

Marja-Leena Laakso

Prelinguistic Skills and Early  
Interactional Context as Predictors  
of Children's Language Development



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## ABSTRACT

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Prelinguistic skills and early interactional context as predictors of children's language development

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Yhteenveto: Esikielellinen kommunikaatio ja sen vuorovaikutuksellinen konteksti lapsen kielen kehityksen ennustajina

Diss.

A variety of infants' prelinguistic skills, their contribution to children's later language development and the critical features of social environment that are related to these skills were the focus of this investigation. Infants' prelinguistic behaviors and maternal interactional strategies were measured at 14 months of age. Children's language and cognitive development were studied at 14, 18, 24 and 30 months of age using both parental report forms and structured laboratory assessments. The research belongs to the Jyväskylä Longitudinal Study of Dyslexia (JLD) in which a total of 214 families from the Province of Central Finland participate. The results indicated that individual variation in prelinguistic behaviors was related to individual variation in subsequent language skills. Children who showed early interest in shared reading and had advanced skills in intentional communication and symbolic play had more developed language skills than children who were less advanced in these prelinguistic behaviors. The associations between prelinguistic behaviors and later language skills were, however, specific, so that early interest in shared reading and the level of symbolic play related more strongly to language comprehension, whereas most of the joint attentional behaviors had stronger associations to expressive language. These results suggest that in order to identify communication and language delays and deficits as early as possible, it is important to gain a comprehensive picture of the child's various prelinguistic skills. In relation to environmental influences it was found that mothers who were more skillful and sensitive in their interactions with the child had infants who were more advanced in their prelinguistic communication and whose later language skills, especially language comprehension, were more developed. Mothers' education had a positive association with their interactional strategies and contributed to their child's language. The findings on environmental influences suggest that skillful and sensitive environmental guidance supports the social-cognitive basis of language development and, hence, could also be utilized in the prevention of some language problems.

Key words: prelinguistic communication, language development, parent-child interaction, joint attention, symbolic play, shared reading, longitudinal studies

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**Jyväskylä Longitudinal  
Study of Dyslexia (JLD)**

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The moment in 1994 when professor Heikki Lyytinen asked me to join the newly founded longitudinal research endeavour "Early language development and genetic risk for dyslexia" was probably the most important single event in the process which led to the completion of my doctoral dissertation. My first steps as a researcher, however, were taken a few years earlier in the research project "Parents' interactional strategies and children's learning disabilities". I am very grateful to this project and its members Prof. Paula Lyytinen, Anna-Maija Poikkeus, Ph.D., Prof. Helena Rasku-Puttonen and Prof. Timo Ahonen for all the knowledge and experience I gained through this collaboration. It was, in deed, this project which gave me the first insights into this fascinating field of study. It taught me immensely about designing interactional tasks, constructing coding procedures, and conducting data analyses. I completed my licentiate thesis based on this data and participated in several articles published around it (Laakso, 1995; Lyytinen, Rasku-Puttonen, Poikkeus, Laakso, & Ahonen, 1994; Lyytinen, Rasku-Puttonen, Ahonen, Poikkeus, & Laakso, 1995; Rasku-Puttonen, Lyytinen, Poikkeus, Laakso, & Ahonen, 1994).

This dissertation study is a part of the Jyväskylä Longitudinal Study of Dyslexia (JLD) which belongs to the Human Development and Its Risk Factors Programme at the University of Jyväskylä. This programme was appointed the status of a centre of excellence by the Ministry of Education in 1996. The JLD-project is headed by Prof. Heikki Lyytinen, Prof. Timo Ahonen, Prof. Matti Leiwo, and Prof. Paula Lyytinen, and I'm truly grateful to all of them for giving me the opportunity to work in this innovative and ambitious research project. I also want to express my gratitude to Academy Professor Lea Pulkkinen, the director of the centre of excellence and to the Department of Psychology for providing me the facilities for the studies.

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# 1 INTRODUCTION

## 1.1 Early language development

Children acquire language in the context of their psychological development and the linguistic challenges they have to solve are always embedded in a personal and interpersonal context (Bloom, 1998). In the present work the focus is on the psychological processes of acquiring language, instead of, for instance, the philosophy of language development, or understanding of the specifically linguistic and innate principles of language acquisition.

In our western culture language is by far the most important channel for sharing the contents of our minds and for making manifest our hidden desires, beliefs, and feelings. Language development is not, however, separate or distinct from the more general processes or contexts of child development. It is dependent on the same principles that guide development in general, not only principles that are specific to learning words or building up sentences. Linguistic interpretations and expressions are closely tied to development in the areas of thinking, emotionality, and social interaction. In this chapter, the process of early language development is divided into two sections: the acquisition of first words beginning towards the end of the first year, and the combining of words into sentences taking place towards the end of the second year.

### 1.1.1 The emergence of words and acquisition of vocabulary

There is a predictable sequence in the emergence of the sounds produced by infants that precedes fluent speech. The earliest stage of prelinguistic vocal development consists of vocalizations containing vowels only. Soon the vocal

repertoire expands by the use of consonants. At about 5 to 7 months of age, infants suddenly begin to produce canonical babbling, which is characterized by consonant-vowel syllables (McCatheren, Warren, & Yoder, 1996; Nieminen, 1991). This canonical babbling is expected to reflect the development of the infant's oral-motor skills and maturing neurological functioning, and for that reason to be related to later spoken language.

Long before the production of meaningful words infants manifest clear signs of understanding language by responding to familiar words and phrases (Fenson et al., 1994). Great variability is observed in the age at which children start to recognize the words other persons say. Research findings on the timetables of early comprehension skills appear to vary depending on what methods have been used in the investigations (Tomasello & Mervis, 1994). When experimentally controlled tests are utilized the average age for early word comprehension is about 12 to 14 months (Oviatt, 1980) whereas parental reports indicate word comprehension in infants at ages around 8 to 10 months (Fenson et al., 1994; Nieminen, 1991). Using parental reports we found in our Finnish sample that 14-month-old infants understood approximately 140 words while the average language production was 12 words (Lyytinen, Poikkeus, Leiwo, Ahonen, & Lyytinen, 1996). The predictive relations to subsequent language skills have been found to be much higher for language production than for language comprehension. Measuring early language comprehension is a very difficult task, at least with children under the age of two (McCathren et al., 1996; Tomasello & Mervis, 1994). Use of experimental tasks bring with it serious interpretive problems, for example, distinguishing noncompliance from not understanding is very difficult. Parental reports, on the other hand, may be contaminated by overestimation as parents may not always accurately distinguish whether the child truly understands the word or whether he or she relies on nonverbal information indicating the word's referent.

The boundary between babbling and early words is an ambiguous one (Adamson, 1996; Nieminen, 1991). Between 10 and 13 months, most infants begin to mix conventional words within babbling. Endowing an infant's vocalization with the status of a word is a quite difficult task. Often the first "words" that children use differ from real words in that they are firmly attached to a specific context and they are typically idiosyncratic inventions and can be understood only by those close members of the child's network who have a history of sharing meanings with the infant. The two criteria most often used for crediting a child with words are aspects of phonetic shape and presumed meaning (Bloom, 1998). In the Finnish adaptation of the widely used parental report instrument MacArthur Communication Development Inventory (MCDI; Fenson et al., 1994), the instructions given to the parents specify that only words which the child produces spontaneously and uses to refer repeatedly to the same objects would be accepted. Furthermore, in cases in which the child uses idiosyncratic pronunciation of a word the parents were asked to write down the word in the form the child uses it (Lyytinen, et al., 1996). These specifications were likely to contribute to our findings showing substantially lower numbers of produced words than those reported in the MCDI norms (Bates, Dale, & Thal, 1995; Bates et al., 1994).

After producing his or her first words it may take an infant many months to acquire a vocabulary of 30 to 50 words. Towards the end of the second year most children show a vocabulary spurt, and by 18 months of age most have learned about 50 words (Bates et al., 1995; Bloom, 1998). In the Finnish sample (Lyytinen et al., 1996; Laakso, Poikkeus, Katajamäki, & Lyytinen, 1999) we found that at 18 months the average size of the infants' productive vocabulary was 48 words whereas at two years of age it was 265 words. The early vocabularies typically include names for familiar objects and people like *mama*, *dada*, *cookie*, and social-regulative words such as *no*, *more* and *bye* (Lyytinen, Lari, Lausvaara, & Poikkeus, 1994). The first words the infants learn are names for things that interest them or things about which they have strong feelings (Adamson, 1996; Bloom, 1998).

The variability in early language is wide (Bates, et al., 1995; Huttenlocher, Haight, Bryk, Selttzer, & Lyons, 1991). Infants of the same age may have productive vocabularies ranging from only one or two words to well over a hundred words (Lyytinen et al., 1996). Variability in the onset and rate of early language learning may have its origins both in endogenous and exogenous factors. Endogenous factors such as skills in analyzing the sound patterns of speech or the different strategies infants use for processing language, however, are affected by and dependent on the social context, for example the interactional patterns in the infant's early social environment (Bloom, 1998). Variation manifested by individual children in early word learning is, however, mostly within a normal range (Fenson et al., 1994; Tomasello & Mervis, 1994) and results in appropriate language use later in development.

Acquisition of an extensive vocabulary does not yet make a child a fluent speaker, because at the early stage production is limited to only one word at a time. Within communicative episodes, a single word often conveys the meaning of an entire sentence. However, if language is to keep up with development in other domains such as cognition and emotional and social understanding, children need to learn to combine words. Just as an affect expression is insufficient for conveying all the intentions and mental meanings of the 1-year-old, single-words utterances are not elaborate enough to express the representations in desires, beliefs, and feelings of the 2-year-old (Bloom, 1998).

### 1.1.2 Phrases and simple sentences

Children's use of multiword utterances marks a major movement into reciprocal use of language, and out of infancy. Children begin to relate words to other words as elements in a linguistic system. For many children, the beginning of phrases and the first simple sentences emerge soon after the vocabulary spurt. Children begin by putting together words already in their vocabulary, for example, "*no*" and "*milk*" become "*no milk*". The meaning of these early two-word sentences is determined by the meanings of the individual words, for example, the meaning of negation in the sentence like "*no milk*" comes from the meaning of *no*. Children also repeat word combinations

heard in familiar routines, such as "go byebye", although they have not learned them as combinations of two separate words (Bloom, 1998).

To advance in their language development children need to analyze words as separate units and to understand the meaning relations between them. Word order is a central feature that children have to learn in order to express different meanings. In two-word combinations, the order of the words is fixed and follows consistently the order in which children hear them in adult speech. Somewhat later children learn that different orders are expected for different functions. Construction of sentences, thus, involves both processes of analysis and synthesis (Anisfeld, 1984).

An important aspect of early language learning is the acquisition of the morphological and syntactic structures of one's native language. The exact features of grammar are language specific. The use of suffixes is an essential feature of the richly inflected Finnish language, and the rules for case and verb inflections are complicated. Research on the syntactic development of Finnish children indicates that the learning of morphological rules is most rapid between 2 and 4 years of age, and by the age of 5 children typically master most of the morphological and syntactic structures of the Finnish language (Lyytinen, 1988).

The most commonly used measures of early syntactic development are the Mean Length of Utterance (MLU; obtained from a minimum of fifty intelligible utterances from the child's spontaneous speech acts; Brown, 1973) and the Maximum Sentence Length (MSL; obtained via MCDI parental reports of the three longest sentences that the parents can recall; Fenson et al., 1994). These assess the length of speech units in morphemes and yield information on the children's developing knowledge of the grammar (i.e., the rules concerning how words are combined to form sentences and how they are inflected). In our Finnish sample, using the MSL, 2-year-old children's sentence length was approximately 5 morphemes (Laakso et al, 1999) and they used an average of 8 suffixes at that age (Lyytinen, Laakso, & Poikkeus, 1998). Analyses of the cross-age relationships between the first words and the structures of the first sentences have revealed (Bates, Bretherton, & Snyder, 1988) that the MLU, obtained at 20 months of age is related to the production scores but not to the comprehension scores of the early stages (13 months).

Several theories have been put forward to explain the developmental transition to multiword utterances and the acquisition of linguistic categories and syntactic rules. Some investigators have sought to answer this questions by looking at the early patterns of mother-infant interaction (Bates, Camaioni, & Volterra, 1975; Bruner, 1977) or at the functions that language serves in different social settings (Ninio & Snow, 1996). Another group of theories emphasizes basic cognitive abilities, such as perceiving patterns and correlations between the units of language that regularly go together (Tomasello, 1992; 1995), and yet another class of theories holds that linguistic categories themselves are innately determined and guide the acquisition of grammar from the beginning (Chomsky, 1965). The vast individual differences seen in the transition to multiword speech cast doubt on the notion that there is a general programming for making the transition to grammar. The observed differences point to the

influence of factors such as cognition and the linguistic input children receive in their social interactions (Bloom, 1998).

Production of sentences makes several demands on the young child's cognitive resources. The child needs to recall linguistic procedures and structures, to understand the separate meanings of individual words, and to learn the rules for combining words. Development in children's social cognition enables them to detect and pick up a variety of pragmatic cues from the socio-cultural context for learning these things. Social cognition operates together with the child's developing understanding of the world of objects and events and the child's affective engagement with persons and objects (Bloom, 1998). In the next chapters these socio-cognitive and interactive aspects of development are discussed in more detail.

## **1.2 Early predictors of language development**

Research findings on young infants' social and cognitive abilities and orientation towards other persons and communication (for review see Bloom, 1998) document convincingly that infants begin to work their way toward language from the day they are born. Prelinguistic communication is present right after birth and its meaning gradually wanes as children begin to use words as their primary means of communicating. Not long ago many scientifically minded people considered young infants incapable of communication since they did not use language. The accounts, for example, by Trevarthen (1977, 1979) claiming that human beings are already at birth equipped with a mechanism of personality which is sensitive to persons and expresses itself as a person were highly influential for later studies of infants' prelinguistic behaviors. Nowadays, there exists considerable evidence that development from prelinguistic to linguistic communication is a continuous process (for review see Reddy, 1999). Previous research has identified four sets of predictors of later language development. They are: 1) babbling, 2) intentional communication behaviors, 3) vocabulary comprehension, and 4) symbolic play. In the next sections, two of these early predictors of language development are analyzed in detail, development of intentional communication behaviors, and symbolic play. According to Bloom (1998), the child's engagement in affective processes and his or her understanding of the objects in joint attentional episodes guides the child in discovering word meanings.

