

Home Literacy Environment and Inside-Out Emergent
Literacy Skills of Children with Differing Familial Risk of
Dyslexia

JYVÄSKYLÄN YLIOPISTO
Psykologian laitos
PL 35
40351 Jyväskylä

Minna Kaaranen
Master's Thesis
Department of Psychology
University of Jyväskylä
2001

ABSTRACT

Minna Kaaranen
Supervisor : Heikki Lyytinen
Master's Thesis
Department of Psychology
University of Jyväskylä
Autumn 2001
56 pages, 2 appendix pages

The relations between home literacy environment and children's phonological and letter naming skills were examined in a longitudinal study of 158 children. Of these children 78 had a parent who was diagnosed as reading disabled and had a familial background of reading difficulties. In 42 cases the parent with reading difficulties was mother (the MRD -group), and in 36 cases father (the FRD -group). Control group consisted of 80 children from families with no such difficulties. Literacy environment constituted of five components: mother's own literacy activities, father's own literacy activities, frequency of child's unaccompanied reading, frequency of shared reading activities with parent, and duration of a reading session combined with total reading amount in a day. Information on parent's own literacy habits were collected through a questionnaire before the children's birth, and home literacy activities were inquired when the children were 4 years of age, and again at age 5. Letter naming and phonological skills were tested at ages 4 ½ and 5 ½. In the MRD group, there were associations between home literacy environment factors and children's letter naming skill and the phonology factor. The home literacy environment composites remained correlated with letter naming skill even after accounting for mother's education and child's IQ. The connections with the phonology factor disappeared after the controlling of mother's education and child's IQ. In other groups no such associations were found.

Keywords: Home literacy environment, letter naming, phonology, reading disability.

TIIVISTELMÄ

Tässä tutkimuksessa tarkasteltiin pitkittäisasetelmassa kodin lukemiseen liittyvän ympäristön yhteyttä lapsen fonologisiin ja kirjainten nimeämisen taitoihin. Otoksen koko oli 158 lasta, joista 78 lapsen kohdalla toisella lapsen vanhemmista oli todettu lukihäiriö ja lisäksi vanhemman suvussa oli esiintynyt lukemisen vaikeutta. Vanhempi, jolla oli lukemisen vaikeutta oli 42 tapauksessa äiti (MRD -ryhmä) ja 36:ssa tapauksessa isä (FRD -ryhmä). Kontrolliryhmään kuului 80 lasta. Kontrolliryhmän lapsien vanhemmilla tai heidän suvussaan ei esiintynyt lukemisen vaikeutta. Lukemiseen liittyvä ympäristö muodostettiin viidestä komponentista: äidin lukuharrastuneisuus, isän lukuharrastuneisuus, lapsen itsenäisen lukemisen frekvenssi, yhdessä vanhemman kanssa lukemisen frekvenssi ja yhteisen lukuhetken yhtäjaksoinen kesto yhdistettynä päivän aikaiseen yhteenlaskettuun lukemiseen käytettyyn aikaan. Tiedot vanhempien lukuharrastuneisuudesta kerättiin kyselyllä ennen lapsen syntymää. Muut ympäristökomponentit muodostettiin kyselyjen perusteella, jotka vanhemmat täyttivät lapsen ollessa 4-vuotias ja uudelleen lapsen ollessa 5-vuotias. Kirjainten nimeämisen taito ja fonologiset taidot testattiin kahdesti: 4 ½ - ja 5 ½ -vuotiaana. MRD -ryhmässä löydettiin yhteyksiä ympäristötekijöiden ja lapsen taitojen välillä. Yhteydet kirjainten nimeämisen taitoon säilyivät vielä äidin koulutuksen ja lapsen älykkyyden kontrolloinnin jälkeenkin. Yhteys lapsen fonologisiin taitoihin hävisi äidin koulutuksen ja lapsen älykkyyden kontrolloinnin jälkeen. Muilla ryhmillä ei löydetty kodin lukemiseen liittyvän ympäristön ja lapsen fonologisten ja kirjainten nimeämisen taitojen välisiä yhteyksiä.

Avainsanat: Kodin lukemiseen liittyvä ympäristö, kirjainten nimeäminen, fonologia, lukihäiriö.

INDEX

1. INTRODUCTION	2
2. METHOD	15
2.1. Subjects	15
2.2. Procedure	16
2.2.1. Home Literacy Environment.....	16
2.2.2. Emergent Literacy Skills	16
2.2.3. Control Variables	18
2.3. Analysis.....	18
2.3.1. Factor Analysis	18
2.3.2. Analysis of Variance.....	19
2.3.3. Cross-Lagged Panel Correlation (CLPA)	19
3. RESULTS	22
3.1. Preliminary Analysis.....	22
3.1.1. Reading Habits Questionnaire	22
3.1.2. Phonological Skills	25
3.1.3. Letter Naming	27
3.2. Descriptive Statistics and Group Differences	27
3.3. Associations Between the Features of Home Literacy Environment and the Emergent Literacy Skills	30
3.4. Partial Correlations and Cross-Lagged Differentials.....	32
4. DISCUSSION	41
REFERENCES	51
APPENDIX.....	57

1. INTRODUCTION

Letter knowledge and phonological skills have been mentioned repeatedly as the best preschool period predictors of the development of decoding skills and reading achievement (e.g. Adams 1990; Elbro, Borstrom, & Petersen, 1998; Lonigan, Burgess, & Anthony, 2000; Snow, Burns, & Griffin, 1998). Lonigan et al. (2000) found in their study that phonological sensitivity and letter knowledge were the only unique predictors of child's subsequent decoding skills. They concluded that preschool letter naming and phonological sensitivity measures accounted for 54% of the first grade decoding skills. According to Adams (1990), knowledge of letters and phonemic awareness have a strong and direct relationship to success and ease of reading acquisition. She also suggested that children with reading disabilities often perform poorly on these tasks (see also Byrne, 1998; Gallagher, Frith, & Snowling, 2000).

More traditional approaches to the study of reading suggests that there is a point in time when a child is ready to begin to learn to read and write (Lonigan et al., 2000; Whitehurst & Lonigan, 1998, 1999). Emergent literacy approach, however, claims that the development of literacy is a continuous process that begins early in the life of a child. Literacy development is seen as a gradual process that will take place over time and no clear demarcation between reading and prereading is assumed (Lonigan et al., 2000, Whitehurst & Lonigan, 1998, 1999). Furthermore, it is assumed in this approach, that the development of oral language, reading, and writing happen interdependently and concurrently in a social context without formal instruction (Whitehurst & Lonigan, 1998, 1999). Besides the skills that are presumed to predict future literacy skills, the study of emergent literacy includes also the environments that support these skills (Whitehurst & Lonigan, 1998, 1999).

It is evident that there are differences between children at school entry in how much they have had literacy related experiences, and that these differences predict their subsequent academic achievement in the early school years (Leseman, & DeJong, 1998;

Scarborough, & Dobrich, 1994, Snow et al., 1998). To the children, who have had a lot of literacy related preparation and experience, the lessons in school will probably be easier, and it is likely that they show more interest in lessons. This is why their learning to read is probably faster than the learning of those of their peers, who have had less literacy fostering home environments (Adams 1990). These differences at the beginning of school years might lead to different trajectories. Stanovich (e.g. 1986) named this process as the Matthew effect (i.e. The rich get richer while the poor get poorer).

Parents are at central position when trying to affect the early literacy related skills of a child before school entry. Parents are the providers of their children's genetic and home environments (Laakso, Poikkeus, & Lyytinen, 1999), and both environmental and genetic influences interact in enforcing language development (Valsiner, 1998). Parents are important interaction partners in the course of child's literacy development. According to Vygotsky's theory of development (in Valsiner, 1998), children's cognition develops through interacting with a more competent other around culturally valued tasks in a zone of proximal development (ZPD). ZPD refers to the difference of how a child performs alone, and how well he or she performs with the aid of a competent other. In this theory subject is seen as an active agent, who creates new, and restructures the field when travelling through experiences. Experiences are considered to create possible conditions to the next moment of experience. Child is seen as an active agent, who chooses from the possibilities provided, significant others (mainly parents) offer possibilities and environments for the child (Valsiner, 1998).

Whitehurst and Lonigan (1998, 1999) divided emergent literacy skills into two broad interdependent sets of skills and processes. These sets were termed inside-out and outside-in units. Outside-in unit contains contextual and semantic skills and processes of decoding. Inside-out unit contains sound (e.g. phonemes) and print (e.g. graphemes) units. Both processes are needed in the process of reading. According to Whitehurst & Lonigan, (1998, 1999) three emergent literacy skill factors that appear to be associated with preschool children's later reading abilities were phonological processing abilities, print knowledge (e.g. letter knowledge), and oral language. The first two inside-out skills are selected as outcome measures of this study. Phonological awareness, or phonological sensitivity, refers to "the ability to attend explicitly to the phonological structure of spoken words, rather than just to their meanings and syntactic roles" (Snow, et al., 1998). Children who are better at detecting and manipulating syllables, rhymes or

phonemes are also quicker to learn to read (Lonigan et al., 2000). This relationship has been found even after controlling for the effect of other factors such as IQ, receptive vocabulary, memory skills, and social class (Wagner, Torgesen, & Rashotte, 1994). When Snow et al. (1998) reviewed the connections between phonological awareness and future reading skills of kindergartners in 27 research samples from 24 studies, the average correlation .46 was found. Individual differences in phonological skills are also relatively stable across time from kindergarten on (Wagner et al., 1994).

Perhaps even a stronger predictor of reading skills than phonological awareness appears to be letter name knowledge (Adams 1990; Gallagher, 2000; Lonigan 2000; Pennington, 2001; Snow et al., 1998). Snow et al. (1998) actually suggest that letter naming ability (simply the measure of how many letters a child can name when letters are shown in a random order) is nearly as successful at predicting future reading skill, as is an entire readiness test. Furthermore, Pennington et al. (2001) found letter-name knowledge at age 5 to be the strongest predictor of future reading difficulties of a child. At the most basic level, reading requires ability to translate units of print into units of sound, i.e. a reader must first know the names of the letters to be able to decode text (Whitehurst & Lonigan, 1998, 1999).

The reason for why this association appears so strongly is still somewhat unclear (Adams, 1990). On the one hand, children who have this skill already at school entry are perhaps in better position to gain from the teaching, which starts with letter names, and on the other hand, letter naming may just reflect some other underlying skill or knowledge (Adams, 1990). Even though letter naming is often found to be the best predictor of the development of literacy, it is noteworthy that most efforts to try to teach the letter naming skills to preschoolers have failed to have an effect on future reading ability (Adams, 1990). Significant results were, however, found when letter naming skills and phonological awareness were taught together (Adams, 1990; Snowling, 2000). Whitehurst et al. (1994) found in their intervention study, which used the combination of dialogic reading and sound foundations, that the intervention was significant in the domains of writing and print concepts. Their study also demonstrates, that children's language abilities can be enhanced by interactive book reading in the home. Effects on language were large in this intervention, but only for those children whose primary caregivers had been actively involved in the at-home component of the program.

