Language Development and Symbolic Play in Children With and Without Familial Risk for Dyslexia

Paula Lyytinen
Anna-Maija Poikkeus
Marja-Leena Laakso
Kenneth Eklund
Heikki Lyytinen
Department of Psychology
University of Jyväskylä
Jyväskylä, Finland

The purposes of this study were to investigate (a) whether children in families with a positive history of dyslexia were more likely to show delays in language development than children without family risk and (b) whether a delayed onset of expressive language (late talking) predicted later language development. We analyzed the language development of 200 children longitudinally at 14, 24, 30, and 42 months and assessed their symbolic play at 14 months. Half of the children (*N* = 106) were from families with a history of dyslexia (the Dyslexia Risk [DR] group), and other children served as age-matched controls. Parental reports and structured tests were used to assess children's receptive and expressive language and symbolic play. No differences emerged between the two groups in receptive language, symbolic play, or on the Bayley MDI. The groups, however, diverged in expressive language measures. The maximum sentence length at 2 years and object naming and inflectional morphology skills at 3.5 years were higher for the control group than for the DR group. Reynell receptive score at 2.5 years provided the greatest unique contribution to the prediction of the children's receptive and expressive language. Children's risk status did not contribute to receptive language, but provided a significant contribution to their expressive language at 3.5 years, even after the variance associated with parental education and children's previous language skills was controlled. Late talkers in the DR group differed from the other members of the DR group in both receptive and expressive language at 3.5 years, although in the control group children with a late-talking history performed at age-level expectations. The findings suggest that children with a familial risk for dyslexia and with a history of late talking are at higher risk for delays in language acquisition than children without the familial risk for dyslexia.

KEY WORDS: language development, familial dyslexia, late talking, symbolic play, early predictors

Early identification of potential problems in language development is an important issue among those children who are at a familial risk for a language impairment (Scarborough, 1990, 1991; Snowling (in press); Spitz, Tallal, Flax, & Benasich, 1997). According to Bishop, North, and Donlan (1995), language impairments have a genetic component that increases the child's probability of having subsequent language problems. Spitz and her colleagues (1997) have investigated familial transmission of language impairment prospectively through their examination of language acquisition and cognitive development in the younger siblings and offspring of individuals with well-defined language impairments and their age- and gender-matched controls. One half of the children at 16 to 26 months attained lower receptive and expressive language scores—scores that fell at least 1.5 *SD* below the mean for their age in the positive family history group. Spitz et al. (1997) concluded that children with a positive family history for language impairments are at risk for language delay.

It is well documented that dyslexia, a language-based reading disability, also runs in families (e.g., DeFries, 1991; Hallgren, 1950; Pennington, 1994; Schulte-Körne, Deimel, Muller, Gutenbrunner, & Remschmidt, 1996). Dyslexia refers to reading problems that cannot be attributed to sensory, intellectual, emotional, or socioeconomic handicaps or to other known impediments to learning to read (Leonard, 1998; Scarborough, 1990). Reading problems are associated with an impairment in the phonological domain of language, but other predictors of early language development are still relatively poorly understood. We examine in this study whether children in families with a positive history of dyslexia show slower development in early language and symbolic play than children without family risk. Furthermore, we investigate whether a delayed onset of talking predicts children's language development.

Reading ability is considered to be one of the most important cognitive and communicative skills in modern literate societies. A number of prospective longitudinal studies comparing at-risk children with their age mate controls have been carried out in order to identify precursors of later reading disability from an early age (e.g., Gallagher, Frith, & Snowling, 2000; Locke et al., 1997). Scarborough's (1990) study is the first prospective and completed dyslexia investigation in which language development was followed from the age of 2.5 years until the age at which the children's reading status could be confirmed. In her study 65% of children from families with a genetic risk of dyslexia could be classified as reading-disabled at age 8, when compared with their controls of similar socioeconomic status (SES).The results revealed a changing pattern of language difficulties over time for children who later became dyslexic. At age 2.5 years, the spoken language of children at risk, compared with that of their controls, had shorter sentence length and less syntactic complexity; and their phonological production included more errors. The receptive and expressive vocabulary skills of the children who later faced reading problems were less well developed at ages 3 and 3.5 years than were those who did not become children with reading disabilities. At the age of 5 years, they exhibited weaknesses in object-naming, phoneme awareness, and letter-sound knowledge. These late preschool differences were related to subsequent reading status as well as to prior language skills. Scarborough suggests that some of these linguistic deficits could possibly be observed at even younger ages among children who become dyslexic.

The preliminary findings of Locke et al. (1997) revealed that children's early vocal and speech development did not discriminate between the children in the dyslexia risk and control groups. Group differences were, however, found between the ages of 3 and 4 years, wherein at-risk children showed delayed rhyme discrimination and verbal short-term memory. Gallagher, Frith, and Snowling (2000) investigated precursors of literacy-delay among children at familial risk of dyslexia between the ages of 45 months and 6 years. As in the study by Scarborough, the at-risk group was drawn from families where at least one member was dyslexic (mother, father, or both, or sibling). The comparison group consisted of families in which no adult or sibling was reported as having reading difficulties. All parents were tested on their reading, spelling, and cognitive skills to confirm the family status. Gallagher et al. found that one half of the children (57%) at genetic risk of dyslexia were late in their early literacy skills at 6 years, when compared with children of similar socioeconomic status. Corresponding incidence among controls was only 12%. The largest group differences among the early language measures were found for vocabulary, naming, and digit span. Letter knowledge at 45 months was the strongest predictor of literacy level at 6 years. The familial risk status also accounted for a significant portion of the variance in the literacy outcome.

The present data are from the Jyväskylä Longitudinal Study of Dyslexia (JLD; for a general overview of the study, see Lyytinen, 1997) in which we have followed children at familial risk for dyslexia and their controls from birth. The risk status was based on the familial background of the child. At least two close relatives of the index children had to have reading problems, including one parent who was tested in very great detail as to his or her reading status. Children have participated in an intensive assessment program including sensory, motor, cognitive, and language measurements. The emphasis has been on language development, but a number of physiological and other experimental studies have been performed. An important goal is also to uncover environmental correlates of these developmental skills which are associated with subsequent reading acquisition.

According to previous dyslexia studies 30% to 60% of offspring of dyslexic parents are likely to face problems in learning to read. In the JLD study it is closer to the latter figure, but it means that not all of the children in the at-risk group should have any problems. Therefore, one issue is the criterion measures that could be used to narrow the range of those among whom the risk can be estimated to be increasing. The late onset of talking and slow growth of expressive vocabulary have been salient indices of the accumulation of potential risk for language-related problems at an early age. Bates, Dale, and Thal (1995) have found a powerful relationship between vocabulary size and the increase of utterance length and sentence complexity in early childhood. This kind of continuity has been observed in comparisons of children who start to talk early and those whose expressive language emerges slowly. The latter group referred to in the literature as "late talkers" has recently received a lot of attention (Bates et al., 1995; Ellis Weismer, Murray-Branch, & Miller, 1994; Thal, Bates, Goodman, & Jahn-Samilo, 1997). Rescorla, Roberts, and Dahlsgaard (1997) showed that toddlers whose specific language impairment manifested in delays of the onset of talking between the ages of 24 and 31 months scored significantly lower on all language measures implemented at age 3 when compared with control children matched on age, SES, and nonverbal ability. This group of late talkers also made relatively slower progress in their syntactic and morphological development than they did in their lexical development.

