that the cumulative effect of parent-child interactions over the first three years of life have more influence on early literacy skills than do later parent-child interactions.
This speculation supports the conclusions presented by Hart and Risley (1995). In their study, Hart and Risley proposed that interventions for children introduced after the age of three may have limited impact on developmental skills, due to the cumulative effect of the first three years of parent-child interactions.

Regardless of the differences found between this study and the Rush and Payne et al studies, one possible conclusion that could be drawn about the relationship between the PICS, SFRS and early literacy skills was that the characteristics of the parent-child interactions over the first three years of children’s lives may have more influence on early literacy skills than do the variables measured by the SFRS at 54-months.

Utility of PICS subtasks to predict outcomes

The fourth and final finding of this study related to the utility of the PICS subtasks to predict outcome variables. A high level of multicollinearity existed between these subtasks making it impossible to determine if any one individual subtask predicted early literacy skills better than the overall PICS Means scores do. One might expect that the behaviors, techniques and characteristics that parents demonstrated with their children when dealing with frustrating circumstances, teaching novel tasks, or playing would be similar, and this held true in this study. Therefore, to further analyze how the PICS and its subtask variables related to early literacy skills, the variables were placed into a correlation matrix.

The PPVT-3 was strongly related to the three subtask scores, Teaching, Frustration, and Play, as well as the overall PICS Mean scores. The WJ-R was strongly related to all of these variables, except the Frustration score. The only other significant relationship was found between the Teaching scores and the Alliteration task. It should be highlighted that the correlations for the 3-minute task of Teaching strongly related to three of the five outcome variables, more than any of the other PICS variables. Furthermore, it is important to recall that the Play scores are an average of three 3-minute play periods, or a total of 9-minutes of observation, and that the overall PICS Means are an average of the Frustration, Teaching and Play tasks combined, totaling at least 15-minutes of observations. Therefore, it would seem that observing the Teaching tasks alone may provide as much information as the observations from the other, longer Play tasks, or the overall PICS score. Given this fact, it would appear that the Teaching task may provide “more bang for the buck”. However, further analyses of
the PICS Means and subtask variables is warranted to determine if this outcome is consistent with a larger sample.

Further analyses of the PICS subvariables of child language, parent language, joint attention, emotional tone, parental responsivity, and parental guidance may also be warranted and help determine if any of the subvariables are more strongly related to early literacy skills. It appears, based on preliminary analyses, that joint attention and emotional tone scores have low levels of variability, specifically during the 36-month tasks. During the 36-month parent-child interactions, most parents were attending to the same things their children were working on, and most of the interactions were positive, resulting in minimal variability in the joint attention and emotional tone scores. During the 14- and 24-month tasks, however, episodes of crying by infants/toddlers were associated with some lower emotional tone scores. Also at this younger age, some parents tended to be more directive, leading to more variability in the joint attention scores as well. Thus, analyses of the PICS subvariables may help determine which of the six subvariables provided the most significant information about the parent-infant/toddler interactions. In turn, this may allow the scale to focus on the characteristics that most highly relate to early literacy skills and help to further demonstrate if any one PICS subtask predicted early literacy skills better than the overall PICS Means.

Limitations

Limitations of this study included, but are not limited to, the small sample size. This factor alone may have influenced many results. Additional analyses, using a larger sample and the same variables are planned, which should hopefully provide additional information, beyond the current study results.

Another limitation of this study was that all participants were Caucasian and had similar educational levels. These two variables may have restricted the variability and the overall generalizability of this study. Again, further studies with larger, more diverse samples may provide additional information. Also, expanding the population to include families from middle- and high-income households may provide additional information regarding the validity and generalizability of the PICS scores.

The fact that the parent-child interactions were videotaped is another limitation of this study, since videotaping could have possibly influenced the parent-child interactions.
Attempting to observe and rate everyday parent-child interactions, without video taping, may provide more accurate representations of daily experiences and interactions for children from low-income families.

Another limitation of this study was the level of multicollinearity that existed between the frustration, teaching and play tasks. Multicollinearity resulted in a modified analysis, using correlations for research question number 3, as opposed to the regression equations that were proposed originally. There are at least two suggested ways to decrease multicollinearity: 1) gather more information about the population by increasing the sample size, and 2) refine the instrument in which the multicollinearity is evident (Berry & Feldman, 1985). Increasing the sample size may decrease the standard error, and therefore, offset the effects of multi-collinearity. Given this, further analyses using a larger sample are planned in the future. Additional families, who participated in the EHS National Evaluation study, are currently completing the pre-kindergarten assessments, and more families will be completing the same assessment next spring. Data from these families, who completed the same birthday related and pre-kindergarten assessments as did the participants in this study, could be obtained and analyzed. This would provide the opportunity to further analyze the relationship between parent-child interactions and early literacy skills from a larger sample of low-income families.