These connections between the preschool emergent literacy measures and future reading development, and the notion that reading skills are a critical foundation for children's whole academic success (Cunningham & Stanovich, 1997; Scarborough, & Dobrich, 1994), raises the question of how these skills could be reinforced and facilitated in the preschool period. More specifically, is there something that parents (as the significant, more competent others) could do in the home environment context to promote their children's letter knowledge and phonological skills?

Various ways to study and define home literacy environment and its effects on emergent literacy skills has been used (Leseman et al., 1998). Interest on this subject has been growing in the last decades and there has been some debate of the importance of home literacy environment (Bus, van Ijzendoorn, & Pellegrini, 1995). As Whitehurst and Lonigan (1999) remark, the research has focused mainly on the connections between the literacy environment and language abilities, and other emergent literacy skills (inside-out units) has largely been neglected. Hence, little is known about the origins of inside-out skills. Very little research has examined the effect of the home literacy environment on the children's phonological skills (Burgess 1997). Crain-Thoreson, and Dale (1992) found in their study of verbally precocious children that story reading with parents and exposure to instruction in letter names and sounds contributed the development of emergent literacy at ages 2 ½ and 4 ½. In a more recent study on the effect of home literacy environment to phonological awareness, shared reading onset was significantly related to phonological awareness and other oral language abilities in middle to high SES families (Burgess 1997). Scarborough and Dobrich (1994), however, ended up to presume that shared reading activities would not be associated with syntactic or phonological structure of children's language (see also Whitehurst & Lonigan, 1998, 1999). When considering the wide agreement on the predictive value of letter naming skills on subsequent reading skills, it was surprising that so few studies had examined the environmental precursors of this skill. Only two were reported in the reviews of Bus et al. (1995) and Scarborough and Dobrich (1994).

Specific literacy practices have, however, often been found to contribute to other language skills, for example differences in oral language development of 5-4 year olds in low SES group (Payne, Whitehurst, & Angell, 1994), and to the development of receptive vocabulary in 3-6 year olds (Senechal, LeFevre, Hudson, & Lawson, 1996). In the study of Payne et al (1994) home literacy environment accounted for 12% -

18,5% of the variance in child language scores. By using a similar home literacy measure as Payne et al. (1994), Griffin and Morrison (1997) found that home literacy environment scales predicted unique variance in kindergarten and second grade language-based literacy skills even after accounting for IQ and mother's education. Senechal et al. (1996) found, that storybook exposure explained statistically significant unique variance in children's oral-language skills but not in their written-language skills. In a recent intervention study on the effects of family literacy project on kindergarten student's early literacy skills, Jordan, G.E., Snow, C.E., and Porsche, M.V. (2000) reported significant gains in children's language scores. Amount of participation, which was measured as completing book-related activities at home, was related to the size of the effect. They also found that the impact was especially strong on children, who scored low at the pretest. Furthermore, the home literacy environment may have an effect on the development of early orthography-phoneme associations (Cunningham & Stanovich, 1993), and help children to make a successful transition between oral language skills and literacy (Torgesen, Wagner, & Rashotte, 1994).

Overall, the evidence that the home literacy environment in fact have an effect on children's emergent literacy skills is pretty convincing (see for review Bus et al., 1995; Scarborough & Dobrich, 1994), especially on the outside-in skills. Even though Scarborough & Dobrich criticize the fact that the effect of home literacy environment on child's skills has been accepted uncritically, they conclude that there is an effect present, and that intervention and ethnographic studies support this conclusion. Bus et al. found similar effect sizes as Scarborough and Dobrich (about 8%) in their review. They concluded that parent-preschooler reading is related to language growth, emergent literacy skills and reading achievement, and that book reading at preschool period is a necessary preparation for beginning reading instruction at school. Some researchers have thought that these amounts of explained variance (8%) have been underestimations because of the low methodological level of studies reviewed, and that the real importance of home literacy environment is greater than Scarborough and Dobrich have suggested (e.g. Lonigan, 1994).

The frequency of shared reading has been the most common home literacy environment measure used in research (Bus et al., 1995; Laakso et al., 1999). It is, however, only one facet of home literacy experiences (Scarborough & Dobrich, 1994). Because of this, also multifaceted measures of home literacy environment have been

used (e.g. Griffin, & Morrison, 1997; Payne et al., 1994). These multifaceted measures are more reliable (Payne et al., 1994), and provide probably “more meaningful estimates of the efficacy of parental practices” (Scarborough, & Dobrich, 1994), than do measures that are based on just one single item/question. These multifaceted measures have, however, been criticized because of being too holistic (Whitehurst et al., 1994), and containing sometimes too much diversity and therefore interpretation gets clouded (Scarborough, & Dobrich, 1994). Therefore measures of home literacy environment should pursue to be interpretable and non-holistic, and at the same time, include various important facets of the home environment. The work of Teale and Sulzby (1986) provides a classification to be the basis of the formation of this kind of measures.

Teale and Sulzby (1986) categorized child’s possibilities to learn of print in a following way:

- a) Experiences in which children interact with adults in writing and reading situations,
- b) Experiences in which children explore print on their own,
- c) Experiences in which children observe adults modelling literate behaviours

Research on the predictors of literacy acquisition has largely been neglecting the influences of attitudinal, interest and enjoyment factors (Scarborough, & Dobrich, 1994). It is, however, reasonable to assume that if a child is more interested in reading or literacy related activities, he or she would turn out to be a better reader and writer than a child who is not that motivated and interested (Bus et al., 1995, Scarborough, & Dobrich, 1994). Scarborough et al (1991) found that children who came poorer readers did use less time amusing themselves with books at preschool period. Frequency of shared reading interactions was also somewhat connected to child’s subsequent reading skills, but the amount of reading seemed to depend on the child rather than the adult (e.g. child’s disinterest in reading). This connection has also been found already at a very young age. Lyytinen, Laakso, and Poikkeus (1998) found, that the children who were reported to be more interested in books at 14 months, had larger vocabularies at age 24 months. Their fathers and mothers also read to these highly interested children more frequently.

Parents own literacy practices are seen as a way to transfer literacy skills from parents to their children (Snow, et al., 1998). If children learn from their parents that literacy is a source of enjoyment, they may be more motivated to try to learn to read, even though it can be difficult during the early years (Snow, et al, 1998). Results are conflicting concerning this matter. In the study of Scarborough et al. (1991), only little evidence was found to support the hypothesis that the differences in parents own reading habits were related to their children's reading achievement. Payne et al. (1994) reported similar results. In the light of these studies parents own reading practices (observable literacy-related behaviours for the child) does not seem to have such a strong impact on child's literacy and language development as shared reading experiences. However, in other studies these associations have been found. For example parents have been found to influence their children's interest in books (Rowe, 1991) and language skills (Lyytinen et al., 1998) through their own reading pattern.

Parents with reading problems has been found to read less frequently than parents with no such problems (Bus et al., 1995; Elbro et al., 1998; Scarborough et al., 1991; Snowling, 2000), and the more severely dyslexic adults have been found to have more negative attitude towards reading (Leinonen et al., 2001). In addition to the influence of their own reading pattern, it has been proposed that parents, who have reading difficulties would perhaps read less also to their children, and that this difference could explain the fact that reading problems aggregate in families (Scarborough et al., 1991; Snowling, 2000). Testing of this assumption has generated results that seem to imply that the matter is not so simple. Amount of parent-child reading have not been found to differ in families with reading difficulties (RD group) and families with no reading related problems (NR group) (Elbro, 1998; Scarborough 1991; Snowling, 2000). Additionally, at age 14 months, the frequencies of maternal interactional behaviors, children's participation in shared reading, or their language skills were not found to differ in NR and RD groups (Laakso et al., 1999). However, maternal orienting of the children's attention was found to be positively related to later language development only in NR group. This association was negative in the RD group.

In addition to the differences in the observable literacy behaviours of parents, in shared reading interaction quality, and in the environments parents construct for their children, genetic factors also influence directly on child's motivational and skill factors. Children with different genotypes differ in how they can make use of the environmental

stimuli for the benefit of their developing language and literacy skills (Laakso et al., 1999). Genetic influences can be claimed to provide a strong indication of child's degree of risk for reading difficulties, both directly, and indirectly through the home environment (Lyytinen et al., 2001). So, as mentioned already earlier, parents are the providers of the both the genetic and social environments of their children.

When a child is a member of a family in which reading difficulties have occurred she or he can be considered as being at risk for reading difficulties, whether for biological or environmental reasons. (Snow et al., 1998; Snowling, 2000). When there are incidences of reading disability in a family, there is a higher than normal probability that a child will also have difficulties with reading (e.g. Pennington et al., 1991). Even though the reading disability of the mother or the father does not completely predict their children's reading disabilities, there is a substantially greater risk present when compared to children of normally reading parents (one estimate being from 31 to 62 percent versus from 5 to 10 percent) (Snow, et al, 1998). The reason for family patterns of reading problems can be either shared genetic or shared environmental factors, or actually the complex interplay between them (Snow, et al, 1998; see Lyytinen et al., 2001 for application of models of gene-environment interaction).

Social mechanisms of the transmission of reading difficulties are not yet fully understood, and further research is needed especially in the period before the school entry (Elbro, 1998). This period is important because the emergent literacy skills are good predictors of future reading skills and it would be crucially important to be able to identify the children at risk as early as possible (e.g. Scarborough & Dobrich, 1994). It is therefore important to search for the early precursors of emergent literacy skills. Also, at that time there is no teaching effect yet present, which would complicate the picture unnecessarily (Scarborough & Dobrich, 1994). The subjects of this study are participants of the Jyväskylä Longitudinal study of Dyslexia (JLD), in which there are two study groups; one with familial risk of dyslexia and one without this risk (i.e. The control group). When the subjects of a study are participants of a project, in which the participants are followed intensively from birth to first school years, and the parents have been advised and given information concerning reading difficulties and what could be done to help the children at risk, it must be assumed that this information have had an effect on the parents (Lyytinen, et al., 2001). They also suggested, that if the social environmental factors have any significant influence on child's reading related skills in

the JLD project, these factors reduce the difference between NR and RD groups, instead of making the difference greater. Risk group parents have probably gained from the intensive follow-up of the project, and they have had a lot of information concerning the importance of parent-child shared reading interactions. This may have caused the parents of RD group, who have the knowledge of their genetic risk to be even more sensitive in providing support for their children (Lyytinen et al., 2001). However, little is yet known of the social environmental factors within the RD group (Laakso et al., 1999).