### **1.2.1 The development of communicational gestures and joint attention**

The first months of communicational development have been called the preintentional stage. At this stage the acts of communication are still very immature. According to Trevarthen (1979), they are, however, powerful enough to take charge of the process by which the cognitive processes of the mind develop. In the first few months, the infant establishes the basis for a deep



affectional tie to his or her parents or other close companions, and the underpinnings of mutual understanding (*primary intersubjectivity*) develop. During these first months infants and their caretakers engage in interpersonal exchanges in which partners take turns as “speakers” and listeners, much like they do later in verbal communicative episodes (Bruner, 1977; Tronick, Als, & Adamson, 1979). Infants and their partners use and elaborate these early structures in order to allow new conventional forms to develop. Gestures and words settle into the established arrangement of joint interactional episodes between the infant and the parent (Adamson, 1996; Bates, Benigni, Bretherton, Camaioni, & Volterra, 1979; Reddy, 1999).

Researchers have noted that the episodes of highly intensive interpersonal engagement begin to fade away around 6 months of age. Infants who were delightfully immersed in face-to-face conversation turn their attention away from communicational partners towards the world of objects (Adamson, 1996). The advent of object interest places the infant at the entry to *referential communication*. At around 8 to 9 months of age infants begin to act in ways that clearly are intended to have an effect on the listener. This period is called the *intentional communication* stage, in the sense that some information other than the affects alone of the people involved is conveyed (Reddy, 1999). Triadic exchanges in this period involve the coordination of attention between the infant, another person, and an object (Bakeman & Adamson, 1984). Tomasello, Kruger, and Ratner (1993) have proposed that the changes in infants’ social-cognition have to do with their emerging understanding of other persons as intentional agents. Similarly to the dramatic change through which 4-year-olds come to understand others as mental agents in terms of their thoughts and beliefs, 1-year-olds come to understand others as intentional agents in terms of their concrete goals (Tomasello, 1995). Mundy and his colleagues (Mundy & Gomes, 1998; Mundy, Kasari, Sigman, & Ruskin, 1995) have convincingly shown that individual differences in the infants’ social-cognitive skills are associated with their later language development.

The infants’ attempts to get someone to do something (e.g., obtain out-of-reach objects or manipulate objects) are first signs of intentional communication acts (Mosier & Rogoff, 1994). Along with requesting acts, children around 12 months of age typically begin to use conventional gestures which are no longer attached to specific objects or contexts (i.e., waving bye-bye, pointing to objects, shaking head for “no”, nodding for “yes”). Also various other forms of social interaction are regarded as early signs of intentional communication (i.e., showing off or playing peekaboo) (Bruner, 1981; Fenson et al., 1994). The term joint attention is used to refer to behaviors that infants use to direct the adult’s attention in order to establish a shared focus on an activity, object, or person. Most commonly, definitions of joint attentional states include the infant’s spontaneous gaze alternation between the interactional partner and an object which is in mutual attentional focus (Mundy et al., 1995; Tomasello, 1995; Tomasello & Farrar, 1986).

Among the most influential investigations of prelinguistic communication are the studies conducted by Bates and her colleagues (Bates et al., 1975; Bates et al., 1979; Bates, et al., 1988). Their interest was in the development and

interrelations of gestural communication (e.g., showing, giving, requesting, pointing), language (e.g., comprehension, babbling, nonreferential and referential words), and play (symbolic and combinatorial). In the literature, these prelinguistic skills have been referred to in various terms (e.g. pretend acts, symbolic acts, functional play, conventional actions with objects, etc.). In addition to the fact that there are many terminological differences, it is not resolved whether the various preverbal skills reflect a single common cognitive process, or whether they reflect different psychological processes, and consequently have different linguistic correlates (Bates, 1979; Fenson et al., 1994; Mundy & Gomes, 1998; Tomasello, 1995).

### 1.2.2 The development of symbolic play

Children's understanding of the objects, events, and circumstances in joint attentional episodes with their parents is, according to Bloom (1998), one of the resources that guide the child in discovering the meaning of words. Studies focusing on the second year of life have found parallels in the content of representations in consciousness that are expressed both in object play and in language (Kelly & Dale, 1989; Nieminen, 1991; Ogura, 1991; Veneziano, 1981). McCune (1995), for instance, found a significant association between the onset of pretense and vocabulary development, and between combinatorial pretense and the onset of word combinations. Also, Lifter and Bloom (1989) found that at the same time as the children begin to use perceptually and culturally relevant features of objects in their play behaviors, a vocabulary spurt is observed in their language development.

Parallel trends in children's play behaviors and language are suggested to stem from a single underlying cognitive capacity. According to Piaget (1962), both language and symbolic play reflect the development of an underlying symbolic ability, and the beginning of representational thinking. Also many recent studies share this view (e.g., Bornstein & O'Reilly, 1993; Tamis-LeMonda & Bornstein, 1996). The new theories of representation (for review see Mandler, 1998) have criticized Piaget's theory, claiming that conceptual representation begins earlier and develops in parallel with the sensorimotor system. However, Mandler (1998) holds that much of the development in object behaviors is actually compatible with the notion of infancy as a purely sensorimotor stage. Although some aspects of learning might proceed faster than Piaget posited or they may require some more innate structuring to start the learning process, in general, learning to manipulate objects is a type of functioning that Piaget's sensorimotor theory describes well.

Observations of infants' object behaviors have indicated that despite the fact that already 6- to 8-month-olds have acquired a declarative representational system and conceptual knowledge on objects, the first signs of nonverbal symbolic activity are not seen in children's play until the early part of the second year of life (Bates, 1979; Belsky & Most, 1981; Belsky, Garduque, & Hrnčir, 1984; Tamis-LeMonda & Bornstein, 1996). At this early stage the symbolic schemes are still brief and vague and limited to familiar routines and

activities (e.g., eating, dressing). In addition to a well developed object concept and detailed information on object features, the manifestation of symbolic play seems to demand more elaboration in the areas of cognition, social understanding, and fine-motor skills (Casby, 1997). Sophisticated symbolic schemes also demand advanced affective and social understanding. Through knowledge on the specific roles and relationships between persons and objects, and development in internal intentional states a child can make public his or her own contents of mind, hidden beliefs, desires, and feelings (Bloom, 1998).

Many studies have provided strong evidence on the predictive relationship between the level of complexity of children's play behaviors and their later language development (Bloom, 1993; Tamis-LeMonda & Bornstein, 1993; 1994; Ungerer & Sigman, 1984). The same accomplishments that are needed in symbolic play, e.g., perceptual and memory processes, ability to sustain and regulate attention, and flexible joint attentional skills, are also essential for the acquisition of early language (Ruff, 1990; Tamis-LeMonda & Bornstein, 1990; 1996). Findings concerning the strength of the language-play relation are not, however, entirely consistent. Relations that emerge in empirical studies depend at least partly on how play is defined, in what kind of context and at what age play and language are measured, and what kind of assessment methods and scoring criteria are used (e.g., Casby, 1997; Dixon & Shore, 1991; Lyytinen, Poikkeus, & Laakso, 1997; Tamis-LeMonda & Bornstein, 1990, 1993, 1996). There is clear evidence (for review see Bornstein & Tamis-LeMonda, 1995) that children's symbolic play changes from solitary contexts to collaborative ones. Bornstein, Haynes, O'Reilly, and Painter (1996), for example, found that children's symbolic play increased from when they played alone to when they played collaboratively with their mothers. However, information on the predictive relations between children's play behaviors in these different settings and their later language skills is lacking.

Information on the child's early play skills is important not only for predicting later language, but also with respect to prelinguistic communication intervention (Yoder, Warren, & Hull, 1995). Play is the primary intervention context for young children, and children's level of play skills has been shown to predict the success of prelinguistic communication intervention and to distinguish between children who will "catch up" without intervention.

### **1.3 Parent child interaction as a context for language learning**

Language is inherently social because it has to be learned from other persons. The strong version of a social theory of language acquisition assumes that the interaction between the caregiver and the child is of primary importance with responsibility resting largely on the adult who controls the transactional system and guides the language learning. The origins of this theory lies in the work of Vygotsky (1978), but its strongest contemporary representative is Jerome Bruner (1975; 1983). More recent formulations have broadened the view of the social basis of language development by giving more consideration to the

child's contributions in early conversational interactions (Bloom, 1998, Baldwin, 1995; Harris, 1992; Tomasello, 1995). According to Bloom (1998) the motivation for learning language lies in the infant's need for sustaining and promoting intersubjectivity, and sharing beliefs, desires, and feelings with other persons.

It has been argued that most research on the effects of the social context on children's development has overlooked children's own contribution (Bloom, 1998; Schaffer, 1992). Studies which have investigated spontaneous everyday interactions between the parent and the child have revealed that both partners contribute to the structure and contents of the early dialogues, but, in fact, it is the child who is in charge, and determines joint attention more often than does the parent (Bloom, Margulis, Tinker, & Fujita, 1996; Harris, 1992; Schaffer, 1992). In this chapter two aspects of parent-child interactional context are described in more detail. Firstly, shared reading interactions are discussed as an example of the most optimal interactional context for early language learning and, secondly, the adult's contribution to joint interaction episodes is analysed.

### **1.3.1 Early shared reading experiences**

When one is interested in the influences of early parent-child interactions in relation to children's later language development, the context of early book reading interactions is of special importance. Early routinized interactions between the parent and the child form the central context for early language acquisition, and shared reading interactions are considered to represent one of the most optimal contexts (for reviews, see Bus, van Ijzendoorn, & Pellegrini, 1995; Scarborough & Dobrich, 1994).

In vocabulary learning, the primary task for the infant is to link words and sentences with the correct objects, events, or properties in the world (Bruner, 1983). At an early age this attention coordination is, however, a cognitively demanding task for the infant. The major advantage of shared reading relates to this specific point: the reference context in shared reading is more clearly defined than it is in many other joint object interactions (Ninio & Bruner, 1978), making it easier for the infant and the parent to achieve a shared attentional focus. Opportunity for language learning is shown to be most optimal when the infant and the adult share the same focus of attention, and when the adult's speech is about the shared topic of interest (e.g., Dunham, Dunham, & Curwin, 1993; Harris, 1992; Tomasello & Farrar, 1986).

The language models provided by parents in shared reading are shown to be more sophisticated, and the interactional structure more reciprocal than is typical for many other early communicative settings (Hoff-Ginsberg, 1991; Lewis & Gregory, 1987). Crain-Thoreson and Dale (1992) found that the frequency of story reading in the home and children's engagement in a story reading episode at 24 months were significant predictors of children's language ability two and a half years later. In another study, children's storybook knowledge explained unique variance in children's receptive and expressive vocabulary scores after controlling for parents' exposure to print and SES level (Senechal, LaFevre, Hudson, & Lawson, 1996). Together these results and many

others (e.g., Beals, DeTemple, & Dickinson, 1994; DeBaryshe, 1993; Griffin & Morrison, 1997; Snow, 1994) indicate that exposure to books provides a rich source of linguistic stimulation for the child which then fosters his or her language development in a unique way.

Most of the studies on the significance of early reading interactions on children's language skills have focused on the frequency of these experiences, and the potentially more crucial aspect, the quality of shared reading, has been analysed to a lesser extent. Crain-Thoreson and Dale (1992) found that active engagement of the child predicted the child's later language and literacy skills more strongly than did any of the parental book reading variables, and appeared to be the most important qualitative aspect of shared reading. Valuable information on ways to support the child's engagement in shared reading and hence influence his/her language learning has been gained via intervention studies. The study conducted by Whitehurst and his colleagues (Whitehurst, Falco, Lonigan, Fischel, DeBaryshe, Valdez-Menchaca, & Caulfield, 1988) revealed that children whose parents had received training in shared reading received higher scores on expressive language tests than children in the control group. The critical parental strategies were encouraging of the child's active participation, informative feedback, and adjustment of the reading behaviors according to the child's current linguistic performance.

Shared reading experiences, as well as other literacy activities, are considered especially important for children who are at risk for later language or reading difficulties (Scarborough, Dobrich, & Hager, 1991). Exposure to books offers a natural and pleasant way to acquaint the child with the "contracts" of literacy without intentional teaching, e.g., orienting to pages, identifying print, and learning about story structures (Snow & Ninio, 1986). This kind of knowledge is believed to support the child's later acquisition of literacy skills (see Scarborough & Dobrich, 1994). Scarborough and her colleagues (Scarborough et al., 1991) explored this specific issue, along with many other topics, when they followed the development of language and literacy skills in children with and without genetic risk for dyslexia. Their study revealed that at preschool age there were no differences in the frequency of shared reading between the two groups of families. However, it turned out that those children from dyslexic families who developed reading problems by the end of the second grade had had less frequent exposure to books than those preschoolers who became normal readers. Scarborough and her colleagues believe that this result was more due to the children's early lack of interest in shared reading and books than to their parents' behaviors. Scarborough and Dobrich (1994) argue that children who early on display an interest in literacy activities induce their parents to read to them more frequently. Probably this relationship functions also in the opposite direction: those children who show a clear dislike of shared reading and books exclude themselves from the possibility of the rich source of linguistic stimulation which is available in shared reading experiences.

An interesting and important question is what the child's early interest in shared reading and books captures; to what extent this interest is a biologically endowed trait and to what extent it reflects the child's early experiences with

books and shared reading. Crain-Thoreson and Dale (1992) have suggested that children's book engagement reflects early intellectual abilities or the extent of learning to use books as a tool for acquiring knowledge, i.e. learning how to learn. In other studies (Arnold, Lonigan, Whitehurst, & Epstein, 1994; Lyytinen, et al., 1998), some suggestive data have been provided which argues on behalf of environmental influences on children's early interest in shared reading. The processes originating in the child and in the parent are, however, functioning in a transactional manner and their separate influences may be impossible to tear apart at least in naturalistic studies.

