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Language, Play, and Toy Sharing in Infancy

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LANGUAGE, PLAY, AND TOY SHARING IN INFANCY

by

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ABSTRACT

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Toy sharing between 97 infants and their mothers was used to measure shared reference, mother and infant attention-directing strategies, and maternal and infant responsiveness. The association of toy sharing with early language and symbolic play was assessed. Infants were videotaped in a 10-minute free-play session at 11 months. Videotapes were coded for frequency of toy exchanges and level of infant symbolic play. Language was assessed at both 11 and 14 months. Maternal responsiveness to infant-initiated toy exchanges was positively related to symbolic play at 11 months. Maternal responsiveness was also related to Productive, Receptive, and Total Language scores at 14 months. Symbolic play at 11 months and language at 11 and 14 months were associated, suggesting underlying cognitive abilities associated with language and play development. Results support the notion that shared reference, maternal responsiveness, and underlying infant cognitive abilities are important components of a context where scaffolding of language and symbolic play can occur.

(78 pages)

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Lisa A. Newland

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CHAPTER I

STATEMENT OF THE PROBLEM

Language and play are fundamental forms of communication in early childhood. Language develops as a mode of expression during infancy, and play is another mode of expression that is used to communicate the symbolic intent and content of actions during infancy and early childhood (Fenson, 1984; Fenson & Schell, 1986). Understanding what influences the rate of development in these areas is important. Language impairment in infancy may lead to long-term outcomes such as learning problems and social problems later in childhood. Likewise, lack of appropriate development of play behaviors due to unfavorable family and child-care influences may lead to social and emotional problems in preschool (Howes & Stewart, 1987). Knowing what is associated with language and play development in infancy could inform intervention programs and affect parenting styles. This would help children by promoting optimal development in infancy.

Language and play seem to be affected by both maturation and environmental influences. For example, both language and play require symbolic representation, a cognitive function. Yet varying rates of development of language and play skills indicate that sociocultural influences may also be important in shaping development (Vygotsky, 1934). Specifically, the mother-infant relationship has been associated with language and play. One kind of mother-infant interaction that may be essential for language and play in infancy is shared reference between mother and infant. Shared reference is a social interaction in which mother and infant are focused on the same object. Attention to each other and objects during mother-infant interactions reflects varying patterns of guided participation (Rogoff, Mistry, Goncu, & Mosier, 1993). Thus, shared reference to objects during play may both affect and reflect maternal instruction strategies. These instructional strategies are likely to affect the development of language and toy play.

Purpose of the Study

If language and play covary regardless of environmental influences, that would indicate that language and play are influenced by biological factors (e.g., maturation of the brain). This is indicated somewhat by the fact that language and pretense in play follow a predictable sequence during childhood (Tamis-LeMonda, Bornstein, Cyphers, Toda, & Ogino, 1992). If language and play development are related to environmental influences, however, this would indicate that both biological and environmental influences are important (Tamis-LeMonda & Bornstein, 1994).

This study replicated previous studies by examining the relation between language and play at 11 and 14 months. In addition, this study extended previous studies by examining the relation of maternal and infant toy sharing to play at 11 months and language at 11 and 14 months. One purpose of this study was to answer the question, "Did language and symbolic play covary in this sample?" A second purpose of this study was to determine whether or not toy sharing, one aspect of shared reference, was associated with language and play in this sample. This led to two additional questions, "Was toy sharing associated with language and symbolic play at 11 months?" and "Was toy sharing related to language at 14 months?"

Language in this study was defined as receptive, productive, responsive, and total language abilities, as measured by language subscale items in the Bayley Scales of Mental Development (Bayley, 1969). The Productive Language subscale was used as a measure of the ability to produce syllables and words. The Receptive Language subscale was used as a measure of the ability to understand familiar words and simple verbal requests. The Responsive Language subscale was defined as the ability to understand a question and follow directions. Total Language was defined as the sum of Productive, Receptive, and Responsive Language scores.

Play was defined as the amount and level of pretense in play, as measured by Belsky and Most's (1981) play scale. Mean Play, Peak Play, and Symbolic Play were computed from play-scale data. Mean Play was defined as the average level of play across intervals. Peak

Play was defined as the highest level of play exhibited. Symbolic Play was defined as the frequency of intervals in which the infant played at level 6 or higher, which was considered Symbolic Play (Belsky & Most, 1981).

Toy sharing was defined as an attempted or completed toy exchange between infant and mother, which was initiated by either play partner. Maternal and infant offering, accepting, taking, and exchanging of toys were used to measure aspects of toy sharing. Offering was defined as showing or offering a toy to the other. Accepting was defined as acknowledging or accepting a toy which the other had previously offered. Exchanging was defined as returning a toy that had been offered to and accepted by the other play partner. Taking was defined as taking a toy that the other had not offered or taking back a toy that had been offered to the other.

Research Hypotheses

This study tested three research hypotheses. Each hypothesis is outlined below.

1. Because language and play have been shown to covary in the past, it was hypothesized that language scores (as measured by Productive, Receptive, Responsive, and Total Language scores) and play scores (as measured by Mean, Peak, and Symbolic Play scores) would be positively correlated at 11 months.
2. Because maternal influences in particular have been found to affect both language and play, it was hypothesized that the amount of toy sharing between mother and infant (as measured by the frequency of maternal and infant offers, accepts, takes, and exchanges) would be correlated with language scores (as measured by Productive, Receptive, Responsive, and Total Language scores) and play scores (as measured by Mean, Peak, and Symbolic Play scores) at 11 months.
3. It was also hypothesized that toy sharing at 11 months (as measured by the frequency of maternal and infant offers, accepts, takes, and exchanges) would correlate with language scores (as measured by Productive, Receptive, Responsive, and Total Language scores) at 14 months, controlling statistically for language scores at 11 months (as measured by Productive, Receptive,

Responsive, and Total Language scores) and play scores at 11 months (as measured by Mean, Peak, and Symbolic Play scores).

CHAPTER II

REVIEW OF LITERATURE

There appears to be substantial evidence that language and play develop in an invariant sequence, indicating a biological basis for development. Yet learning theorists claim that language and behavior are learned through environmental surroundings. One way of studying the influences on language and play from both the environment and biological maturation is to use a contextual approach, such as that proposed by Vygotsky. In order to best understand a contextualist point of view, it is necessary to understand the basic theories of human development, the underlying assumptions of these theories, and how contextualism builds on these theories. Two basic theories of human development, neither of which is adequate in explaining language and play development by itself, include the biological innateness view of Chomsky and the environmental learning view of Bandura. These two theories will be reviewed first, and their limitations discussed, before turning to the useful contextual view of Vygotsky.

Biological Perspectives of Language and Play

Some theorists have proposed that language development is a process of biological maturation, occurring during a "critical period" (e.g., Lenneberg, 1967). Lenneberg (1967) cited several factors that point to a "critical period" of language development during childhood, including growth characteristics in the brain. In fact, recent research comparing language development in apes and human children has supported the notion of a critical period for language acquisition (Savage-Rumbaugh et al., 1993). Apes who were exposed to language after 2 years of age comprehended much fewer words than those exposed to language at an early age. Savage-Rumbaugh et al. have suggested that perhaps early exposure to language had an effect on "language-activated circuitry" that was developing in the brain (1993, p. 43).

Lenneberg (1967) said that during maturation, there are structural, chemical, and electrophysiological changes in the brain that may be related to language acquisition. In fact,

humans do develop distinct physical structures and cognitive processes that support language development. They have been outlined by Savage-Rumbaugh et al. (1993). Humans, as compared to apes and other nonhuman primates, have vocal tracts that bend sharply, allowing the production of phonemic sounds. Humans have distinct brain hemispheres that support both "holistic-integrative processes" and "analytic sequential-processes." Language comprehension requires integration of information, while production requires the sequential processes necessary to control motor movements of the mouth and tongue. An active nervous system also allows humans to collect sensory information, process and remember this information, and direct behavior and motor movements, all skills necessary for language use. In addition, human brains are "prewired" for some behaviors, yet flexible enough to permit integration of environmental information. They allow for both volume transmission and synaptic transmission, and can integrate previous experiences with present sensory information. The increased depth of the human neocortex (in relation to other primates) provides more "information capacity." All of these structural and cognitive differences contribute to the human biological propensity towards language (Savage-Rumbaugh et al., 1993). These structural assets and cognitive abilities develop over time, however, as "neurophysiological and articulatory-acoustic maturation" occurs, and as muscle control develops (Bloom, 1993, p. 67).

Chomsky (1968) similarly felt that language acquisition was part of a biological process, but he proposed that it required more than simple maturation of the brain. He claimed that a language acquisition device, or an LAD, controlled language development. Chomsky described the LAD as an innate language processor with a universal grammar. Chomsky stated that evidence of an LAD lies in the fact that children learn to speak and understand language to some extent regardless of intelligence levels or individual experience. Slobin's (1979) theory was similar to Chomsky's. He proposed, however, that rather than possessing an innate grammatical system, children inherit "an innate means of processing information and forming internal structures" (p. 56). This capacity has allowed children to formulate grammar in their own native

language. Indeed, the cognitive processes outlined previously do indicate that humans are equipped with specific language-supportive brain functions. Savage-Rumbaugh et al. (1993) described language skills that were more flexible and context specific than envisioned by Chomsky (1968) and Slobin's (1979) theories.

Bloom (1993) described other human features that prepare infants for expression through language. Infants can communicate from birth on, using such signals as crying, eye contact, smiling, facial expressions, gestures and body language, and beginning speech sounds. These early abilities indicate that humans come "biologically prepared" for expression in a social context (p. 77).

Recent research has also pointed to biological influence on play behaviors. One such study found that pretense in play follows an invariant developmental sequence, regardless of environmental influences (Tamis-LeMonda et al., 1992). This sequence of play behaviors has been established in several studies (Belsky, Goode, & Most, 1980; Belsky & Most, 1981; Bornstein & Tamis-LeMonda, 1990; Tamis-LeMonda & Bornstein, 1989, 1990, 1994). Since language and play are thought to covary due to underlying cognitive skills, these data supported the theory that language and play are controlled, in part, by biological processes.

Although biological theories of language and play explain why development occurs in an invariant sequence, they do not fully explain individual differences in rates of development or the negative influence of impoverished environments on both language and play. Biological theories may agree that some sort of language stimulation is necessary in infancy, but they do not describe the effects of positive and negative environmental influences. For this, one must turn to environmental theories.

Environmental Perspectives of Language and Play

Learning theorists have suggested that language is learned from experiences in the environment. Bandura (1971) said that language is learned by modeling from parents and

others. He stated that children do not learn, through imitation, each specific phrase that they use. Rather they are modeled a set of specific rules about language that include grammar, phonetics, and syntax. They then use these rules to form their own unique sentences. It has in fact been found that preschoolers can learn new words from watching television (Rice & Woodsmall, 1988). This has had profound implications today, when computers, televisions, stereos, and video games are readily available to many children. Other learning theorists, such as Skinner, believed that language, like other behaviors, is a conditioned response that is controlled by its consequences (Brown, 1980). For example, children may have learned to speak in order to get their needs and wishes fulfilled, which was a form of positive reinforcement. In fact, language ability as a "reward" in itself has yet to be examined. Clearly, children who can communicate effectively with language are able to communicate more clearly and in a different fashion than those who lack these skills, which may motivate language acquisition (Savage-Rumbaugh et al., 1993).