In an effort to refine the PICS, the instrument in which the multicollinearity is evident, further analyses of the subvariables are also suggested, as referred to in the previous paragraphs. These strategies may help to decrease the level of multicollinearity and facilitate a stronger, more valid instrument. These strategies may also provide information that would allow research question number 3, *Do parent-infant/toddler interactions from one simulated activity predict early literacy skills as well as parent-infant/toddler interactions from three simulated activities*, to be analyzed further.
CONCLUSION

Summary

In summary, the findings presented here suggest that there were significant and positive relationships between parent-infant/toddler interactions and some early literacy skills. Specifically, expressive language, symbol/letter identification, and word segmentation skills were strongly related to the quality of early parent-child interactions. It also appeared that parent-infant/toddler interactions predicted early literacy skills better than early literacy experiences reported by the mothers in the months prior to children entering kindergarten. Based on these results, this author proposes that parent-infant/toddler interactions play an important role in early literacy skills and potentially, later academic success, but further investigations are strongly suggested. This research holds implications for parents from low-income households, as well as for providers working with this population, and researchers interested in this field.

Implications

Implications for families

For parents from low-income households, understanding that everyday interactions with infants and toddlers may relate to early literacy skills, and potentially later school success, is critical. Many parents may believe that since infants and most toddlers do not talk, parents need not talk to their young children. Or, they may think that a child should be seen and not heard. The findings here, and in other studies (Hart & Risley, 1995; Walker et al, 1994), indicate this is not true. The first three years of parent-child interactions relate to early literacy skills, and previous researchers have shown that early literacy skills relate to later academic success (Juel, 1988). Therefore, it seems imperative that parents from low-income households be made aware that their everyday interactions may influence their children’s success in school.

Parents need to be made aware that it is not just literacy activities, such as reading with their children or going to the library, that influence literacy skills; however, these activities can not be minimized. Rather, parents need to be aware that children learn from everyday interactions, as proposed by Rogoff (1990). Parents have the opportunity to guide their children’s participation in life and teach them through everyday experiences, not just
during reading and literacy activities. Parents should seize teachable moments as they occur all day long.

**Implications for providers**

Several policy and programmatic implications may also be gleaned from this study. Although current goals of EHS may not specifically include improving parent-child interactions, it would appear that, given the relationship between parent-child interactions and early literacy skills, direct intervention in this area may be warranted. Based on previous researchers' findings, limited amounts of direct modeling or coaching of parent-child interactions occurred during EHS home visits (Peterson et al, 2000). Given that there were no significant differences between the interactive characteristics or outcome variables of families receiving EHS and families not receiving EHS, it could be concluded that more direct and specific approaches may be necessary to change and improve parent-infant/toddler interactions. Before this can be determined, however, further investigations need to be completed.

Collaboration between researchers and providers may be an appropriate way to determine if goals focusing on parent-child interactions positively influence early literacy skills. Implementing goals related directly to increasing positive parent-child interactions with half of the families involved in a program, such as EHS, while maintaining family selected goals with the other half, may be one possible way to investigate this issue. If this “experimental approach” were implemented, analyses of the parent-child interactions from both groups, and their relationship to later early literacy skill development could help determine if the goals influenced parent-child interactions.