About half of the familial risk group children in the JLD project have a mother with reading difficulties (and who have relatives with these problems, see Leinonen et al., 2001 for more detailed presentation of the grouping criteria), but a normally reading father (the MRD group), the other half have a dyslexic father and relatives with reading problems in father's side, but a normally reading mother (the FRD group). In this study these children formed separate groups (in addition to the control group). The effect of mother's literacy related activities and other features has been the main focus of the research in the field (Lyytinen et al., 1998). However, also the role of the father has nowadays been accepted as an important contributor of their children's development (Laakso, 1995). Lyytinen et al. (1998) found that shared reading with the father was linked to children's early interest in books. The associations between 2 year olds' lexical and grammatical skills and mothers' education, literacy activities, and shared reading with the child were, however, stronger than those of the fathers. The influence of maternal behaviours was seen to have a more extensive influence on children's language skills when compared with the influence of the fathers.

The possibility that parents own reading practices have an effect on children's emergent literacy skills combined with the knowledge of the different amount of influence of mothers and fathers were seen as important reasons for the division of the risk group in two. The home literacy environment of the MRD and FRD groups are expected to differ from each other because of the different reading skills and different familial background of reading difficulties of the mother (who probably is the parent who reads the most with the child). Frequency of shared reading, parents own literacy activities and attitudes, and child's reading practices alone (serves as an estimate of the child's interest in reading) are compared between the study groups. Additionally, it might be argued that there are difference between the risk groups and control group in

how well the children of dyslexic parents can benefit from the stimulus in the home literacy environment (Laakso et al., 1999).

Besides the social environment factors and familial risk, socio-economic status and child's IQ have been often mentioned as important predictors of children's literacy and language related skills (e.g. Bugress, 1997; Griffin & Morrison, 1997; Scarborough & Dobrich, 1994). Scarborough and Dobrich (1994) even suggested that SES differences would predict more variance in reading related skills than any other feature in the environment. They also claimed, that other environment features would be connected to SES and were only therefore predictive of subsequent literacy and language skills. This is because parents of higher SES groups tend to provide more literally enriching environments (Scarborough & Dobrich, 1994). Bus et al. (1995), however, suggested that the effect of parent-preschooler reading is not dependent on the SES (see also Snow et al., 1998). Furthermore, the connection between home literacy environment, and emergent literacy skills has been found even after accounting for the effect of maternal education and child's IQ measure (Griffin & Morrison, 1997). Relationship between home literacy environment and phonological skills were also established within high and middle SES groups (no SES group variance) (Burgess, 1997). Hence, home literacy environment's influence does not depend solely on the socio-economic differences between the families, but the effect is real and should be studied. The effect of mother's education and child's IQ will be considered in this study.

Most of the research on the connection between home literacy environment and children's reading related skills have been correlational in nature (Scarborough & Dobrich, 1994). Correlational study does not prove causality or reveal the direction of effect. By using a longitudinal design with repeated measures of both home literacy environment factors and skills, the possibility to answer the questions concerning causality increases (see analysis method chapter for more detailed discussion). On the basis of the studies by this far, it can not be stated that the direction of causality goes from specific reading practices to literacy and language related skills, or that these skills would have a causal effect on the reading practices in the home environment (Bus et al., 1995; Pellegrini, Galda, & Charak, 1997; Scarborough & Dobrich, 1994). It is likely that the children, who have had early experiences with print, will have better emergent literacy skills (e.g. Bus et al., 1995). On the other hand, it is as possible and probable that children's perceived abilities and desires will have an effect on how often they are

read to (Scarborough & Dobrich, 1994). Family members are in fact found to be sensitive to their children's interest and skills when they are selecting activities and materials in order to promote their children's literacy development and family-child interactions in their home environment at kindergarten age (Saracho, 1997, 2000). These endogenous and exogenous variables function most likely in a reciprocal manner, both fostering each other (Bus et al., 1995; Lyytinen et al., 1998; Scarborough & Dobrich, 1994). Lyytinen et al. (1998) found that already at early age (14 months) the children with better language and linguistic skills were the most interested in reading, attended to books earlier, made more initiatives for reading, and engaged for longer periods in shared reading sessions with a parent, than the children with not poorer linguistic and language skills. More interested children had also larger vocabularies, and they were read to more often. Lyytinen et al. (1998) concluded that literacy experiences, child's inherent interest in reading, and child's developing language skills all support each other reciprocally. Causality is somewhat addressed in this study.

Aim of this study was to add knowledge on the connections between home literacy environment, and two preschool inside-out emergent literacy skills (letter naming and phonological awareness). In addition to the distinction of different language and literacy skills, Scarborough and Dobrich (1994) suggested that it might be fruitful to make the distinctions among various facets of literacy experience. Furthermore, the effects of shared reading should be studied in a larger context, including also the measures of other aspects of home literacy environment, attitudes, and skills (see also Dunning et al., 1994; Lonigan, 1994).

Home literacy environment was divided here into a few elements based on the categorization of Teale and Sulzby (1986), to examine if these different kinds of home literacy features would have a different impact on letter naming or phonological skills. Factor analysis was used to determine the facets of home literacy environment from a questionnaire-based data. In this way the measure is aggregated and therefore provide stronger and more reliable estimates (Payne et al., 1994), while being non-holistic at the same time. Interpretations will therefore stay clearer and more sensitive on the differential influences of the literacy experiences. (see, Scarborough and Dobrich 1994; Whitehurst et al., 1994). Influence of shared reading, father's literacy activities, mother's literacy activities and children's own, unaccompanied reading (a proxy measure of child's motivational factor) on children's phonological skills and letter

knowledge were examined. Design of this study was longitudinal, including two measurements of emergent literacy skills (at ages 4 ½ and 5 ½ years), and two measurements of home literacy environment (at ages 4 and 5 years –except for parents own literacy activities). All of the measures were compared between control, MRD, and FRD groups, and associations were examined within these groups to study whether the features of home literacy environment would have different impact in different groups, formed on the basis of genetic risk.

The factors of shared reading, parent's own reading activities, and child's own interest are assumed to foster letter naming and phonological skills in every group of interest. On the basis of earlier studies (see Bus et al., 1995; Scarborough & Dobrich, 1994), the effects are not, however, assumed to be large, and the shared reading factor is assumed to have the greatest impact.

When the groups are compared, the greatest effects are expected to be found in the MRD group, where the parent with reading difficulties is the mother. The mothers have been found to have more effect on the language and literacy skills of the child than fathers (e.g. Lyytinen et al., 1998), and are also spending more time with their child in reading related activities. The factors that could affect mother's impact on their children's emergent literacy skills could be thought to be primarily the reading related skills of the mother and her motivation and effort to facilitate the development of the child. Dyslexic mothers have problems in their own reading and they are also reading less themselves (Leinonen et al., 2001). The skills of the mother may affect the child both through genetic and social transmission. The effect of the mother's own skills is, however, not in the focus of this study and will be examined later in more detail. The motivation of the mother to facilitate the literacy development of her child can vary between the mothers. The dyslexic mothers are expected to have the highest motivation due to their own experiences and the knowledge concerning the risk their children have. Interviews of these mothers show that they are highly motivated to help their children to have it easier with reading than they had themselves. Furthermore, the mothers of this study, possess a great deal of knowledge concerning the social and genetic transmission of dyslexia and are therefore probably even more motivated to be active in facilitating their children's literacy development.

Frequency of shared reading itself was therefore not expected to be lower in this group (as Scarborough et al., 1991 did), but there might be some difference in the

quality of the interaction (Lyytinen et al., 1998) due to the poorer literacy skills of the RD mothers. Therefore the child might not be gaining of literacy interaction as much as the children of a normally reading mother are. It must be noted, however, that the dyslexia of a mother may have such a large impact on parent's own reading practices and shared reading interactions, and therefore also on child's interest and attitudes, that these effects can be seen also in the emergent literacy skills of the child.

2. METHOD

The data reported here were collected as a part of a larger study on early language development and precursors of dyslexia and reading skills (Jyväskylä Longitudinal study of Dyslexia, JLD), in which the same children are followed from birth through early school years (see Lyytinen et al 1995).

2.1. Subjects

The subjects of this study were 158 children from the Jyväskylä Longitudinal study of Dyslexia. The original sample size of the JLD project was approximately 200. Over the years few of them has dropped out of the project and some of the children were not included in to the sample of this study, either because they had not participated to the assessment phase at age 4 ½, or they had not yet participated the 5 ½ -year study phase (being too young). The children and their parents came from the city of Jyväskylä and its surrounding communities in the Province of Central Finland. There were 78 children who had a parent with a familial background of reading difficulties and were diagnosed as reading disabled (for details see Leinonen et al., 2001). In order to study if it makes a difference if the parent with reading difficulties is mother or father, three groups were identified. In 42 cases the parent with reading difficulties was mother (the MRD -group) and in 36 cases the parent with reading difficulties was father (the FRD -group). There were 20 girls and 22 boys in the MRD group, and 17 of the FRD group children were girls and 19 were boys. Control group children's parents had reported problems neither in reading nor in learning to read and they did not have relatives with reading deficits. Control group consisted of 33 girls and 47 boys. All of the parents spoke Finnish as their native language. None of the children had mental, physical or sensory handicaps.

2.2. Procedure

2.2.1. Home Literacy Environment

Family background questionnaire was administered before the child's birth to collect demographic data. Parent's education and their own literacy activities were measured by this questionnaire. Measures of parent's literacy activities consisted of their report on how often they typically read newspapers and magazines, the extent to which they liked book reading and how many books they generally read in a year. Parents were asked to answer separately using a 4-point scale. The scores were summed separately to obtain a composite score of parent's literacy activities individually for mothers and fathers. The Cronbach's alphas for these composite scores were .60 for the fathers and .62 for the mothers.

Reading Habits Questionnaire was administered at age 4, and again at age 5. The questionnaire covered parent-child shared reading interactions and child's own independent reading related activities and interests (see Appendix).

2.2.2. Emergent Literacy Skills

These skills were measured at ages 4 ½ years and 5 ½ years. Items were identical at both phases.

Phonological skills

a) *Syllable and phoneme segmenting*: three pictures were shown to the child and named. After this child heard a small part of a word (varying from syllable to one phoneme). Experimenter asked the child to point the picture in which the sound can be heard. There was 14 items at this computer-aided task.

b) *Synthesis*: Experimenter said a word in small peaces (syllable-by-syllable or phoneme-by-phoneme); child was asked to tell which word it was. There was 12 items at this task.

c) *First phoneme identification*: First experimenter showed all of the 9 item pictures to the child one by one and asked the child to name the pictures. After this the experimenter said one phoneme from the beginning of a word and asked the child to guess what word he/she meant.

d) *Rhyming*: Child was asked to continue a sentence in a way that it'll be a poem. Only correct rimes were calculated as a right answer. There was 10 items at this task.

There was some practise items at the beginning of all of these tasks.

Letter Naming

Children were shown 23 letters, one by one and asked to identify them. The first letter of the child's first name was shown first. The letters were organized in groups of six letters (the last group had of course only 5 letters), and the letters were shown in the same order to every child. If the child did not know any of the letters in a group, the experimenter moved to the next task. If the child knew at least one letter in a group, the next group of six letters was asked. All of the letters were upper case.