Play, too, has been examined using learning theories. According to Crain (1992), learning theorists have suggested that behavior is learned either through modeling or reinforcement. These principles have been applied to research examining play behaviors. Pretend play has been linked to interactions with parents and peers (Dunn & Dale, 1984; Haight & Miller, 1993). This does not explain, however, why the use of pretense in play has followed an invariant developmental sequence in infancy (Tamis-LeMonda et al., 1992). To understand play and language more fully, researchers have studied language and play development in the context of specific environmental interactions.

Contextualist Perspectives of Language and Play

Several theorists have looked at development from a contextual point of view. One contextual theory that had been particularly valuable for understanding language and play is Vygotsky's theory of cognitive development. Vygotsky's theory combined viewpoints from both

biological and environmental theories, attempting to explore the interaction between natural development (from within humans) and the social-historical context (Vygotsky, 1934). This was particularly evident in Vygotsky's concept of a "zone of proximal development."

Vygotsky (1934) conducted a series of studies in which children were asked to solve problems "appropriate" for their age, as well as a few harder problems that required some assistance. From these studies, he formed the notion of a zone of proximal development, defined as "the discrepancy between a child's actual mental age and the level he reaches in solving problems with assistance" (p. 187). Some children with a mental age of eight were able to solve much harder problems with assistance than other children of the same mental age. Vygotsky suggests that this was a much better indication of the natural capacity of the child than mental age alone. However, the concept of the zone of proximal development also demonstrates the importance Vygotsky placed on environmental conditions, for he discussed at length the variety and impact of teaching styles. The assistance of adults seemed particularly important in learning to speak, where Vygotsky said that "imitation is indispensable" and "good instruction is that which marches ahead of development and leads it" (p. 188). This would also seem to apply to other areas of development, such as the increased use of language and pretend play in young children.

The "zone of proximal development" has been an important concept for researchers studying language and play because environmental conditions may narrow the gap between actual and potential levels of development. Mothers who provide supportive assistance or "scaffolding" for an infant's skill development (in language and play) could help them perform at higher levels of development than they would have without help (Wood, Bruner, & Ross, 1976). Vygotsky (1978) suggested that good instruction will result in learning which stays ahead of development, rather than following development. In other words, instructors should assign tasks that a child is not able to do and then offer assistance. If a child is offered tasks that he or she can do, learning is no longer taking place. This concept can be applied to mother-infant play

relations. By initiating pretend play and increasing the complexity of their speech, for example, mothers are able to lead children's learning in language and play and advance children's development in these areas. Mothers can also offer supportive assistance by responding to their infant's increasing abilities.

Instructing children within their "zone of proximal development" occurs when an expert (such as the mother) and a novice (the child) engage in joint problem-solving tasks. In this context, the expert and novice "structure their interactions so as to transmit information from the expert to the novice" (Rogoff & Lave, 1984, p. 95). This transmission of information can occur in a play session if mothers initiate social play and provide a language-rich environment, and children attend to the situation. Research has found that children then generalize information from one problem-solving situation to another by searching for similarities between old problems and new ones (Rogoff & Lave, 1984). The generalization of rules in language may account, in part, for the rapid development of language during the first two years.

Vygotsky (1934) found that the development of "higher functions" was influenced by social and cultural influences during a "sensitive period," and was dependent on instruction and "cooperation with adults" (p. 189). Although never mentioned by Vygotsky, there is one social factor that seems necessary for learning to occur. If children are to gain information from adults, they must focus their attention on the learning task. The ability of dyads to mutually focus their attention has been related to dyadic relationship quality, as well as to infant developmental level (Bakeman & Adamson, 1984; Baldwin, 1991; Roggman, Hart, Carroll, & Egan, in press). Shared reference, defined as an episode where mother and child are focused on the same object, seems necessary for language learning to occur, particularly the optimal kind of learning which Vygotsky described (Tomasello & Farrar, 1986).

Vygotsky also took a contextual approach to explaining word meanings, which he described as the union of thought and speech. He stated that word meaning "permits true causal-genetic analysis, systematic study of the relations between the growth of the child's

thinking ability and his social development" (p. 9). Surely shared reference with a caregiver is one aspect of social development which must be considered, not only for language development, but also for the development of pretend play.

Piaget (1983) suggested that language development is promoted by the maturation of the brain in the context of a language rich environment. Although he stressed the importance of maturation of the brain, he also implied that maturation is not solely responsible for language development. Piaget's (1983) theory emphasized that maturation, experience, the social environment, and equilibration are all necessary to understand development. Children's experience with objects, as well as their cultural and educational environments, accelerates or retards their progress through development stages. Thus, children construct knowledge by acting on their environment and drawing conclusions about their actions, either through assimilation into existing schemes or accommodation. Neo-Piagetians have agreed that children construct knowledge by organizing their experiences in the world, yet they have specified that rate of development is affected both by attentional capacity and universal experiences, such as exposure to caretakers and language (Case, 1992). Environmental interactions in play which facilitate learning may include social toy play and verbal communication.

In support of a contextual perspective, research has suggested that it is neither biology nor the environment alone, but rather their interactions that influence the development of language and pretend play. The next section will review the literature pertaining to both the biological and environmental influences on these areas of development in infants, toddlers, and young children. These findings have increased our understanding of the contributions of biology and the environment on language and play, and have revealed some of the specific biological and environmental components at work. Specific biological influences on language and play, as well as maternal influences which contribute to development, will be described in the next section.

Cognition in Language and Play

Cognitive abilities, one aspect of biological maturation, have been shown to be associated with both language development and symbolic play. Several studies have examined this association, although they have not taken into account any environmental influences. In one study, the play of infants who were not yet producing words was at the lowest level of symbolic play, but the play of infants who were using single words was at various symbolic levels (Kelly & Dale, 1989). This study did not "prove" whether language production or symbolic play came first, but did suggest that they were highly associated with one another. In the same study, infants who combined words into a multiword utterance (but were not able to combine parts of the utterance with other words in a way that was semantically similar) were better able to imitate sounds and play at higher levels of symbolic play than infants who were only using single words. In addition, infants who were able to combine parts of a multiword utterance with other words were better at performing means-end tasks than infants who could not combine parts of a multiword utterance with other words. This suggests that specific cognitive skills are necessary for the development of language and symbolic play in infancy and that both language and play require a certain level of biological maturation (Kelly & Dale, 1989).

Symbolic play has been related to other semantic aspects of language. Toddlers' productive vocabulary has been associated with both symbolic play and semantic diversity, defined as the ability to use a word in a number of semantic categories, such as agent, action, possession, recipient, or locative (Tamis-LeMonda & Bornstein, 1994). Comprehension of verbs has been linked to cognitive abilities in play, such as "the ability to consider others in the role of actor during play with objects," and "the ability to engage in symbolic action sequences on objects in play" (Smith & Sachs, 1990, p. 409). Both of these findings relate to the understanding of pretense. The results, although they do not take environmental influences into account, do link cognitive abilities with language and symbolic play.

Language has also been used in other ways to assess young children's understanding

of pretense in play. Some young children were able to describe a pretend situation with language to an adult interviewer, rather than simply repeating back the instructions the adult had given in the pretend situation. This was interpreted as a sign of cognitive understanding of pretense in play (Harris & Kavanaugh, 1993).

Another aspect of play, object knowledge, has also been related to language development. In one study, two types of object displacements (moving one object in relation to another) were related to language. Constructions, defined as moving objects together to create a configuration, were associated with the emergence of words and they increased with age. Separations, or moving objects apart, decreased as children got older and their language abilities increased (Lifter & Bloom, 1989). Language and play with objects covaried in Lifter and Bloom's study despite individual differences in rates of development.

Generally, research concerning language and play has focused on the increased use of symbolic play during the second year. During the first year, infants' play is generally nonsymbolic, and is characterized by sensorimotor manipulation of objects. During the second year, however, play becomes more symbolic and increasingly complex. Research has shown that "pretense schemes are related to the self before others, that single-scheme pretense appears before multi-scheme pretense, and that pretense with literal objects precedes that with 'substitute' objects" (Tamis-LeMonda et al., 1992, p. 22). This knowledge has been used to relate play with language abilities, because both require the use of symbols and reflect increasing cognitive capacities in symbol acquisition (Kelly & Dale, 1989).

Maternal Influences on Language and Play

The previous section described specific cognitive capacities associated with the development of language and play. This section describes maternal influences on the development of infant language and play during the first 2 years. The studies reviewed in this

section support the idea of a contextual model of language development and symbolic play development.

Piaget's notion of pretend play was that play emerges spontaneously as children become capable of representational thought, and that this occurs prior to pretend play with others. Several studies, however, have found that pretend play emerges primarily as a social activity, in congruence with Vygotsky's theory. Haight and Miller (1993) reported that from 1 to 4 years of age, 68-75% of children's pretend play was actually social, not individual. In addition, mothers were children's primary play partners during the first 3 years. This occurred despite the fact that children had access to same-age playmates. Dunn and Dale (1984) reported that it was not until around 2 years of age that children's play preferences shifted from maternal to sibling play. In addition, maternal influences on infant play were found to be particularly dominant up to 12 months of age, when almost all infant pretend play was initiated by mothers (Haight & Miller, 1993). By age 2, about half of pretend episodes were initiated by the child, reflecting their increased play capabilities (Dunn & Wooding, 1977). Thus, as Vygotsky's theory suggested, mothers do lead infants' play capabilities by initiating pretend play situations.

Play with mothers could also provide a context for developing language skills. When toddlers are engaged in play, they hear and produce speech related to objects and actions. Within this context, speech is concretely related to the situation and is highly redundant. Early language development is fostered in this context (Ervin-Tripp, 1991).

Additional research has found that other environmental aspects, such as socioeconomic status, are related to both maternal interactions and infant language and play. Economically disadvantaged children have been more prone to delays and deficits in sociodramatic and pretend play. Although results have been conflicting, lower-class children in some cultures engaged in lower quality and less frequent pretend play than economically advantaged children. In addition, lower-class children tended to verbalize less during play, which could have caused a measurement error for pretend play. These results were linked to maternal practices and

attitudes, such as attending to and joining in children's pretend play, teaching pretend games, and providing stimulating toys (McLoyd, 1986).

The effects of maternal-infant play interactions were evident in a cross-cultural study. A cross-cultural comparison of American and Japanese mothers and infants found significant differences in the infants' language and play (Tamis-LeMonda et al., 1992). American infants were more developmentally advanced in both productive and receptive vocabularies, while Japanese infants were more advanced in symbolic play. Although language and play in toddlers advanced in a linear fashion for both groups, the differences reflected varying rates of development. These differences were associated with differences in maternal interactions and were reflective of differing cultural norms. Japanese mothers and infants participated in more symbolic play, as compared to the greater use of nonsymbolic play by American mothers and infants. Japanese symbolic play also reflected an increase in maternal demonstrating and soliciting of other-directed pretend play. This was consistent with a characteristic of the Japanese culture, that Japanese are "especially sensitive to others in dyadic interaction" (p. 34).

Language, play, and maternal interactions at both 1 year and 2 years of age have also been assessed (Tamis-LeMonda & Bornstein, 1994). At 2 years, maternal language and play were related to toddler language and play. However, at 1 year of age, infant production and comprehension of language was not affected solely by maternal stimulation, since production and comprehension level were maintained when maternal stimulation was limited. Because neither biological nor environmental influences alone seem to affect development, a contextual model of language and play development should be favored.