In conclusion, studies examining the quality of children's early reading interactions with their parents are scant. The findings of Crain-Thoreson and Dale (1992) on the predictive significance of children's active book engagement were based on a sample of 25 precocious talkers. Thus, further research is needed. If, as Crain-Thoreson and Dale hypothesize it is the case that early shared reading interactions capture more effectively children's early intellectual functioning than many standardized measures with questionable ecological validity, analysis of these exchanges could have strong diagnostic value. Also the accumulating evidence (for review see Bus et al., 1995) of the benefits of early reading interactions on later language and literacy skills suggests that these exchanges could have clinical utility in interventions with children at risk for difficulties in language and literacy skills.

### **1.3.2 Adult's contribution to joint involvement episodes**

Episodes of object manipulation in which the parent and the child pay attention to, and jointly act upon some external topic or object are conducive to early prelinguistic development, and supportive of language acquisition (Dunham & Dunham, 1995; Schaffer, 1992; Tomasello, 1992). There are a number of accounts available of the typical adult behaviors in these joint interactions. One component concerns the mere presence of the adult. Children need to feel secure in order to perform satisfactorily, and in the early years the parent's physical availability is usually needed to enable that. Parents' sensitive joining in their infants' play also enhances the infants' motivation and makes the experience more interesting for the child. There is, however, evidence that mere presence of the adult is insufficient for improving the child's performance and more active involvement on the caregiver's side is needed (O'Connell & Bretherton, 1984; Slade, 1987).

Establishing a shared attentional state involves, according to Dunham and Dunham (1995), contingent parental responding to the infant's behavior and reciprocating some specified aspect of the infant's behavior. Although the onset of these interactions is typically guided by the infant, the adult's actions are important for maintaining the object-focused communication (Adamson, 1996; Bakeman & Adamson, 1984; Bruner, 1975). The most central elements of adult behaviors which have been found to contribute to children's early communicational development are responsiveness and the quality of attention-directing strategies (Akhtar, Dunham, & Dunham, 1991; Belsky, Goode, & Most,

1980; Garner & Landry, 1994). The adult can respond to the infant's object directed interest by following the infant's focus of attention, or the adult can persuade the infant to switch his or her attention to an object on which the infant is not currently focused. Parental strategy which involves attention-following during social interactions has consistently been found to be related to more advanced lexical development in infants (Akhtar et al., 1991; Dunham, et al., 1993; Landry, 1995; Rocissano & Yatchmink, 1983; Tomasello & Farrar, 1986; Tomasello & Todd, 1983). One possible mechanism underlying this association is assumed to be related to the infant's active object manipulation which happens during the attention-following episode at the same time as the label is delivered by the adult. The word learning process is believed to be facilitated when children have the opportunity to experience the same object across several sensory modalities (Dunham & Dunham, 1995).

Parental elaboration of infants' actions is another interactional strategy that has been found to contribute to infants' early social and cognitive development (Bruner, 1983; Schaffer, 1992; Tomasello, 1992; Whitehurst et al., 1988). The notion of elaboration owes its theoretical heritage to ideas presented by Vygotsky (1978), and his concept of "the zone of proximal development". In different contexts these elaborative acts have been conceptualized somewhat differently. The strategies of parental reading behaviors which are linked in higher scores on expressive language for their children include parental feedback in the form of expanding children's vocalizations. These expansions both encourage the child to participate in shared activity and also provide him or her with a more advanced language model (Arnold & Whitehurst, 1994). The concept of topic-maintaining expansions is used for a form of parental support and elaboration in which the adult both maintains a joint focus of attention with the child and "scaffolds" more advanced structures by commenting on some new aspects of the shared topic (Dunham & Dunham, 1995; Tomasello, 1992). Adult elaborations on the child's behaviors are assumed to facilitate the child's understanding of the adult partner as an intentional agent (Tomasello, 1995). Although young children's understanding of another persons' mental life is a matter of considerable debate, there exists empirical evidence for the suggestion that contingent topic expansions may facilitate emerging theory of mind at this age (Dunham, Dunham, Tran, & Akhtar, 1991).

Overall, important progress has been made in recent years in terms of identifying the optimal social structures for communicational and language development in infancy. However, in order to gain more knowledge on the emotional, motivational, and cognitive processes that presumably underlie these structures, we have, according to Bloom (1998), to make more explicit the assumption of intentionality – that language expresses and articulates the representations in consciousness. A major challenge for us as researchers of early development is appreciating the active mind of the child and acknowledging the significance and value it deserves.

## 2 AIMS OF THE EMPIRICAL STUDIES

The purpose of this dissertation was to investigate the prelinguistic period of development when infants have no or little productive language to express their intentions and feelings. The first main aim was to investigate the variety of prelinguistic skills that the infants have developed in order to communicate with other people. We hypothesized that individual variation in these prelinguistic skills would contribute to individual variation in early language abilities. We also hypothesized that the various aspects of prelinguistic skills would be related to each other based on the assumption that they all share the same underlying cognitive structure of representational skills. The aspects of prelinguistic skills investigated in the present study were intentional communication skills, symbolic play behaviors, and infants' early interest in books and shared reading.

The second major goal was to investigate the interactional context of prelinguistic development and to examine the critical features of social environment in relation to prelinguistic behaviors and language skills. Two different settings, shared reading and joint object play, were selected as contexts for early mother-child communicative interactions. As indicated in the review above joint object involvements are considered optimal structures for early language development in middle and late infancy. We hypothesized that maternal strategies that support the infants' object interactions with toys or books and maintain or elaborate on topics of shared interest would be related to children's prelinguistic skills and language development.



### 3 METHODS

#### 3.1 The selection of participant families

The present study is part of the Jyväskylä Longitudinal Study of Dyslexia (JLD, Lyytinen, Leinonen, Nikula, Aro, & Leiwo, 1995; Lyytinen, 1997). Families expecting a baby during the years 1993-1996 in the Province of Central Finland were contacted and requested to participate in the study according to institutional informed consent procedures. Altogether 214 families participate in the follow-up. 112 of the participating families have a familial background of dyslexia, and 102 families have no signs of reading difficulties. The studies in this dissertation consist of 3 different subsamples (the same participants were included in Studies II and III). The distribution of the participants in different Studies is presented in Table 3.1.

TABLE 3.1 The subsamples of the dissertation

Studies in the dissertation	N	Parental reading status	Child gender
Study I	128 mother-child dyads	39 mothers with reading difficulties 89 mothers with average reading skills	73 boys 55 girls
Study II & III	111 mother-child dyads	55 mothers with reading difficulties 56 mothers with average reading skills	66 boys 45 girls
Study IV	171 children	86 parents with reading difficulties 85 parents with average reading skills	93 boys 78 girls

### 3.2 Background information on the participating families

The participants form a representative sample of the Finnish families in many respects. The parents' educational distribution in the main study (JLD), and in all the subsamples was representative of the Finnish population. In the subsample of Study I, parental educational level differed slightly according to parental reading status ( $p < .05$ ), but in the other subsamples no significant difference was observed in parental education level between families with or without reading difficulties. The effects of parental educational level on measures used in various analyses are discussed separately in each article. The mean age of the mothers in the main study was 30 years (ranging from 18 to 42 years), and that of the fathers 32 years (ranging from 19 to 34 years) at the time of screening of the families before the children were born. The average number of children in these families was at that time 1.8 (ranging from 1 to 8). Presently the families have an average of 2.3 children, the range being the same. The selection criterion for IQ of the parents was 85 or above (assessed by the Raven B, C and D matrices; Raven, Court, & Raven, 1992).

In the main study, 54% of the children were firstborns and 46% had one or more older siblings. All the infants in the various subsamples were full-term and none of them had mental, physical or sensory handicaps. The Bayley Mental Development Index (MDI) scores, obtained at two years of age, were similar for children with or without familial background for dyslexia. The fact that there were no major differences in the background variables nor in the children's early language skills or mother-child interactional behaviors between these two groups of families, lead to our decision to pool the data across the groups with and without familial dyslexia in Studies II, III and IV. Prior literature (for review see Scarborough & Dobrich, 1994), provided a basis for assuming some differences in the early literacy activities in families with and without dyslexia (the research focus in Study I). However, in relation to early prelinguistic communication or maternal scaffolding behaviors there was no strong theoretical basis to assume differences between the infants at risk for dyslexia and the children without such a risk factor (the research focus in Study II and III). In Study IV the effects of parental reading status on infants' early play and language skills were analysed, and no significant differences were discovered.

### 3.3 Methods

The research design in all the studies was longitudinal. All studies followed and predicted children's language development and investigated its interactional context. The earliest assessment phase in the studies was 14 months of age, and the latest was 2.5 years of age. Table 3.2 summarizes the times of data collection, the measures used, and the studies in which they were utilized.

TABLE 3.3 Assessment phases and methods used in various studies of the dissertation

Assessment Phases	Methods	Studies			
		I	II	III	IV
14 months	<i>Language measures</i> MCDI <sup>1)</sup> ; Vocabulary comprehension and production	X	X	X	X
	<i>Prelinguistic communicational measures</i> MCDI; Actions and gestures sum		X		
	Joint attentional behaviors		X	X	
	Social interactional behaviors			X	
	<i>Child's book-reading interactions</i> Engagement in shared reading	X			
	<i>Play measures</i> Symbolic Play Test (SPT)			X	X
	<i>Maternal interactional behaviors</i> Maternal interactional sensitivity		X		
	Maternal attention-directing			X	
	Maternal book-reading strategies	X			
	18 months	<i>Language measures</i> MCDI <sup>1)</sup> ; Vocabulary production	X		
MCDI <sup>1)</sup> ; Maximum Sentence Length		X			
RDLS <sup>2)</sup> ; Verbal comprehension		X	X		X
RDLS <sup>2)</sup> ; Expressive language		X			
<i>Play measures</i> Symbolic Play Test (SPT)					X
24 months	<i>Language measures</i> MCDI <sup>1)</sup> ; Vocabulary production		X		X
	MCDI <sup>1)</sup> ; Maximum Sentence Length		X		X
	Bayley; Expressive language score		X		X
	<i>Cognitive development</i> Bayley; Mental Development Index (MDI)				X
30 months	<i>Language measures</i> RDLS <sup>2)</sup> ; Verbal comprehension			X	
	RDLS <sup>2)</sup> ; Expressive language			X	

Note. <sup>1)</sup>MCDI= The MacArthur Communicative Development Inventories (Fenson et al., 1994)

<sup>2)</sup>RDLS = The Reynell Developmental Language Scales (Reynell & Huntley, 1987)

The language measures used in the studies focused mostly on early lexicon, children's receptive and expressive vocabulary. These data were collected using two widely used research instruments: the MacArthur Communicative Development Inventories (MCDI; Fenson et al., 1994), which is based on parental reports, and a laboratory administered language test, the Reynell Developmental Language Scales (RDLS; Reynell & Huntley, 1987). At 18 and 24 months of age the Maximum Sentence Length was measured using a parental report (MSL; Fenson et al., 1994).

In choosing the child's prelinguistic and interaction measures earlier literature was of crucial importance. Figure 3.3 shows the concepts and operationalizations of children's prelinguistic skills used in the different studies. In Studies II and III we used slightly different terms for infants' intentional communication. In Study III a broad category of Social interactional behaviors was applied for infants' behaviors in joint mother-child play. The label "intentional communication" was not suitable in this context because we analysed not only various aspects of intentional communication but also behaviors which could not be regarded as intentional communication, in the sense that they did not involve interaction between the infant and the mother.

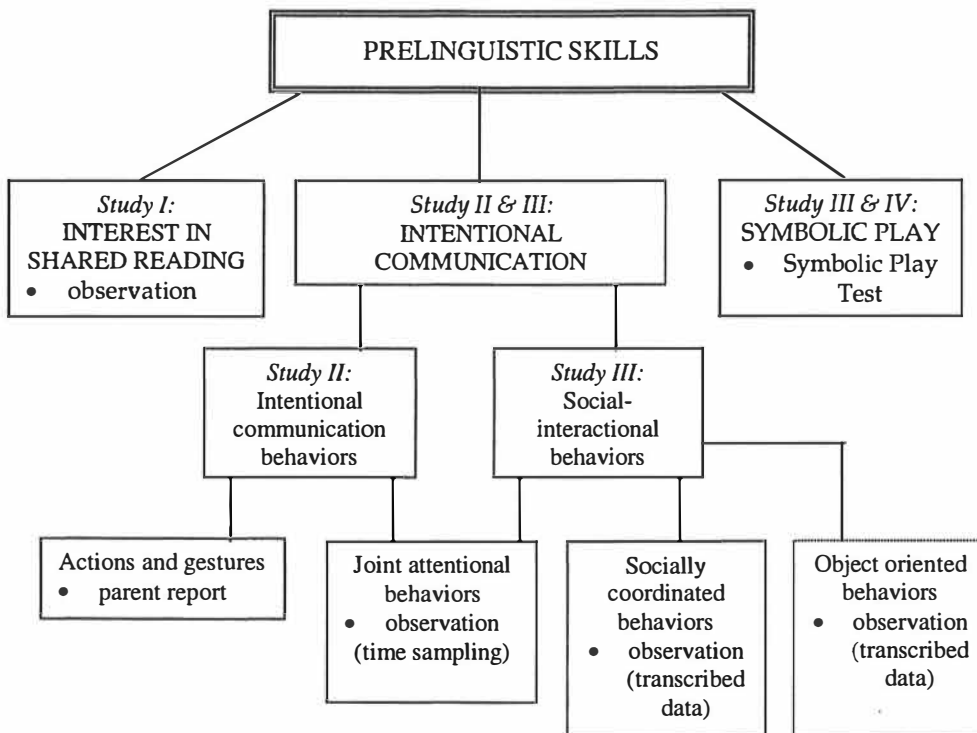


FIGURE 3.3 Terminology used in the assessment of intentional communication

The writings of Baldwin (1995) and Tomasello (1995) especially guided the planning of observational measures of the infant's early social interactional and joint attentional behaviors. Measures of the infants' early communicational actions and gestures were obtained using the MCDI parental report forms which cover also communicational skills independent of verbal expression. In relation to maternal attention directing strategies, the studies of Susan Landry and her colleagues were the most influential (Gardner & Landry, 1994; Landry, Gardner, Swank, & Baldwin, 1996; Landry, Chapieski, & Schmidt, 1986; Landry, 1995). Children's early symbolic play competence was assessed using an adaptation of the Symbolic Play Test (SPT; Lowe & Costello, 1976). The investigations of early shared reading interactions were guided mostly by findings of Scarborough and her colleagues (Scarborough, et al., 1991; Scarborough & Dobrich, 1994), and Whitehurst and his colleagues (Arnold, et al., 1994; Whitehurst et al., 1988).