The definitions and examples listed with the subvariables of the PICS could be used to provide basic suggestions for positive parent-infant/toddler behaviors that could be incorporated into goals with families. Service providers may simply take part in daily activities with families from low-income homes, such as cooking or cleaning, and model effective, age appropriate language and problem solving skills to use with infants and toddlers. These types of interactions may be a natural and effective way to increase positive parent-infant/toddler interactions and in turn, increase early literacy skills and potentially later school success.
There are other ways that service providers may influence parent-infant/toddler interactions in the home during daily activities as well. For example, directly modeling good parental language skills for parents of toddlers may be one possible way to begin influencing parent-infant/toddler interactions. This can be done by simply imitating and expanding sounds an infant or toddler makes while playing. Other techniques, such as suggesting and explaining a variety of prompts to parents in order to assist children when completing a puzzle or challenging task, as opposed to doing the puzzle for them or taking it away, is another way that service providers may impact parent-infant/toddler interactions in a positive manner and influence later skill development. Providers can also demonstrate how to follow a child’s focus of attention, versus switching the child’s attention to something new. Labeling items that a child is attending to, as opposed to not following the child’s attention, has been shown to help increase a child’s language skills that, in turn, may relate to later reading development (Dunham et al., 1993; Tomasello & Farrar, 1986). Furthermore, being responsive to a child’s behaviors and emotions, by commenting on their accomplishments or supporting them through challenging tasks, are additional skills that service providers can model or teach directly to parents or caregivers (Hart & Risley, 1995). These characteristics appear to be related to positive parent-infant/toddler interactions and may influence early literacy development, however further investigations are warranted.

Implications for researchers

This exploratory study holds implications for researchers. First, as noted in the previous section, a collaborative research effort between researchers and practitioners to investigate the effectiveness of goals directly related to parent-child interactions may be worth investigating. Creating an “experimental situation” of half of the families having goals directly related to increasing positive parent-child interactions and the other half having family selected and directed goals may help to determine if early interventions impact later skill development.

Furthermore, replication of this study, with larger more diverse samples, is necessary to enhance the validity and generalizability of the current study. In this study, the sample size was small and there were twice as many treatment families as control families. These two issues alone limit the strength of this study and restrict the generalizability as well.
Evaluation of the second and third waves of families involved in the National Evaluation of EHS are underway. Data from those families could be analyzed to further evaluate the relationship between the PICS and early literacy skills.

Beyond that, research and analyses using the PICS instrument to analyze its predictive abilities in other areas may be useful as well. Determining the predictive relationship between the PICS and social skills is one area that may be fruitful to explore, given previous researchers’ findings that some aspects of mother-child interactions at 20-months related to social skills when children were 60-months-old (Beckwith & Rodning, 1996).

Additionally, refinement of the PICS should continue when data from larger sample sizes can be obtained and analyzed. Analyses of the subvariables are needed to determine which, if any, can be removed from the scale in order to simplify and refine the instrument, possibly allowing for easier use in the future by practitioners and researchers alike. Another way to simplify the PICS may be to determine if one of the ages (14-, 24-, or 36-months) better predicts early literacy skills, as opposed to using all three ages. If it could be shown that 24-month parent-child interactions accurately predicted early literacy skills, then there would be no need to analyze 36-months interactions. Parent-child interactions could be observed and analyzed when children were 24-months old and interventions could start then, if needed. Also, continued analyses of the subtasks in the PICS may also help determine if one of the subtasks may predict early literacy skills as well as the entire scale. This would help simplify and shorten the instrument.

It may also be possible to use the PICS in real life situations, as opposed to coding videotaped parent-child interactions. If the PICS could be simplified enough to use in the field, a pilot study would be necessary to determine if real-time field observations and scoring would be valid and reliable. If the PICS, or sections of it, could be shown to be valid and reliable in the field, then interventionists working in the homes could use it on a fairly regular basis to not only monitor parent-child interactions, but also determine the focus of future interventions.
APPENDIX A. OBSERVATION INSTRUMENT
PICS Instructions

You will be coding three distinct parent-child interactions at 14, 24, or 36 month birthday related assessments. These parent-infant/toddler interactions will simulate daily experiences. The activities include a frustration task (at 14 and 24 months) or self-selection task (at 36 months); a teaching task (at 14, 24, and 36 months); and play task (at 14, 24, and 36 months). Unless otherwise specified, code each “task” for the first 3 minutes of the parent-child interaction using descriptions in the code book. For the play task, code three separate 3 minutes play sessions (P-1, P-2, P-3).

In order to assure accurate coding, observe each 3-minute interaction a minimum of two times. To begin a coding session, set the timer to 3 minutes and have it count down. When the time beeps, stop the tape, and then stop the timer. This is especially important when coding the play task to avoid coding overlap, or avoid missing interactions that should be coded. It is also helpful to write down the time on the lower right corner of the tape when the timer beeps, to assure you are not missing codable moments.

There are a few ABC’s that can help you have an accurate and reliable coding session:

ALWAYS include justification for your scoring on each variable in the spaces provided on the score sheets.

BEGIN CODING (and start the timer) when the assessor says “You can begin now.”