Shared Reference as a Measure of Maternal Interactions

When mothers and infants share reference to the same objects, mothers may influence symbolic representation expressed in language and play. Shared reference may be necessary for scaffolding to occur in infant language and play. For example, infants need to be focused on

the same object as their mothers in order for the mother to label objects or demonstrate symbolic play. Likewise, if infants are to get feedback about word usage and pretend play, both infant and mother must be focused on the same object (Nelson, 1973). Several studies have found that language development is fostered during episodes of shared reference (Dunham & Dunham, 1992; Tamis-LeMonda & Bornstein, 1989; Tomasello, 1990). Shared reference may involve action, visual attention, or other sensations.

Simple visual joint attention, one aspect of shared reference, has been associated with early language. Research has found that within a joint attentional episode, children produced more utterances per minute, words per minute, and words referring to objects per minute, and had a higher average number of turns in conversation than when they were not engaged in a joint-attentional episode with mothers. Maternal behavior was also affected, with mothers producing more but shorter utterances per minute in a joint attentional episode (Tomasello & Farrar, 1986). In another study, early maternal encouragement of shared reference was also predictive of later language, but not play (Tamis-LeMonda & Bornstein, 1989).

Several factors seem to affect the amount of shared reference between mother and infant. Bakeman and Adamson (1984) found that person engagement by infants tended to decline with age, while coordinated joint attention to objects increased. Shared reference also occurred more often with mothers than with peers.

Shared reference has also been associated with the quality of the mother-child relationship. Both attachment and cognitive skills were correlated with infant looking behaviors in a laboratory play session. Within a play session, a securely attached infant was more likely than an insecurely attached infant to look at the same object as his/her mother (Roggman et al., in press). Thus, attachment style was associated with shared reference in a play session.

Infants themselves contribute to coordination with mothers' looking. In one study, mothers looked at and labeled a toy different than the one the infant's attention was focused on. This was suspected to cause a "mapping error" in infants. In fact, infants were able to use

nonverbal cues, such as where the mom was looking, to correctly identify the object referenced by the mother (Baldwin, 1991). Additional studies have found that characteristics of the infant affect maternal attention-directing strategies. Mothers of babies with Down syndrome introduced a toy more often when the infant was not involved in play, thus trying to engage the infant. These mothers were also more likely to "physically orient" the infant to an object (Landry & Chapieski, 1989).

Cultural variations also affect maternal attention and assistance during child problem-solving activities. A cross-cultural comparison of mother-child dyads in Salt Lake City, Utah, and San Pedro, Guatemala, revealed differences in mother-child attention during daily interactions (Rogoff et al., 1993). San Pedro mothers were quicker to assist children during problem solving, but offered fewer verbal cues. Thus, San Pedro children learned more from observation than through verbal instruction. Salt Lake mothers were more likely to direct their attention toward other adults than towards children, but they used more verbal cues and more verbal attention-directing strategies when instructing children. Thus, Salt Lake children learned more through direct instruction and maintained shared reference through verbal exchanges (Rogoff et al., 1993).

Although shared reference seems to vary with age and infant characteristics, the ability of mothers to guide participation in play sessions through the use of attention-directing strategies is important (Rogoff et al., 1993). Mothers influence language development in this context by initiating interactions which result in joint action on objects. These parent-infant social interactions with toys facilitate both turn-taking and language development (Bruner, 1983).

Toy Sharing

Toy sharing is one type of mother-infant interaction that is dependent upon shared reference. It is likely that shared reference must precede toy sharing, because the dyad must be able to focus their attention on the same object before they can use that object to interact. Thus,

toy sharing represents a more refined skill associated with shared reference. The dyad not only focuses on the same object, but they use that object to interact socially. According to Bruner, the use of objects to complete joint tasks, such as exchanging toys, is what facilitates language development (Bruner, 1977).

The relation of toy sharing with language and play has not been previously examined. It is likely to be similar to the relation of joint attention with language and play, because joint attention and toy sharing are different aspects of shared reference. Other correlates of toy sharing have been indicated in previous research, however.

Toy-sharing behaviors have been associated with age. Hay (1979) studied toy exchange behaviors of 12-, 14-, and 18-month-old children with their parents. Cooperative interchanges were recorded, which were defined as interactions between parent and child involving the same toy, and in which both were mutually involved, a repetition of actions occurred, and an alternation of turns occurred. Sharing behaviors were defined in two ways, showing and giving. Both cooperative interchanges and sharing increased with age, indicating a maturational influence.

Frequency of toy-sharing behaviors in a laboratory setting has been related to the quality of the mother-infant relationship, as measured by attachment styles. In one study, securely attached dyads produced more frequent toy exchanges than insecurely attached dyads. Securely attached dyads also displayed more successful infant-initiated toy exchanges than anxiously attached dyads. Thus, securely attached dyads were more competent at coordinating their attention towards toys, particularly when the infant was directing mother's attention by initiating toy exchanges (Roggman, Langlois, & Hubbs-Tait, 1987).

Maternal and infant attention-directing strategies are likely related to toy-sharing behaviors. Possessing the ability to coordinate attention to toys would allow the mother to scaffold language and symbolic play in infancy through guided participation in play interactions. By initially directing an infant's attention towards toys, mothers can foster language and play

skills. As infants develop greater language and play skills, mothers should respond to infant-initiated toy play. Toy sharing, then, could be used as a measure of shared reference, attention-directing strategies, and maternal responsiveness in play. Toy sharing has not been used to measure these constructs previously, except by Roggman et al. (1987). This study used the frequency of accepting and exchanging toys as a measure of the amount of shared reference in a play session. The frequency of offering and taking toys was used to asses whether mothers or infants were directing the play session. Maternal responsiveness was also measured as accepting or exchanging toys that the infant offered. This kind of responsiveness is necessary for scaffolding emerging infant abilities.

Summary

Much of the cited research has made important contributions to our understanding of children's language, play, and cognitive capacities. Looking at the problem from only one point of view (i.e., maturation or maternal influences) did not provide a full understanding of both general development and individual differences; approaching the problem from a contextual standpoint, however, helped clarify contributors to both general development and individual differences. This study examined symbolic representation as a maturational factor necessary for language and play development. Maternal interactions in toy sharing were examined as mediators of language and play development.

CHAPTER III

METHODS

Subjects

Subjects for this study included 97 infant-mother dyads who participated in a previous study in which language was assessed at 11 and 14 months and mother-infant interactions and infant play were videotaped at 11 months. Subjects were recruited by contacting mothers who had announced the birth of a child in a public newspaper (N = 293). Families were first contacted by letter and then by telephone and invited to participate in the study (N = 223). Those who agreed (N = 125) were sent a packet of forms 2 weeks prior to scheduled visits. These forms were to be completed and brought to the scheduled laboratory visit.

Of 100 who were originally tested at 11 months (did not cancel or fail to show up for the testing), 97 were videotaped with no excessive crying or technical problems (no sound or no time codes) and had available data for this study. Of the 97 tapes, 80 had taped play sessions of at least 10 minutes. Of the 80 subjects with complete data for the play session, 70 had complete language data at 11 months and 65 had complete language data at 14 months. When subjects were matched for complete data on all variables, 63 mother-infant dyads had no missing data.

Attrition resulted from the infant crying or technical problems (n = 3), and those tapes were not able to be coded. Attrition also resulted from taped play sessions that were not a full 10 minutes, or 40 intervals, in length (n = 17). Finally, attrition resulted from incomplete language data at 11 months (n = 10) and 14 months (n = 5). When files were matched for complete data, additional subjects were dropped from the study (n = 2).

Group differences between infants with longitudinal language data (n = 65) and those with incomplete longitudinal data (n = 5) were tested by calculating t tests. There were no statistically significant differences at 11 months between the groups in Productive, Receptive, Responsive, or Total Language scores, or in Mean Play, Peak Play, or Symbolic Play (p = .05).

All but 3 subjects were full-term, born within 3 weeks of the expected due date. The 3 who were not full-term, however, were not born more than 4 weeks early. All infants came from middle-socioeconomic-status households, M=44.55 on the Hollingshead (1975) Four Factor Index.

Procedures

Mothers and infants were taped for 10 minutes in a laboratory playroom. The child was allowed to play on the floor with a set of developmentally appropriate toys (Appendix C), which were chosen such that a range of developmental levels of play would be elicited (simple manipulation, functional, relational, and various types of pretend play). Belsky and Most (1981) did not provide a list of suggested toys for this assessment. Mothers were seated in a chair and instructed to complete a questionnaire, but to respond to or help the child if needed. Level of play and frequency of toy exchanges were coded from this 10-minute play session.

After the 10-minute play observation, each infant was tested using the Bayley Mental Development Index (Bayley, 1969). Research assistants were trained in administering this test prior to data collection. They observed and scored tapes of others administering the Bayley. Their scores were then compared with those of a previously trained assistant. They also administered the Bayley to pilot study babies, and a previously trained assistant scored the videotape. They had to have at least 95% agreement to continue administering the Bayley in this study. Mothers sat at a nearby table and completed another instrument not used in this study. Only performance on language items from this test was used for this study.

Measures

Although multiple measures were used in the original study to assess several aspects of social and cognitive development, this study used previous assessments of language and

obtained new data by coding videotaped behavior for level of infant play and toy sharing between mothers and infants.

Reliability and Agreement

All measures were checked for reliability before, during, and after data collection. Before data collection, testers and coders were trained using pilot subjects or previously coded videotapes. The number of cases used for training varied by measure because complexity and history of previous use varied by measure. During data collection, at least every fourth tape was checked for reliability of testing or coding so that testers or coders would not "drift" over time. Before and during data collection, detailed accuracy checks were necessary and therefore absolute agreement from item to item, interval to interval, or incident to incident was calculated. Although simple percent agreement (the number of agreed observations divided by the number of total observations) is reported extensively in the literature, the Kappa statistic is increasingly reported because it corrects for chance agreement.

After data collection, all cases that had been tested or coded independently were combined and a proportional reliability statistic, intraclass correlation (ratio of subject variance to obtained score variance using mean squares), was calculated for total scores across cases.

Generally, simple agreement over .90, Kappa over .70, and intraclass correlation over .70 is considered more than adequate (Hartmann, 1982). Agreement and reliability statistics and the exact numbers of cases used are reported for each measure used in this study.

Bayley Scales of Infant Development

The Mental Development Index of the Bayley Scales of Infant Development (Bayley, 1969) was used to assess cognitive ability. The test measures infant competence in two areas, object knowledge and language abilities. For this study, selected items from the Bayley MDI that assess aspects of language skill were used to generate Total Language scores and language subscale scores. This method of extracting language items from the Bayley MDI was used

previously by Bee et al. (1982). The language items used in this study were comparable to those found in instruments such as the TELD (Hresko, Reid, & Hammill, 1991), which was designed to focus specifically on language. The Bayley items were selected to overlap 4 months on either side of the targeted age, since the Bayley is age specific in months. The Bayley manual reported split-half reliability coefficients of .81 to .93 and interrater item-by-item agreement of 89.4% for the Mental Scale from which the language items were taken.

Accuracy of Bayley testing was checked for 30 cases at 11 months and 26 cases at 14 months. At 11 months, item-by-item percent agreement was 89%, Kappa was .89, and interrater intraclass r was .85. At 14 months, item-by-item percent agreement was 93%, Kappa was .91, and interrater intraclass r was .89.

The language items from the Bayley were used to calculate three subscales, Productive Language, Receptive Language, and Responsive Language. Productive Language refers to the ability to vocalize syllables and words, as well as naming objects. Receptive Language refers to the ability to understand spoken words and verbal requests. Responsive Language refers to the ability to respond to a verbal request to perform an action that has been demonstrated. Correlations between subscales were examined to see if they should be combined or kept separate in the statistical analyses. Subscales using the Bayley language items at 11 and 14 months are found in Appendices A and B. Because the sets of items were not the same at the two times of measurement, the raw scores are not directly comparable.