## **4 THE ORIGINAL STUDIES**

I

**Shared Reading Interaction in Families with and without  
Genetic Risk for Dyslexia: Implications for Toddlers' Language  
Development**

by

Marja-Leena Laakso, Anna-Maija Poikkeus, and Paula Lyytinen  
Infant and Child Development, 00, 000-000, in press

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## II

### **Early intentional communication as a predictor of language development in young toddlers**

by

Marja-Leena Laakso, Anna-Maija Poikkeus, Johanna Katajamäki  
and Paula Lyytinen  
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## Study II

### Early intentional communication as a predictor of language development in young toddlers

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*Interrelations between various types of early intentional communication measures, and their relations to children's concurrent and subsequent language skills and maternal interactional sensitivity were studied in a sample of 111 mother-infant pairs. Intentional communication was assessed at 14 months of age using a composite of early actions and gestures derived from parental reports (MacArthur Communicative Development Inventories; MCDI), and measures of early joint attentional behaviours obtained via observations of parent-child play interaction. The sum of actions and gestures and the measures of joint attentional behaviours correlated significantly with each other suggesting that the measures obtained using different techniques and data sources partly tap the same social-cognitive skills. However, the interrelations between various types of joint attentional behaviours did not indicate a single coherent structure. Whereas the parental ratings of intentional communication significantly predicted both later language comprehension and production, the relations between observed joint attentional behaviours and language skills varied depending on the specific aspects of these behaviours that were measured. Both sets of measures of intentional communication were related to concurrent maternal interactional sensitivity, which in turn predicted children's language comprehension at 18 months of age. Overall, the present study suggested that early communicational behaviours form the basis for the development of language skills, and that the development of intentional communication is supported by a sensitive parental interactive style. Key words: intentional communication, joint attention, language skills, maternal sensitivity.*

Children's entry into verbal communication vastly expands their interaction with other people and their experiences with objects and the world around them. Studies on infants' early communication development have revealed that there is much continuity between early prelinguistic parent-infant interaction and later emerging verbal communication (Bates, Benigni, Bretherton, Camaioni, & Volterra, 1979; Mundy, Kasari, Sigman, & Ruskin, 1995; Olson, Bates, & Bayles, 1984; Tomasello, 1995). During the first months of life infants and their caretakers engage in interpersonal exchanges in which partners take turns as "speakers" and listeners much like they do later in verbal communicative episodes (Bruner, 1977; Tronick, Als, & Adamson, 1979). Infants and their partners appear to use and elaborate prior structures in order to allow new conventional forms to develop. Gestures and words settle into the established arrangement of joint interactional episodes between the infant and

the parent (Adamson, 1996; Bates et al., 1979). In the early stage the new emerging symbolic structures serve the old communicative functions, but rapidly they expand and create new possibilities to convey messages and share information and feelings between people.

The empirical evidence on infants' early social-cognitive behaviours have convinced researchers (Adamson, 1996; Tomasello, 1995) that around their first birthday infants undergo a revolution in their understanding of other people and how they work. This new understanding has been called "secondary intersubjectivity" referring to the infant's ability to recognize the mutuality inherent in joint attention on objects external to the interactional participants (Baldwin, 1995; Trevarthen, 1977). Tomasello, Kruger, and Ratner (1993) have presented evidence that infants' early joint attentional skills have to do with their emerging understanding of other persons as intentional agents. In parent-infant communications involving external objects, the infant's growing understanding of the world of objects and the uses of things become apparent. The appropriate use of objects signals also relevant advances in representational competence (Fenson et al., 1994). Infants no longer just act on objects instead they develop gestures about them (Adamson, 1996). Around the first birthday infants start to use conventional gestures and ritualized vocalizations which are no longer attached to specific objects or context (Bates, 1979; McCathren, Warren, & Yoder, 1996). These social behaviours are salient indicators of intentional communication prior to the onset of expressive language.

Numerous factors are predictive of overall language development (e.g. neurological, social-environmental). A small group of predictors comes from the development of prelinguistic communication (McCathren et al., 1996). Early communicational skills are considered to reflect the infant's level of social cognition, i.e. abilities for representational thought, understanding of means-ends relations (Bates et al., 1979), and integration of cognitive processes with interpersonal aspects (Bruner, 1977; Mundy, Kasari, & Sigman, 1992; Tomasello, 1995). The study of prerequisites to language and relations between language and cognition has originated from the theoretical works of Piaget (1962) and Werner and Kaplan (1963) over three decades ago. In the 1970s, after many years of silence, empirical studies (Bates, Camaioni, & Volterra, 1975; Bloom, 1973; Bruner, 1975; Schaffer, 1977) began to emerge which all shared the same key element: the view of the child as an active creator of his/her language. In this new theorizing the roots of language were, however, considered to derive from the social interaction of the first two years of life. These studies strengthened the view that social-cognitive processes inherent in prelinguistic communication provide a foundation that supports or facilitates subsequent language development (Bates et al., 1979).

Among the most influential investigations of prelinguistic communication are the studies conducted by Bates and her colleagues (Bates et al., 1975; Bates et al., 1979; Bates, Bretherton, & Snyder, 1988). Their interest was in the development and interrelations of gestural communication (e.g., showing, giving, requesting, pointing), language (e.g., comprehension, babbling, nonreferential and referential words) and play (symbolic and combinatorial). These studies laid the basis for a parent checklist format: The MacArthur

Communicative Development Inventories, MCDI (Fenson et al., 1994), which is nowadays a widely used research instrument and covers early vocabulary and grammar as well as the communicational and representational skills independent of verbal expression. In other studies these prelinguistic skills have been referred to in various terms (e.g. pretend acts, symbolic acts, functional play, conventional actions with objects, etc.). Despite these terminological differences the current theory on early intentional communication has emphasized that the development of various nonverbal communicational behaviours may reflect a single common cognitive process (Bates, 1979; Fenson et al., 1994; Tomasello, 1995). Recently, however, it has been claimed that various aspects of early communicational behaviours may reflect the development of different psychological processes, and consequently also have different linguistic correlates (Mundy & Gomes, 1998).

Mundy and his colleagues (e.g., Mundy et al, 1995; Mundy & Gomes, 1998) have studied infants' nonverbal communication using the Early Social-Communication Scales (ESCS; Selbert, Hogan, & Mundy, 1982). This scale yields six mutually exclusive categories: initiating and responding to social interaction, initiating and responding to joint attention, and initiating and responding to behaviour regulation. The recent findings (Mundy & Gomes, 1998) indicated that after considering initial covariance in language and cognitive status, different aspects of early joint attentional behaviours related to different aspects of early language: responding to joint attention had strong predictive associations with receptive language whereas joint attentional initiations predicted expressive language. Although the sample size in this study was quite small (N=24), these data provide support for the hypothesis that aspects of nonverbal communication uniquely contribute to subsequent language development.

Studies which contain joint attentional abilities in their conceptual framework provide strong evidence on the importance of these skills in early language learning (Adamson & Bakeman, 1991; Bruner, 1983; Dunham & Dunham, 1992; Smith, Adamson, & Bakeman, 1988). Most commonly, joint attentional states are defined in a way which includes the infant's spontaneous gaze alternation between the interactional partner and the shared object (Mundy et al., 1995; Tomasello, 1995; Tomasello & Farrar, 1986). Not all instances of eye-contact during joint object play are regarded as signs of intersubjective understanding. Of crucial importance are the quality and timing of the eye-contacts and other social behaviours, the affect they express, and their coordination into ongoing interaction. The infants' cooperative behaviours, their social initiatives relating to objects, and imitations of object actions are also regarded to reflect new understanding of other persons and communication (Baldwin, 1995; Tomasello, 1995).

Adults play an important role in the development of infants' early communicational skills (e.g., Adamson, 1996; Bruner, 1975; 1983; Dunham & Dunham, 1990; Schaffer, 1984, Tomasello & Farrar, 1986). Parents commonly take the responsibility for creating the state of joint engagement at the age when infants are not yet capable of doing it on their own (Adamson, 1996; Schaffer, 1984). Parental structuring of these early object-engagements has been shown to

raise the infant's concurrent level of object manipulation (Bornstein, 1995; Fiese, 1990), and communication (e.g., Stevens, Blake, Vitale, & MacDonald, 1998). Sensitive parental activity includes, for example, maintaining the infant's attention and motivation, simplifying the task, demonstrating and marking the critical features (e.g., Stevens, et al., 1998), and matching the intensity and temporal patterning of the parent's behaviours according to the infant's emotional states (Dunham & Dunham, 1995). Maternal sensitivity in joint object interactions has been shown to explain variance in early language development (Dunham & Dunham, 1992; Smith, et al., 1988; Tomasello & Farrar, 1986; Tomasello & Todd, 1983). Stevens and her colleagues (Stevens et al., 1998), for instance, showed that mothers who to a higher extent scaffolded their child's object interactions by maintaining attention and motivation had infants with a greater number of early words. These kind of parental behaviours are believed to make a long-term contribution to children's language development (Saxon, 1997; Smith, et al., 1988)

Although infants' joint attentional abilities and communicational actions and gestures have been eagerly investigated, surprisingly few studies exist focusing on their interrelations and their associations to subsequent language development in normally developing infants. Our research questions were centered along the lines of the following three main assumptions. First, based on the current conceptualization suggesting a common underlying process in nonverbal communication, we expected a positive relationship among different measures of infants' early intentional communication at 14 months of age (gestures and actions measured by the MCDI parental report forms, and joint attentional skills observed in mother-child play interaction). Secondly, we expected that these measures of early intentional communication predict children's subsequent language development at 18 and at 24 months of age. And thirdly, we assumed that maternal interactional sensitivity at 14 months of age has positive links both with children's prelinguistic communication and early language.

## Method

### Participants

The participants were 111 mother-child pairs. Children (66 boys, 45 girls) were all full-term and none of them had mental, physical or sensory handicaps. The mean age of mothers was 31 years ( $SD= 4.3$ ; range 19 – 41). Mother-child play interactions were studied when the child was 14 months of age (+/- one week). Measures of the child's early gestures and actions were obtained using parental reporting at this same age. Information on the child's language development was gathered at the ages of 14, 18 and 24 months. The children and their families came from the city of Jyväskylä and its surrounding communities in the Province of Central Finland, and all parents spoke Finnish as their native language. The parents' educational distribution was representative of the

Finnish population. Education was classified into four categories which were based on both basic level education and advanced educational training. Of the parents 6.3 % had less than vocational school level professional training, 28.7% had 2 years vocational school level training, 31.5% had completed training in at least three-year vocational institutes or colleges, and 33.4% had a higher degree from a college or university. This sample is part of a larger study on early language development and precursors to reading skills (see Lyytinen, 1997; Lyytinen, Leinonen, Nikula, Aro, & Leiwo, 1995; Lyytinen, 1997). Altogether 214 families with varying parental reading skills participated in the follow-up, and the present subsample consisted of those children who had turned 2 years at the onset of analyses and whose mothers represented different levels of reading skills from average to poor readers. Levels of maternal reading skills or parental education did not have an effect on any of the measures used in the present analyses.

## Procedure

*Intentional communication: Actions and Gestures.* An index of early communicative gestures and actions was derived from the MacArthur Communicative Development Inventory, MCDI, which covers the ages from 8 to 16 months. The Finnish adaptation (Lyytinen, Poikkeus, & Laakso, 1997) of this parental report scale includes the comprehension and production of first words. The Actions and Gestures section includes altogether six subscales, but one of them, Pretend Objects, was excluded from the analyses based on findings from previous studies indicating that this subscale shows little variation and does not, therefore, function adequately psychometrically (Fenson et al., 1994). The five subscales were:

- A. First communicative gestures (e.g., shakes head "no", waves bye-bye)
- B. Games and routines (e.g., plays peekaboo, plays chasing games)
- C. Actions with objects (e.g., combs or brushes own hair, drinks from a cup)
- D. Pretending to be a parent (e.g., puts to bed, feeds with spoon)
- E. Imitating adult actions (e.g., pounds with hammer, "reads", waters plants)

The skills measured by these five subscales are theoretically closely related to each other (Fenson et al., 1994), and the items represent behaviours that appear to predict early language development (Bates et al., 1979). The Cronbach Alpha reliability of the Actions and Gestures scale was .78.

*Intentional Communication: Joint Attentional Behaviours.* Free play between the mother and the child was videotaped in the laboratory for 10 minutes. Videotaping took place through a one-way mirror using a standard VHS-camera that was monitored by the experimenter in the adjoining room. A high quality external microphone was placed centrally in the testing room, and the child and the parent could freely move about in the room while playing with

the toys. An amiga system was used to include running time (at 0.1 sec) in the video recordings.

Mothers were asked to participate in their children's play behaviours in the way they typically do at home. The play material consisted of toys familiar to children of this age (e.g., ball, telephone, doll, truck, blocks and a nesting tower of cups). Frequencies of the child's joint attentional behaviours were coded from videotapes using a 15 second time-sampling procedure. The child's behaviour was observed over four time samples per minute (giving 40 time samples per subject for the 10 minute period). For every 15 second period in which the child exhibited the criterion behaviour at least once he or she received one tally mark. Thus, the score for each of the coded five behaviour categories could range from 0 to 40.