CODE based on what you actually see, not what you want to see. (Be objective and use the operational definitions provided. Do not be subjective, that leads to inaccurate measures.)

Specific directions for each age and task:

For the frustration task:

• The times for the frustration task vary. Regardless of how long the task lasts, code the first 3 minutes. There is one exception:

• At 14 and 24 months, if the frustration task is terminated, score all variables as N/A.
• At 14 months, if there is NO parent/child interaction for the entire 3 minutes, score all scales as N/A. (some times the child simply looks around, at the camera, the evaluators, cats, etc. and never requires any attention/interaction from mother.) The key issue here is that the child's behavior does not demand parental attention or interaction. A child who is crying and looking around or calling for mom is eliciting/ requesting interaction. If the parent does not respond, it should be scored accordingly.

• There is no frustration task for the 36 month tapes, but rather a “chosen activity”, which lasts for 5-minutes. Allow the first minute to pass (use the timer for accuracy), and then code for three minutes. The most effective way to complete this is to set the timer for 1-minute when the assessor states “You can begin now”. When the timer beeps, stop the tape and write down the time on the tape. Reset the timer for 3-minutes and begin coding as usual. You will actually be coding minutes 2-4 of the session. Do not code the last minute of the session.

*For the teaching task:*

• At 14, 24, and 36 months, if parent terminates the task early, record the length of time they engaged in the task on the form. Code variables based on what you observed, but keep in mind that the parent had more than three minutes to complete the task, and therefore may not have used all the opportunities provided to teach the child the task. IF the child has “mastered” the required teaching task in that time, make a note of that in the justification section, do not penalize, and score accordingly. However, if the parent “gives up” and terminates the task early, this should be reflected in the scoring.

• At 36 months, the child is given puzzles to complete, accompanied by the instructions to the parent, “Please allow your child to work on the puzzles. You can help them as they need it”. The child is allowed to work on each puzzle for three minutes, however, some children/parents will move on to the second puzzle before the time expires, while others will use the entire three minutes. Score the parent/child interaction on the first three minutes of the task, regardless if they are working only on one puzzle or complete two in that amount of time.
PART 1 - Language Heard (code for both PARENT AND CHILD separately)

Child- Consider developmentally appropriate skills for each age:

14 month old: ______ 1 syllable phrases or word approximations are developmentally expected; articulation varies significantly- do not penalize for poor articulation (i.e.: consider attempts to imitate as good)
______ inflection, or variation in the child’s utterances, are noted
______ include conventional gestures (pointing/giving/showing/looking at or turning toward parent)

24 month old: ______ 2 word phrases are developmentally expected; articulation should be better, consider intonation (pattern of sounds) and inflection (has high/low sound characteristics similar to word imitating or attempting to speak).
______ listen for words and good approximations of words or attempted imitations, as opposed to babbling or consonant/vowel combinations (ex: “ga-ga-ga”, “mum-mum”)
______ gestures may be seen, but should be accompanied by a look to the mother (as in an attempt to gain joint attention with the mother)
______ approximately half of the child’s speech should be understandable

36 month old: ______ 3-4 word phrases; short sentences including some descriptors (sizes, colors, etc)
______ utterances should be mostly intelligible or partially intelligible (when trying to expand their ideas/use descriptors, etc.)
______ the child is beginning to use language in a conversational manner

1 2 3 4 5 N/A
Few, if any of the child’s utterances are appropriate for their age
About half of the child’s utterances are appropriate for their age
Almost all of the child’s utterances are appropriate for their age
Parent- Consider developmentally appropriate interactions for each age:

14 month old: _____ parent uses shorter phrases (3-5 word phrases)
   _____ parent repeats phrases or words *occasionally*, emphasizing nouns (labels)
   _____ include conventional gestures (pointing/giving/showing), coupled with labels (point to picture and says “Dog. That’s a dog.”)
   _____ exaggerates intonation (pattern of sounds) and inflection (singsongy aspects of words or phrases)

24 month old: _____ parent uses longer sentences (5-7 words), including some adjectives
   _____ continues to point and label items (as seen in 14 month tapes)
   _____ parent has an engaging element to voice, not monotone; may include some exaggerations of intonation and inflection (see 14-month description above)
   _____ parent uses a wider range of words, adding descriptors often; attempting to expand the child’s vocabulary

36 month old: _____ parent uses conversational-like sentences (back and forth with child); demonstrating to the child that there is a “purpose” for talking, to communicate
   _____ parent may include some compound sentences (connected with “and, or” etc, and may use if-then statements)
   _____ consider the quality and richness of the sentences (_____ Do they use complete sentences? _____ Do they use a variety of words and phrases?)