Belsky and Most Play Scale

Belsky and Most (1981) developed a scale of development of exploration and play, which was used in this study to code highest levels of play behavior during free play. The videotapes of free play sessions, which were 10 minutes in length, were analyzed every 15 seconds for the highest level of play displayed by the infant during each 15-second interval. Belsky and Most reported an interrater agreement of 87% prior to data collection, and reported reliability coefficients ranging from .79 to .98 when levels of play were coded. Accuracy of

coding in this study was maintained by checking every fourth tape (n = 25), with an average Kappa of .82. The coding sheet for level of play is found in Appendix D. Table 1 shows the codes used for coding complexity of play.

Toy Sharing

Toy-sharing behaviors were coded using a revised version of the coding procedure developed by Roggman et al. (1987). Reliability of this measure has been established previously by checking the accuracy of coded social toy play. Both simple and complex toy exchanges were examined, and reliability was reported as 91-99% agreement for 35 cases (Roggman et al., 1987).

In this study, videotapes of infants and mothers during the 10-minute free play session were coded for frequency of toy exchanges in 15-second intervals. Two coders were trained to code frequency of toy exchanges by practicing with pilot study data to establish reliability. Incident-by-incident agreement of 90% or higher between coders had to be established prior to coding data. Accuracy of coding toy sharing in this study was maintained by checking every fourth tape (n = 25), with incident-by-incident agreement of 99%. Kappa could not be calculated for this measure because there was often more than one code per interval, so chance or expected agreement could not be calculated. The coding sheet can be found in Appendix E. Table 2 shows the codes that were used for coding toy sharing.

Research Design

In this study, infants were assessed at 11 months on measures of language development, play styles, and toy sharing and were assessed again at 14 months on language development. There was no intervention introduced between the two assessments. This longitudinal, correlational design was chosen to assess relations between 11-month variables and 14-month language scores. Because this was not an experimental design, causation cannot be inferred from the results.

Table 1

Infant Play with Objects

Level of play	Description
Level 1	indiscriminate mouthing of toys
Level 2	simple manipulation
	turning over an object
	touching an object
	holding an object
	banging or shaking objects
	banging wall, window, or floor
	dropping toy off chair
	turn cup upside down
Level 3	Functional: appropriate for object and intentional extraction of some unique piece of information
	rolling or throwing ball
	rolling cup
	looking at and turning pages of book
	turning clicker on yellow octagon
	rolling cylinder on blue octagon
	shaking chain
	shaking phone to hear bells
	dumping toys out of box
	moving petition to "escape" from area
	stepping on book to hear squeak
	squeezing ball while looking at it
	pull cup out of larger cup
	looking at pictures on the bottom of cup
	hand in cup(s)
	dumping smaller cups out of larger cups
	sharing an object with mom
Level 4	Relational: bringing together and integrating two or more toys in an inappropriate manner, i.e., not intended by manufacturer
	larger cup on top of smaller cup
	banging two cups together
	banging a toy on the window or wall
	holding two toys together that do not belong together
	put chain in cup
	put cup on mom's head
Level 5	Functional relational: bringing together and integrating two toys in an appropriate manner, i.e., intended by the manufacturer

(table continues)

Level of play	Description
Level 5	nest cups make tower out of cups put toys in box put lid on box trying to put toy over window put cups on tray originating from somewhere else put phone on receiver
Level 6	Enactive renaming: approximate pretense activity, but without confirming evidence of actual pretense behavior touch cup to lip without tipping cup or head or making drinking noise putting telephone to ear without "talking"
Level 7	Pretend self: pretense behavior toward self in which pretense is apparent (combination of two) raise cup to lip, tip cup, tip head and/or making drinking sounds put telephone to ear and vocalize
Level 8	Pretend other: pretense behavior directed away from child toward other pretend to pour from one cup to another offer mom a drink offer mom telephone to talk
Level 9	Substitution: using a "meaningless" object in a creative or imaginative manner, i.e. using cup as another object use cup as a hat use cup as a phone wear chain as a necklace
No Play	fussing, crying, walking around, no toys

Note. Belsky & Most's 1981 (revised).

Table 2

Social Play Coding

Toy exchanges	description
Code 1	Ignores an offer: is offered/showed a toy, but does not accept it
Code 2a	Accepts an offer: is offered/showed a toy and takes it
Code 2b	Acknowledges an offer: smiles or talks about a toy that is shown/offered, but does not accept it
Code 3	Responds to accepted toy: manipulates a toy that has been accepted from the other Or talks about an accepted toy (labels, describes, labels actions appropriate to the object, etc.)
Code 4	Returns the toy: offers to return the toy after accepting it from the other, but without responding to the toy (May say "Thank you," "Your turn," etc.)
Code 5	Complex exchange: attempts to/returns the toy that has been accepted and responded to. This is coded for the person offering to return the toy. If it is a continuing complex exchange (with the same toy) keep coding 5's, not 6a's.

Toy assertions	description
Code 6a	Offers a toy: hands a toy towards the other (within arms reach) or sets it down in front of them, may or may not release if other tries to accept
Code 6b	Shows a toy: looks at or gestures towards the other person with toy in hand
Code 7	Retracts a toy: pulls back toy other tries to accept after offer or show
Code 8	Takes a toy: takes a toy from the other that the other has not offered
Code 9	Retakes: takes back an unoffered toy that the other had previously accepted or taken

Note. Roggman, Langlois, & Hubbs-Tait's 1987 (revised)

CHAPTER IV

RESULTS

Subjects for this study were from a sample of 100 infants tested at 11 months of age. There was an attrition rate of 37, which resulted from crying or technical problems (n = 3), incomplete play sessions less than 10 minutes in length (n = 17), incomplete language data at 11 months (n = 10) and 14 months (n = 5), and matching files for complete data on all variables (n = 2).

To test for group differences due to attrition, t tests were calculated on available data (n = 70). No statistically significant group differences on the initial measures of language and play were found between those with longitudinal data and those without it, indicating that attrition at 14 months was not likely related to differences in infant scores at 11 months.

The mean age of the 97 infants with available data at 11 months was 10.76 months, with a standard deviation of .47 months. The mean age of the 65 infants tested at 14 months was 14.44 months of age, with a standard deviation of .28 months. The families of the 97 infants initially tested had a mean score of 44.55 on the Four Factor Index of Social Status, indicating that they were from middle class families (Hollingshead, 1975).

Data Analysis

Frequencies, means, and standard deviations were calculated for all measures and are presented for each construct. Since all of the variables were measured at least at the interval level, correlation and regression were used to analyze the data. These analyses showed which variables were associated. Correlation was used to show the direction and strength of relations, and regression provided more explanation of the pattern of covariation. Strong correlations were defined as an absolute value of r ranging from .65 to 1.00. Moderate correlations were defined as an absolute value of r ranging from .30 to .65. Weak correlations were defined as an absolute value of r ranging from .00 to .30.

Number of Subjects per Analysis

The number of subjects reported varied per analysis, with the maximum number of subjects used whenever possible. For frequencies and means, the number of subjects was limited only by the attrition rate for that variable Thus, a different n size was reported for each variable, with a minimum of 65 subjects and a maximum of 97 subjects. This was also true for correlations between multiple measures of the same construct (e.g., multiple measures of play with each other). Correlations between measures of different constructs at 11 months were limited by the variable with the least amount of valid cases. Correlation and regression analyses between 14-month language scores and 11-month variables were limited by matching files such that only subjects with complete data on all variables were included ($n = 63$).

Multiple Measures of Constructs

Multiple measures of each construct were used to assess similarities and differences between various aspects of language, play, and toy-sharing behaviors. Using multiple measures of each construct was based on theory and prior research. Testing a hypothesis more than once by using multiple measures, however, could have resulted in alpha inflation. Justification for multiple measures will be discussed separately for each construct in this section by comparing correlations between measures. This issue will be addressed again later by comparing the number of statistically significant correlations between multiple measures and other variables with what was expected due to chance alone.

Measures of language. Previous studies of infants and toddlers have used specific language measures that rely on maternal report of infant receptive and productive language abilities (Tamis-LeMonda & Bornstein, 1989, 1990, 1994; Tamis-LeMonda et al., 1992). Additional measures of language abilities used in previous research include coding transcripts of toddler language use during play sessions (Tamis-LeMonda & Bornstein, 1994). The Bayley Scales of Infant Development (Bayley, 1969) have also been used to extract language items and compute a language score for infants (Bee et al.,1982). This procedure had the advantage of

using both maternal report and child performance on language tasks.

This study was not originally designed to measure language abilities at 11 and 14 months. Bayley scores, however, were available for infants who completed the assessment. Language items were extracted from the Bayley scales, and four scores were computed. As in most early language research, Productive and Receptive Language scores were computed. In addition, some of the items that required receptive language abilities also required the ability to follow directions. Because this was thought to constitute a more refined language ability, responses to these items were totaled into a score called Responsive Language. In addition, a Total Language score was computed to determine whether or not language subscales and Total Language were differentially associated with other variables.

All four measures of language were proposed to measure separate and distinct aspects of language development, which, when combined, measured the construct called language. Correlations between these four measures of language were computed to test this hypothesis. Correlations between language items at 11 months are listed in Table 3, and at 14 months are listed in Table 4.

Corrrelations between Receptive Language and Productive Language scores were moderately, positively related at both 11 months (Pearson r = .43) and at 14 months (Pearson r = .47). In fact, these relations were very close to the expected values based on previous research. Tamis-LeMonda and Bornstein (1990) reported a similar association between productive and receptive language at 13 months (r = .43), as measured by the Bates, Bretherton, and Snyder (1988) language inventory. However, squaring Pearson r indicated that only 18-22% of the variability in Productive Language scores was associated with Receptive Language scores. This suggested that the two variables were measuring unique aspects of language, and both measures were used.

Responsive Language scores had a very low association with Productive and Receptive Language scores at 11 and 14 months. Pearson r values ranged from r = .05 to r = .07. This low

Table 3

Correlations Between Language Scores (11 Months)

	Productive	Receptive	Responsive	Total Language
Productive	- -	.43**	.05	.66**
Receptive		- -	.05	.65**
Responsive			- -	.67**
Total Language				- -

(n = 70)
*p < .05
**p < .01

Table 4

Correlations Between Language Scores (14 Months)

	Productive	Receptive	Responsive	Total Language
Productive	- -	.47**	.05	.83**
Receptive		- -	.07	.72**
Responsive			- -	.48**
Total Language				- -

(n = 65)
*p < .05
**p < .01

association was expected, due to the increased complexity of Responsive Language questions, which required additional language skills. This low association established discriminant validity, which justified using Responsive Language as an additional variable.

Language subscales had a moderate to high positive association with Total Language scores at 11 and 14 months. Pearson r values ranged from r = .65 to r = .67 at 11 months, and from r = .48 to r = .83 at 14 months. Squaring these r values indicated that 23-69% of the

variability in Total Language was associated with language subscale scores. The fairly high percentage of shared variance suggested that the language subscales were measuring some aspects of the construct "language." However, 31-77% of the variability in subscale scores was not associated with Total Language at 11 and 14 months. This suggested that each subscale was also measuring a unique aspect of language, and all four scores were used in additional analyses to test for unique associations with other variables.