According to Rescorla et al. (1997), toddlers who are slow to start talking are at risk for a continued delay in expressive language. However, results concerning different predictors of language development have not been consistent across previous studies. In the study by Thal and Tobias (1992), receptive language and gesture production were found to be significant predictors. Comprehension has been considered a more reliable predictor of language development than production at ages 2 and 3 years (Rescorla, 1984; Thal & Katich, 1996). The findings of Menyuk, Liebergott, and Schultz (1995) also showed that comprehension of two-part relations at 14 months is the best predictor of both comprehension and production outcome measures at 3 years among premature and full-term children.

Children's symbolic play represents prelinguistic skills that form a basis and support for subsequent language development (McCathren, Warren, & Yoder, 1996), as well as revealing the increasing cognitive competence of the child (McCune, 1995). Those children who are more skilled in perceptual categorization and attentional regulation required by symbolic play obtain better knowledge of the objects, actions, and symbols that are common to a child's environment. This information, in turn, provides a good foundation for the children's subsequent language development (e.g., McCathren et al., 1996; Tamis-LeMonda & Bornstein, 1996).

Play researchers have been interested in the representational skills of children with language impairment as reflected in symbolic play (e.g., Casby, 1997; Roth & Clark, 1987; Terrell, Schwartz, Prelock, & Messick, 1984). Casby (1997) suggests in his review that actual differences in the early symbolic play abilities of children with and without language impairment are quite small when the groups are age-matched. Rescorla and Goossens (1992), however, found a difference in object-based symbolic play between 2-year-old children with expressive language impairments (LI) and age-matched normal-language children. Play of children with LI was less advanced developmentally and less varied in content than that of their controls. Despite group differences in the frequency of symbolic play types, children with language impairments demonstrated ordinal levels of symbolic play similar to those of their age-matched controls.

In a few studies, symbolic competence has been found to be related more to language comprehension than to production (Laakso, Poikkeus, Eklund, & Lyytinen, 1999a; Lyytinen, Poikkeus, & Laakso, 1997; Sigman & Sena, 1993). Sigman and Sena (1993) have suggested that children whose symbolic play acts were more developed showed better language comprehension in both structured and unstructured situations. Our previous findings have revealed that symbolic play assessed at 14 months significantly predicts vocabulary production and Bayley MDI at the age of 2 years (Lyytinen, Laakso, Poikkeus, & Rita, 1999) and verbal comprehension at age 2.5 years (Laakso et al., 1999a). Accordingly, we expect that symbolic play assessed at this early phase of development still provides a unique prediction of children's receptive language skills at the age of 3.5 years.

Although heritability of developmental dyslexia has received convincing support, the influence of the environment should always be taken into account as expressed, for instance, in the bioecological model produced by Bronfenbrenner and Morris (1998). From the exogenous factors, parental education has been shown to be a strong predictor of children's later language ability, apparently through its association with linguistically more enriching parental interaction (Thal & Katich, 1996). Griffin and Morrison (1997) have suggested that educated parents are themselves likely to be interested in literacy activities and to have a higher tendency to provide a stimulating linguistic environment for their children. Similarly, according to Snowling (in press), one of the most important environmental predictors of reading acquisition is the maternal education level. This is likely to be affected not only through a linguistic environment at home but also via child-rearing practices and interactional patterns. Our previous results, however, showed that no differences emerged between the dyslexia risk group and the control group in the frequencies of maternal interactional behaviors or in children's participation in shared reading (Laakso, Poikkeus, & Lyytinen, 1999b). This is one reason why we are not focusing on environmental measures other than the contribution of parents' education in this context.

Language development is, however, enforced by both environmental and genetic influences, which function in complex interaction with each other. The exact contribution of genetic factors to the connections between parental education and children's language development remains unspecified, as parents provide their children with both genes and home environments (e.g., Pennington, 1994). Genetic factors influence the way in which a child makes use of the stimuli in the home environment for the benefit of his or her developing language; and through the mechanism of evocative gene-environment correlations, the child's genetic risk may modify the parents' interactional behavior towards him or her (Lyytinen et al., 1998; Plomin, 1994; Rutter et al., 1997; Rutter & Pickles, 1991).

Given the reviewed findings, we assumed that the innate risk and the lifetime emergence of individual delays and paucity of environmental support may be correlated but at the same time also behave additively. This means that children who face problems in language development at an early age have an additional risk of being impaired later if they belong to the group at familial risk for dyslexia. A question of interest is also the relative contribution of the environmental factors, such as parents' education. We address three core questions in this study. First, are children in the at-risk group slower to develop language and symbolic play skills than children without familial risk for dyslexia? Second, do late talkers from dyslexia-risk families have more protracted language delay than those from non-risk families? Finally, we investigate the course of the development of the risk status by examining whether symbolic play, early receptive and expressive language skills, and children's group status predict their language level at 3.5 years?

Method

Participants

The participants were 200 full-term children. None of the children had mental, physical, or sensory handicaps. One hundred and six of the children were defined as at familial dyslexia risk (the DR group) due to dyslexia among parents and close relatives, and 94 children were age-matched controls who had no family history of dyslexia. In 47 families, reading and spelling problems were identified in the father, in 56 families they were identified in the mother, and in three families both parents had reading and/or spelling problems. Demographic information concerning children and their parents is presented in Table 1. The selection of the parents included assessment of the parents' cognitive level in a laboratory setting before the child's birth (Raven's Standard Progressive Matrices: Subtests B, C, and D; Raven, Court, & Raven, 1992). Parental IQ levels were similar between the groups. Parents' education was classified into seven categories, which were based on a composite score of basic-level education and advanced educational training. The mean of the mothers' education was 4.1 (SD = 1.5) in the dyslexia risk group in a scale ranging from 1 to 7 and 4.5 in the control group (SD = 1.3). The comparable numbers of the fathers' education were 3.7 (SD = 1.3) and 3.8 (SD = 1.4), respectively. The difference between dyslexia risk and control group mothers' education was significant (p < .05). Its contribution has been examined in the analyses when needed. The education of the fathers did not differ between the groups. The sample mainly represented parents around the age of 30 years.

Table 1. Demographic information for children with and without familial risk for dyslexia.