2.2.3. Control Variables

WPPSI-R Performance IQ (Wechsler, 1989) measured at age 5 was used as a measure of child's IQ.

Measure on mother's education used in subsequent analysis comprises both basic education and additional training (ranging from 1= 'less than 3 years of basic education and no additional training' to 7= '3 years of basic education and more than 4 years of additional training').

2.3. Analysis

In this chapter I will review shortly the analysis methods that were used in this study.

2.3.1. Factor Analysis

Exploratory factor analysis was performed for the home literacy environment measures and for the four phonological skills using oblimin rotation. Oblimin rotation was selected because it allows the factors to correlate. This was considered as the natural state of these factors. It was therefore seen probable that the frequency of child's reading related activities alone correlate with shared reading with a parent. Use of oblimin rotation was possible because regression analysis was not planned, and therefore multicollinearity problem was not an issue. Factor scores, which were calculated by using the regression method, were used in subsequent analysis. Factor analysis was evaluated by using communalities, factor loadings, and amount of cumulative variance explained (%). Communalities illustrate how well each variable correlates with obtained factor solution. There are no too stringent distribution

assumptions in exploratory factor analysis. Variables used in the factor analyses of this study had close to normal distributions and did not have any outliers. Hence, it was possible to safely calculate the correlations, which were the basis of factor analyses.

2.3.2. Analysis of Variance

Repeated measures analysis of variance was used to compare the means of letter naming, phonological skills, and home literacy environment measures between control, MRD and FRD group at two points in time. One-way ANOVA was used only after the interaction between group and time was evaluated. The means of child's IQ (WPPSI-R), mother's education level, and parent's reading activities were compared between the groups by one-way ANOVA (these variables were measured only at one point in time). Assumptions were checked and found to be fulfilled reasonably well (i.e. distributions were close to normal or normal, and variances (ANOVA) and covariance matrices (MANOVA) were approximately equal).

2.3.3. Cross-Lagged Panel Correlation (CLPA)

Before describing the basic logic of the cross-lagged panel correlation method, I consider briefly correlation and causation. It is a fact that correlation alone does not imply causality. When two variables are strongly correlated, it can be concluded that those variables are strongly related to each other, not that one is the cause of another. Only experimental data can conclusively demonstrate causal relations between variables. It is however, possible to infer causality between two measures if three criteria are met: covariation, directionality, and elimination of extraneous variables. First, changes in one variable have to be associated with changes in another. This criterion is met if two variables correlate with each other, and if the correlation is not caused by pure chance, or for example by an outlier. Second, the presumed cause must

precede the presumed effect in time. Third, all influence that some extraneous variables might have on the relationship between the two variables studied, must be controlled or eliminated. There is always a possibility that both variables are caused by a third variable (Leary, 1995).

First and second criteria are easily met in a longitudinal study like this. A third criterion is always somewhat imperfectly fulfilled in a quasi-experimental study (Leary, 1995). However, Kenny (1975) claims that cross-lagged analysis is a test for the third variable effects, i.e. a test for spuriousness. Cross-lagged panel correlation (CLPA) method combined with partial correlation coefficients is used in this study to control for spuriousness and subsequently to infer causality.

Traditional 2w2v CLPA model consists of two variables that are measured at two time points (2 waves). There are six correlations between these variables: two autocorrelations (r_{x1x2} and r_{y1y2}), two synchronous correlations (r_{x1y1} and r_{x2y2}), and two cross-lagged correlations (r_{x1y2} and r_{x2y1}). According to Campbell's (1963, in Kenny, 1975) original suggestion it would be possible to infer the direction of causality by calculating the cross-lagged differential, $r_{x1y2} - r_{x2y1}$. If the differential is positive, X is the cause of Y and if negative, Y is the cause of X.

Assumptions:

1. Stationarity: lack of change over time in the strength and direction of the causes of a variable.
2. Synchronicity: X and Y are measured at the same point in time.

Second assumption was not met in this study, because the design is actually a 4w2v design (see Figure 1). Home literacy environment factors were measured at ages 4 and 5, and emergent literacy skills at ages 4 ½, and 5 ½. According to Kenny (1975) a CLPA analysis is still possible by comparing r_{x3y2} with either r_{x1y2} or r_{x3y4} . Because of this difference, a substituting assumption must be made:

3. Stability: empirical values do not change over time (measured by autocorrelation).

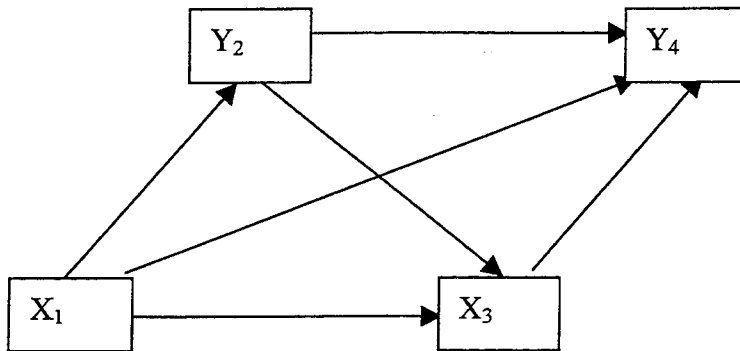


Figure 1. 4 wave - 2 variable design.

Second order partial correlation coefficients were calculated before the calculation of cross-lagged differential. Child's IQ and mother's education were seen as probable third variables (e.g. Griffin and Morrison, 1997), and the effect of these variables were removed before the CLPA analysis.

The CLPA is used in this study more as a descriptive method than an attempt to proof causality or the direction of the causal relationships. The use of cross-lagged differential has been criticised (e.g. Rofosa, 1980) and it is considered too simple to verify the direction of effect. This method is still selected here for its usefulness in descriptive purposes and also to produce suggestive results for further research.

3. RESULTS

Results are presented in three main sections. First one is the preliminary analysis section, in which the factor analysis of home literacy environment measures and phonological skills are presented. Second section includes descriptive statistics and group comparisons. Correlation coefficients between the literacy environment and emergent literacy skills within groups are calculated and compared. Third section presents partial correlation coefficients controlling for child's IQ and SES differences, as indicated by mother's education. Cross-lagged differential will be calculated to examine the direction of causality.

3.1. Preliminary Analysis

3.1.1. Reading Habits Questionnaire

Differences in the items of Reading Habits Questionnaire among children in the three subgroups were tested using one-way ANOVA. Because multiple comparisons were made, the Bonferroni multiple comparison test was used to adjust the significance level. The two risk groups, FRD and MRD did not differ from each other in any of these items. However, means of both risk groups were different from control group in some items.

At age five, control group children were reported spending significantly less time reading alone in a day ($p = .049$) and looking pictures with a parent ($p = .024$) than the MRD group children. In control group, however, fathers were reported reading significantly more with the child when the child was four years old, than the fathers of

MRD group ($p = .013$). Surprisingly, the mean reading frequency of the fathers to their children was not lowest at the FRD group, where the father was dyslexic, but in the MRD group, where the mother had the reading problems.

These individual items were not used in the further analysis, but a more multifaceted score was constructed. In order to identify different home literacy environment components, a factor analysis using oblimin rotation was performed at both time points. Even though the aim was to extract two of the three factors that Teale and Sulzby (1986) suggested (child's reading activities alone and shared reading activities with a parent), it was decided to use 'eigenvalues over one' -criteria in extracting, in order to capture the maximum amount of variance.

Instead of the expected two, three factors were extracted. The extracted factors explained 59,3 % of the total variance at age 4, and 57,7 % at age 5 (see Table 1). Factor solution was similar at both time points. Factor scores, which were calculated using regression method, were used in subsequent analysis.

Table 1. Rotated factor solution and communalities for Reading Habits Questionnaire at age 4 and 5.

	4 Years				5 Years			
	1	2	3	h^2	1	2	3	h^2
Looks at book/magazine independently		0,789		0,733		0,682		0,581
Child "reads" the story to...		0,639		0,477	0,304	0,536		0,464
Duration of reading episode alone		0,646	0,319	0,598		0,713	0,368	0,681
Total reading per day alone		0,761		0,703		0,888		0,822
Asks to be read to	0,763			0,727	0,674			0,613
Story is read to the child	0,929			0,792	0,852			0,732
Shared looking at pictures	0,391			0,339	0,497			0,430
Mother reads to the child	0,701			0,581	0,853			0,667
Father reads to the child	0,481			0,252	0,381			0,182
Duration of reading episode with parent			0,636	0,504			0,614	0,515
Total reading per day with parent			0,763	0,812	0,428		0,578	0,661

Note. Loadings < .30 were omitted. h^2 stands for extracted communalities

The factor solutions were pretty straightforward. At age 4 only duration of reading episode alone had a substantial loading in two factors. At age five duration of reading episode alone, child reads the story to oneself or to other and total reading amount in a day with parent had loadings over .30 to two factors. First factor reflects frequency of shared reading with parent, second child's unaccompanied reading, and third consists of two variables: the total amount of reading with parent in a day and duration of the latest

reading session with a parent, reflecting more time dependent shared reading than the first factor.

All communalities, except 'father reads to the child' at age 5, were quite high, indicating that the variables correlate well with the factor solution. Even though the reading of the father at both ages had weak communality it was not removed from the model because father's contribution was seen as an important part of child's home literacy environment.

Consequently five facets of home literacy environment were now constructed:

1. Frequency of shared reading with parent (Factor 1),
2. Child's unaccompanied reading (Factor 2),
3. Total amount of reading with parent in a day & duration of the latest reading session with a parent (Factor 3),
4. Mother's own literacy activities and attitude towards reading (Composite)
5. Father's own literacy activities and attitude towards reading (Composite)

Correlations presented in Table 2 show that home literacy factors were fairly stable in every group. Because the oblimin rotation was used in factor analysis, it was possible to consider relations between home literacy factors also within a wave. At age four in FRD group duration of reading & total reading in a day was not significantly related either to shared reading or to child's unaccompanied reading. Furthermore, at age five, shared reading and child's unaccompanied reading were not correlated in this group. All other correlations were significant in every group. Connections between the home literacy facets were overall lower in FRD group and stronger in MRD group. Interesting was that mother's and father's own literacy activities composites were related to home literacy factors at age five only in MRD group. Mother's literacy activities were especially strongly correlated with reading duration/total reading at age five.

Table 2. Intercorrelations of the home literacy facets within groups.