The following categories were used to code the child's behaviors:

1. Using coordinative actions (e.g., accepting objects from the mother, complying with the mother's object-related requests, prolonged and active looking at the mother's object-related actions)
2. Alternating gaze between the mother and an external object (while playing with a toy him- or herself or while the mother manipulates the toy, the child looks into the mother's eyes, and again looks back at the toy)
3. Following or directing the mother's gaze (following the mother's gaze: the mother looks at a toy and the child looks first at the mother and then directs his or her gaze towards the same toy as the mother; Directing or attempting to direct the mother's gaze: the child looks at a toy and vocalizes or points towards the toy and then looks at the mother with the result that mother directs her gaze towards the same toy or the child demonstrates this type of communicational intent, although the mother does not respond by switching her gaze toward the object of the child's focus)
4. Imitating the mother's object-related actions or verbalizations (e.g., the mother demonstrates a new activity such as putting a spoon in a cup and stirring with the spoon, and shortly after observing this the child stirs with the spoon in a similar fashion; the mother moves a toy truck back and forth and at the same time vocalizes "broom, broom" while the child is paying attention, and shortly after this the child vocalizes in a similar fashion)
5. Making social initiatives (e.g., giving objects to the mother; pointing to objects while vocalizing communicatively at the same time)

Two coders participated in the coding of joint attentional behaviours. One of the coders was the first author and the other one was a female graduate student of Psychology. A training period took place prior to the coding of this sample to ensure agreement and mutual understanding of the categories and specific criteria. Interobserver reliability was assessed by having these two coders independently code the same randomly selected cases which represented 20% of the sample of 111 mother-child dyads. The mean correlation between the ratings of the coders was .85. Correlations ranged from .74 (imitating mother's behaviour) to .95 (coordination in interaction).

*Maternal Interactional Sensitivity.* A total number of 11 variables was used to assess different aspects of maternal interactional sensitivity (e.g., attention

directing and maintenance, versatility of motivational strategies, emotional availability, cognitive guidance). Based on watching the whole 10 minute session the coder rated separately the mother's behaviour on each of these variables using either a 5 or 3 point Likert-scale. A composite score reflecting the overall maternal sensitivity was computed from these variables. In order to give equal weight to the ratings they were standardized before computing the sum score. The Cronbach Alpha reliability for this composite was .90. The sum score was based on the following variables (for detailed descriptions see Appendix): 1) Initiatives to motivate the child's play, 2) Providing reinforcement, 3) Drawing into joint activity, 4) Versatility of motivational strategies, 5) Emotional availability, 6) Emotional attunement, 7) Affective encouragement, 8) Enjoyment of joint interaction, 9) Allowing the child's independent activity, 10) Sensitivity in guidance of the child's activity, 11) Extending of the child's activity.

The same two coders who coded the child's behaviours also rated these maternal data. The mean interobserver correlation was .81 ranging from .79 (drawing into joint activity) to .87 (enjoyment of joint interaction).

*Child Language.* The child's language development was assessed at 14, 18 and 24 months of age.

1. *Comprehension and production at 14 months of age.* The scores derived from the vocabulary section of the younger children's form of the MacArthur Communicative Development Inventory (MCDI ; Dale, 1996; Fenson et al., 1994) were used as the measure of the child's vocabulary comprehension and production at 14 months. The comprehension and production scores are based on parents' observations of their child's behaviours on a day to day basis in the child's natural contexts.
2. *Comprehension at 18 months of age.* The Reynell Developmental Language Scales (RDLS; Reynell & Huntley, 1987) were administered in the laboratory setting by a familiar experimenter when children were 18 months of age. This test provides separate measures of verbal comprehension and expressive language, but only the index of verbal comprehension was used in this study. The index of verbal comprehension is based on the child's performance on 67 items. The 18-month-old children in our sample typically passed 15 items. The first item sets that most children mastered include recognition of familiar words and phrases, relating words to familiar household objects or miniature toys, and relating objects with each other according to instructions. The MCDI parental report form for older children (16-30 months) does not include a scale for vocabulary comprehension, and the choice of the RDLS was, thus, well founded and provided a reliable and a widely used measure of comprehension at this age.
3. *Expressive language at 24 months of age.* The sum score of expressive language was based on three sources of data: Vocabulary production and maximum sentence length reported by the parent, and Bayley expressive score obtained in the administration of the Bayley Scales of Infant Development (Bayley, 1993). Vocabulary production score and maximum sentence length (MSL) were both obtained from the MCDI parental report forms (Fenson et al., 1994). Scoring of the MSL follows the procedure used in scoring the MLU (mean length of utterance; Brown, 1973, Miller, 1981). MSL, however, differs from MLU by being based on the three longest sentences that the parent can recall. Bayley expressive score was based on the sum of correctly named targets on two expressive language items (Naming Pictures and

Naming Objects). This expressive language index has earlier been used by Siegel, Cooper, Fitzhardinge, and Ash (1995).

The range of the MCDI vocabulary production was considerably wider than that of the Bayley expressive score, and the mean sentence length (see Table 2). In order to give equal weight to each of the three scores, they were standardized before computing the sum score of expressive language. The Cronbach Alpha reliability for this sum score was .87. The sum score was slightly skewed on the right, and, therefore, natural logarithmic transformation was applied prior to the analyses.

## Results

### Descriptive Statistics

*Actions and Gestures:* In the categories of games and routines, and actions with objects the means approached the maximum score in their representative scales. For games and routines and communicative gestures a third of the infants received the maximum score. For actions with objects half of the infants received the score 13 or higher (maximum was 16). However, symbolic gestures were rarely reported by parents at this age; a third of the 14-month-olds had only one or no symbolic gestures in their behavioural repertory. Means and standard deviations for early actions and gestures are presented in Table 1.

*Joint Attentional Behaviours.* Our results revealed that at 14 months of age using coordinative actions was the most frequently observed category of joint attentional behaviours (see Table 1). Alternating gaze between the mother and the external object and object-related initiatives towards the mother were also common. Imitating mothers' object-related behaviours and following or directing mothers' gaze were still quite rare.

TABLE 1 Means and standard deviations for the intentional communication measures at 14 months of age

Measure	Mean	(SD)	Range
<i>Actions and gestures</i>			
Communicative gestures	13.39	3.36	3-20
Games and routines	3.79	1.08	1-5
Actions with objects	11.97	2.61	3-16
Symbolic gestures	3.79	3.50	0-13
Imitating adult actions	6.64	2.41	1-11
<i>Joint attentional behaviors</i>			
Coordinative actions	21.44	6.33	5-35
Alternating gaze	14.77	6.61	3-33
Following gaze	1.95	2.10	0-8
Imitating	2.20	1.49	0-5
Making initiatives	11.16	6.37	1-30



*Maternal Interactional Sensitivity.* The total score in maternal interactional sensitivity ranged from 17 to 47 (Mean = 35,  $SD = 7.43$ ). This score did not correlate with the mothers' age, nor with maternal education. Maternal interactional sensitivity towards boys or girls did not differ although the mean score was somewhat higher for the girls than for the boys (Mean for girls = 36.78, Mean for boys = 34.47).

*Child's Language Skills.* Children's vocabulary comprehension at 14 months of age clearly exceeded vocabulary production. Between 14 and 24 months a substantial increase was observed in children's productive vocabularies (from 15 to 265 words). Language comprehension across age correlated significantly ( $r = .38$ ;  $p < .001$ ), but the comparison of absolute values is difficult because the data were derived from different sources (parental reports at 14 months vs. standardized test situation at 18 months). The means and standard deviations for all these language measures are shown in Table 2.

TABLE 2 Means and standard deviations for the language measures

Measure	Mean	SD	Range
<i>14 Months</i>			
MCDI: Vocabulary comprehension	156.79	83.89	13-369
MCDI: Vocabulary production	14.64	20.33	0-135
<i>18 Months</i>			
RDLs: Verbal comprehension	15.18	5.67	4-33
<i>24 Months</i>			
MCDI: Vocabulary production	265.11	160.52	0-595
MCDI: Mean sentence length	5.14	2.72	0-15
BSID: Expressive language	8.86	4.94	0-15

#### **Associations between different aspects of children's intentional communication, maternal interactional sensitivity, and child's language at 14 months of age**

Pearson correlations (except for following mother's gaze and vocabulary production which were not normally distributed and required the use of Spearman correlations) showed that five out of ten possible correlations between the various joint attentional behaviours were significant (see Table 3). The association was strongest between alternating gaze and interactional initiatives ( $r(111) = .68$ ,  $p < .001$ ), while, for example, alternating gaze and imitating mother's behaviours did not correlate with each other. The relations between the actions and gestures sum and the different aspects of joint attentional behaviours were, however, mostly significant. Only interactional initiatives did not correlate with early gestures and actions. The infant's ability to follow or direct mother's gaze was the category of joint attentional abilities which was most strongly related to the actions and gestures sum.

The correlation between the actions and gestures sum and infant's concurrent language comprehension was strong and although the correlation coefficient was considerably lower with language production this relation was also statistically significant. Of joint attentional measures only coordinative actions had significant correlations to language comprehension at 14 months ( $p < .05$ ). However, three joint attentional measures produced significant correlations with concurrent language production: gaze alternation ( $p < .01$ ), imitating the mother's behaviour ( $p < .01$ ), and interactional initiatives ( $p < .01$ ).

Maternal interactional sensitivity correlated very significantly ( $p < .001$ ) with concurrent language comprehension, but not with language production. The correlation of maternal interactional sensitivity was also significant with the actions and gestures sum and two aspects of joint attentional behaviours (e.g., coordination in interaction and imitating maternal behaviour).

TABLE 3 Within age correlations<sup>a)</sup> between child measures and maternal measures at 14 months of age

Measures	2	3	4	5	6	7	8	9
<i>Language skills</i>								
1. MCDI: Vocabulary comprehension	.36***	.72***	.20*	.06	.05	.17	.08	.32***
2. MCDI: Vocabulary production		.41***	.14	.29**	.18	.34***	.27**	.18
<i>Intentional communication</i>								
3. MCDI: Actions and gestures sum			.21*	.21*	.26**	.21*	.18	.23*
4. Coordinative actions				.12	.21	.22*	.15	.26**
5. Gaze alternation					.40***	-.06	.68***	.01
6. Following or directing mother's gaze						-.10	.42***	.04
7. Imitating mother's behavior							.09	.29**
8. Interactional initiatives								.09
<i>Maternal interaction</i>								
9. Interactional sensitivity								

Note. <sup>a)</sup> Pearson correlations, except for associations involving variables 2 and 6 which were examined using Spearman correlations \*  $p < .05$ , \*\*  $p < .01$ , \*\*\*  $p < .001$

### Intentional communication, maternal interactional sensitivity and children's subsequent language comprehension

In order to investigate the extent to which the infants' various intentional communication skills and maternal interactional sensitivity were associated with children's subsequent language hierarchical regression analyses were

carried out. First, hierarchical regression analyses were performed with children's verbal comprehension at 18 months of age as dependent variable. The independent variables were entered into the equations in three steps: 1) Actions and gestures sum; 2) Maternal interactional sensitivity; and 3) Joint attentional behaviours: Coordinative actions, gaze alternation, following or directing mother's gaze, imitation and initiatives. These independent variables were selected on the basis of the concurrent associations detected between these measures of intentional communication and interactional variables and child's language skills.

The results of the first regression analysis (see Table 4) showed that the early communicational gestures contributed significantly to the prediction of verbal comprehension at 18 months of age: the more the parents reported their infants used actions and gestures at 14 months, the higher the level of their child's verbal comprehension was four months later. Maternal interactional sensitivity entered at Step 2, added to the prediction of verbal comprehension. The more sensitive and guiding the mother was during joint play interaction at 14 months of age, the more developed her child's verbal comprehension was at 18 months of age. None of the joint attentional variables added to this prediction. However, Pearson-correlation analyses carried out separately showed that coordinative actions were associated with verbal comprehension at 18 months ( $r = .26, p < .01$ ).

TABLE 4 Results of the hierarchical regression analyses predicting language Comprehension at 18 months of age

Step predictor at 14 months	$\Delta R^2$	Beta <sup>a)</sup>	r
1. Actions and gestures	.12***	0.34***	0.34***
2. Maternal interactional sensitivity	.07**	0.26**	0.32***
3. Joint attentional behaviors	.03		
Coordinative actions		0.16	0.30**
Gaze alternation		-0.11	-0.04
Following or directing gaze		-0.02	0.04
Imitating mother's behavior		-0.04	0.13
Interactional initiatives		-0.00	0.00
Total R <sup>2</sup>	.22** [F(7,102)=3.69, p<.01]		

Note. <sup>a)</sup>Standardized beta at each step. \*p<.05; \*\*p<.01; \*\*\*p<.001.  
 $\Delta$ = increase

### **Intentional communication, maternal interactional sensitivity and children's subsequent language production at 24 months of age**

Next, hierarchical regression analyses were performed with children's expressive language skills at 24 months of age as dependent variable. The same independent variables were entered in equation as was the case with language comprehension. However, we moved the maternal interactional sensitivity

from Step 2 to Step 3 when analysing relations to language production instead of comprehension, because based on previous studies we expected that maternal interactional sensitivity would play a less important role in language production. The independent variables were : 1) Actions and gestures; 2) Joint attentional behaviours: Coordinative actions, gaze alternation, following or directing the mother's gaze, imitation and initiatives; and 3) Maternal interactional sensitivity. The results of this regression analyses (see Table 5) revealed that the sum of actions and gestures contributed significantly to the prediction of expressive language at 24 months of age: the more the child was reported to use communicational actions and gestures at 14 months of age, the higher was his/her expressive language at 24 months of age. The joint attentional variables, entered at Step 2, added significantly to the prediction of expressive language. Two of the joint attentional variables made a unique contribution and showed a significant correlation with the child's expressive language: imitating maternal behaviour and following the mother's gaze. The more the child imitated maternal object related behaviours and followed or directed the mother's gaze at 14 months of age, the more advanced was the child's expressive language 10 months later. Maternal interactional sensitivity did not add a unique contribution to the prediction of the child's expressive language.