Characteristic	Dyslexia Risk Group *N* = 106		Control Group *N* = 94	
Child gender				
Females (*n*)	52		41	
Males (*n*)	54		53	
Birth position				
Firstborns (*n*)	55		50	
Older sibling(s) (*n*)	51		44	
Parents' education				
Mother (*M*, *SD*)	4.11	1.48	4.49	1.33
Father (*M*, *SD*)	3.68	1.28	3.83	1.42
Parents' age (years)				
Mother (*M*, *SD*)	29.52	4.36	29.79	4.05
Father (*M*, *SD*)	31.62	5.32	32.34	5.28

Screening the Families

The children and their families come from the city of Jyväskylä and its surrounding communities in the Province of Central Finland. Screening of the families took place before the child's birth using a three-stage procedure. At the first stage, the whole population of families expecting a baby in the years 1993–96 (>10,000 parents) was targeted using a short questionnaire administered at the local municipal maternity clinics. These clinics are visited by practically all prospective mothers. A more comprehensive questionnaire on parents' school achievement, experiences of remedial teaching, and reading or spelling difficulties at school and later was mailed to approximately 5,400 parents who were interested enough in the project to give their addresses in the first screening. This questionnaire was returned without missing data by 3,130 parents. At the third stage, the parents meeting specified criteria associated with reading problems participated in an interview and a comprehensive individual assessment of reading, spelling, and reading-related phonological and orthographic skills. Tasks of oral text reading, nonword reading, written spelling, and word recognition were used in the diagnosis of dyslexia and in selecting parents for the dyslexia and control groups. For inclusion in the dyslexia risk group, the child's parent had to have at least three scores that were more than 1 *SD* below the norm. At least two of these scores should represent direct measures of reading and/or spelling. A detailed description concerning the selection and reading status of parents of the dyslexia risk group can be found in Lyytinen et al. (1995) and in Leinonen et al. (in press).

Early Reading Experiences Associated With Families

Mothers' and fathers' own literacy activities and reading habits were inquired of separately using the Family Activity Questionnaire. Parents were asked, for instance, to report how often they typically read newspapers and magazines, the extent to which they like reading, and how many books they generally read in a year. Parents with reading difficulties reported that they themselves enjoy reading less and engage less in pleasure reading than parents without such difficulties (Leinonen et al., in press). However, no differences emerged between the dyslexia risk group and the control group in the frequencies of maternal interactional behaviors and children's participation in shared reading at age 14 months. Interactions of mother-child dyads while reading a novel picture book were videotaped. Both groups of mothers supported their child's maintenance of attention in the book in a similar way—that is, by labeling, providing feedback, and by activating the child to point or name (Laakso et al., 1999b).

Measures

Children were assessed longitudinally at 14, 24, 30, and 42 months. At 30 months, data collection was carried out in the children's home. All other testing took place in laboratory settings. Mother or father was present, thus providing a supportive atmosphere for the child but not participating in the testing.

Play and Cognitive Measures

Symbolic Play

The level of sophistication of children's play was measured at 14 months using an adaptation of the Symbolic Play Test (SPT; Lowe & Costello, 1976; Lyytinen et al., 1999). The child was seated in a high chair at a table, and the mother and the experimenter were seated next to him or her. The parent was asked to follow the child's play without manipulating the toys herself or commenting on the play. The experimenter restricted verbalizations to a minimum, avoiding in particular any verbal suggestions for play or clues as to the nature of the objects presented, but responded to the child's overtures in order to keep the situation natural and the child motivated.

Three sets of miniature toys were presented in a standard arrangement for the child to manipulate freely. Set I: doll, cup, spoon, saucer, comb, brush. The toys were given in three stages; (1) the doll on its own; (2) cup, spoon, and saucer added; (3) comb and brush added. This was to elicit responses to the doll as such. Set II: doll, bed, blanket, pillow. Set III: truck, trailer, man, four small wooden logs. The child could explore each set of toys spontaneously until he or she had finished manipulating it or the play became repetitive. The total observation time for the three sets lasted up to an average of 10 minutes.

Play activities were videotaped with standard video equipment (VHS) and coded directly from the videotapes. The categories used by Lowe and Costello (1976) were modified slightly in accordance with Casby (1997) and have been reported by Lyytinen et al. (1999). Symbolic play included the following behaviors: Set I: (1) symbolic handling of doll (e.g., kissing, hugging, walking etc.); (2) stirs in cup, picks up "food" from saucer; (3) feeds self with spoon or "drinks" from empty cup; (4) combs or brushes own hair; (5) feeds doll; (6) combs or brushes doll's hair; (7) "feeds" other persons; (8) combs or brushes other person's hair (parent or experimenter). Set II: (9) puts doll to bed—involving doll, bed, and blanket and/or pillow; (10) uses blanket/pillow in a substitutive way (e.g., wipes face, mouth). Set III: (11) places man in driver's seat; (12) moves truck or trailer about; and (13) joins truck and trailer and moves them about. Each activity performed by the child was given one point. Thus, the maximum score of the symbolic play test was 13. Every new behavior was coded once. If the child, for instance, combed his or her hair three different times, the code was recorded only once. Coding of the play actions was based on the children's actions and nonverbal behavior rather than on their language. Interobserver reliability was assessed by having two persons independently code the same randomly selected cases (12% of the data). Agreement between the coders was 80%.

The Bayley Scales of Infant Development–II (Bayley, 1993) were administered by a trained examiner in a laboratory setting when the child was 24 months old. The Bayley provides a standardized Mental Development Index (MDI) assessing general aspects of cognition, such as problem-solving, memory, object permanence, color concepts, number concepts, and spatial constructive abilities. The mean of the Bayley MDI was equal for children belonging to the dyslexia risk group ($M = 101$, $SD = 13.1$) and for their controls ($M = 102$, $SD = 12.3$).

Language Measures

Measures at 14 Months

Scores of language comprehension were derived from the vocabulary section of the Finnish adaptation (Lyytinen, 1999) of the younger children's form of the MacArthur Communicative Development Inventory (CDI; Dale, 1996; Fenson et al., 1994).

Measures at 24 Months

Parents reported on their children's language skills by using the Finnish toddler version of the MacArthur Communicative Development Inventories. The CDI provided information on vocabulary production and maximum sentence length. Parents were asked to write down three of the longest utterances they had heard their child make recently. Maximum sentence length, which is based on the mean number of morphemes, was assessed at 24 months. The CDI inventories were mailed to parents before a laboratory visit and were to be returned during the visit. The examiner reviewed the inventory with the parents to ensure that it was accurately completed. Any problems that the parents might have had in filling out the inventory were then identified and clarified.

The Bayley expressive score was based on the sum of correctly named targets on two language items (Naming Pictures and Naming Objects) of the Bayley Scales of Infant Development. This score was carried out following the procedure documented by Siegel, Cooper, Fitzhardinge, and Ash (1995). The index of expressive language skills at 24 months was the mean score based on three sources of data: vocabulary production, maximum sentence length reported by the parents, and the Bayley expressive score obtained in a test situation. In order to give equal weight to each of the three scores, they were standardized before computing the mean of the expressive composite score. The Cronbach Alpha reliability for this score was .87.