		2	3	4	5	6	7	8
1. Father's literacy activities	Control	0,205	0,044	-0,012	0,101	0,140	0,030	-0,023
	MRD	0,384*	-0,090	0,109	0,158	0,152	0,365*	0,333*
	FRD	0,325	-0,083	-0,009	0,312	0,092	0,199	0,135
2. Mother's literacy activities	Control		0,082	0,114	0,113	0,154	0,114	0,062
	MRD		0,277	0,258	0,356*	0,401*	0,345*	0,561***
	FRD		0,084	0,147	0,252	-0,120	0,220	-0,160
3. Shared Reading (4 Years)	Control			0,386***	0,315**	0,605***	0,276*	0,227
	MRD			0,698***	0,695***	0,809***	0,513**	0,663***
	FRD			0,601***	0,161	0,534**	0,368*	0,373*
4. Reading Alone (4 Years)	Control				0,324**	0,335**	0,632***	0,113
	MRD				0,608***	0,555**	0,743***	0,444*
	FRD				0,336	0,263	0,620***	0,433*
5. Reading duration&Total reading (4 Years)	Control					0,266*	0,244*	0,456***
	MRD					0,649***	0,388*	0,695***
	FRD					0,254	0,366*	0,726***
6. Shared Reading (5 Years)	Control						0,364**	0,266*
	MRD						0,651***	0,421**
	FRD						0,319	0,395*
7. Reading Alone (5 Years)	Control							0,329**
	MRD							0,362*
	FRD							0,547***
8. Reading duration&Total reading (5 Years)	Control							
	MRD							
	FRD							

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

3.1.2. Phonological Skills

Differences in the means of the phonological skills among children in the three subgroups were tested using one-way ANOVA. Bonferroni correction was used to adjust the significance levels because of the multiple comparisons. The two risk groups, FRD and MRD, did not differ from each other in any of these skills. However, like with the Reading Habits Questionnaire, both risk groups differed from control group in some respect (see Table 3). Both risk groups had lower mean test scores than the control group on all of these phonological skills, even though the difference was not significant everywhere. The group of children, whose mother was the parent with reading difficulties, performed poorest of all the groups at every phonological skill measured at age 5 ½.

Table 3. Phonological skills at ages 4 ½ and 5 ½; means, standard deviations and group comparisons (risk groups compared to control group).

		4 ½ Years		5 ½ Years	
		M	S.D.	M	S.D.
Identification of initial phoneme	Control	5,23	2,20	7,53	1,53
	MRD	4,79	2,50	5,93 ***	2,39
	FRD	4,31 *	2,35	6,58 *	2,01
Syllable and phoneme segmenting	Control	9,19	2,21	10,10	1,97
	MRD	8,41	2,07	9,15 *	2,30
	FRD	8,22 *	1,87	9,42	2,37
Blending	Control	4,96	2,27	6,58	2,00
	MRD	4,60	2,47	5,61 *	2,37
	FRD	4,77	2,21	6,03	1,86
Rhyming	Control	6,80	1,95	10,32	2,39
	MRD	5,98 *	2,15	8,97*	3,04
	FRD	6,31	2,63	9,35*	1,95

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

Mean differences from the control group's values are marked with asterisks. (One-way ANOVA)

Factor analysis using oblimin rotation was performed separately at both time points in order to test whether one factor model would be sufficient description of these phonological skills. Results indicated that this was true, these skills were all a part of one factor at both time points (see Table 4). The factor solution explained 56,21 % of total variance at age 4 ½, and 46,71 % at age 5 ½. One factor model was suitable for all groups.

Table 4. Factor solution and communalities for Reading Habits Questionnaire at age 4 and 5.

	4 ½ Years		5 ½ Years	
	Communalities	1	Communalities	1
Identification of initial phoneme	,638	0,799	,539	,734
Syllable and phoneme segmenting	,488	0,699	,295	,734
Blending	,548	0,740	,550	,543
Rhyming	,575	0,758	,484	,742

Because only one factor was extracted, it was not possible to calculate factor scores or use the rotation methods. It was though considered necessary to standardize the values. Standardization was decided to perform using control group's mean and standard deviation, because control group was thought to represent more closely the total population than the whole sample, where 50 % of the subjects had exceptionally high

familial risk for dyslexia. Hence, measures of segmenting, synthesis, rhyming, and first phoneme identification were standardized using control group's mean and standard deviation. Mean of these standardized values were then calculated and this average value was again standardized, now using mean and standard deviation of the whole sample.

3.1.3. Letter Naming

Distributions of letter naming tasks were highly skewed. At age 4 ½ years approximately one third of the children knew the name of one letter or none, half of the children could name only 5 letters or less, and 75,2 % of the children knew less than 13 of the 23 letters presented. At age 5 ½ the distribution was skewed to the left; now 9,3% of the children could name only one or none of the presented letters, half of the children named already 13 letters or more, and 24,8% of the children could name 19 letters or more. Letter naming skill developed rapidly within this one-year period. Letter naming variable was categorized because of the skewness of the distributions. Using the control group's lower and upper quartile at each time point did this.

3.2. Descriptive Statistics and Group Differences

Differences in the emergent literacy skills, home literacy environment factors, parent's literacy activities composite, children's IQ measure and mother's education among children within the three subgroups were tested using one-way analysis of variance after repeated measures analysis of variance. A repeated measure ANOVA was carried to check group - time interactions. In home literacy environment factors or letter naming skill such interactions were not present, in phonological skill however, interaction was found ($p = .018$). Hence, when group differences in phonological skill are considered, one-way ANOVA results should be interpreted with caution (See Figure 2).

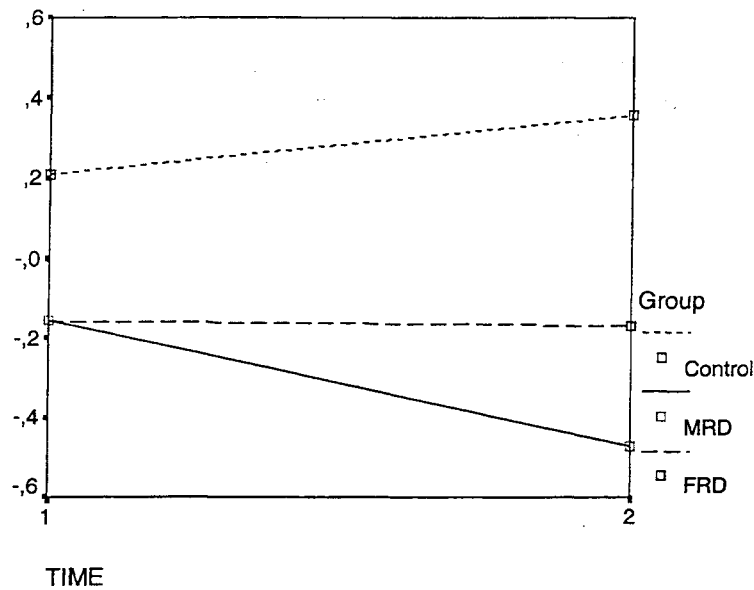


Figure 2. Estimated marginal means of phonological skills

Mean of the standardized phonological skill composite dropped between the two points in time in the MRD group, stayed at the same level in FRD group and rise in control group. The relative position of the children with dyslexic mother declined and the relative position of the children with dyslexic mother declined and the relative position of control group got better within this period. These changes brought out the significant differences when MRD and FRD groups were compared to control group at age 5 ½ ($p = .000$, and $p = .018$, respectively). Difference in MRD and FRD group children's performance was not significant ($p = .183$)

Descriptive statistics and one-way ANOVA results are presented in Table 5. Mean differences from control group are marked with asterisks. In addition to the differences from control group, there were two differences between the risk groups. First: if the child's father had reading difficulties (FRD group), the mean of the composite 'duration of a reading session & the total amount of reading in a day' at age 5 was significantly higher than in the MRD group ($p < .05$). Second: the sum of father's own literacy activities was significantly higher in MRD group ($p < .01$). Fathers who had reading difficulties read less than fathers who had no such problems. The mean score of the mother's reading activities among the mothers with reading difficulties was also lower than the mean score of the mothers of control and FRD group, but the difference was not significant.

Table 5. Child's emergent literacy skills, home literacy environment variables, mother's education measure and child's IQ measures in the MRD, FRD, and control group.

	Control group		MRD group		FRD group	
	M	S.D.	M	S.D.	M	S.D.
WPPSI-R - Performance IQ, 5 Years	101,86	13,18	100,51	15,26	100,14	14,7
Mothers' education	4,50	1,28	3,93	1,64	4,47	1,52
Phonology 4 ½ Years	0,21	0,86	-0,16	1,06	-0,16	1,08
Phonology 5 ½ Years	0,36	0,85	-0,47 ***	1,20	-0,17 **	0,77
Letter Naming 4 ½ Years	1,99	0,72	1,76	0,62	1,86	0,72
Letter Naming 5 ½ Years	1,96	0,72	1,64 *	0,66	1,72	0,81
Shared Reading 4 Years	-0,00	0,94	-0,15	1,09	0,10	0,80
Reading Alone 4 Years	0,00	0,88	0,01	0,98	-0,14	0,99
Reading duration/total reading 4 Years	-0,00	0,88	-0,14	0,90	0,08	0,90
Shared Reading 5 Years	-0,15	0,89	0,13	1,03	0,13	0,90
Reading Alone 5 Years	-0,11	0,86	0,27	1,06	-0,04	0,99
Reading duration/total reading 5 Years	-0,07	0,78	-0,06	0,88	0,26	0,88
Father's literacy activities	7,23	1,91	6,93	2,30	5,32 ***	2,25
Mother's literacy activities	8,30	1,70	6,44	2,53	7,09	2,17

Note * $p < .05$; ** $p < .01$; *** $p < .001$ Mean differences from the *control* group's values are marked with asterisks. (One-way ANOVA)

As expected, both risk groups scored somewhat lower than control group in letter naming and phonology at age 4 ½ and 5 ½. The difference between control group and MRD group was significant in phonological skill and in letter naming at age 5 ½, but not yet at age 4 ½. FRD group children scored significantly lower than control group children only in phonology at age 5 ½ and in father's own literacy activities composite. Means of the other home literacy environment factors did not differ between control group and the two risk groups. Means of child's IQ measure and mother's education did not differ between any of the groups.

In sum, there were differences between control group and the risk groups in the emergent literacy skills but not in the home literacy environment. Only difference in the environmental variables was the fact that dyslexic fathers had lower score on their own literacy activities composite than did normally reading fathers. It seems that dyslexic parents do not read less frequently with their children, risk group children were reported to read alone as much as control group children, and parent's reading differed significantly from the other groups only in father's reading activity composite in FRD group.

3.3. Associations Between the Features of Home Literacy Environment and the Emergent Literacy Skills

Even though there were almost no differences in the home literacy environments between the groups, there might still be differences in the manner how the home literacy environment variables were connected to the emergent literacy variables within groups (i.e. group x environment x skills three-way interaction). We should ask if the home environment has the same effect in every group. Do the children of dyslexic mother or father benefit of reading as much as the control group children? In order to answer these questions Pearson and Spearman correlation coefficients were calculated. Correlations between emergent literacy skills, home literacy environment factors, and parents reading activities were calculated separately for each group to see if the correlation patterns were similar in the groups or not.