Measures of play. Belsky and Most's revised (1981) play scale, and earlier editions (Belsky et al., 1980) have been used as a valid and reliable index of infant play (McCune-Nicholich, 1981; Tamis-LeMonda & Bornstein, 1989, 1990, 1994; Tamis-LeMonda et al., 1992). Interval and frequency codes of level of play have been used to calculate the percentage of pretense actions (level 7 or above on the 1980 play scale) that occurred during a play session (Tamis-LeMonda & Bornstein, 1989). In addition, Mean Play has been calculated as the average level of play across all play acts coded (Tamis-LeMonda & Bornstein, 1990).

This study coded pretend play as the highest level of play displayed in each 15-second interval. An average level of play score, or Mean Play, was then calculated across intervals. In addition, the highest level of play exhibited during the play session was recorded as Peak Play. It was hypothesized that there would be a difference between the highest level displayed (Peak Play) and the level the infant generally played at (Mean Play) and that there would be a difference between their associations with other variables. Those infants who had a higher Mean Play score relative to their Peak Play score tended to play closer to their highest ability level more often than the other infants.

Symbolic Play was also measured as the frequency of intervals where an infant played at level 6 or higher, which represented a level of symbolic play on the Belksy and Most (1980) play scale. This variable was included as a way of comparing infant symbolic play competence relative to other infants. Symbolic Play differed from Mean Play, which was affected by extreme high or low scores, and Peak Play, which was a single measure of play competence. Symbolic

Play indicated to what extent actual symbolic play occurred across the 10-minute play session.

For these reasons, Mean, Peak, and Symbolic Play were hypothesized to reflect different aspects of play competence and, therefore, to have varying associations with each other and with other variables. Correlations between play scores at 11 months were calculated to test this hypothesis, and are reported in Table 5.

Mean, Peak, and Symbolic Play were all moderately, positively associated with each other. Pearson r values ranged from r = .42 to r = .58. The strongest association was between Mean Play and Peak Play. This was to be expected, since Peak Play affects the average level of play across intervals. Squaring the r values indicated that 18-34% of the variance was shared between the three measures of play, which suggested that they were all measuring play competence, and convergent validity was established. This was expected, in particular because scores for the three measures were dependent on each other. However, since 66-82% of the variance in play scores was unique to each measure, each play score was measuring a unique aspect of play competence. Therefore, all three measures of play were retained for use in additional analyses.

Measures of toy sharing. Toy-sharing variables were used to measure shared reference, maternal and infant attention directing, and responsiveness during the 10-minute play session. Maternal encouragement of attention has been measured previously as the frequency of

Table 5

Correlations Between Level of Play Scores

	Mean Play	Peak Play	Symbolic Play
Mean Play	- -	.58**	.42**
Peak Play		- -	.45**
Symbolic Play			- -

(n = 97)
*p < .05
**p < .01

attempts to verbally or physically orient toddlers' attention towards the environment (Landry & Chapieski, 1989; Tamis-LeMonda & Bornstein, 1989). It has also been measured as the frequency of 15-second intervals in which this type of attention directing occurred (Tamis-LeMonda & Bornstein, 1990).

This study measured maternal attention-directing strategies that were related to the use of toys. These strategies were defined as offering toys to the infant (Mom Offer) or taking toys from the infant (Mom Take). In addition, infant attempts to use toys to direct mother's attention were similarly measured and defined as Baby Offer and Baby Take. Previous research has indicated that mothers vary their attention-directing strategies according to infant behavior and level of development (Bornstein & Tamis-LeMonda, 1990). Therefore, it was hypothesized that measuring both maternal and infant attention directing would result in a more accurate measure of who was leading play by directing attention, mother or infant.

It has been suggested that maternal responsiveness may be an even better predictor of child outcomes than maternal attention directing (Tamis-LeMonda & Bornstein, 1990). Maternal responsiveness is a measure of who was leading the play session and how often the mother was following the infant's lead. In addition, it is possible to measure how frequently an infant responded to maternal attention-directing strategies. In fact, early mother-infant interactions have been found to be "mutually corresponding" and to exert bidirectional influences on mother and infant behavior (Bornstein & Tamis-LeMonda, 1990). In this study, both maternal and infant responsiveness were measured as the frequency of accepting and exchanging toys (Mom Accept, Baby Accept, Mom Exchange, Baby Exchange). Measuring what the mother was doing in relation to what the infant was doing provided more information about the dyad's relationship. For these reasons, it was hypothesized that measures of attention directing and responsiveness should be used for both mothers and infants, and that these measures would be associated differentially with each other and with other variables. This hypothesis was tested by correlating

toy-sharing variables, and these correlations are reported in Table 6 for mothers and Table 7 for infants.

Correlations between toy exchange variables were generally in the expected directions. Mom Offer and Mom Take, measures of maternal attention-directing attempts, were moderately positively correlated (Pearson r = .49) and shared 24% of their variance. Baby Offer and Baby Take, measures of infant attention-directing attempts, had a low positive correlation (Pearson r = .26) and shared only 7% of their variance. Perhaps infants at 11 months did not fully understand

Table 6

Correlations Between Maternal Toy Exchange Scores

	Mom Accept	Mom Offer	Mom Take	Mom Exchange
Mom Accept	- -	.02	.21	.70**
Mom Offer		- -	.49**	.13
Mom Take			- -	.05
Mom Exchange				- -

(n = 80)
*p < .05
**p < .01

Table 7

Correlations Between Infant Toy Exchange Scores

	Baby Accept	Baby Offer	Baby Take	Baby Exchange
Baby Accept	- -	.14	.49**	.55**
Baby Offer		- -	.26*	.29*
Baby Take			- -	.13
Baby Exchange				- -

(n = 80)
*p < .05
**p < .01

that taking toys directed maternal attention, and used toy offers instead. Mom Accept and Mom Exchange, measures of maternal responsiveness, were highly positively related (Pearson r = .70) and shared 49% of their variability. Baby Accept and Baby Exchange, measures of infant responsiveness, were moderately positively related (Pearson r = .55) and shared 30% of their variability. Convergent validity was established based on these results, and it was concluded that the toy-sharing variables did measure maternal and infant attention directing and responsiveness.

It should be noted, however, that 51% of the variability associated with Mom Accept and Mom Exchange was unique to each variable. Of the variability associated with Baby Accept and Baby Exchange, 70% was unique to each variable. Likewise, 76% of the variability associated with Mom Take and Mom Offer was unique to each variable, and 93% of the variability associated with Baby Take and Baby Offer was unique to each variable. This suggested that each toy exchange variable added some unique information, and should be used in further analyses.

The low correlations between measures of maternal responsiveness and measures of maternal attention directing indicated that these variables were indeed measuring separate aspects of toy-sharing behaviors. Pearson r for measures of maternal responsiveness and measures of maternal attention directing ranged from r = .02 to r = .21.

The frequency of Baby Accept was associated with Baby Offer (r = .14) and Baby Take (r = .49). Baby Exchange were also slightly associated with infant taking (r = .13) and offering (r = .29) of toys. Although these relationships between the constructs "infant attention directing" and "infant responsiveness" were not expected, it may be the case that the infants who offered and took toys were more often engaged with mothers overall, and therefore accepted and exchanged toys at a higher frequency. Overall, only 2-8% of the variability was shared across the constructs "infant responsiveness" and "infant attention directing."

Infant toy-sharing variables were also associated within the constructs "infant

responsiveness" and "infant attention directing." Infant offering was related to taking toys (r = .26) and accepting was related to exchanging toys (r = .55). Therefore, 7-30% of the variance was shared within constructs for infants. All four infant variables were more closely associated with each other than expected, but were retained for further analyses. Their associations with other variables were checked for differences related to measurement.

Frequencies and Means

Productive, Receptive, Responsive, and Total Language Scores were calculated by summing scores on individual items in the language measure. Means and standard deviations for these scores at 11 months are listed in Table 8. Means and standard deviations for these scores at 14 months are listed in Table 9.

Because the questions used to assess language at 11 and 14 months were not the same, the two sets of scores are not directly comparable. Although the Bayley manual (Bayley, 1969) did provide calculations for standardizing raw Bayley scores, these calculations were not accurate when only specific items were extracted from the measure. In addition, the total number of questions used to assess language at 14 months (18 items) was higher than the number of questions used at 11 months (15 questions). Average language scores increased by 2.64 points, which corresponded to the increase in total possible correct answers.

Distributions of language scores at 11 months (Table 8) looked fairly normal. The means plus and minus (2 x standard deviation) roughly covered the range for each variable. This indicates that the distributions might have been slightly leptokurtic. In addition, the means for Receptive, Responsive, and Total Language were higher than the midpoint of the range, indicating that these distributions may have been negatively skewed, and the items somewhat "too easy."

Distributions of language scores at 14 months were not normal (Table 9). Productive scores were positively skewed due to a low mean. Receptive, Responsive, and Total Language

Table 8

Language Scores (11 Months)

Variable	Mean	Std Dev	Range
Productive	2.04	1.18	0.00 - 4.00
Receptive	2.69	1.18	0.00 - 4.00
Responsive	4.64	1.67	1.00 - 7.00
Total Language	9.39	2.69	2.00 - 15.00

(n = 70)

Table 9

Language Scores (14 Months)

Variable	Mean	Std Dev	Range
Productive	2.14	1.40	0.00 - 6.00
Receptive	2.48	.88	1.00 - 4.00
Responsive	7.41	.93	3.00 - 8.00
Total Language	12.03	2.24	7.00 - 18.00

(n = 65)

were higher than expected and leptokurtic. Responsive Language scores in particular were affected by a ceiling effect, resulting from language tasks that most of the infants could successfully complete. Generalizability of these scores should be examined with caution; however, only 14-month Responsive Language scores deviated considerably from the normal distribution.

Frequencies and mean scores for level of play were calculated and are listed in Table 10. The distribution of Mean Play was slightly negatively skewed and leptokurtic. The distribution of Symbolic play was positively skewed, which was expected. On average, the 11-month-olds peaked out at level 5, which limited their Symbolic Play score. Those who did play at

Table 10

Level of Play Scores

Variable	Mean	Std Dev	Range
Mean Play	2.70	0.48	1.90 - 4.11
Peak Play	5.36	1.22	3.00 - 9.00
Symbolic Play	3.43	3.51	0.00 - 14.00

(n = 97)

level 6 or higher affected the distributions of Mean Play and Symbolic Play.

Toy exchange scores were calculated by summing the frequency of toy-sharing behaviors for mother and infant during the 10-minute play session. Means and standard deviations of toy-sharing scores for both mothers and infants are found in Table 11. Comparing the means to the ranges indicated that all variables were affected by outliers who had extreme scores, and all means were low for the possible ranges. Comparing across means revealed a pattern where, on average, both mothers and infants did more accepting and offering than taking or exchanging of toys. This suggests that, overall, offers were used more frequently than taking to direct the other's attention, and furthermore, accepting was used more often than exchanging toys as a way of responding to the other's offers. Thus, even when mothers accepted toys, they did not necessarily return the toys. Distributions look fairly normal except for Symbolic Play, which has a low mean for the range and is positively skewed.