Measures at 30 Months

Children were administered the Reynell Developmental Language Scales (RDLS; Reynell & Huntley, 1987). This is a commonly used language test for which the validity and reliability have been demonstrated for toddlers. The test provides separate measures of receptive and expressive language. Only the receptive scale was used in this study.

Measures at 42 Months

Naming vocabulary was assessed using the Boston Naming Test (BNT; Kaplan, Goodglass, & Weintraub, 1983). A shortened version of the Peabody Picture Vocabulary Test–Revised (PPVT–R; Dunn & Dunn, 1981) of receptive vocabulary was also given at this age. On each PPVT item, the child indicated which of four pictures corresponds to a spoken word. These tests are widely used to assess children's comprehension and production of the meanings of words.

The subtest of Comprehension of Instruction belonging to Korkman's Developmental Neuropsychological Assessment (1998; NEPSY) was administered to assess children's ability to process and respond quickly to verbal instructions of increasing complexity. The experimenter asked the child to listen and to be careful. Then she or he asked the child to point to some pictures by saying, for instance, "Show me a big bunny," "Show me a sad bunny," "Show me a bunny that is little and blue," etc.

The mastery of inflectional morphology of the highly inflected, agglutinative Finnish language was measured with the 20-item Berko-type test (Lyytinen, 1987). The test measures children's ability to inflect old Finnish words that are no longer in use and thus not known by the child. In the task, words from 2 to 4 syllables are orally presented together with a drawing, and the child is instructed to generate the inflection of the target word. The test covers inflection of the present tense: comparative, superlative, and elative form (i.e., from something). After a practice session, five test trials were given concerning each type of inflection. The estimate of internal consistency of the test was .79.

Receptive and Expressive Language Mean Scores at 42 Months

The mean scores for both receptive and expressive language were based on two sources of data. Expressive score was a composite of the Boston Naming and Inflectional Morphology Tests, whose intercorrelation was .43 ($p < .001$). Receptive language score was a composite of the PPVT-R and the NEPSY's Comprehension of Instructions ($r = .45$, $p < .001$). In order to give equal weight to the test scores, they were standardized before computing the composite mean score. The Cronbach Alpha reliability for the expressive score was .63 and for the receptive, .64.

Results

Group Differences in Early Language and Play Measures

The means of the play and language tests were lower in the DR group than in their controls (see Table 2), but none of these differences reached significance before the age of 2 years. The first language variable that differentiated the groups was the 2-year-olds' maximum sentence length [$F(1, 195) = 4.72$, $p < .05$]. Children in the control group produced longer utterances indexed by the mean number of morphemes.

Table 2. Play and language skills in children with and without familial risk for dyslexia.

Measures	Dyslexia Risk Group		Control Group			
	M	*SD*	*M*	*SD*	F^a	*p*
14 months						
Symbolic play	3.54	1.86	4.09	2.18	3.65	ns
Vocabulary comprehension (CDI)	150.25	83.40	164.88	82.26	1.55	ns
24 months						
Vocabulary production (CDI)	254.92	153.85	277.91	162.71	1.03	ns
Maximum sentence length (CDI)	4.90	2.47	5.75	2.99	4.72	.05
Bayley expressive score (BSID)	8.84	4.61	9.81	4.31	2.18	ns
30 months						
Reynell receptive score (RDLS)	35.69	6.54	37.20	6.52	2.49	ns
42 months						
Boston Naming Test	17.45	5.69	20.05	5.76	10.22	.01
Inflectional Morphology Test	13.37	8.29	16.44	8.13	5.89	.05
Peabody Picture Vocabulary Test	36.09	14.46	39.19	14.90	1.95	ns
Comprehension of Instructions (NEPSY)	11.31	3.51	12.02	3.48	1.98	ns

[a] *df*s vary between 1,170 and 1,198 due to missing data on the single measures.

The overall situation was different at 3.5 years. MANOVA of the language measures showed a significant group effect ($p < .05$). ANOVAs of the single measures revealed that reliable differences between the groups were present in the Boston Naming [$F(1, 197) = 10.22$, $p < .01$] and in the Inflectional Morphology [$F(1, 170) = 5.89$, $p < .05$] Tests. None of the measures of receptive language revealed significant differences between the groups at the ages observed in this study.

Continuity in Language Development

From the age of 2 years onwards, language measures started to show consistency and correlated significantly with subsequent language skills in the DR group (see Table 3). Significant, positive connections were also found in the control group, but the correlations were neither as consistent nor as high. The best early predictors were the maximum sentence length assessed at 24 months and the Reynell receptive scale administered to children at 30 months, whose correlations with receptive and expressive language at 3.5 years were highly significant among the children of the DR group. Intercorrelations of language measures of the 3.5-year-olds revealed a similar pattern of significant associations in both groups.

Symbolic play correlated significantly with subsequent language skills among the control group; 7 of the 9 coefficients reached significance, at least at the level of .05 (see Table 3). The strongest connection was found between symbolic play at 14 months and the Reynell receptive score at 30 months ($r = .39$, $p < .001$). Correlation between symbolic play and the Inflectional Morphology Test (at 3.5 years) was also significant among the controls ($r = .27$, $p < .05$), but not among the DR group; the difference of the correlations between the groups was significant ($p < .05$).

Predictive Relationships Among Language Skills

In order to investigate the extent to which children's early play and language skills, parents' education, and family status contributed to a child's language skills at the age of 3.5 years, hierarchical multiple regression analyses were conducted separately for receptive and expressive outcome measures. The predictors were entered in the same order for both measures. The order of play and language measures was determined by developmental succession of the assessments. Block 1, including mothers' and fathers' education, was inserted into the multiple regression models first. Then Blocks 2, 3, 4, and 5 were inserted, representing children's symbolic play and vocabulary comprehension at 14 months, expressive language skills at 24 months, and receptive language at 30 months, respectively. Block 6, child's family status (risk or control), was entered as the last predictor into a regression model to ascertain whether this factor plays any critical predictive role in addition to the variation observable from the lifetime differences. The results are summarized in Table 4, reporting correlation coefficients to the criterion and increments in R^2

Table 3. Correlations between the play and language measures in children with and without familial risk for dyslexia.