The groups did in fact seem to have different correlation patterns in some respect when the association between the features of home literacy environment and phonological skills were considered. Significant correlations were found only in the MRD group. Same pattern was found when the Spearman correlation coefficients were calculated between the features of home literacy environment and letter naming (see Table 6).

Table 6. Pearson correlation coefficients between home literacy environment variables and the phonology composite.

	Phonology					
	Control		MRD		FRD	
	4 ½	5 ½	4 ½	5 ½	4 ½	5 ½
Shared Reading 4 Years	0,171	-0,067	0,360*	0,184	-0,010	-0,243
Reading Alone 4 Years	0,188	0,047	0,095	0,086	0,065	-0,204
Reading duration&Total reading 4 Years	0,029	-0,085	0,372*	0,381*	0,223	-0,026
Shared Reading 5 Years	0,055	0,039	0,313	0,285	-0,163	-0,109
Reading Alone 5 Years	0,080	0,049	0,110	0,164	0,287	-0,080
Reading duration&Total reading 5 Years	0,167	0,066	0,377*	0,298	0,264	0,034
Father's literacy activities	-0,185	0,005	0,081	0,119	0,190	0,128
Mother's literacy activities	0,000	-0,050	0,184	0,236	0,168	-0,024

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

As shown in Table 6, duration of reading session & total reading in a day at age 4 was associated with child's phonological skill at age 4 ½ and at age 5 ½ only in MRD group. Duration of reading session & total reading in a day at age 5, and shared reading at age 4 correlated positively with child's phonological skill at age 4 ½. The same associations failed to be significant in other groups. Child's unaccompanied reading or parents own reading activities were not correlated in any group with child's phonological skills. In other words, in the group of children, whose mother had reading difficulties, the children who engaged longer periods in shared reading, who were reported to spend more time and attend more frequently in reading interaction with parent at age 4, had better phonological skills. Furthermore, in MRD group, better phonological skills at age 4 ½ predicted higher score on duration of reading session & total reading in a day at age 5.

Table 7. Spearman correlation coefficients between home literacy environment variables and letter naming.

	Letter naming					
	Control		MRD		FRD	
	4 ½	5 ½	4 ½	5 ½	4 ½	5 ½
Shared Reading 4 Years	0,006	0,076	0,349	0,338	-0,062	-0,222
Reading Alone 4 Years	0,146	0,167	0,329	0,330	-0,016	-0,136
Reading duration&Total reading 4 Years	0,148	0,085	0,481**	0,175	0,257	0,007
Shared Reading 5 Years	0,016	-0,071	0,489**	0,283	-0,169	-0,290 ^{a)}
Reading Alone 5 Years	0,080	0,097	0,351*	0,300	0,023	-0,216
Reading duration&Total reading 5 Years	0,153	0,223	0,191	0,264	0,182	-0,056
Father's literacy activities	0,047	-0,018	0,062	0,139	0,167	0,144
Mother's literacy activities	0,005	-0,074	0,357*	0,368*	0,197	0,164

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

a) Two extreme values were omitted from calculation.

In the MRD group, duration of reading session & total reading in a day at age 4, and mother's own literacy activities were associated with child's letter naming skill at age 4 ½. Mother's own literacy activities were also positively correlated with child's letter naming skill at age 5 ½. Better letter naming skills at age 4 ½ seemed to predict more frequent reading related activities with parent and without parent. No such positive associations were found in other groups (see Table 7).

To test if the correlation patterns really were different, significance of the differences in the correlation coefficients between control group and MRD group, and between FRD group and MRD group were tested using Fisher's z transformation (McNemar, 1969). Levene's test statistic was used to check the assumption of equal variances in groups. Almost all of the z-values were negative, indicating that correlation coefficients were almost always higher in MRD group than in FRD group or in control group. Significant difference was found in 18 comparisons ($z > |1.96|$), which was equal to one fourth of the comparisons made. Because of these differences, it seems probable that, for some reason, children who have a mother with reading difficulties, benefit more from more advantageous home literacy environment when compared to the children of FRD and control group.

Once these differences between the groups were established, MRD group was selected to be the focus of subsequent analysis. I went on to evaluate if the correlations between home literacy facets and emergent literacy skills could be explained by the effect of third variables, and whether something could be said about causality.

3.4. Partial Correlations and Cross-Lagged Differentials

Although strong correlations were found between the home literacy environment and the emergent literacy skills in the MRD group, question remains concerning the effect of other important sources of variance. Mother's education and child's IQ were considered as such (Griffin and Morrison, 1997). Can differences in mother's education or child's IQ explain the correlations that were found between the home literacy environment and the emergent literacy skills? Spearman and Pearson correlation coefficients were calculated within the MRD group between these measures and mother's education and child's IQ measure (see Table 8).

Table 8. Spearman and Pearson correlation coefficients between home literacy environment variables, emergent literacy skills, parents own literacy activities and child's IQ measure and mother's education measures in the MRD group

	Mothers' education	WPPSI, 5;0 - Performance IQ
Phonology 4 ½ Years ^{a)}	0.220	0.439**
Phonology 5 ½ Years ^{a)}	0.076	0.312*
Letter Naming 4 ½ Years ^{b)}	0.184	0.184
Letter Naming 5 ½ Years ^{b)}	0.004	0.079
Shared Reading 4 Years ^{a)}	0,081	0,425 *
Reading Alone 4 Years ^{a)}	-0,034	0,323
Reading duration/total reading 4 Years ^{a)}	-0,053	0,621 ***
Shared Reading 5 Years ^{a)}	0,297	0,158
Reading Alone 5 Years ^{a)}	0,114	0,134
Reading duration/total reading 5 Years ^{a)}	0,051	0,196
Father's literacy activities ^{a)}	0,105	0,006
Mother's literacy activities ^{a)}	0,231	-0,005

Note * $p < .05$; ** $p < .01$; *** $p < .001$. a. Pearson correlation coefficient, b. Spearman correlation coefficient

Even though mother's education was not significantly related to any of these home literacy factors, there were some associations that were close to the 95% significance level (see Table 8). Child's IQ correlated strongly with phonological skills and an amazingly strong correlation was also found with reading duration-total reading in a day at age 4. Because of these associations, two-tailed partial correlation coefficients were calculated, controlling for the effects of both mothers education and child's IQ. Results of partial correlation coefficients between those associations that were significant before introducing the controlling effects are presented in figures 3-7.

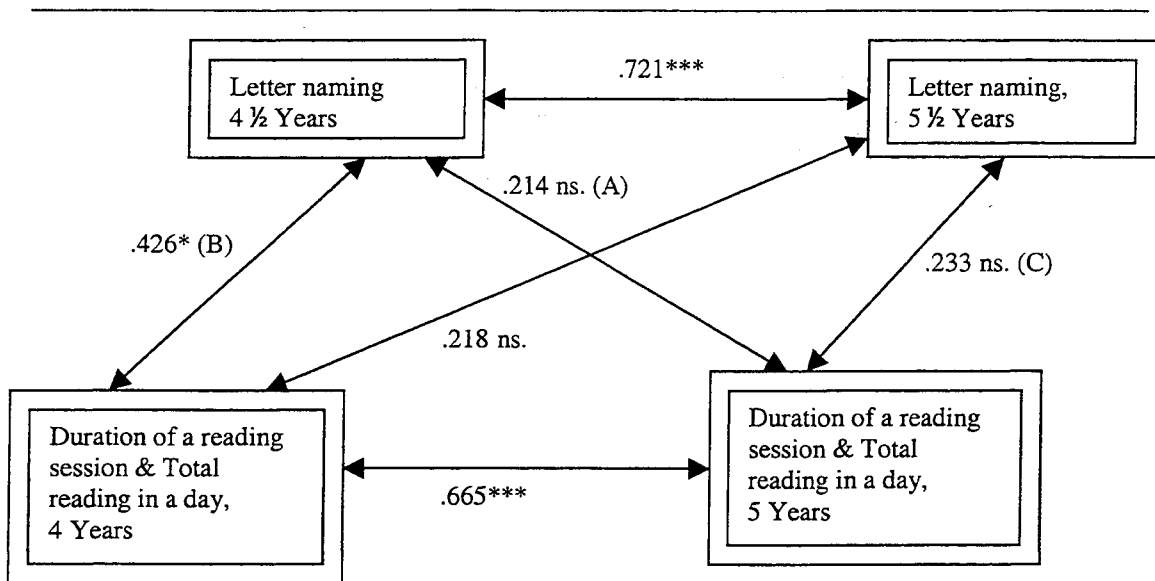


Figure 3. Two-tailed partial correlation coefficients between letter naming and duration of a reading session & total reading in a day in MRD group after controlling for child's IQ and mother's education (N=25). A, B, and C are used to mark the associations.

As can be seen in Figure 3, the measures of letter naming and duration of reading session & total reading in a day were fairly stable ($p < .001$). Significant correlation was found between duration of reading session & total reading in a day at age 4 and letter naming at age 4 1/2 ($p < .05$) (association B). All the other correlations were non-significant. The amount of time that child was spending with a parent at age 4 in this group seemed to foster his or her letter naming skill six months later. This association, however, failed to be significant at the later age ($r = .233$, $p > .05$) (association C). Correlations changed only a little bit between letter naming and duration of a reading session & total reading in a day after controlling for child's IQ and mother's education. Largest the change was in the association B, between duration of reading session & total reading in a day at age 4 and letter naming at age 4 1/2 (correlation coefficient dropped by .055).

Can any conclusions be made of the direction of causality? The answer here is no. First, in a 4w2v situation like this one here, the CLPA analysis had two assumptions: a) the strength or direction of the causes of a variable should not change over time, and b) the empirical values should not change over time (i.e. there should be an autocorrelation). In this case, the autocorrelations of these variables were reasonably high, but the strength of the correlation between letter naming and duration of reading session & total reading time in a day changed from association B to association C. This situation is not symmetrical, the strength of the association between these variables seem to change over time. Second, the idea of the inference of causality was based in the calculation of the cross-lagged differential. In this case this would mean comparing $r_{x_3y_2}$ (association A) with either $r_{x_1y_2}$ (association B) or $r_{x_3y_4}$ (association C). In this case, the cross-lagged differential would be positive here in both comparisons, but almost zero in the other. When the association A was compared with the association B, the cross-lagged differential was .212, and when association A was compared with the association C, the cross-lagged differential was only .019. No causal inference was possible for these reasons.