Correlation Analyses

It was hypothesized that language scores (as measured by the Bayley Language Scale) and play scores (as measured by Belsky and Most's play scale) would be positively correlated at 11 months. Correlations of Total Language and language subscale scores (Productive, Receptive, and Responsive) with the three level-of-play scores are shown in Table 12. Only Responsive Language scores were moderately correlated with Mean Play and Peak Play at 11

Table 11

Toy Exchange Scores

Variable	Mean	Std Dev	Range
Mom Accept	2.51	4.00	0.00 - 23.00
Mom Offer	4.01	5.07	0.00 - 26.00
Mom Take	0.18	0.71	0.00 - 5.00
Mom Exchange	0.57	1.45	0.00 - 7.00
Baby Accept	2.73	3.30	0.00 - 13.00
Baby Offer	6.18	5.74	0.00 - 23.00
Baby Take	0.05	0.22	0.00 - 1.00
Baby Exchange	0.33	0.96	0.00 - 5.00

(n = 80)

Table 12

Correlations Between Language and Play Scores (11 Months)

	Productive	Receptive	Responsive	Total Language
Mean Play	-.02	.01	.30*	.19
Peak Play	-.14	-.10	.35**	.12
Symbolic Play	.00	-.10	-.07	-.09

(n = 70)
*p < .05
**p < .01

months (Pearson r ranging from r = .30 to r = .35). Other language variables had a small correlation with play variables (r = .00 to r = .19), and some associations were slightly negative. These associations were not expected. However, examination of previous research revealed a similar pattern of association. Tamis-LeMonda and Bornstein (1994) reported in their study that the association between symbolic play and productive vocabulary at 13 months was only r =.10.

In addition, the association between symbolic play and receptive vocabulary was r = .33. Because Responsive Language includes receptive language skills, results of this study are supported. However, squaring Pearson r reveals that only 9-12% of the variability in play was associated with Responsive Language.

The null hypothesis "language and play are not related at 11 months" was rejected. One aspect of language, Responsive Language, was related to two measures of play. Since the null hypothesis was tested with 12 correlations, alpha inflation should be considered. The number of statistically significant and moderate correlations (2) was greater than the number expected to be moderate and statistically significant (.6, or zero to one correlations) due to chance alone (5% of the correlations).

It was also hypothesized that the amount of toy sharing between mother and infant would be associated with language scores at 11 months. The associations between infant and mother toy exchanges with Total Language scores and language subscale scores (Productive, Receptive, and Responsive Language) are shown in Table 13. None of the relations between language scores and toy exchange variables were statistically significant at 11 months, and only seven variables had an association at or above r = .10. Less than 2% of the variability in language scores was associated with any toy exchange variables.

Testing the hypothesis 32 times with various measures of language and toy sharing should have resulted in 5% of the correlations (or 1.6 correlations) being moderate and statistically significant by chance alone. Since none of the correlations were either moderate or statistically significant, alpha inflation did not occur in this analysis.

The null hypothesis "language and toy sharing are not related at 11 months" was not rejected. This finding conflicts with previous studies, which found that maternal attention-directing strategies were moderately associated with language comprehension at 13 months (Tamis-LeMonda & Bornstein, 1989, 1990). Receptive and Responsive Language scores were expected to be associated with toy sharing. These results could have been affected by the low

Table 13

Correlations Between Toy Exchanges and Language (11 Months)

	Productive	Receptive	Responsive	Total Language
Mother:				
Accept	-.03	.00	.14	.07
Offer	-.01	.04	-.09	-.04
Take	-.14	-.02	.08	-.02
Exchange	.15	.06	.04	.11
Infant:				
Accept	.10	.06	-.08	.01
Offer	-.07	.06	.08	.04
Take	-.05	.08	.06	.05
Exchange	.14	.10	-.09	.05

(n = 70)
*p < .05
**p < .01

frequency of maternal takes and exchanges of toys, discussed earlier. In addition, previous studies have noted that how language and play are measured affects the nature of their relations with each other and with other variables (Tamis-LeMonda & Bornstein, 1994).

Several of the toy exchange variables were associated with level of play at 11 months. Correlations of infant and maternal toy exchanges with play scores are shown in Table 14. Frequency of maternal accepting and exchanging of toys, measures of maternal responsiveness, had low to high positive associations with play at 11 months, with Pearson r ranging from .18 to .36. Thus, 3-13% of the variability in play was associated with maternal responsiveness.

Maternal attention directing (Mom Offer and Mom Take) had low associations with play at 11 months, however. Since previous research has indicated that maternal attention directing is moderately associated with symbolic play at 13 months (Tamis-LeMonda & Bornstein, 1989,

Table 14

Correlations Between Toy Exchanges and Play (11 Months)

	Mean Play	Peak Play	Symbolic Play
Mother:			
Accept	.35**	.25*	.22
Offer	.08	-.02	.12
Take	-.04	.00	-.15
Exchange	.36**	.18	.25*
Infant:			
Accept	.23	.05	.27**
Offer	.19	.12	.01
Take	.03	-.06	.11
Exchange	.46**	.26*	.38**

(n = 80)
*p < .05
**p < .01

1990), this lack of association was contrary to what was expected.

Analysis of infant toy-exchange variables revealed some interesting patterns in relation to play at 11 months. Infant responsiveness to maternal attention directing (Baby Accept and Baby Exchange) had low to high associations with play (r ranging from r = .05 to r = .46). Five of the six associations had r = .23 or greater. In particular, infants who were capable of completing mother-initiated toy exchanges tended to have higher average levels of play (r = .46), to reach higher peak levels of play (r = .26), and to use symbolic play more frequently (r = .38). Associations between infant accepting and level of play were slightly lower. These data support the notion that infants contribute to their own development, and how they relate to their mother is associated with their level of development. All measures of infant attention directing had a very low association with play, except for Baby Offer, with r = .19.

The null hypothesis "toy sharing and play are not related at 11 months" was rejected. based on the strong associations between measures of toy sharing and measures of play. Associations seemed to be largely restricted to measures of responsiveness, however. Infant and maternal attention directing alone was not highly associated with infant symbolic play. Maternal and infant responsiveness to attention-directing strategies was associated with play, however, indicating that responsiveness and shared reference are important components of play.

Of the 24 correlations reported between play and toy sharing, 12 had values of r = .18 or higher (with 3-21% shared variance between variables), and 8 were statistically significant. Of the 24, one correlation (or 5%) would have been expected to be significant by chance alone. Therefore, alpha inflation did not appear to be a problem in measuring toy exchange variables.

The correlations between 11-month variables and 14-month language scores are listed in Table 15. Many of the associations were in the expected direction, but were limited to one or two measures of each construct. Correlations with a magnitude of .20 or higher will be discussed in this section.

Both maternal acceptance and exchanging of toys at 11 months, which were two measures of maternal responsiveness, were associated with either 14-month Productive, Receptive, or Total Language scores. Pearson r values ranged from r = .21 to r = .32, with four out of five relations reflecting moderate associations. Squaring Pearson r values indicated that 4-10% of the variability in 14-month language scores was associated with maternal responsiveness. Measures of maternal attention-directing strategies (Mom Offer and Mom Take) had extremely low associations with 14-month language scores. Thus, although the association between language and maternal toy-sharing behaviors at 11 months was minimal, a lagged association occurred between maternal responsiveness at 11 months and language scores at 14 months.

The association between infant toy-sharing behaviors and 14-month language was low for all measures of these constructs, except for frequency of Baby Accept. The association of

Table 15

Correlations Between 11-Month Variables and 14-Month Language Scores

	Productive	Receptive	Responsive	Total Language
Mother:				
Accept	.21	.30*	.16	.31*
Offer	.12	.03	-.07	.06
Take	.02	.00	-.04	.04
Exchange	.30*	.19	.13	.32**
Infant:				
Accept	.22	.12	.03	.20
Offer	.14	.15	.07	.17
Take	.02	.08	.03	.05
Exchange	.09	.05	.04	.10
Level of Play:				
Mean Play	.15	.20	.08	.20
Peak Play	.21	.26*	.10	.27*
Symbolic Play	.06	.06	.18	.14
11-Month Language:				
Productive	.17	-.10	.18	.14
Receptive	.24	-.03	-.05	.12
Responsive	.16	.14	.42**	.32**
Total Language	.28*	.02	.32**	.31**

(n = 63)
*p < .05
**p < .01

11-month infant toy acceptance with Productive Language at 14 months was r = .22, and with Total Language at 14 months was r = .20. This was an important finding, because it indicated that infant behaviors were also associated with later developmental outcomes, and thus their development was not controlled by maternal stimulation alone. These associations were still considered low, however, and reflected only 4-5% shared variance between variables.

The null hypothesis "there is no relation between 11-month toy sharing and 14-month language" was rejected, but the association was limited to mother and infant responsiveness and specific aspects of language. Using multiple measures of these constructs revealed unique associations between specific aspects of language and toy sharing.

Mean and Peak levels of play at 11 months had fairly low associations with Productive, Receptive, or Total Language scores at 14 months, with r values ranging from r = .20 to r = .27. The associations of Peak Play with Receptive and Total Language at 14 months were statistically significant. Symbolic play at 11 months had low associations with language at 14 months. This pattern has been established in previous research, which indicated that symbolic play at 13 months was associated with semantic diversity but not with productive vocabulary or mean length of utterance at 20 months (Tamis-LeMonda & Bornstein, 1994). Symbolic play was associated with specific aspects of later language, indicating that underlying cognitive abilities are not the only factors related to language development. The null hypothesis "Play at 11 months is not associated with language at 14 months" was rejected, but again only specific aspects of each construct were related.

Receptive, Responsive, and Total Language scores at 11 months had low to moderate associations with some Productive, Responsive and Total Language scores at 14 months. Pearson r values ranged from r = .24 to r = .42 for six of these relations, suggesting that 6-18% of the variability in 14-month language was associated with 11-month language. There was some stability in language across time; however, specific abilities at 11 months were not necessarily directly related to those same abilities at 14 months. For instance, Total Language

at 11 months had a low to moderate association with Productive, Receptive, and Total Language scores at 14 months (r = .28 to r = .32). Responsive Language at 11 months was moderately associated with both Responsive (r = .42) and Total Language at 14 months (r = .32). Receptive abilities at 11 months had a low association with productive abilities at 14 months, which indicated that receptive language skills may be part of the cognitive tools necessary to produce language. This has been supported in recent research (Savage-Rumbaugh et al., 1993).

These results indicated that cognitive abilities were not sufficient in explaining language development across time, since some skills were not stable across time. Other factors, such as maternal behaviors, were also related to language development. Differing patterns of stability in language across time were also reported by Tamis-LeMonda and Bornstein (1994), with some aspects of 13-month language associated with 20-month language.

Overall, 18 correlations between 11-month variables and 14-month language reached values of r = .20 or higher. Since the null hypothesis for 11-month and 14-month variables was tested with 60 correlations, 5% of these, or 3 correlations, would be expected to have a low to moderate magnitude and be statistically significant due to chance alone. In fact, 11 correlations were statistically significant, with r = .26 or greater. Therefore, multiple measures of constructs did not appear to be associated with alpha inflation in the relations between 11- and 14-month variables.

Regression Analyses

It was hypothesized that the frequency of toy exchanges at 11 months would be associated with Total Language scores at 14 months, controlling statistically for Total Language scores and Mean Play scores at 11 months. A series of regression models was used to test the increase in explained variance when toy sharing was added to models with 11-month language and play scores as predictors of 14-month language scores. Zero order correlations between

11- and 14-month variables were used to construct regression models. Models were also constructed based on contextual theory and previous research, which suggested that biological maturation (measured as language skills and symbolic play skills) as well as environmental influences (measured as maternal behaviors associated with toy sharing) would be associated with language skills at 14 months.

Differences in maternal responsiveness through toy sharing were assessed by constructing separate models, which included Mom Accept or Mom Exchange. Although zero order correlations between these measures of maternal responsiveness and other variables were of a similar magnitude, it was hypothesized that they may provide unique information to the models. Mothers who completed toy exchanges were responding to offers by accepting toys, as well as continuing the toy exchange by returning toys. These mothers set up a context then where scaffolding of language and play could have occurred. For this reason, both accepting and exchanging toys were tested in separate models to check for differences in results.