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<td>Few if any of the parent’s utterances are appropriate for the child’s age</td>
<td>About half of the parent’s utterances are appropriate for the child’s age</td>
<td>Almost all of the parent’s utterances are appropriate for the child’s age</td>
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PART 2- Emotional Aspects of Parent-Child interactions

**Emotional tone**: (code for PARENT AND CHILD)
The overall emotional feeling of the interaction: was it a pleasant experience for the child and the parent? Did they “enjoy” their time together? Was it mostly positive or negative? Also consider the amount of positive vs. negative comments made by the parent to or about the child during the activity.

*Examples:*

- **prohibitions** (negative comments) - “Don’t”, “Stop acting so bad”, “Quit it”, “That’s wrong”, “You are bad”, etc.
- **approvals/affirmations** (positive comments) - “That’s right, juice”, “Good job!”, “Yeah, you did it!” “I love you”, etc. Gentle corrections are acceptable (ex: “No, you goofy boy, that’s a leg, not an arm.”)

**NOTE**: In order to score above a (3) both child and parent must demonstrate some element of positive affect (ex: mother gives praise and child smiles in response; a lot of laughter by mother and child; etc.)

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<td>Few if any of the parent/child interactions seem enjoyable/pleasant. Mostly (-) comments made by parent</td>
<td>About half of the parent/child interactions seem enjoyable/pleasant. About ½ of the parent comments are (+), ½ (-) OR Few (+) or (-) comments/ Neutral affect; not overly pleasant or unpleasant</td>
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<td></td>
<td>In almost all of the parent/child interactions seem enjoyable/pleasant. Most of the comments by parent are (+); few (-)</td>
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**Joint Attention: (code for PARENT AND CHILD)**

The amount of time that the parent and child are paying attention to each other or the same object simultaneously.

Key items to consider: Are the parent and child attending to the same thing?

(playing with same toys)

Are their eyes looking at the same thing? (looking at a book together)

Are they interacting/engaged in the same thing? (singing a song together)

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<td>In few if any of the parent/child interactions are they attending to the same thing</td>
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<td>In almost all of the parent/child interactions they are attending to the same thing</td>
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PART 3 - Level of Cognitive Stimulation
(Code for PARENT only)

Parental guidance: a prompt hierarchy which ranges from the parent verbal statement(s) providing *a lot of choice and limited direction*, moving to verbal statement(s) which provide *a lot of direction and limited choice*. Consider degree of guidance as various levels of prompts:

**Examples:**
- Parent uses informative statements, such as “Oh, I see a caterpillar on this page”. (see below)
- Parent makes suggestions to the child such as “What do you think will happen next?” “Where does this piece go?” “What’s in there?”. (see below)
- Parent directs child’s behavior, “Put that here.” “No, stop that.” “That goes here.”. (see below)

You need to consider the proportion of the various prompts used by the parent. A parent may start with an informative statement, then move to more suggestive or directive statements if it appears that the child is not understanding what the parent wants them to do. For example, a parent says and informative statement: “There’s a button on the shirt”. Child points to baby. Parent might move to suggestive statement: “Yes, that’s a baby, but can you find the button?” Child points to baby again. The parent then moves to a more directive statement and points to the buttons saying, “Here, here are the buttons. You point to the buttons”.

A  
Informative- Parent says:  “That’s a horse”  “I’m going to find some socks”  
Suggestive-  “Can you say horse?”  “Can you find the socks?”  
Directive-  “Say ‘horse’”  “Point to the socks”  “Here are the socks (parent points). You point to the socks.” (parent may actually do hand-over-hand to direct the child)

B (taken from videos)

1 2 3 4 5 N/A

Most prompts are directive, with very few (if any) suggestive informative
About half of the prompts made are informative or suggestive, and half are directive
Most prompts are informative or suggestive; few directive prompts used

NOTE: If the parent makes six or fewer comments during a three-minute session, score N/A. For this section, when scoring an N/A you must write down the comments/statements made by the parent. Since there will be six or less, this should be quite possible.
Responsivity (code for PARENT only)