TABLE 5 Results of the hierarchical regression analyses predicting language Production at 24 months

Step predictor at 14 months	$\Delta R^2$	Beta <sup>a)</sup>	r
1. Actions and gestures	.10***	0.32***	0.32***
2. Joint attentional behaviors	.10**		
Coordinative actions		0.03	0.20*
Gaze alternation		-0.10	0.15
Following or directing gaze		0.22	0.23*
Imitating mother's behavior		0.25	0.27**
Interactional initiatives		0.10	0.17
3. Maternal interactional sensitivity		0.06	0.16
Total R <sup>2</sup>	.20** F(7,102)=3.61, p < .01		

Note. <sup>a)</sup>Standardized beta at each step. \*p<.05; \*\*p<.01; \*\*\*p<.001.  
 $\Delta$ = increase

## Discussion

The age around infants' first birthday represents a critical period in the development of communicative intentions and conventional signals. Intentional communication is viewed as a process which precedes, correlates with, and possibly also contributes to the emergence of verbal communication (Bates, 1979). Within normal populations there is a great deal of variation in children's

nonverbal communication skills (Mundy & Gomes, 1998) and verbal skills, for example, in vocabulary size (Bates, Dale, & Thal, 1995; Huttenlocher, Haight, Bryk, Seltzer, & Lyons, 1991). There is also some indication, especially for special populations (Mundy et al., 1995; Mundy, Sigman, & Kasari, 1990; Mundy, Sigman, Kasari, & Yirmiya, 1988; Ulvund & Smith, 1996), that early communicational competence is consistently related to later language development. This study both addressed the questions of interrelations between various aspects of early communicational competencies at 14 months of age, and analyzed the continuities between early intentional communication and later language development in a large sample of children whose development is proceeding normally.

Children's early intentional communication can be investigated and categorized using various approaches and methods of assessment. Mundy and Gomes (1998) have argued that multiple measures would be useful in the study of early communicational development in order to better understand the psychological processes behind these skills. In their recent study (Mundy & Gomes, 1998), they found that the measures of initiating joint attention and responding to joint attention did not correlate with each other, whereas initiating behavioural regulation correlated positively with both of these measures. Based on these results, Mundy and Gomes concluded that their data were not completely consistent with models emphasizing the commonality of cognitive processes behind the measures of nonverbal communication. The present study found some support for this view as the correlative analyses indicated strong associations between some joint attentional behaviours (e.g., gaze alternation and interactional initiatives), while some other aspects had no significant interrelations (e.g., following or directing the mother's gaze and imitating the mother's behaviour). On the other hand, we found that the parental report of the child's actions and gestures correlated significantly with most aspects of joint attentional behaviours, except for interactional initiatives. These associations indicate that different measurement techniques partly tap the same social-cognitive skills present in early intentional communication.

Our next task was to investigate how the different measures of early intentional communication relate to children's concurrent and subsequent language development. Our results showed that the sum of actions and gestures correlated significantly with both concurrent language comprehension and production, and was a strong predictor of language comprehension at 18 months and expressive language at 24 months. A very high concurrent association with language comprehension indicates that the parental reports, which measure the child's use and understanding of nonverbal communicative gestures and appropriate actions with objects, probably reflect the same underlying skills as the index of early vocabulary comprehension. It could be speculated that the associations between the actions and gestures sum and the language measures that were based on parental reports are influenced by the fact that parents were the only source of data in these measures. The finding that the sum of actions and gestures was a strong predictor of the tester-administered Reynell 18-month verbal comprehension, however, points to the reliability of parents as reporters of early preverbal communication. This is in

line with our earlier studies showing parents' ability to reliably observe also their children's vocabulary skills (Lyytinen, Poikkeus, Leiwo, Ahonen, & Lyytinen, 1996).

In line with Mundy and his colleagues (Mundy et al., 1995; Mundy & Gomes, 1998), we found that the associations between children's joint attentional behaviours and language skills depended on the specific aspects of the skills that were measured. The studies on specific relations between various aspects of joint attentional behaviours and language skills have been rare. The recent study of Mundy and Gomes (1998) found support for their hypothesis that responding to joint attention (in contrast to initiating these episodes) is an especially strong predictor of receptive language. In the present study joint attentional behaviours were not categorized according to this dimension (initiating vs. responding). However, our result that the category of coordinative actions (in which infants followed or responded to various maternal object-related actions) was a significant predictor of later receptive language, was in accordance with the findings of Mundy and his colleagues. In the earliest phase, development of comprehension skills may need mostly passive joint engagement on the child's part with the caregiver providing the necessary supportive structure, which makes the language used in the situation immediately meaningful for the child (Bakeman & Adamson, 1984; Bruner, 1982).

The results of the present study concerning the joint attentional predictors of later expressive language are somewhat difficult to interpret in the framework provided by Mundy and Gomes (1998), who used different and broader categories of joint attention. As a whole their results appear to suggest that more active joint attentional behaviours on the child's part predict later language production than comprehension. This view gained support also in our study. We found that following or directing the mother's gaze and imitating the mother's object actions contributed significantly to the prediction of expressive language at 24 months. This finding is in line with the beliefs that the child's ability to follow or direct another person's gaze is an important precursor to later language development (Baldwin, 1995; Tomasello, 1995), and, for instance, the finding by Desrochers, Morissette, and Ricard (1995) showing that the child's gaze following at 15 months related significantly with his or her expressive language at 24 months. Infants' use of imitation in mother-child interactional contexts, on the other hand, has been suggested to be closely linked with children's skills in participating in dialogue and understanding of some linguistic structures (Martinsen & von Tetzchner, 1989). Accordingly, the present study showed that early imitation predicted subsequent expressive language containing a measure of syntax construction (MSL).

The role of caregivers in creating and structuring early joint object engagements has been emphasized in previous research (Adamson, 1996; Bruner, 1975; 1983; Dunham, Dunham, & Curwin, 1993; Schaffer, 1989; Tomasello & Farrar, 1986; Tomasello & Todd, 1983). In the present study maternal interactional sensitivity rated during infant-mother play had a significant association with the sum of actions and gestures and two measures of child's observed joint attentional behaviours. The mothers who were more

skillful in maintaining the infant's attention and motivation and more sensitive in matching their behaviours according to the infant's emotional states had infants who were more advanced in their early intentional communication. This result supports the earlier findings that sensitive parental guidance raises the level of infant's object actions and early communicational behaviours (e.g., Bornstein, 1995; Fiese, 1990; Stevens et al., 1998). Gaze following and gaze alternation, however, were not associated with maternal interactional sensitivity. Their weaker links with parental interactional strategies may be attributed to the assumed greater dependence of the development of gaze-following behaviours on maturational and adaptive mechanisms (Baron-Cohen, 1995; Butterworth, 1995).

Interactional and home environmental factors have been shown to have an important role in the development of language comprehension (Miller & Siegel, 1989). We found that maternal interactional sensitivity correlated concurrently with language comprehension and also contributed significantly to subsequent language comprehension at 18 months. Corresponding relations were not observed in relation to expressive language skills. The quality of maternal behaviours plays an important role in the early interactional routines in which mothers and infants develop mutual sensitivities. In harmonious interactions the mother's nonlinguistic cues aid the child in interpreting the mothers' signals and understanding her utterances (Bruner, 1983; Schaffer, 1989), and, thus, this kind of interaction may be especially relevant for the development of the child's later comprehension skills.

Our finding that maternal sensitivity had no significant concurrent or predictive relation to the child's expressive language skills was partly inconsistent with some previous research. Stevens and her colleagues (Stevens et al., 1998) found that maternal scaffolding at 9 months did not have predictive associations with infants' productive vocabularies at 15 months, although it had concurrent positive association with expressive skills. Smith and her co-workers (Smith et al., 1988) showed that mothers' attention directing strategies at 15 months made a unique contribution in explaining the infants' productive vocabularies 3 months later. Language comprehension was not assessed in these studies. It might be speculated that differences between the studies in these predictive relationships could be attributed to the characterization of maternal sensitivity. Different aspects of social environmental factors are known to influence the child's development at various age phases (Rutter, 1985). The measure of maternal sensitivity used in the present study which emphasizes somewhat more strongly affective aspects of sensitive parental guidance than cognitive attention directing may, thus, contribute significantly to the early phases of children's language development, but it may be less strongly linked to the more complex aspects of language of the later ages.

The current study provided relevant information on several methodological issues in the domain of early intentional communication and mother-child interaction. Parental reports using the MCDI were found to provide a valid evaluation of the child's early gestures and actions correlating significantly with joint attentional behaviours and also with concurrent and subsequent language skills. The MCDI has been widely used as a research

instrument in the evaluation of early lexicon and grammar (Bates et al., 1995; Bates et al., 1994; Fenson et al., 1994), whereas very few reports exist on the utility of the sum of actions and gestures as a measure of early prelinguistic skills. This sum promises to have considerable value in clinical practice as it provides a valid and cost-saving diagnostic and predictive measure on the communicative and symbolic skills of infants who have little expressive language.

Our observations of joint attentional behaviours specified various aspects of preverbal communication that are worth paying attention to in observational contexts when evaluating children's communicative skills and predictors to later language development. To our knowledge the time-sampling procedure has not been used previously in the assessment of joint attentional behaviors. However, some validation for its use is suggested by significant correlations between these measures and parental reports of preverbal communication. We have also used a more traditional frequency-based coding procedure without time-sampling, which is based on three-minute interactional episodes, and preliminary analyses show high correlations between the measures obtained using these two procedures (unpublished manuscript). The advantage that the time-sampling procedure provides is that although it uses the same criteria, it is more economic. In summary, the present study with its large sample size and a broad set of measures increased our knowledge on the links between different aspects of intentional communication and language and their interactional correlates. As we follow the same group of children into school age, of interest to us is whether nonverbal communication assessed in early toddlerhood continues to contribute to linguistic and cognitive development, and what kinds of cognitive and affective aspects of parental attention directing and guidance support the children's development at the later ages.

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## Appendix

### Maternal interactional sensitivity

- 1) *Initiatives to motivate the child's play* (1 - 5; 1 = The mother's initiatives do not sensitively contribute to the child's play - the mother does not make initiatives of her own or her initiatives are poorly timed or she provides an excessive number of initiatives minimizing the child's room for activity; 5 = The mother's initiatives fit in the flow of the child's activities so that the child's interest and affective state remain at an optimal level throughout the session)
- 2) *Providing reinforcement* (1 - 5; 1 = The mother typically provides no support or encouraging feedback to the child; 5= The mother consistently supports the child's play by providing sensitively timed reinforcement and encouragement when the child needs it)
- 3) *Drawing into joint activity* (1 - 5; 1 = The mother does not display an interest in the child's play, and she does not make initiatives to draw the child back into activity when he or she loses interest in the toys; 5= The mother displays high interest in the joint play and by her actions and communication she maintains the child's interest and skillfully encourages him or her to continue going on when he or she begins to lose interest).
- 4) *Versatility of motivational strategies* (1 - 3; 1 = The mother uses only one or two different strategies for maintaining and motivating the child's play, e.g., smiles, acknowledgments; 3= The mother has a large repertoire for maintaining and motivating the child's play, e.g., reorienting, suggestions, modeling, joining in play, extending)
- 5) *Emotional availability* (1 - 5; 1 = The mother does not actively observe the child's behaviours and provide emotional support to the child; 5= The mother's focus is consistently on the child's activity and she expresses warmth and availability of support to the child e.g., by smiling, using affectionate bodily gestures and tone of voice, and linguistic remarks)
- 6) *Emotional attunement* (1 - 5; 1 = The mother does not express sharing of the child's feelings; 5= The mother consistently expresses sharing of the child's feelings e.g., by providing comfort when the child is upset or hurt, expressing enthusiasm when the child is excited, smiling or laughing when the child is cheerful)
- 7) *Affective encouragement* (1 - 5, 1= The mother's affective behaviour is not in synchrony with that of the child, e.g., the mother does not express any enthusiasm or the mother's affective stimulation is too excessive in comparison with the child's mood and behaviour; 5= The enthusiasm and excitement exhibited by the mother is consistently in harmony with the mood and behaviour of the child)
- 8) *Enjoyment of joint interaction* (1 - 5; 1 = The mother does not show any signs of enjoying the play with the child, e.g., expresses tiredness, boredom, lack of interest, reluctance, or nervousness; 5= the mother expresses high enjoyment of the joint activity, e.g., appears to be relaxed, "at home", is smiling, joking, participating eagerly)
- 9) *Allowing the child's independent activity* (1 - 3; 1 = The mother does not leave room for the child's independent activity; 3= the mother allows the child's independent activity and supports and encourages it with her actions and communicative feedback)
- 10) *Sensitivity in guidance of the child's activity* (1 - 3; 1= The mother does not direct or guide child's activity in any way; 3= the mother consistently guides the child's activity in a sensitive and delicate manner)
- 11) *Extending of the child's activity* (1 - 3; 1= The mother makes no attempts to extend the child's activities or vocalizations or her extensions are insensitive and intrusive, e.g., interrupting the child's play by removing a toy from a child to demonstrate a new action with it; 3' = The mother typically extends the child's play by providing new versatile models in a way that is constructive and takes into account the child's developmental level).

III

**Social interactional behaviors and symbolic play competence as  
predictors of language development and their associations with  
maternal attention-directing strategies**

by

Marja-Leena Laakso, Anna-Maija Poikkeus, Kenneth Eklund  
and Paula Lyytinen

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Manuscript (submitted), 1999

IV

**The developmental and predictive relations of play and  
language across the second year**

by

Paula Lyytinen, Marja-Leena Laakso, Anna-Maija Poikkeus and Niina Rita  
*Scandinavian Journal of Psychology*, 1999, 40, 177-186

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## 5 GENERAL DISCUSSION

### 5.1 Prelinguistic predictors of early language development

Identifying communication and language delays and deficits as early as possible is of vital importance. The availability of reliable and valid prelinguistic assessment tools is needed to enable early identification and intervention. Knowledge of infants' early social-cognitive skills could be useful for distinguishing between children in need of intervention and those who most possibly will "catch up" without intervention due to well functioning social and cognitive processes inherent in prelinguistic communication. The present work investigated firstly, the variety of infants' prelinguistic skills and the contributions they make to children's later language skills; and secondly, the critical features of social environment which relate to infants' prelinguistic and language skills. In this discussion section the various prelinguistic skills and their specific interrelations and linguistic correlates are discussed first. After that, the conclusions of the early interactional context are presented, and lastly a summarizing conclusion is drawn from the methodological and clinical implications of the study.