Mean Play and Peak Play were also tested in separate regression models to test for differences between these measures of play. Because average level of play was affected by ouliers and Peak Play was not, it was hypothesized that these measures may differ in the magnitude of their association with 14-month language in regression models.

Forced Order of Entry

It was hypothesized that toy sharing at 11 months would be related to language at 14 months, with the effects of language and play at 11 months partialled out. In order to test this hypothesis, the order of entry was specified and Total Language scores at 11 months were entered on step one, level of play scores on step 2, and maternal toy exchanges on step 3. This model was tested with Mom Accept and Mom Exchange, as well as Peak Play and Mean Play, based on zero order correlations with 14-month Total Language. In this model, only the effect of 11-month Total Language was statistically significant. This model was not effective in explaining the unique contributions of maternal toy exchanges and 11-month symbolic play, due to shared

variance between play and toy sharing at 11 months (zero order correlations of r = .22 to r = .36). With the effects of 11-month Total Language partialled out, neither the unique variance associated with toy sharing nor the unique variance associated with play was of a great enough magnitude to reach statistical significance.

Stepwise Regression Model 1

Two stepwise regression models, reported in Table 16, assessed the association of Total Language at 11 months, maternal toy-sharing variables (Mom Accept or Mom Exchange) and level of play variables (Peak Play or Mean Play) with 14-month Total Language.

In stepwise Model 1, Total Language at 14 months was defined as the dependent variable. Total Language at 11 months, peak level of play at 11 months, and frequency of maternal acceptance of toys were entered as independent variables (see Table 16). Total Language at 11 months was the single best predictor of Total Language at 14 months, with a zero order Pearson r = .31, p < .05. With language at 11 months entered on Step 1, R = .39, F (1, 61) = 10.72, p = .00. Nearly 15% of the variability in 14-month language scores was associated with 11-month language scores.

On Step 2, Mom Accept was added to the model. R increased to .49, F (2,60) = 9.27, p = .00. R-square increased from .15 to .24. Thus, an additional 8.66% of the variability in 14-month language scores was associated with maternal acceptance of toys, when the effects of 11-month language scores were partialled out. Peak level of play did not enter in this model, due to the effects of shared variance with Mom Accept (r = .25). Thus, when the effects of language and maternal responsiveness at 11 months were partialled out, the unique variance associated with peak level of play at 11 months and Total Language at 14 months was not statistically significant.

Stepwise Regression Model 2

In the second stepwise regression model, the associations of maternal completions of

Table 16

Summary of Stepwise Regression Analysis Examining the Predictors of 14-Month Total Language Scores

Step/variable	B	SE B	β	R
Model 1:				
Predictors:				
11-month Total Language				
Mom Accept				
Peak Play				
Step 1				
11-month Total Language	.33	.10	.39	.15**
Step 2				
11-month Total Language	.31	.10	.36	
Mom Accept	.21	.08	.30	.24***
Variables not entered:				
Peak Play				
Model 2:				
Predictors:				
11-month Total Language				
Mom Exchange				
Mean Play				
Step 1				
11-month Total Language	.33	.10	.39	.15**
Step 2				
11-month Total Language	.30	.10	.35	
Mom Exchange	.44	.19	.26	.22***
Variables not entered:				
Mean Play				

(n = 63)
**p < .01
***p < .001

toy exchanges and the average level of play with Total Language scores at 14-months were tested (see Table 16). Total Language at 11 months was the single best predictor of Total Language at 14 months, with a zero order Pearson $r = .31$, $p < .05$. With Total Language at 11 months entered on Step 1, $R = .39$, $F\ (1, 61) = 10.72$, $p = .00$. Nearly 15% of the variability in 14-month language scores was associated with 11-month language scores. Thus, there were no differences between stepwise models for Step 1.

On Step 2, frequency of maternal toy exchanges was added to the model. R increased to .47, $F\ (2,60) = 8.28$, $p = .00$. R-square increased from .15 to .22. Thus, an additional 6.69% of the variability in 14-month language scores is associated with maternal toy exchanges, when the effects of 11-month Total Language scores are partialled out. Average level of play did not enter in this model, due to shared variance with Mom Exchange ($r = .36$). Thus, when the effects of language and maternal responsiveness at 11 months were partialled out, the unique variance associated with average level of play at 11 months and Total Language at 14 months was not statistically significant.

There was not a large difference between the two stepwise regression models reported. When Mom Accept was used in the model rather than Mom Exchange, only 2% more variance was associated with Total Language scores at 14 months.

The assumptions of multiple regression were checked for these models and seemed to have been met. Histograms and plots indicated that the underlying distributions of residuals were fairly normal and that independent variables were linearly related to the dependent variable, and scatterplots appeared to have homoskedasticity. As reported earlier, however, the distributions of variables were not always normal. Some distributions displayed skewness and kurtosis. To the extent that the assumptions have been met, the results are accurate.

CHAPTER V

DISCUSSION

The purpose of this study was to assess the relations of toy sharing and level of play at 11 months with language at 11 and 14 months. Toy sharing was used as a novel measure of shared reference, attention-directing strategies, and responsiveness in mother-infant social play. In general, the results support a contextual model of development. Both maternal social interactions and underlying cognitive factors seem to be related to language competence and play at 11 months and language at 14 months. Mothers scaffold language and play by building on infant abilities displayed in a play session. Infants also contribute to development by participating in social play.

The Association of Language and Play

The associations of early language and play reported in this study suggest that the emergence of symbolic representation underlies both language and symbolic play development. Average level of play and peak level of play were related to Responsive Language scores at 11 months. However, level-of-play scores were not related to Receptive, Productive, or Total Language scores at 11 months. Language and play scores were expected to be more closely related. The lack of association could be related to several factors. At 11 months, language skills, particularly productive language, are just emerging (Bloom, 1993). Likewise, symbolic play skills are just emerging in 11-month-olds. Level five, on average, was the highest level of play displayed by infants in this study, indicating that many did not reach a level of symbolic play. Previous studies have indicated that at 13 months, symbolic play is related to receptive language, but has a very small association with productive skills (Tamis-LeMonda & Bornstein, 1989, 1990, 1994). As older infants begin to produce and combine words, their productive skills do relate to their use of symbolic play sequences (Kelly & Dale, 1989; Smith & Sachs, 1990). At 11 months, infants in this study were just beginning to produce syllables and words. In

addition, Responsive Language in this study included receptive language skills and other cognitive skills. Therefore, these results seem comparable to previous studies.

There was also a relation between play at 11 months and language at 14 months, as was expected. The highest level of play at 11 months was associated with Receptive and Total Language scores at 14 months. Productive Language had a low association with earlier levels of play, which may still be due to the fact that infants are just beginning to speak around age 12 months (Bloom, 1993). Responsive Language at 14 months had a very low association with play at 11 months. The average score for Responsive Language at 14 months was 7.41, out of a possible 8 points, which indicates that a restricted range may have affected the results. Previous research has also found that early symbolic play is only associated with specific language abilities at 20 months (Tamis-LeMonda & Bornstein, 1994).

Language scores were somewhat stable between 11 and 14 months. However, specific skills at 11 months were not necessarily associated with those same language skills at 14 months. Tamis-LeMonda and Bornstein (1994) reported a similar pattern of association in longitudinal language scores.

The data analyzed in this study indicate that the representational skills associated with pretend play may also be necessary for language development. However, these results also suggest that cognition is a necessary but not sufficient component of early language. Some level of stimulation, through play and other interactions, is necessary to develop language skills. In fact, when the effects of 11-month language and maternal interactions were partialled through regression analyses, 11-month play was not predictive of 14-month language. Clearly, physical maturation as well as the development of cognitive processes is fundamental to language proficiency (Bloom, 1993; Savage-Rumbaugh et al., 1993). These cognitive processes may even be controlled by an innate language processor (Chomsky, 1968; Slobin, 1979). But exposure to communicative social interactions is critical for language development (Savage-Rumbaugh et al., 1993). Early play, in the context of social interaction, can promote language

development by exposing infants to communication and increasing cognitive skills such as symbolic representation.

The Association of Play Interactions and Infant Development

Mother-infant toy-sharing behaviors were associated with play at 11 months and language at 14 months. These toy-sharing behaviors were specifically related to coordinating attention, directing the other's attention, and responding to play initiations. Each of these aspects of coordinated social play was related to specific measures of language and play.

Shared Reference

Shared reference to objects occurred when mothers and infants were focused on toys that were accepted or exchanged. Measures of maternal responsiveness were much more associated with play behaviors at 11 months than were measures of maternal attention directing. These same results held true for infant responsiveness. Mothers and infants who responded to offers by accepting and exchanging toys were focusing their attention on the same object as their play partner. Thus, it seems that when mothers and infants attend to toy play by accepting and exchanging toys, this interaction is associated with more advanced infant play. Previous studies have also reported that attending to and participating in children's pretend play is associated with their symbolic play competence (McLoyd, 1986; Tamis-LeMonda et al., 1992). In addition, infants themselves share responsibility for controlling the play situation in which shared reference occurs (Baldwin, 1991). By accepting and returning toys that the mother offers, infants are joining in a play context where they can observe and respond to maternal toy play.

Toy-sharing behaviors at 11 months were not related to language scores at 11 months. Maternal accepting and exchanging of toys, as well as infant accepting of toys, was related to infant language scores at 14 months. This suggests that the amount of shared reference to toys at 11 months has a delayed effect on language. Mothers and infants who attend to toys earlier on may be scaffolding symbolic representation in play, with the effects on language not emerging

until 14 months (Tamis-LeMonda & Bornstein, 1990). The interaction of exchanging toys provides an opportunity for mothers to point to, label, and describe objects, which keeps an infant focused on the objects (Baldwin & Markman, 1989). In addition, speech is concretely related to objects and actions during toy exchanges, which promotes language acquisition (Ervin-Tripp, 1991).

When mothers and infants focus on joint problem-solving tasks, such as exchanging toys, mothers can assess an infant's developmental level. They can then instruct the infant within the infant's "zone of proximal development" (Rogoff & Lave, 1984). This can occur by demonstrating symbolic toy play and by modeling and correcting language use. Infants may be learning language rules and play behaviors through observation and reinforcement during social play, such as learning theorists suggest (Bandura, 1971; Brown, 1980).

Attention-Directing Strategies

Maternal and infant attention-directing strategies did not seem to be related to language or play in this study. Previous studies have indicated that maternal attention-directing strategies, in particular, are associated with play styles and language abilities (Tamis-LeMonda et al., 1992). In the context of joint action and problem solving (learning how to coordinate social toy exchanges), infant level of play can be enhanced through guided participation (Rogoff et al., 1993). However, this is dependent upon infant participation. In this study, measuring both attention directing and responsiveness was useful in discriminating their associations with other variables. The results indicate that guiding infant attention towards toys is not as associated with developmental outcomes as the infant's ability to respond to maternal play initiations.

There was a weak (but not statistically significant) association between infant offers and 11-month average level of play, as well as between infant offers and 14-month language scores. Although the magnitude of the association was small, it does indicate that an infant's willingness and motivation to participate in social play may be related to his/her rate of development in other domains. Infant participation may also be related to other factors, such as relationship quality.