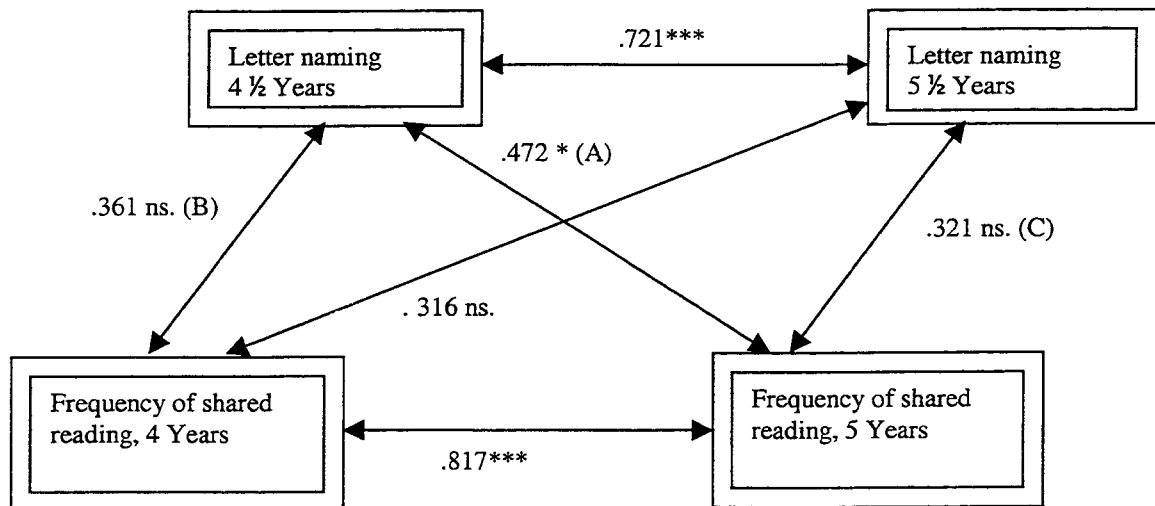


Figure 4. Two-tailed partial correlation coefficients between letter naming and frequency of shared reading with parent in MRD group after controlling for child's IQ and mother's education (N=25). A, B, and C are used to mark the associations.

Measure of the frequency of shared reading was stable ($p < .001$) (see Figure 4). In addition to these autocorrelations, a significant correlation was found between letter naming at age 4 ½ and frequency of shared reading at age 5 ($p < .05$) (association A). All the other correlations were non-significant. The children who knew more letters at age 4 ½, were likely to be read to more frequently at age 5, than were the children who knew less letters six month earlier. Correlations changed only a little bit between letter naming and duration of a reading session & total reading in a day after controlling for child's IQ and mother's education, and three of the four correlation coefficients even got higher. The controlling of mother's education and child's IQ did not have an effect on the relationship between frequency of shared reading and letter naming skills.

When considering the direction of the causality, some suggestive results were found. The assumptions of CLPA analysis are met here, and the cross-lagged differentials could be calculated. When $r_{x_3y_2}$ (association A) was compared with $r_{x_1y_2}$ (association B), the cross-lagged differential was .111, and when $r_{x_3y_2}$ (association A) was compared with $r_{x_3y_4}$ (association C), the cross-lagged differential was .151. These differences were positive and somewhat high, implying that the direction of causality would be from the letter naming skill to the frequency of shared reading. This result should, however, be considered with caution because of the small sample size ($N = 25$) in these analysis (see Table 9 for confidence limits).

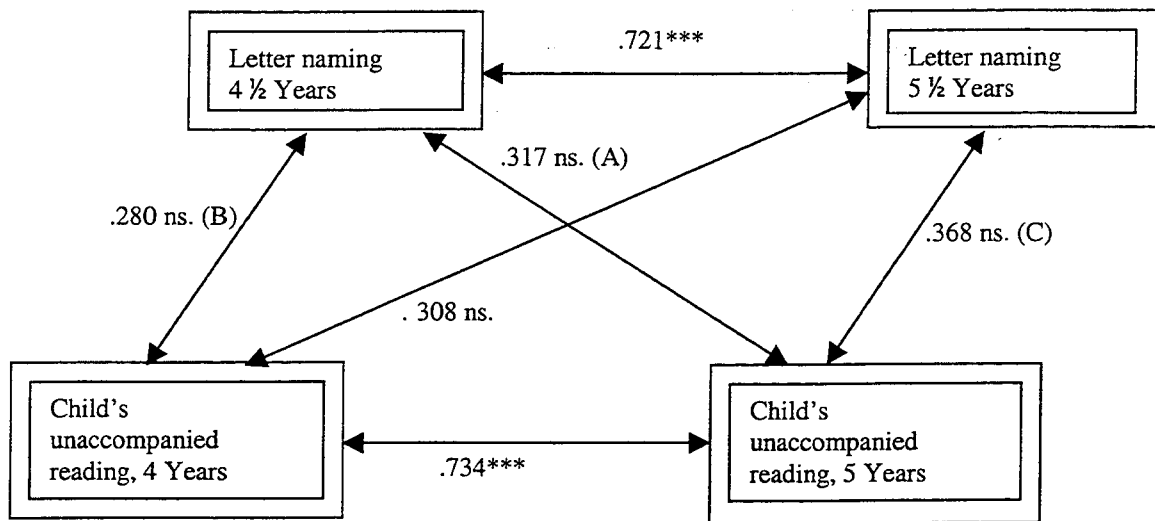


Figure 5. Two-tailed partial correlation coefficients between letter naming and unaccompanied reading in MRD group after controlling for child's IQ and mother's education. (N=25). A, B, and C are used to mark the associations.

Measure of child's unaccompanied reading was also stable ($p < .001$) (see Figure 5). In addition to these autocorrelations, no other significant correlations were found. When compared to the correlations before partialing out the effects of child's IQ and mother's education, all but one coefficient dropped. The correlation coefficient between child's reading alone at age 5 and letter naming skill at age 5 ½ rise by .068. The earlier significant correlation coefficient between letter naming at age 4 ½ and reading alone at age 5, dropped just under the level of significance ($p < .05$) after controlling for child's IQ and mother's education. Such a small changes indicate that the effect of the variables controlled was rather small if it exists at all. Making of any kind of inference concerning the direction of causality, is impossible here. All of the associations are so close of being equal.

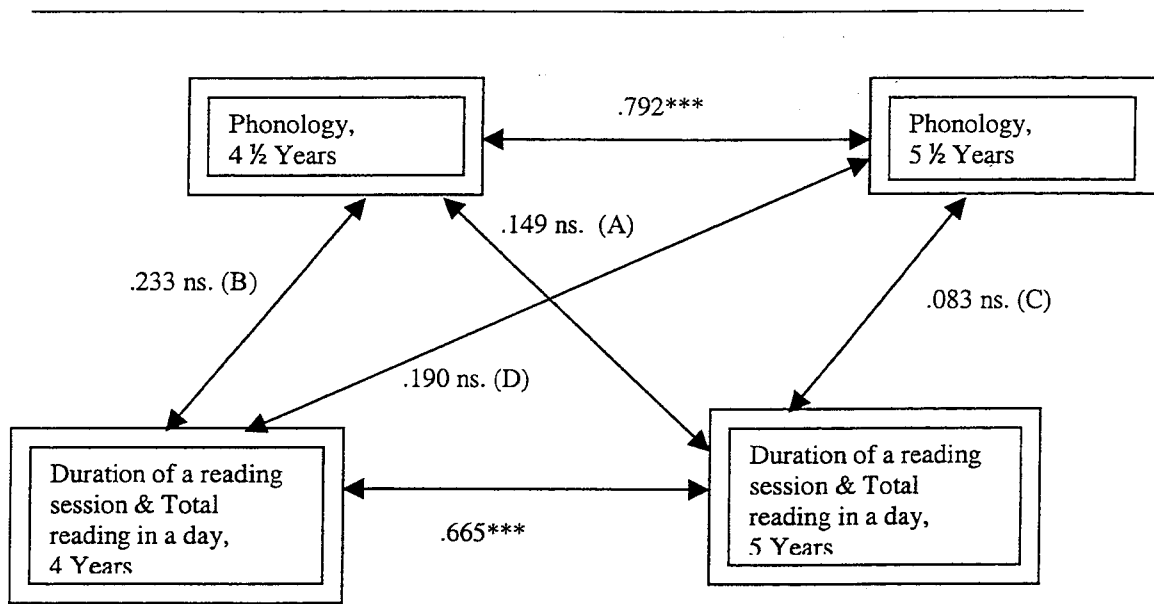


Figure 6. Two-tailed partial correlation coefficients between phonological skills composite and duration of a reading session & total reading in a day in MRD group after controlling child's IQ and mother's IQ (N=25). A, B, C and D are used to mark the associations.

The correlations between the phonology factor and the duration of a reading session & total reading in a day in MRD group did change after controlling for child's IQ and mother's education (see Figure 6). Before introducing the controlling effects, the correlation coefficients of association A ($r = .377$, $p = .018$), association B ($r = .372$, $p = .036$), and association D ($r = .381$, $p = .031$) were significant, but not afterwards. All partial correlation coefficients were smaller than the correlation coefficients before partialing out the effects of child's IQ and mother's education. This finding suggests that shared variance with child's IQ and mother's education explained the connection between phonological skill composite and this home literacy environment factor. No conclusions concerning the direction of causality could be made. All of the associations were again so close of being equal.

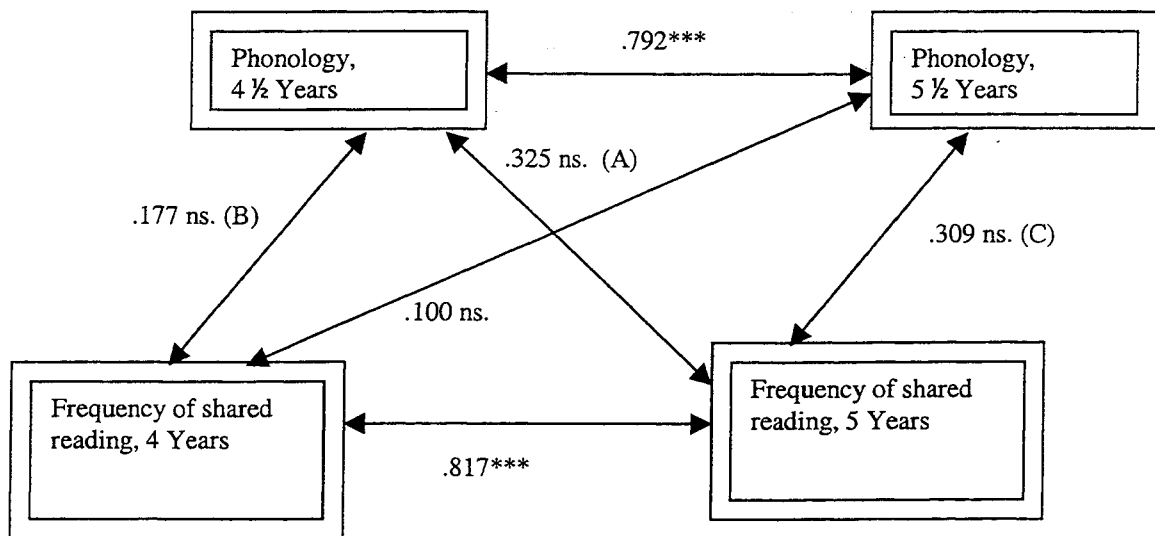


Figure 7. Two-tailed partial correlation coefficients between phonological skills composite and frequency of shared reading in MRD group after controlling child's IQ and mother's IQ (N=25). A, B, C and D are used to mark the associations.