Measures	2.	3.	4.	5.	6.	7.	8.	9.	10.
14 months									
1. Symbolic play	__.18__[a]	__.24*__	__.14__	__.18__	__.24*__	__.12__	__.01__	__.20__	__.22*__
	.13	.32**	.29**	.34**	.39***	.05	.27*	.30**	.28**
2. Vocabulary comprehension		__.39***__	__.27*__	__.08__	__.24*__	__.11__	__.23*__	__.21*__	__.26*__
		.19	.16	.05	.25*	.25*	.07	.20*	.18
24 months									
3. Vocabulary production			__.78***__	__.68***__	__.36***__	__.42**__	__.35***__	__.28**__	__.32***__
			.80***	.67***	.23*	.23*	.20	.25*	.11
4. Maximum sentence length				__.64***__	__.45***__	__.45***__	__.51***__	__.45***__	__.41***__
				.59***	.14	.28**	.24*	.28**	.13
5. Bayley expressive score					__.38***__	__.44***__	__.27**__	__.32**__	__.42***__
					.21	.24*	.08	.15	.07
30 months									
6. Reynell receptive score						__.60***__	__.68***__	__.55***__	__.48***__
						.41***	.40***	.39***	.30**
42 months									
7. Boston Naming Test							__.45***__	__.57***__	__.42***__
							.38***	.54***	.48***
8. Inflectional Morphology Test								__.47***__	__.45***__
								.51***	.46***
9. Peabody Picture Vocabulary Test									__.50***__
									.38***
10. Comprehension of Instructions									

*p < .05; **p < .01; ***p < .001

[a] Correlations of the dyslexia risk group are in bold.

Table 4. Multiple regression results for children's receptive and expressive language at 3.5 years.

		Receptive language			Expressive language		
Block	Predictors	ΔR^2	β	r	ΔR^2	β	r
1.	Mothers' education	.02	.06	.21**	.04*	.03	.22**
	Fathers' education		.06	.13		.12*	.18*
2.	Symbolic play at 14 months	.11***	.13	.29***	.03*	–.10	.18*
3.	Vocabulary comprehension (CDI) at 14 months	.05**	.14*	.24***	.03*	.02	.17*
4.	Expressive language skills at 24 months	.04**	.12	.37***	.10***	.23***	.44***
5.	Reynell receptive score at 30 months	.12***	.38***	.50***	.24***	.53***	.62***
6.	Group (risk or control status)	.00	.04	.11	.04***	.19***	.26***
	Total R^2	.34***			.48***		
		[F(7, 167) = 11,64, p < .001]			[F(7, 165) = 20,93, p < .001]		

*p < .05; **p < .01; ***p < .001

for each block. The standardized betas are from the final block, when all predictors are entered simultaneously into the model.

Table 4 shows that the total R^2 of this model was highly significant, revealing that 34% of the variance in receptive language at 3.5 years could be accounted for by these predictors. All play and language measures in Blocks 2 to 5 provided a significant incremental contribution to the prediction of children's receptive language. Symbolic play at 14 months and Reynell receptive score at 30 months had the greatest contributions. Parents' education had a small correlation but (like children's familial group status) made no significant contribution to the children's receptive language.

The total R^2 was higher for the expressive language model than those for receptive skills, accounting for 48% of the variance. All Blocks, including children's parental education and also the familial group status, made a significant contribution to expressive language. The best single predictor was Reynell receptive score assessed at 2.5 years. This measure provided the greatest unique contribution to the prediction of the children's receptive and expressive language. Children's familial risk status also contributed to expressive language, even after entering all the other predictors first in the model.

Language Development Among the Late Talkers

To further analyze the contribution of family status, two late-talker subgroups were formed. These were selected using the composite score of the three expressive measures at the age of 2 years (with more than –1 *SD* below the mean of standardized scores as the cut-off level). The subgroups comprised 20 late talkers (5 girls, 15 boys) in the DR group and 14 late talkers (4 girls, 10 boys) in the control group. These two subgroups of late talkers did not show any difference associated with symbolic play, the Bayley MDI, or parental education. No difference between these groups was found on the Reynell receptive and expressive scores at 2.5 years.

A MANOVA of the language measures for repeated measures between 2 and 3.5 years for the late talkers revealed a significant interaction between the groups and age for expressive language [$F(1, 32) = 7.67$, $p < .01$]. Also, the receptive measures revealed a significant interaction between the groups at 3.5 years [$F(1, 32) = 6.93$, $p < .05$]. The late talkers in the DR group received significantly lower scores, being still delayed on language comprehension and production 1.5 years later, whereas a large number of the late talkers in the control group had reached the level of their age-mates.

Continuity of language development characterized the late talkers of the DR group only (see Figures 1 and 2). They had significantly lower scores than the other members of the DR group on both receptive [$F(1, 101) = 5.67$, $p < .05$] and on expressive [$F(1, 99) = 6.87$, $p < .01$] skills at the age of 3.5 years. In contrast, the late talkers of the control group, compared with the other members of control group, no longer revealed differences in receptive or expressive skills.

Retrospective examination of late talkers within the control group showed that they differed significantly from the other members of the control group in symbolic play [$F(1, 87) = 7.09$, $p < .01$] at 14 months. A similar trend was found within the DR group, but this difference failed to reach significance.

Discussion

The present study examined early development and predictive relations of symbolic play and language in children with and without familial risk for dyslexia. The earliest language measure that reliably differentiated the dyslexia risk and control groups was the maximum sentence length at age 2 years. The DR group produced shorter utterances, as measured by the mean number of morphemes. Furthermore, the DR group scored lower than their controls on the mastery of object naming and

Figure 1. Receptive language skills at the age of 3.5 years.