Maternal and Infant Responsiveness

Maternal responsiveness to infants during toy play seems to be related to more skilled infant play, whether mothers are responding by simply accepting toys or by accepting and returning them. Maternal responsiveness at 11 months was also associated with infant language at 14 months. In particular, mothers who completed toy exchanges tended to have infants with higher Productive and Total Language scores at 14 months. Mothers who accepted toys at 11 months tended to have infants with higher Receptive Language scores at 14 months. Thus, how mothers responded to infant-initiated toy exchanges was differentially associated with components of 14-month language. Measures of maternal-infant relationship quality, such as attachment styles, are also associated with maternal responsiveness to infant-initiated toy exchanges (Roggman et al., 1987).

There was also a low to moderate association between infant level of play and infant responsiveness to mother-initiated toy exchanges at 11 months. In addition, there was a low association between infant accepting toys and Productive and Total Language at 14 months. This indicates that mothers were directing attention towards toys, but infant responses varied. When infants responded by accepting or exchanging toys, they tended to be more developmentally advanced. Whether they responded because they were more advanced, or developed language and play skills because they were active in social play, cannot be established. This does indicate, however, that infant development is dependent on infant participation as well as maternal stimulation.

These patterns of responsiveness provide support for the notion of scaffolding infant language and play. By initiating social play and allowing the infant time to respond, the mother is providing an opportunity for the infant to learn turn-taking skills associated with communication (Bruner, 1983). The mother is probably also assessing the infant's developmental level, changing her patterns of behavior to fit the needs of her infant, and providing challenging tasks that require her assistance. This is indicated by the fact that mothers keep social play going by

returning toys, stimulating the infant to stay engaged in social exchanges. These actions are associated with instructing children within their "zone of proximal development" (Vygotsky, 1934; Wood et al., 1976). As the infant's abilities increase, mothers allow infants to take the lead in play. In fact, it is towards the end of the first year that infants begin initiating pretend play with mothers (Haight & Miller, 1993). When mothers respond to the infant's lead in social play, they are "scaffolding" or supporting infant communicative interactions. These communication skills may be generalized to other forms of communication, such as language and pretend actions.

Effectiveness of Measures

Results of this study indicate that toy sharing is an effective measure of maternal and infant interactions in play. Frequency of accepting and exchanging toys was associated, as well as frequency of taking and offering toys. This indicates that toy-sharing behaviors do reflect patterns of attention directing and responsiveness in play. Maternal-infant interactions are associated with several aspects of language development, as well as the level of infant symbolic play.

Total Language and language subscale scores measured different aspects of language. Because of this, language subscale scores were sometimes significantly related to variables even when Total Language scores were not related to those same variables. This may indicate that the subscales are a more refined measure of language, and that toy sharing and symbolic play are related more to specific aspects of language rather than to total language abilities.

The three measures of play were differentially associated with other variables and with each other. This indicates that each measure of play is providing unique information about symbolic play. In some cases, the relations between Peak Play and Mean Play were negligible. In other cases, however, the level of play generally displayed by the infant relative to his or her potential level was differentially associated with maternal interactions and infant development.

Limitations of This Study

These results do have limitations in generalization, however. The sample came from a rural, university area. The sample was not randomly drawn from the population of infants in the area, but rather was based on voluntary maternal participation, which may produce bias. The sample was, however, demographically typical for the area from which it was drawn. As reported earlier, attrition was not a threat to external validity

This design could produce several threats to internal validity. One threat to validity in this study was history. Events outside of the research setting may account for the results. An example might be the recent birth of a new child in the family, which may affect the relationship between mothers and infants between assessments at 11 and 14 months. History was not controlled for in this study.

Demand characteristics may have been a problem for the mothers in this study. For instance, they may have interacted more with their infants during the lab session, thereby increasing the amount of toy exchanges. However, they were instructed to complete a questionnaire and only play with the baby if necessary. Also, the Bayley includes questions about language that ask the mother to report the baby's receptive and productive language development, and mothers may have reported higher levels of language development than are actually true. This was not a problem with the Bayley measure, however, because it also includes direct observation items. It is also unlikely that demand characteristics would affect relations between variables. Even if demand characteristics raised the absolute frequency of mothers' behavior (e.g., reporting language abilities or initiating toy exchanges), the strength and direction of the relation between variables would remain the same. Infant behavior is not likely to be affected by demand characteristics, due to their level of cognitive ability.

Novelty effects may also be a threat to internal validity. The laboratory session was set up to be as similar to home as possible, but may have affected the outcomes. One example would be if an infant had never played with the particular toys that were available in the play

session. This would be a novel experience and may affect the results.

Implications for Future Research

Future research should replicate this study in other areas, and perhaps extend the study in a longitudinal design. Assessing the relation of toy sharing with language and play at 14 months, or perhaps even up to 18 months, will provide a clearer picture of the sociocultural influences of maternal-infant interactions. In addition, infants increasingly initiate play with mothers throughout the second year (Dunn & Wooding, 1977). Therefore, infant-initiated social play and maternal responsiveness should become increasingly important factors in infant development across the second year. Language production also increases across the second year (Bloom, 1993). Later assessments of language may more accurately reflect associations with early maternal interactions. In addition, many infants did not exhibit levels of symbolic play at 11 months. This limitation suggests a need for measuring level of play at 14 or 18 months, to assess its relation to language at 14 months or later in infancy. Greater variability of scores after the first year may reveal a more complex model of relations among language, play, and mother-infant social play.

It is likely that the effects of early cognition and maternal influences on language and play reach into early childhood. Because the research design for this study was not experimental, however, causation cannot be implied in the results. Future research should use experimental designs that examine several treatment conditions. For instance, mother-infant dyads could be assigned to three groups. In one group, mothers would be instructed to attempt to direct a play session and to ignore any infant attempts to direct attention. In the other group, mothers would be directed to avoid directing the infant, but rather respond to infant play initiations. The third group would act as a control by directing mothers to play with their infants as they normally would. This type of experiment would reveal differences in infant play behaviors associated with maternal attention directing in the play session. It would not

necessarily reveal differences associated with everyday interactions, however.

In addition, many other possible influences on infant language and play competence should also be examined. Infant characteristics, such as emotional expression, coordination of joint visual attention, and general cognitive ability may affect rates of development. Environmental factors such as financial difficulties may affect the mother-child relationship and infant exposure to play materials, thereby affecting infant social and cognitive development. Maternal behaviors, such as verbal or physical attention-directing strategies, labeling and describing objects, and verbal and tactual expression of emotions may indicate more refined guidance of infants during play sessions. Further exploration of these factors and how they interact over time is likely to suggest avenues for intervention to promote the development of the basic communication skills in infancy, language and play.

This study does have implications for intervention in infancy. Mothers should be counseled about the importance of playing with their infant and responding to infant-initiated play. They should be taught, if necessary, how to assess their infant's developmental level and how to offer challenging tasks to their infant. This would include education about basic child development, such that expectations for infants are set neither too high nor too low. Mothers should be encouraged to form a positive relationship early on with infants by responding to their needs and providing affection, since relationship quality is associated with mother-infant play behaviors. Finally, mothers should be encouraged to do other joint-tasks with their infant that focus on language use and pretense, such as reading books, singing songs, and playing games. By building on skills the infant already has and stimulating the infant with linguistically and symbolically challenging interactions, mothers can promote optimal development in infancy.

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APPENDICES

Appendix A

10-Month Bayley Language Scale

Productive language

Item #	Item Title	P	F
106	Imitates 2 words		
113	Says 2 words		
79	Vocalizes 4 different syllables (only if heard) ma,da,mu,goo,ba		
85	Uses 2 syllable repetition of same sound (ma-ma, da-da)		

Receptive Language

Item #	Item Title	P	F
117	Show shoes or toys (Where are your shoes, Shoes?)		
89	Responds to verbal request		
94	Inhibits on command, when asked to do something		
84	Listen to familiar words (baby, kitty, mama, shoe)		

Responsive Language

Item #	Item Title	P	F
99	Pushes car along (say "push it")		
90	Puts cube in box on command (1 cube in front of child, say "baby do it, baby put it in)		
100	Puts 3 cubes in at once (put block in cup, put it in. Put them all in)		
114	Puts all 9 cubes in at once		
96	Unwraps cube (wrap cube in tissue, say "Where's the block?")		
115	Closes round box (Shut the box. Put cover on, you put it on)		
104	Pats whistle doll (doll on back, hit, say "Pat the dolly")		

Total Productive_____
Total Receptive_____
Total Responsive_____
Total Language_____

Adapted from Bayley Scales of Infant Development (1969).

Appendix B

14-Month Bayley Language Scale

Productive language

Item #	Item Title	P	F
106	Imitates 2 words		
113	Says 2 words		
124	Names 1 object (what is this? Do you want it?) ball watch cup		
138	Names 2 objects		
132	Names/pts 3 objects on 2 cards (show me the) flag star basket		
130	Names 1 picture (what is this?) dog house shoe cup		

Receptive Language

Item #	Item Title	P	F
117	Show shoes or toys (Where are your shoes, Shoes?)		
89	Responds to verbal request		
94	Inhibits on command, when asked to do something		
128	Points 3 parts of doll hair mouth ears hands eyes feet nose (show me dolly's hair. Where is dolly's mouth? Put your finger on hands.)		

Responsive Language

Item #	Item Title	P	F
99	Pushes car along (say "push it")		
90	Puts cube in box on command (1 cube in front of child, say "baby do it, baby put it in)		
100	Puts 3 cubes in at once (put block in cup, put it in. Put them all in)		
114	Puts all 9 cubes in at once		
96	Unwraps cube (wrap cube in tissue, say "Where's the block?")		
115	Closes round box (Shut the box. Put cover on, you put it on)		
104	Pats whistle doll (doll on back, hit, say "Pat the dolly")		
126	Follows 2 of 3 doll directions sit drink kleenex (Put doll in chair. Dolly wants to sit. Dolly wants a drink. Wipe dolly's nose)		

Total Productive_____
Total Receptive_____
Total Responsive_____
Total Language_____

Adapted from Bayley Scales of Infant Development (1969).

Appendix C

Toy List: Free Play Session

Soft book

Ball

Blue octagon shaped toy with red/green roller

Green octagon shaped toy with red lever (looks yellow on monitor)

Red octagon shaped toy with swirls

Chain

Phone

Stacking cups

Plate

Teacup

Lid to box

Box

Wall

Appendix D

Level of Play Track Record

Level of Play **BABY ID # ______________**

Directions: Start the session when the mother opens the box. The first interval will be longer than 15 seconds because you will need the timer to end at :00, :15, :30, or :45. Therefore, you need to let it go until the end of the next 15 second interval and note the time. Every 15 seconds pause the VCR, note the time the interval ended (they should all end in either :00, :15, :30, or :45). Note the highest level of play and the toy with which it occurred. Use the toy chart to identify toys. Use the "Infant Play with Objects" to identify levels of play. When the subject is not playing, note "NP".

TIME	HIGHEST LEVEL OF PLAY	TOY
:00		
:15		
:30		
:45		
:00		
:15		
:30		
:45		
:00		
:15		
:30		
:45		
:00		
:15		
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:45		
:00		
:15		
:30		
:45		
:00		
:15		
:30		
:45		
:00		
:15		
:30		
:45		

Appendix E

Social Play Track Record

Directions: Start the session when the mother opens the box. The first interval will be longer than 15 seconds because you will need the timer to end at 00, 15, 30, or 45. Therefore, you need to let it go until the end of the next 15 second interval and note the time. Every 15 seconds pause the VCR, note the time the interval ended (they should all end in either 00, 15, 30, or 45). For both mother and baby, code each toy exchange that applies for each interval.

Baby ID	end time 1st interval	coders		comments MOM	BABY