**Children's interactional behaviors in the shared reading context** were the first set of prelinguistic behaviors analyzed in this longitudinal design (Study I). The results of this study revealed that interest that the children manifested in shared reading at the age of 14 months was associated significantly with their language skills four months later. The extent to which the child's interest in books and joint reading is a biologically endowed trait and the extent to which it reflects the child's early experiences with books and shared reading is an unresolved question. Our observation that early interest in books is strongly related to children's concurrent skills in language comprehension at 14 months of age suggests that at least partly interest in books involves the same processes that are necessary for early language

learning (Arnold & Whitehurst, 1994). It is, for example, probable that when children have the capacities to understand the linguistic information presented by the parent in shared reading they are also more likely to remain focused in the task and regulate their attention between the book and the parent. There is, however, evidence that early shared reading experiences are also affected by aspects of emotional development, more specifically, by the quality of the early attachment relationship between the mother and the infant (Bus & van IJzendoorn, 1988). Support for this environmental influence on early book reading interest comes also from our recent finding (Master's thesis of Pirkko Leppänen) that firstborn children exhibit more interest in shared reading than do the later born children.

The predictive relationship we found between the children's early interest in shared reading and their later language skills, although significant, was based on a quite short time interval. Whether this interest in books continues to show predictive relations to language skills after a longer time-interval, is an interesting and important question. Our further analyses have explored this issue (Master's thesis of Johanna Katajamäki) and found that early interest in books and reading at 14 months continues to be associated with children's language production and maximum sentence length at 24 months, and language comprehension at 30 months of age. Also we found that the interest a child displays in shared reading has some stability between the ages 14 and 24 months of age. Previously it has been argued (Crain-Thoreson & Dale, 1992) that the child's early engagement with books reflects his or her concurrent intellectual skills. The present results are in line with the assumption that early interest in books and reading contains valuable information that reflects the child's concurrent language skills, and accompanied with other information it may be used to obtain predictions concerning children's later language development.

**Early intentional communication** was our central focus in Studies II and III. In the literature infants' prelinguistic communicational behaviors have been described using various terms: communicational gestures (Bates et al., 1979); pragmatic functions (Bruner, 1981); social-communication skills (Selbert, Hogan, & Mundy, 1982); nonverbal communication behaviors (Mundy et al., 1995); joint attentional skills (Baldwin, 1995; Landry, 1995; Tomasello, 1995); object-focused communication (Adamson, 1996) and triadic exchanges (Charman, 1997). Despite these terminological differences all of these behaviors refer to infants' developing abilities for referential communication, abilities to coordinate attention with another person to an object or topic of shared interest (Bruner, 1975). It has been argued that what underlies the new communicational skills emerging around the first birthday is the aspect of intentionality (Tomasello et al., 1993; Tomasello, 1995). Around that time infants come to understand human activity in terms of the outcomes it is intended to achieve and this new understanding influences the ways infants communicate with other people.

In the present study we used both parental reports and observations of parent-child play interactions in order to assess the infants' intentional communication. The MCDI parental report form of early actions and gestures is



based on a long research tradition (see Bates et al., 1994; Fenson et al., 1994), and it is easy to administer. Extracting incidents of intentional communication from the ongoing flow of parent-child interaction and endowing an infant's interactional act with the status of joint attentional or socially coordinated behavior is, however, highly challenging. Operationalizing the aspect of consciousness in these behaviors, the knowledge shared by two individuals that they are attending to something in common (*secondary intersubjectivity*), is a difficult task to accomplish. The guiding theoretical conceptualizations were derived mainly from the writings of Tomasello (1995) and Baldwin (1995), who argue that around one year of age there are several different behaviors that indicate the infant's abilities in coordinating his or her attentional focus with that of the interactional partner. In our criteria for infant joint attentional and socially coordinated behaviors we emphasized the coordination of the infant's initiatives and responses with the ongoing interaction, the quality of the looks, the timing of interactional overtures, and the affect expression (Tomasello, 1995).

Our findings in Study II revealed significant correlations between parental reports on prelinguistic communication and measures of joint attentional behaviors obtained via observations. These associations provide validation concerning the measurement techniques and suggest that several approaches may be useful for evaluating children's early intentional communication. We also found that parental reports of the children's actions and gestures were stronger predictors of later language comprehension and production than were the observed joint attentional behaviors. It is possible that a relatively short sample of play in a novel context may not capture as well the child's typical level of prelinguistic communication as do the parental reports which are based on daily observations of the child's behaviors. The two approaches that we used for analysing the infants' observed prelinguistic communication, frequency counts of *socially coordinated behaviors* based on highly detailed transcribed records of infants' interactional acts, and of *joint attentional behaviors* based on a time-sampling procedure, correlated strongly with each other. This result suggests that our observational methods were reliable in tapping the features of the child's early intentional communication.

In general the findings indicated that there is considerable continuity in early communicational development and that individual variation in intentional communication skills was related to individual variation in subsequent language skills. Intentional communication behaviors appear to reflect the maturation of important social, cognitive and self-regulatory capacities within the infant which are also relevant for later language acquisition. Moreover, this study provided further specification of associative links between various joint attentional behaviors and language skills: more active joint attentional behaviors on the child's part appear to predict later language production, whereas interactional behaviors containing following or responding to maternal object-related actions are more strongly related to receptive language skills. These results were more in line with the findings of Mundy and his colleagues which point to the distinct contribution of different joint attentional behaviors on discrete components of early language (Mundy et

al., 1995; Mundy & Gomes, 1998) than with views emphasizing the commonality of the cognitive processes in nonverbal communicational skills (see e.g., Bates, Thal, Whitesell, Fenson, & Oakes, 1989). The studies in various clinical populations show the complexity of the underlying processes and mechanisms contributing to various phenotypes of these skills (for review, see Charman, 1997). Overall, however, this and other recent research, has widened our understanding of the significance of the early intentional communication behaviors in normally developing children.

**Symbolic play** represents the third area of prelinguistic skills studied in this dissertation. Our findings from studies III and IV stress the predictive significance of early symbolic play skills in later language development. Of specific interest was our finding that the level of symbolic play at 14 months added more to the prediction of 2-year-olds' Bayley MDI than did any of the language variables. This finding strongly supports the notion of symbolic play as a key cognitive competence reflecting the development in memory processes, attentional skills and other cognitive capacities such as understanding the signifier-signified relationship (e.g., Bornstein, Haynes, Legler, O'Reilly, & Painter, 1997).

In many previous studies symbolic play has been measured in a free play situation in which the mother typically participates actively by providing models and/or prompting the child to engage in play activities. In the present study the mother was present providing a safe atmosphere for the child without participating in the play herself. Thus coding of the child's symbolic play behaviors was not contaminated by the need to separate the contribution of each participant. In fact, in our analyses of 14-month-old's symbolic play behaviors the child's solitary symbolic play was found to be a more powerful predictor of his or her later language and cognitive skills than the measure of the child's symbolic play obtained in mother-child free play (Lyytinen, unpublished manuscript). Based on this finding it appears that the structured nature of the Symbolic Play Test makes it a practical and appealing tool for screening purposes in comparison to the time-consuming analysis of free play in unstructured situations.

**Interrelations between various prelinguistic skills** were investigated in Study III in relation to intentional communication skills and symbolic play competence. To my knowledge, this was the first time these relations were studied in normally developing children. However, an abundance of discussions exists on this issue concerning children having an autistic disorder (for review see Charman, 1997). Earlier accounts of developmental linkages between joint attentional behaviors and symbolic play are somewhat inconsistent but some conclusions might be drawn which could aid in the interpretation of the present results. It has been argued that joint attentional behaviors and pretend play skills are, at least on a behavioral level, quite separate and rather different developmental abilities (Charman, 1997). Elsewhere it has been argued that joint attentional skills are an important antecedent for the development of symbolic play skills (Beeghly, 1998). Existing empirical evidence in the field of atypical development indicates that whenever both of these skills are impaired in an infant he or she is much more prone to

receive a diagnosis of autism than when only one of them is poorly developed. Although the co-occurrence of these deficits does not necessarily mean that they are related to each other, many studies stress the important role which both of these behaviors have in evaluating social-cognitive functioning in prelinguistic children. In our sample of normally developing children the correlation between early intentional communication and symbolic play was not strong enough to reach statistical significance. We, moreover, found that symbolic play skills were more strongly associated with the development of receptive language, whereas the aggregate measure of intentional communication skills related more strongly to language production.

Our original studies did not include the investigation of the relations between the child's early interest in shared reading and the two other aspects of prelinguistic skills. My recent analyses, however, showed that the child's interest in shared reading is strongly related to his or her symbolic play competence but not to his or her intentional communication (joint attentional or socially coordinated behaviors). This preliminary finding is consistent with our results that both interest in shared reading and symbolic play also had stronger associations with language comprehension than with language production.

This study was a relevant first step in the investigation of the relations and functions of symbolic play and intentional communication behaviors in normally developing children. The notion that the various prelinguistic behaviors share the same underlying cognitive basis in the early representational skills appears too general. Our finding that different predictors of later language development were associated with different aspects of early language supports the idea that somewhat distinct cognitive and probably also social interactional processes may underlie these skills. More detailed consideration on these processes is provided in the discussion section of Study III in this thesis. But overall further research in this area is still needed, because, as Mundy and Gomes (1998) argue, we currently have only a very cursory understanding of the nature and significance of this important domain of infant development.

## **5.2 Interactional context of early prelinguistic development**

In addition to the prelinguistic predictors of later language development, the other main theme in this dissertation was the interactional context of early language development, which was investigated in Studies I, II and III. We found that in shared reading situations (Study I) maternal activation predicted the children's later language skills more strongly than other maternal interactional strategies. This finding is in line with the assumption presented by Cornell and his colleagues (Cornell, Senechal, & Broda, 1988) that the active role of the child in shared reading is highly important in children under three, even more than in the later ages. Accordingly, our further analyses (Master's thesis of Anna Orava) revealed that at three years, a high extent of reading of the book by the parent was related to advanced language skills in children, not parental

use of activation. This finding supports the notion of *scaffolding* (Bruner, 1983; parental adapting of their interactional behaviors according to their child's capacities and offering of support and guiding when children need them). In shared reading with children who have less developed language or attentional skills, parents provide much more structuring and support in order to help the children to stay focused and follow the book than they do with linguistically more advanced children.

We found (Studies II and III) that mothers who were more skillful in maintaining the infant's attention and motivation and more sensitive in matching their behaviors to the infant's emotional states in free play situation had infants who were more advanced in their early intentional communication. The developmental significance of the specific structure of parental topic-maintaining expansions (Dunham & Dunham, 1995; Tomasello, 1992) was also supported in our findings. Our analysis of maternal attention directing strategies indicated that maternal extending of the infant's object actions (mother both maintains a joint focus of attention with the child and "scaffolds" more advanced structures by commenting on some new aspects of the shared topic) was strongly associated with the infants' symbolic play skills. The importance of this result is stressed by the fact that, contrary to many previous studies, these two measures were derived independently, from different situations. This finding is also clearly in line with the ideas of Vygotsky (1978) indicating that the development of sophisticated object actions is closely tied to the child's cultural context, to the models the child receives in his or her environment. In addition, we found that maternal interactional sensitivity and attention-directing strategies were much more strongly associated with language comprehension than with expressive language, and that maternal guidance that challenges the infant's current level of competence is optimal for stimulating the infant's development.

In interactional studies mothers have been claimed to be more in charge and more directive when observed with their children in novel activities than in the course of the ordinary activities of daily living (Bloom, 1998). The extensive experience I gained from observing dozens of interaction sessions on-line, and coding the videotaped interactional material did not leave me with the impression of directive and controlling mothers. On the contrary, what was impressive was the very central role that these young children play when interacting with their mothers. The observations reinforced the notion of the leading role of the child in these interactive encounters (see also Nieminen, 1991). For instance, in the book reading the mothers were sensitive in adapting their strategies according to their child's personal styles, motivation and language, and cognitive abilities. Schaffer (1992) argues correspondingly that the structuring principle of the "zone of proximal developmental" is not created by the sensitive parents alone but the children select from the constant flow of parental suggestions the ones that fit in with their own capabilities. It is, thus, the child who appears to be determining the effectiveness of the mother's instructions.

The arguments presented above do not, however, imply that parental behaviors or other environmental factors do not play any role in contributing to

early interactional exchanges between the parent and the child and to the children's later development. Our recent analyses of shared reading behaviors (Master's thesis of Pirkko Leppänen) revealed that maternal education and responding to the child's behaviors in shared reading at 14 months added more to the prediction of the child's interest in shared reading at 24 months than did any of the child's previous language measures or the child's previous interest in shared reading. The mothers' responding to the child's behaviors, however, correlates very strongly with the child's interest. Thus, this result beautifully suggests that in interactions in which the child is interested, willing and able to participate and the parent responds to the child in a sensitive and encouraging way, an optimal social structure supporting further development is created. The crucial point that I want to stress is that we as researchers should be careful not to undermine the surprisingly effective communicational skills that even the youngest children have and the central role they play in structuring the course of early interactions with their caregivers.

Important observation which arose from our findings in Study IV and also from our recent analyses of shared reading interactions, indicated that parental educational level is an important influencing factor in the child's early development. Similarly, Molfese and her colleagues (Molfese, Holcomb, & Helwig, 1994) have shown that parental SES is a strong predictor of children's cognitive development and verbal abilities at the ages of two and three, and its predictive significance is likely to increase with the child's age (see Molfese, DiLalla, & Bunce, 1997). Parental education reflects an accumulation of various positive influences such as more elaborated interactional strategies, a more stimulating living environment, better material and financial resources, and probably also some inherited cognitive talents in language or cognitive processing. Especially for the mothers, education appears to strongly affect their interactional strategies and sensitivity as interactional partners. Our sample differed from some other data presented in previous literature in respect to parental education and other demographic characteristics. For instance, the data of Bornstein and Tamis-LeMonda (Bornstein, et al., 1996; Tamis-LeMonda & Bornstein, 1996) were based on middle-class samples of first-born children. In our sample parental education was representative of the distribution in the Finnish population and only about a half of the children were first-borns while the other half had older siblings. This representative distribution of background variables is likely to widen the generalizability of the results.