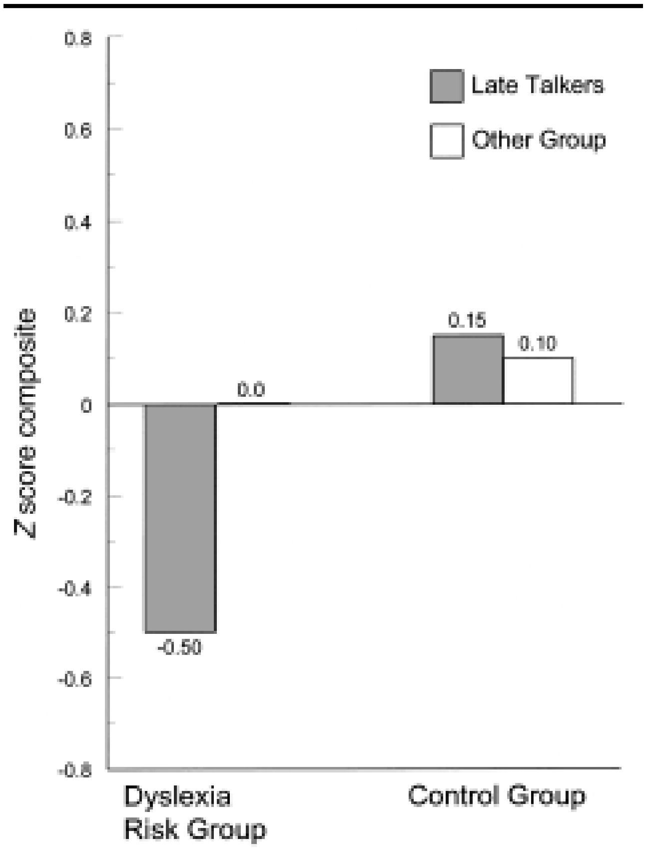
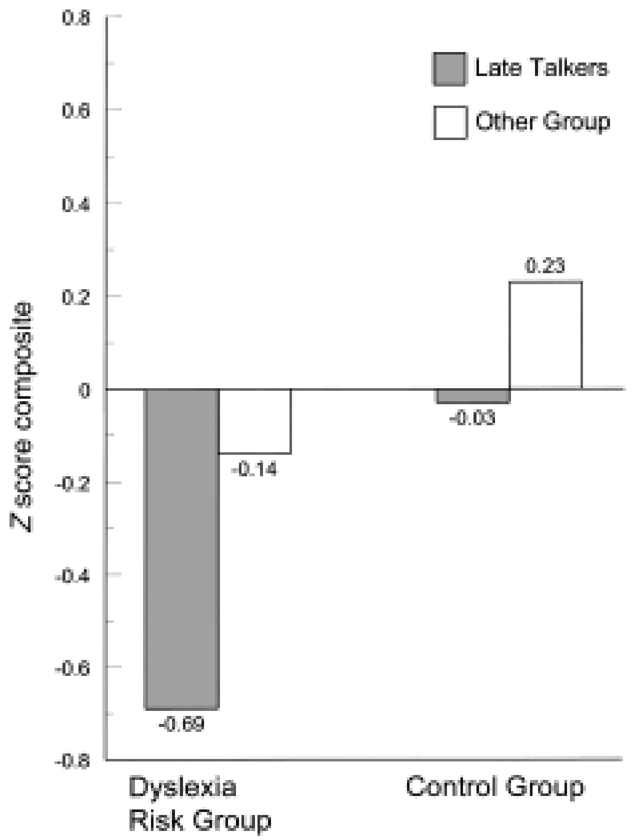


Figure 2. Expressive language skills at the age of 3.5 years.



inflectional morphology at 3.5 years. The modeling results supported our hypothesis regarding the reliable prediction of language development. From the age of 2 years, children in the DR group showed increasing delay as compared with controls in expressive language development. The familial risk status was a significant independent predictor of expressive language at age 3.5 years, even after controlling for the contributions of parental education and prior language measures.

Concerning the measures differentiating the groups, our results are compatible with Leonard, Miller, and Gerber (1999), who suggest that inflectional morphology plays an important role in language acquisition from an early age, particularly in children with language-related problems. We agree with Dale and Cole (1991) and Paul and Alforde (1993) that mastery of inflections can be considered a good index of a child's language-learning capacity. Because of the richly inflected, agglutinative nature of the Finnish language (e.g., Lyytinen, 1987), it is no surprise that difficulties in inflectional morphology were shown among children with familial risk for dyslexia.

Previously, Scarborough (1990) has found that children who became dyslexic had lower object-naming skills at 3.5 years than did their controls. Similarly, as with our results, her at-risk children did not match controls on sentence length and complexity at 2.5 years. Corresponding naming-related findings have also been presented by Gallagher et al. (2000) at the age of 3.9 years. Their results revealed that children from at-risk families whose literacy skills were low at 6 years showed a rather general language delay at 3.9 years. Our results seem to support a more narrow, expressive language delay at 3.5 years.

Children's symbolic play skills assessed at 14 were found to be reliably predictive of receptive and expressive language at the age of 3.5 years. Symbolic play provided a higher unique contribution to language comprehension than to production, in keeping with suggestions by Sigman and Sena (1993) and Lyytinen and her colleagues (1997). Our previous findings have revealed a predictive link between play competence at 14 months and verbal comprehension at 18 and 30 months (Laakso et al., 1999a). The present results also confirmed this predictive connection for a longer age range and supported the notion of the predictive value of symbolic play (McCathren et al., 1996). The sensitivity of this early measure failed, however, to suffice for the showing of any significant difference in symbolic play between the group with and without risk for dyslexia. This finding is in accordance with Casby (1997), who suggested that differences in symbolic play between language-impaired and normal-language age-matched children are small at early phases of development.

The Symbolic Play Test, which reflects the developing representational skills, predicted subsequent language skills more reliably among the controls than the at-risk children. This conclusion was supported by the finding that correlations between symbolic play and language development were higher within the control group than the DR group. Futhermore, we found that verbal comprehension of the Reynell Developmental Language Scales at 2.5 years provided the greatest unique contribution to the prediction of subsequent receptive and expressive language skills. Previous studies (e.g., Bloom, 1998; Leonard, 1998; Rescorla et al., 1997) have also shown that reliable predictive indications of language learning can be isolated at this age. Menyuk et al. (1995) found that language comprehension tasks (comprising discrimination and comprehension of linguistic categories and relations) were the best predictors of both receptive and expressive language at 3 years. In the present study, the predictive power of the Reynell receptive score was higher for subsequent expressive skill than it was for subsequent receptive skill. Although the groups did not differ in receptive language from each other at the age of 3.5 years, the significance of comprehension skills as a discriminator of the groups increased with the function of children's age.

An alternative way to analyze the data revealed predictions that showed reliable differences between the groups with and without risk for dyslexia. One of the most salient measures of early language development is the late initiation of talking. Cross-age continuity in language development among the late talkers was significant among the DR group only. Thus, the 2-year-olds who scored low in the measures of vocabulary growth, in Bayley expressive items, and maximum sentence length still had difficulties in expressive language skills at 3.5 years, but only if they belonged to the DR group. An examination of the data for the late talkers in the control group showed that most of them had caught up with the delay, matching the other members of the control group in expressive skills by 3.5 years. This concurs with the findings of Paul (1996), who has previously suggested that the late talkers may surmount early delays when they have purely expressive delays. These results also fit with those of Rescorla et al. (1997) and Spitz et al. (1997), who have shown that a positive family history of language impairment in conjunction with a continuing delay in expressive language level reveals possible accumulation of the language-related risk. Our findings show that children with a familial risk for dyslexia and with a history of late talking are at higher risk for delays in language acquisition than children without the familial risk for dyslexia.

We can draw another conclusion from our data concerning the late onset of talking which supports the suggestions made by Rescorla et al. (1993, 1997). There seems to be no reasons for any serious concern for those 2-year-olds, even if their expressive level is low, if the child has no other endogenic or exogenic problems. Delay in expressive language may, however, be a sign of a need for support if the child has a familial background of language related-problems.