Amount of time the parent appropriately follows the child’s lead, responds to the child’s actions and/or words, versus missing opportunities to join in the child’s actions or experiences, or missing opportunities to add words or language to an experience or teach the child a task more effectively. For half of the rating keep in mind two elements: (1) did the parent follow the child’s lead? (2) was the parent effective at completing the task at hand (teaching, handling the frustrating situation, playing)? (i.e.: these two elements each account for \( \frac{1}{4} \) of the overall rating). The other half of the rating comes from the elements below that relate to responsivity:

EXAMPLES of Poor Responsivity:
- A parent tries to get a child to label body parts and continues to ask the question, “Where’s the socks?” The child does not point to the socks, but may point to other things in the book. The parent, however, continues to ask the question, “Where’s the socks?”, numerous times and the child never seems to comprehend what the parent wants. This is non-responsiveness, the parent missed the opportunity to teach the child a task by asking an ineffective question over and over.
- Other poor responsiveness instances include short or one-word parental responses of “Uh-huh”, “Yes”, “No”, etc. or simply NO response to the child’s verbalizations/actions. This may also look like a passive parent, who watched the child, but does not comment, interact, or appear interested.

EXAMPLES of Good Responsivity include when the parent:
- Confirms what the child is doing (ex: “You’re doing a good job with that”),
- Models for the child (ex: Child points to dog, parent says, “That’s a doggie. Can you say ‘doggie’?”)
- Gently corrects words they are saying inaccurately or labels they are using inappropriately (child says “shoe out” parent says “No, we aren’t going to take your shoe off now, may be later.”).
- Narrates what the child is doing: “You are playing with the pots and pans.”
- Repeats what the child says: child: “I’m 2 years old” parent: “That’s right, you’re 2 years old”
Responsivity *(code for PARENT only) (continued)*

- Extends, or adds to what the child is saying: child: “car”, parent: “Yes, that’s a *green* car”;
- Expands what the child is saying: child: “What’s that?” parent: “Yeah, let’s see what that is?”

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<td>Few, if any of the times, the parent capitalizes on opportunities to engage/interact. Passively watches</td>
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<td>3</td>
<td>About half of the time, the parent capitalizes on opportunities to engage/interact with the child</td>
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Video Rating Sheet

| 14 months | Coder ID#   |
| 24 months | Family ID# |
| 36 months | Date       |

(for 36 month chosen activity)

FRUSTRATION TASK

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Child Language
Justification:

Parent Language
Justification:

Emotional Tone
Justification:

Joint Attention
Justification:

Parental Guidance
Justification:

Responsivity
Justification:
# Video Rating Sheet

- 14 months
- 24 months
- 36 months

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## TEACHING TASK

(Overall time completed: ______ : ______)

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Video Rating Sheet

☐ 14 months  
☐ 24 months  
☐ 36 months

Coder ID#________  
Family ID# _______  
Date _____/____/____

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Video Rating Sheet

- 14 months
- 24 months
- 36 months

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Case Report Sheet

☐ 14 months  Coder ID#________
☐ 24 months  Family ID# ______
☐ 36 months  Date _____/_____/_____

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<td>Composite PIC Score</td>
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APPENDIX B. PARENT SURVEY FORM
Stony Brook Family Reading Scale

(SFRS)
(Whitehurst, 1993)

1. How often do you or another family member read a picture book with your child? (a child’s picture book)
   1. Daily  2. At least once a week  3. At least once a month  4. Rarely or never

2. At what age did you or another family member begin to read to your child? (enter age in either years or months)
   _____________ years   _____________ months

3. How many minutes did you or a family member read to your child yesterday?
   ____________ minutes

4. How often does your child ask to be read to?
   1. Daily  2. At least once a week  3. At least once a month  4. Rarely or never

5. In a typical day, how many minutes does your child spend looking at books by himself or herself?
   ____________ minutes

6. How often do you go to the library with your child?
   1. Daily  2. At least once a week  3. At least once a month  4. Rarely or never

7. In a typical day, how many minutes per day do you spend reading for information or pleasure, not counting the time you spend reading to your children?
   ____________ minutes

8. How much do you enjoy reading?
   1. Daily  2. At least once a week  3. At least once a month  4. Rarely or never

9. About how many children’s books do you own?
   1. 0-10 books  2. 11-25 books  3. 26-50 books  4. more than 50 books
REFERENCES


infant/toddler relationship, home learning environment, and school readiness. 


Peterson, C.A., McBride, S.L., & Readout, K. (2000, July). Home visiting: Documenting efforts directed toward program goals. In L. Roggman (Chair) *Hey Ma, the Home*


Press.


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