The fact that a subgroup of the participating mothers had dyslexia and respectively their infants had a risk for later reading difficulties is a factor that could be considered to influence the generalization of our results. In previous research only very limited evidence exists for this kind of assumption. Hollis Scarborough and her colleagues (e.g., Scarborough et al., 1991) have investigated the extent of joint literacy activities and the linguistic input that children with genetic risk for dyslexia receive from their mothers. They found no differences between the dyslexic mothers and normally reading mothers in the extent the mothers read to their children (Scarborough et al., 1991), and although they found some differences in grammatical aspects of child directed

talk between the dyslexic and normally reading mothers these differences had no relations to child's language skills (Scarborough & Fichtelberg, 1993). Our results were in accordance with those of Scarborough in that we found no differences in maternal interactional behaviors nor in the child's prelinguistic or early language skills between families with or without dyslexia. It should, however, be noted that the dyslexia group in Scarborough's studies consisted of dyslexic mothers and those children who later become disabled readers, whereas in our sample of at risk children only approximately a half are expected to later manifest reading related problems. Overall, it seems that there is no strong basis for assuming differences in children's prelinguistic skills or maternal interactional sensitivity in families with or without dyslexia at this early age, and thus no major threats exists relating to generalization of these results. However, the few differences we observed (Study I) in the associations between some maternal and child variables between the groups with or without dyslexia make it highly interesting to return to these early measures in a few years after we are able to assess the children's reading skills and identify those children who become disabled readers.

### 5.3 Concluding remarks

Prelinguistic communication is a young research area in developmental psychology. In previous research this domain has been much more extensively studied in children with developmental disorders than in normally developing children. The first studies investigating predictive relations between various joint attentional behaviors and later language skills in normally developing children emerged very recently (Mundy et al., 1995; Mundy & Gomes, 1998). The young history of this research tradition has also contributed to the fact that in institutions or clinics providing services to families with young children, diagnostic tools for assessing children's prelinguistic behaviors, and also knowledge relating to these issues is mostly lacking.

The present dissertation investigating a wide range of prelinguistic behaviors and their specific linguistic and interactional correlates in a large longitudinal sample offers several important implications for clinical practice. The encouraging findings on the predictive significance of the parental report forms (MCDI) both in assessment of prelinguistic communication and early language skills implies that this method could be developed into a clinical screening instrument (a project which has already been begun). Previously the MCDI's utility in the assessment of early lexicon and grammar has been well documented (Bates, et al., 1995; Bates et al., 1994; Fenson et al., 1994), whereas until now there have emerged very few reports on the use of the sum of actions and gestures as a measure of early prelinguistic skills.

The index of child's symbolic play competence which appeared to reliably predict infants' later language and cognitive skills is another research instrument which could be applied for diagnostic purposes. This test is easy to administer, not very time-consuming, and provides an economic way to achieve a reliable index of early cognitive competence in children who have

little expressive language. The observational measures of prelinguistic communication and maternal strategies, although it is unlikely that they could as such be adopted in clinical use, have clinical utility as they help to focus the observations and intervention procedures on the most critical features in early communicative behaviors.

In conclusion, this dissertation investigating the prelinguistic period of infancy indicates that even when children have little or no expressive language they have already developed a wide variety of ways of communicating their intentions and expressing their social-cognitive skills. There are, however, substantial individual differences in these skills, which contribute to variation in later language skills. Although there were, as we hypothesized, several interrelations between various aspects of prelinguistic skills, they did not form one consistent structure. The relations between different prelinguistic behaviors and later language skills were specific, suggesting that somewhat different cognitive and social interactional processes underlie these early preverbal abilities. Thus, in order to design early diagnostic and intervention procedures, obtaining a comprehensive picture of the child's various prelinguistic skills is important. Our hypothesis that maternal sensitivity and strategies that maintain or elaborate on topics of shared interest contribute to children's early prelinguistic behaviors and language skills also found support. This result suggests that, for example, parental training programs would be useful in the prevention and rehabilitation of some language-related problems. Overall, the findings of this study stress the importance of studying early language acquisition in the rich context of infants' internal representations and social interactions.

## EPILOGUE

In addition to the specific results this study generated, there are also some more general but very significant insights it has given me concerning the process and nature of interactional studies. First, the process of making this dissertation has convinced me of the fact that at a very deep level there are no pure mother and child variables in the interactional context. On all the occasions, the one participant's behavior is always affected and will in turn affect the behavior of the other. For example, it is believed that from very early on the infant's individual temperamental features affect the behaviors of the mother, and the mutual consistency or "goodness of fit" between the temperaments of the infant and the mother is an important factor influencing the interactional exchanges between the two (Thomas and Chess, 1977). I came to realize that it is extremely difficult to separate the contribution of one interactional participant totally from the actions and behaviors of the other - or at least when doing this one should be very careful in drawing interpretations from the findings. For example, in early book reading the mother's activation strategy is not likely to reflect a conscious maternal interactional property per se but much more genuinely it reflects the adjustments of her own interactional intentions to the capabilities and intentions of her child. Thus the overt observable activation strategy is an elegant creation rising from this interplay.

Knowing the complex mutual adjustments of the interactional partners to each others' behaviors and the intensive interactional history between the mothers and their 14 month-old infants, it is obvious that the researcher as an outsider can never gain a full understanding of the communicational intentions and the significance of the expressed verbal or nonverbal messages between the participants (for example, see the study of Adamson, Bakeman, Smith, and Walters (1987) for the adults' interpretations of the infants' acts). Daniel Stern (1977) has beautifully described the early interaction between the parent and the child as forming a kind of dance, a mutual choreography which is deeply known only by the two participating individuals. Some mother-child interactional patterns may resemble more either the dance of the waltz or that of the polka, for instance, which contain a different tempo and different gestural, motional and facial expressions. The difficult but extremely interesting task of the researcher is to try to understand and interpret these very sensitive and intimate choreographies of intersubjective sharing between the parents and their children. I have often felt quite humble and small when faced with this task. Now, after completing one step of this challenging work I want to stress that although we received very interesting and important results in our analyses there always exists the invisible area in parent-child relations which our scientific methods can never fully reach.



## YHTEENVETO

Suuret yksilöiden väliset erot kielen kehityksen alkuvaiheessa ovat tunnustettu tosiasia. Diagnosoinnin ja interventiodien näkökulmasta tärkeää olisi löytää menetelmiä, jotka mahdollisimman varhain antaisivat viitteitä kielen kehityksen ongelmista tai viivästyneestä kehityksestä. Tämän tutkimuksen tavoitteena oli tarkastella lasten esikielellistä kommunikaatiota ja löytää keskeisiä piirteitä, jotka ennustaisivat myöhempää kielellistä kehitystä. Toisena tavoitteena oli tutkia ympäristöllisten piirteiden, kuten äidin vuorovaikutuskäyttäytymisen sekä vanhempien koulutuksen yhteyttä esikielelliseen kommunikaatioon ja lapsen myöhempään kielen kehitykseen.

Tämä neljästä tutkimuksesta koostuva väitöskirjatyö on osa laajaa pitkätaistutkimusta ”Lapsen varhainen kielen kehitys ja geneettinen dysleksiariski”, jossa seurataan yli kahtasataa keskisuomalaista perhettä lapsen syntymästä varhaiseen kouluikään. Päähankkeen tavoitteena on tunnistaa varhaisia ennusmerkkejä mahdollisista myöhemmistä kielen kehityksen ja lukutaidon vaikeuksista. Väitöskirjani tutkimukset muodostuvat tämän laajan hankkeen osa-aineistoista ja käsittelevät ikävaihetta 14 kuukaudesta kahden ja puolen vuoden ikään.

Esikielellisen kommunikaation piirteitä tutkittiin lasten ollessa 14 kuukauden ikäisiä ja arvioinnin kohteena olivat lapsen varhainen kirjoihin ja lukutilanteisiin osoittama kiinnostus, taidot tavoitteellisessa kommunikaatiossa sekä symbolisen leikin taso. Pääosa esikielellistä kommunikaatiota kuvaavista mitoista saatiin havainnoimalla vanhemman ja lapsen välistä vuorovaikutusta. Myös vanhempien raportoimia tietoja lapsen varhaisista kommunikatiivisista eleistä ja toiminnoista (The MacArthur Communicative Development Inventories, MCDI) käytettiin vuorovaikutustilanteista koottujen tietojen rinnalla. Äidin vuorovaikutus-käyttäytymistä ja strategioita tutkittiin sekä kirjankatselun että vapaan leikin tilanteissa. Lapsen kehittyvää kieltä kartoitettiin 14, 18, 24 kuukauden sekä 2.5 vuoden iässä. Kielimitat keskittyivät varhaisen sekä ymmärtävän että tuottavan sanavaraston seuraamiseen ja varhaisen lauserakenteen ja kieliopin kehityksen tutkimiseen (ilmaisujen keskipituus). Tietoja lapsen sanavaraston kehityksestä koottiin sekä vanhempien raportoimien lomakkeiden välityksellä että strukturoitujen testien avulla.

Tutkimustulokset osoittivat, että lasten yksilölliset erot varhaisissa esikielellisen kommunikaation taidoissa olivat selvästi yhteydessä myöhempään yksilöllisiin eroihin kielen kehityksessä. Lapsen varhainen kiinnostus kirjatilanteisiin ja symbolisen leikin taso ennustivat erityisesti myöhempää ymmärtävää kieltä, kun taas tavoitteellisen kommunikaation ja myöhemmän kielen väliset yhteydet olivat riippuvaisia siitä, mikä nimenomainen aspekti tavoitteellisen kommunikaation piirteistä oli kyseessä. Tutkimus osoitti myös, että vanhempien raportoimat lapsen varhaiset kommunikatiiviset eleet ja toiminnat korreloivat selvästi vuorovaikutustilanteissa havaittujen lapsen tavoitteellisen kommunikaation piirteiden kanssa (esim. katseen vuorottelu tai

seuraaminen, vuorovaikutuskumppanin esinetoimintojen jäljittelemine tai omien esinetoimintojen koordinoiminen suhteessa vuorovaikutuskumppanin toimintoihin).

Havainnot vanhemman toimintatavoista osoittivat, että kirjanluku-tilanteissa lapsen aktivointi (esim. äiti pyytää lasta nimeämään tai osoittamaan tai esittää kysymyksiä) oli strategia, joka oli vahvimmin yhteydessä lapsen myöhempään kieleen. Vapaan leikin tilanteessa ne lapset olivat esikielellisessä kommunikaatiossaan parhaiten kehittyneitä, joiden äidit olivat taitavampia pitämään yllä lapsen tarkkaavuutta ja kiinnostusta sekä sensitiivisempiä huomioimaan lapsensa emotionaalisen tilan ja sovittamaan toimintansa sen mukaisesti. Äitien taitava lapsen leikkitoimintojen ja kielellisten ilmausten laajentaminen oli erityisen voimakkaasti yhteydessä lapsen symbolisen leikin taitoihin ja sitä kautta myöhempään ymmärtävän kielen kehittymiseen. Tulostemme pohjalta kävi ilmi, että äitien koulutuksella oli yhteys sekä heidän vuorovaikutuskäyttäytymiseensä että myös suoraan lapsen kieleen. Vastaavia yhteyksiä ei löytynyt suhteessa isien koulutukseen.

Tulosten pohjalta on pääteltävissä, että varhaisessa kehityksessä on selvää jatkuvuutta lapsen esikielellisistä toiminnoista myöhempään kielelliseen taitoon. On ilmeistä, että lapset, jotka oppivat varhain käyttämään kommunikoiivia eleitä, osaavat jakaa tarkkaavuuttaan vuorovaikutustilanteissa kumppanin ja yhteisen kiinnostuksen kohteen kesken ja ovat esinetoiminnoissaan pitkälle kehittyneitä, ovat turvallisella tiellä myöhemmän kielen omaksumisen suhteen. Samalla kertaa, kun nämä esikielellisen kommunikaation piirteet toimivat hyvinä ennusmerkkeinä myöhemmän kielen kehityksen arvioinnissa, ne voivat olla myös toimivia varhaisen intervention kanavia. Vuorovaikutus, jossa aikuinen jakaa lapsen kanssa yhteisiä mielenkiinnon kohteita seuraamalla lapsen tarkkaavuuden suuntautumista ja laajentamalla lapsen toimintoja ja ilmaisuja, tukee lapsen varhaisen kielen kehityksen perustaa ja on erityisen merkityksellistä silloin, kun viitteitä mahdollisista myöhemmistä kielellisistä vaikeuksista on havaittavissa. Eriytyneet yhteydet erilaisten esikielellisten toimintojen (esim. symbolinen leikki vs. tavoitteellinen kommunikaatio) ja myöhempien kielellisten kykyjen välillä kertovat siitä, että esikielellisten taitojen taustalla vaikuttavat todennäköisesti osin erilaiset kognitiiviset prosessit. Näin ollen kielellisten vaikeuksien aikainen diagnosointi ja kuntoutuksen suunnittelu edellyttääkin mahdollisimman monipuolista tietoa lapsen varhaisen esikielellisen kommunikaation erityispiirteistä.

Tuloksemme ympäristöllisten tekijöiden yhteydestä esikielelliseen kommunikaatioon sekä myöhempään kielelliseen kehitykseen voidaan tulkita positiivisena osoituksena siihen suuntaan, että lapsen kielen sosiaalis-kognitiiviseen perustaan voidaan vaikuttaa taitavalla ohjauksella ja tuella ja näin mahdollisesti myös ennaltaehkäistä kielellisen kehityksen ongelmia.

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