An essential issue is why the late talkers in the DR group do not catch up with the developmental pace of the late talkers in the control group. Could literacy activities within the family account for this difference? This seems, however, not to be the case. In an earlier study of the same participants (Laakso et al., 1999b), no differences emerged between the dyslexia risk and the control group mothers' behavior towards their child in the book-reading session. Both groups of mothers supported their child's attention in the book in a similar way by labeling and by activating the child to point or name. These observations relating to the mother's role are compatible with Gallagher et al.'s (2000) findings that parents of literacy-delayed children read to their children as often as parents of control children and spend more time with their child for the learning of letters than do parents of controls. Parents being committed to an intensive longitudinal study of language and themselves having language-related problems may pay more attention to their child's development than do parents usually. Therefore, our finding that the children's familial risk status contributed to expressive language development, even when parental education and the previous language level were controlled, is fundamental. It shows that something critical occurs in the developmental path of the children at risk for dyslexia between the age of 2 and 3.5 years that is not explained by the parent's efforts nor the child's prior development. An apparent candidate is the activation of genetic influences, the consequences of which will be seen more slowly and possibly attaining their greatest influence at the phase of acquisition of reading.

Acknowledgments

We thank the families who participated in the study, S. Leinonen and the personnel of maternity clinics of Central Finland for their help in enrolling the families, J. Erskine for polishing the language, A. Mäkiaho for assistance in statistics, J. Katajamäki for collecting data, K. Eklund for organizing the assessment visits, and J. Gilger for valuable comments. This work belongs to the Finnish Centre of Excellence Programme (2000-2005) and has been supported by the Academy of Finland and the University of Jyväskylä.

References

Bates, E., Dale, P. S., & Thal, D. (1995). Individual differences and their implications for theories of language development. In P. Fletcher & B. MacWhinney (Eds.), *The handbook of child language* (pp. 96–151). Cambridge, MA: Blackwell.

Bayley, N. (1993). *The Bayley Scales of Infant Development* (2nd ed.). San Antonio, TX: Psychological Corporation.

Bishop, D. V. M., North, T., & Donlan, C. (1995). Genetic basis of specific language impairment: Evidence from a twin study. *Developmental Medicine and Child Neurology, 37*, 56–71.

Bloom, L. (1998). Language acquisition in its developmental context. In W. Damon (Ed.), *Handbook of child psychology* (5th ed., pp. 306–370). New York: Wiley.

Bronfenbrenner, U., & Morris, P. A. (1998). The ecology of developmental processes. In R. M. Lerner (Ed.), *Theoretical models of human development* (Handbook of child psychology, Vol, 1, pp. 993–1028). New York: Wiley.

Casby, M. W. (1997). Symbolic play of children with language impairment: A critical review. *Journal of Speech, Language, and Hearing Research, 40*, 468–479.

Dale, P. S. (1996). Parent report assessment of language and communication. In K. N. Cole, P. S. Dale, & D. J. Thal (Eds.), *Assessment of communication and language* (pp. 161–182). Baltimore: Paul H. Brookes.

Dale, P. S., & Cole, K. N. (1991). What's normal? Specific language impairment in an individual differences perspective. *Language, Speech, and Hearing Services in Schools, 22*, 80–83.

DeFries, J. C. (1991). Genetics and dyslexia: An overview.

In M. Snowling & M. Thomson (Eds.), *Dyslexia: Integrating theory and practice* (pp. 3–20). London: Whurr.

Dunn, L. M., & Dunn, L. M. (1981). *Peabody Picture Vocabulary Test–Revised*. Circle Pines, MN: American Guidance Service.

Ellis Weismer, S., Murray-Branch, J., & Miller, J. F. (1994) A prospective longitudinal study of language development in late talkers. *Journal of Speech and Hearing Research, 37*, 852–867.

Fenson, L., Dale, P. S., Reznick, J. S., Bates, E., Thal, D., & Pethick, S. J. (1994). *Variability in early communicative development*. Monographs of the Society for Research in Child Development, *59*(5, serial no. 242).

Gallagher, A., Frith, U., & Snowling, M. J. (2000). Precursors of literacy delay among children at genetic risk of dyslexia. *Journal of Child Psychology and Psychiatry and Allied Disciplines, 41*, 202–213.

Griffin, E. A., & Morrison, F. J. (1997). The unique contribution of home literacy environment to differences in early literacy skills. *Early Child Development and Care, 127–128*, 233–243.

Hallgren, B. (1950). Specific dyslexia (congenital word-blindness): A clinical and genetic study. *Acta Psychiatric Neorology (Suppl.), 65*, 1–287.

Kaplan, E., Goodglass, H., & Weintraub, S. (1983). *The Boston Naming Test* (2nd ed.). Philadelphia: Lea & Febiger.

Korkman, M. (1998). NEPSY: *A developmental neuropsychological assessment*. San Antonio, TX: Psychological Corporation.

Laakso, M.-L., Poikkeus, A.-M., Eklund, K., & Lyytinen, P. (1999a). Social interactional behaviours and symbolic play competence as predictors of language development and their associates with maternal-directing strategies. *Infant Behavior and Development, 22*, 541–556.

Laakso, M.-L., Poikkeus, A.-M., & Lyytinen, P. (1999b). Shared reading interaction in families with and without genetic risk for dyslexia: Implications for toddlers' language development. *Infant and Child Development, 8*, 179–195.

Leinonen, S., Muller, K., Leppänen, P., Aro, M., Ahonen, T., & Lyytinen, H. (in press). Heterogeneity in adult dyslexic readers: Relating processing skills to the speed and accuracy of oral text reading. *Reading and Writing: An Interdisciplinary Journal*.

Leonard, L. B. (1998). *Children with specific language impairment*. Cambridge, MA: The MIT Press.

Leonard, L. B., Miller, C., & Gerber, E. (1999). Grammatical morphology and the lexicon in children with specific language impairment. *Journal of Speech, Language, and Hearing Research, 42*, 678–689.

Locke, J. L., Hodgson, J., Macaruso, P., Roberts, J., Lambrecht-Smith, S., & Guttentag, C. (1997). The development of developmental dyslexia. In C. Hulme & M. Snowling (Eds.), *Dyslexia: Biology, cognition and intervention* (pp. 73–96). London: Whurr.

Lowe, M., & Costello, A. J. (1976). *Manual for the Symbolic Play Test*. Windsor, U.K.: NFER.

Lyytinen, H. (1997). In search of the precursors of dyslexia: A prospective study of children at risk for reading problems. In C. Hulme & M. Snowling (Eds.), *Dyslexia: Biology, cognition and intervention* (pp. 97–107). London: Whurr.

Lyytinen, H., Ahonen, T., Aro., M., Aro, T., Närhi, V., & Räsänen, P. (1998). Learning disabilities: A view of developmental neuropsychology. In R. Licht, A. Bouma, W. Slot, & W. Koops (Eds.), *Child neuropsychology. Reading disability and more... A tribute to Dirk Bakker* (pp. 29–54). Uitgeverij: Eburon.

Lyytinen, H., Leinonen, S., Nikula, M., Aro, M., & Leiwo, M. (1995). In search of the core features of dyslexia: Observations concerning dyslexia in the highly orthographically regular Finnish language. In V. W. Berninger (Ed.), *The varieties of orthographic knowledge II: Relationships to phonology, reading, and writing* (pp. 177–204). Dordrecht: Kluwer.

Lyytinen, P. (1987). Cognitive skills and Finnish language inflection. *Scandinavian Journal of Psychology, 28*, 304–312.

Lyytinen, P. (1999). *Varhaisen kommunikaation ja kielen kehityksen arviointimenetelmä (Finnish Manual for Communicative Development Inventories).* Jyväskylän yliopiston lapsitutkimuskeskus ja Niilo Mäki Instituutti. Jyväskylä: Yliopistopaino.

Lyytinen, P., Laakso, M.-L., Poikkeus, A.-M., & Rita, N. (1999). The development and predictive relations of play and language across the second year. *Scandinavian Journal of Psychology, 40*, 177–186.

Lyytinen, P., Poikkeus, A.-M., & Laakso, M.-L. (1997). Language and symbolic play in toddlers. *International Journal of Behavioral Development, 21*, 289–302.

McCathren, R. B., Warren, S. F., & Yoder, P. (1996). Prelinguistic predictors of later language development. In K. N. Cole, P. S. Dale, & D. J. Thal (Eds.), *Assessment of communication and language* (pp. 57–75). Baltimore: Paul H. Brookes.

McCune, L. (1995). A normative study of representational play at the transition to language. *Developmental Psychology, 31*, 198–206.

Menyuk, P., Liebergott, J. W., & Schultz, M. C. (1995). *Early language development in full-term and premature infants*. Hillsdale, NJ: Lawrence Erlbaum.

Paul, R. (1996). Clinical implications of the natural history of slow expressive language development. *American Journal of Speech-Language Pathology, 5*(2), 5–21.

Paul, R., & Alforde, S. (1993) Grammatical morpheme acquisition in 4-year-olds with normal, impaired, and late-developing language. *Journal of Speech and Hearing Research, 36*, 1271–1275.

Pennington, B. F. (1994). Genetics of learning disabilities. *Journal of Child Neurology, 10*(Suppl.), 69–76.

Plomin, R. (1994). *Genetics and experience: The interplay between nature and nurture.* Thousand Oaks, CA: Sage.

Raven, J. C., Court, J. H., & Raven, J. (1992). *Standard progressive matrices*. Oxford, U.K.: Oxford Psychologists Press.

Rescorla, L. (1984). Individual differences in early language development and their predictive significance. *Acta Pediologica, 1*, 97–115.

Rescorla, L., & Goossens, M. (1992). Symbolic play development in toddlers with expressive specific language impairment (SLI-E). *Journal of Speech and Hearing Research, 35*, 1290–1302.

Rescorla, L., Hadicke-Wiley, M., & Escarce, E. (1993). Epidemiological investigation of infant vocalizations of expressive language delay at age two. *First Language, 13*, 5–22.

Rescorla, L., Roberts, J., & Dahlsgaard, K. (1997) Late talkers at 2: Outcome at 3. *Journal of Speech, Language, and Hearing Research, 40*, 556–566.

Reynell, J. K., & Huntley, M. (1987). *Reynell Developmental Language Scales Manual* (2nd ed.). Windsor, U.K.: NFER-Nelson.

Roth, F., & Clark, D. (1987). Symbolic play and social participation abilities of language impaired and normally developing children. *Journal of Speech and Hearing Disorders, 52*, 17–29.

Rutter, M. L., Dunn, J., Plomin, R., Simonoff, E., Pickles, A., Maughan, B., Ormel, J., Meyer, J., & Eaves, L. (1997). Integrating nature and nurture: Implications of person-environment correlations and interactions for developmental psychopathology. *Development and Psychopathology, 9*, 335–364.

Rutter, M., & Pickles, A. (1991). Person-environment interactions: Concepts, mechanisms and implications for data analysis. In T. Wachs & R. Plomin (Eds.), *Conceptualization and measurement of organism-environment interaction* (pp. 105–141). Washington, DC: American Psychological Assocation.

Scarborough, H. S. (1990). Very early language deficits in dyslexic children. *Child Development, 61*, 1728–1743.

Scarborough, H. S. (1991). Early syntactic development of dyslexic children. *Annals of Dyslexia, 41*, 207–220.

Schulte-Körne, G., Deimel, W., Muller, K., Gutenbrunner, C., & Remschmidt, H. (1996). Familial aggregation of spelling disability. *Journal of Child Psychology and Psychiatry & Allied Disciplines, 37*, 817–822.

Siegel, L. S., Cooper, D. C., Fitzhardinge, P. M., & Ash, A. J. (1995). The use of the mental development index of the Bayley Scale to diagnose language delay in 2-year-old high-risk infants. *Infant Behavior and Development, 18*, 483–486.

Sigman, M., & Sena, R. (1993). Pretend play in high-risk and developmentally delayed children. In M. H. Bornstein & A. O'Reilly (Eds.), *New directions for child development: The role of play in the development of thought* (Vol. 59, pp. 29–42). San Francisco: Jossey-Bass.

Snowling, M. J. (in press). Language and literacy skills: Who is at risk and why? In D. V. M. Bishop & L. Leonard (Eds.), *Speech and language impairments: From theory to practice*. Hove, U.K.: Psychology Press.

Spitz, R. V., Tallal, P., Flax, J., & Benasich A. A. (1997). Look who's talking: A prospective study of familial transmission of language impairments. *Journal of Speech, Language, and Hearing Research, 40*, 990–1001.

Tamis-LeMonda, C. S., & Bornstein, M. H. (1996). Variation in children's exploratory, nonsymbolic, and symbolic play: An exploratory multidimensional framework. In R. Rovee-Collier & L. Lipsitt (Eds.), *Advances in infancy research* (pp. 37–78). Volume 10 (pp. 37–78). Norwood, NJ: Ablex.

Terrell, B. Y., Schwartz, R. G., Prelock, P. A., & Messick, C. K. (1984). Symbolic play in normal and language-impaired children. *Journal of Speech and Hearing Research, 27*, 424–329.

Thal, D. J., Bates, E., Goodman, J., & Jahn-Samilo, J. (1997). Continuity of language abilities: An exploratory study of late- and early-talking toddlers. *Developmental Neuropsychology, 13*, 239–273.

Thal, D. J., & Katich J. (1996). Predicaments in early identification of specific language impairment. Does the early bird always catch the worm? In K. N. Cole, P. S. Dale, & D. J. Thal (Eds.), *Assessment of communication and language* (Vol. 6, pp. 1–28). Baltimore: Paul H. Brookes.

Thal, D., & Tobias, S. (1992). Communicative gestures in children with delayed onset of oral expressive vocabulary. *Journal of Speech and Hearing Research, 35*, 1281–1289.

Received June 28, 2000

Accepted February 27, 2001

DOI: 10.1044/1092-4388(2001/070)

Contact author: Paula Lyytinen, PhD, Department of Psychology, University of Jyväskylä, P.O. Box, SF-40351, Jyväskylä, Finland. E-mail:plyytine@psyka.jyu.fi