The relationship between joint reading at age 4 and phonological skill at age 4 1/2 was significant before introducing the effects of mother's education and child's IQ, but not afterwards (Figure 7). These variables explain the original association. No causal conclusions can be made based on the cross-lagged differential because of the difference in the strength of the associations B and C.

In addition to these facets, parents' own reading activities were of interest. Mother's own reading activities stayed correlated with letter naming skill at age 4 1/2 ($r = .365$, $p = .014$), and with letter naming skill at age 5 1/2 ($r = .385$, $p = .010$) after the effect of mother's education and child's IQ were partialled out. The corresponding correlations with fathers own reading activities stayed insignificant.

All of the partial correlation results introduced earlier must be interpreted with some caution, and be considered as suggestive because of the relatively small sample size (N=25). The confidence limits of the associations needed for causal inference by using cross-lagged differential, are listed in Table 9. As can be seen, such a small sample size would require rather large correlation coefficients to be sure that the confidence limit would not include zero, and that the association could be considered positive for certain.

Table 9. Confidence limits for the two tailed partial correlations in MRD group (N=25)

Association	R	Confidence limits	
		Lower 95%	Upper 95%
Figure 3.			
(A) Letter Naming 4 ½ Years -> Duration & Total reading, 5 Years	.214	-.198	.562
(B) Duration & Total reading, 4 Years -> Letter Naming 4 ½ Years	.426	.037	.703
(C) Duration & Total reading, 5 Years -> Letter Naming 5 ½ Years	.233	-.179	.575
Figure 4.			
(A) Letter Naming 4 ½ Years -> Frequency of shared Reading 5 Years	.472	.095	.731
(B) Frequency of shared Reading 4 Years -> Letter Naming 4 ½ Years	.361	-.040	.662
(C) Frequency of shared Reading 5 Years -> Letter Naming 5 ½ Years	.321	-.085	.636
Figure 5.			
(A) Letter Naming 4 ½ Years -> Reading alone 5 Years	.317	-.089	.633
(B) Reading alone 4 Years -> Letter Naming 4 ½ Years	.280	-.130	.608
(C) Reading alone 5 Years -> Letter Naming 5 ½ Years	.368	-.032	.666
Figure 6.			
(A) Phonological skills 4 ½ Years -> Duration & Total reading, 5 Years	.149	-.262	.514
(B) Duration & Total reading, 4 Years -> Phonological skills 4 ½ Years	.233	-.179	.544
(C) Duration & Total reading, 5 Years -> Phonological skills 5 ½ Years	.085	-.324	.462
Figure 7.			
(A) Phonological skills 4 ½ Years -> Frequency of shared reading, 5 Years	.325	-.080	.638
(B) Frequency of shared reading, 4 Years -> Phonological skills 4 ½ Years	.309	-.098	.628
(C) Frequency of shared, 5 Years -> Phonological skills 5 ½ Years	.177	-.235	.535

4. DISCUSSION

The effects of the home literacy environment on the preschool language and literacy skills has been studied actively in the last decades (Scarborough & Dobrich, 1994). The purpose of this study was to examine whether there are associations between the home literacy facets and the two inside-out emergent literacy skills (letter naming and phonological skills) even after partialing out the effects of child's IQ and mother's education, and whether these associations are different in the selected study groups. Additionally of interest was whether something could be said of the direction of the effect.

This study differs from the earlier studies and adds to them in the following ways:

1. Letter naming and phonological skills served as outcome measures, which has been rather rare (Bus et al., 1995; Burgess, 1997) -even though these variables are often considered as the best predictors of future decoding skills (e.g. Adams, 1990).
2. Different home literacy environment facets were considered separately. In addition to the effect of shared reading, parents own literacy measures (from both parents separately), and child's interest in reading activities were examined. These facets were based on the categorization of Teale and Sulzby (1986), and suggestions of Scarborough and Dobrich (1994).
3. The effects of the home literacy environment were examined within and between the three study groups, which were formed in a novel way for this specific research field, which focuses on the effects of home literacy environment on the reading related skills. The group division was based on the

genetic risk of dyslexia and additionally on the sex of the reading impaired parent. In addition to the comparisons of the home literacy environment facets and the selected emergent literacy skills between these groups, the differences in the associations of these variables were compared between the groups.

4. Design was longitudinal and there were two measures of both home literacy environment and inside-out emergent literacy skills variables. This made it possible to examine the stability of both measures, and to draw some conclusions concerning the direction of causality (based on the cross-lagged differential).

Before concentrating on the results concerning these primary questions, I have some notions concerning the preliminary data analysis. The four phonological skills selected in to this study (identification of initial phoneme, syllable and phoneme segmenting, blending and rhyming) were all a part of one factor. This factor solution was present at both time points. There has been some controversy whether different phonological skills are presentations of only one underlying factor and the debate is still in progress (e.g. Lonigan, 2000). Høien, Lundberg, Stanovich, Bjaalid (1995) for example have found evidence that phonological skills would not be all part of one factor, but that there would be three factors (phoneme, syllable, and rhyme). Lonigan (2000) have in contrary stated that one factor model would be the correct representation of phonological skills. This viewpoint was supported here.

The factor analysis of the Reading Habits Questionnaire revealed three factors instead of the expected two. Shared reading was divided in two, to the frequency and duration parts. Similar result was reached in the study of Briggs and Elkind 1977. It would have been possible to extract only two factors and the items, 'duration of reading session with a parent' and 'amount of total reading in a day with a parent' would have loaded mainly in to the shared reading factor. It was, however, decided to let the variables load more 'freely' (eigenvalues greater than one criterion was used) to capture as much variance as possible. This extra factor ('duration of reading session with a parent' and 'amount of total reading in a day with a parent') reflected more time-related side of shared reading interactions than the other shared reading factor, which was

named as 'frequency of shared reading'. The third home literacy environment factor was named as the child's unaccompanied reading, in which both frequency and the more time-dependent ('duration of reading session alone' and 'amount of total reading in a day alone') variables loaded. The other two home literacy measures were the literacy activities of the mothers and fathers, which were calculated from the Family Background Questionnaire.

Almost all of the home literacy facets that were measured at age 4 were significantly correlated with all of the home literacy facets at age 5. Shared reading experiences facilitated child's own interest and reading alone, and the children who were more interested at age 4, were also more often read to later on. The factors were also highly interrelated within measurement points in all groups. Similar results were found at younger children in the study of Lyytinen et al. (1998). Both the home literacy environment facets and the emergent literacy skills had high autocorrelations in every group indicating a high stability of the measures. Differences between the subjects stayed relatively same across the one-year period in question. The children, who were interested in reading at age 4, were probably interested in reading also at age 5, and the same was true for shared reading, letter naming and phonology. Stability of these questionnaire-based factors supports also the assumption of the reliability of the measures.

First actual research question concerned the group differences in the two inside-out emergent literacy skills, in the home literacy facets and in their association. Differences were found between the two risk groups and control group in the emergent literacy skills, as expected. Earlier research have revealed that the children who have dyslexia in their family have an increased risk of dyslexia (Pennington et al., 1991), and the children with reading disabilities have often poorer phonological and letter naming skills (Adams, 1990; Byrne, 1998; Gallagher et al., 2000). Both risk groups were poorer in all of the tasks at both time points, poorest of all performed the MRD group. However, the difference between the FRD and the MRD group children's performance in letter naming or in phonological skill was not statistically significant.

As expected, apart from father's own reading activities and attitude towards reading, no differences were found in the home literacy environment facets. Only difference was the fact that fathers of the FRD group were less active readers than were the fathers of the other groups. This was understandable, of course, because of the

reading difficulties of these fathers. It was expected that the mothers of the MRD group would have been less active readers than the mothers of the other groups, but this was not the case. The mothers of the MRD group did in fact read less, but the difference from other groups was not statistically significant. No differences were found in the shared reading factors between the groups. This result was expected on the basis of the earlier studies (Gallagher et al., 2000; Laakso et al, 1999; Scarborough et al., 1991). The reading skills of a parent had no effect on the shared reading amount or frequency. The children of the three study groups were also reported to be equally interested in reading, when measured as the amount and frequency of reading alone.

Hence, the differences in child's interest in reading, frequency or amount of shared reading interactions or parent's own literacy activities could not explain the differences in the emergent literacy skills of these children. The next obvious question was whether there were differences between the groups in the correlation patterns of these variables. Is the effect of home literacy environment different in these groups? The results were somewhat puzzling at first. Even though the factors of shared reading, parent's own reading activities, and child's own interest were assumed to foster letter naming and phonological skills in all of the groups, associations were found only in the MRD group. The effect was assumed to be highest in this group but the finding that there were significant correlations only in this group was surprising. In order to explain this result, the distributions of the variables in the three study groups were examined once more. No such differences in the distributions were found that could have explained the result. Distributions were all adequately close to normal distribution, and the ranges were also similar in groups. There were, however, small differences in the variances of the variables between the groups. The largest variances were found most often in MRD group, but these differences were considered too small to create such a large differences in the correlation patterns. Furthermore, no outliers that could have caused the result were found. Thus, no statistical reasons for the high correlations in the MRD group and no correlations in the other groups were discovered. What then could explain these results?

One possible explanation might be that the children without genetic risk of dyslexia do not need special assistance. The minimal amount of environmental exposure would then be sufficient to insure the learning of the letter names and sounds in the control groups. Home literacy environment would operate as a resource for decreasing

the gap between risk and control groups, as Lyytinen et al. (2001) suggested. Stainthorpe and Hughes (2000) concluded that in the case of the precocious readers the home environment is not enough to account for precocious reading ability even though it is highly instrumental in nurturing literacy development. The similar conclusion might be in order here. The additional effort for control group children probably is not needed, and these children learn letters and sounds if they are provided at least with some amount of letter and sound stimulus. The children with genetic risk of dyslexia are in comparison thought to need the extra assistance and time. In this scenario the risk group parents have the possibility to facilitate the letter and sound learning of their children by providing some extra support. This assumption is supported by the fact that there was no effect present in control group, but it does not explain why the effect was present only in the MRD group. How come the FRD group children did not gain from the shared reading interactions when the MRD children did?

The sex of the parent with reading difficulties seemed to be the only obvious difference in the home environments of the MRD group and the FRD group children. Both had the similar genetic risk, had as much shared reading interaction sessions and were as interested in reading. Even the IQ and mother's education were not significantly different in these groups. The influence of the mothers has been claimed to be larger than the influence of the fathers (e.g. Lyytinen et al, 1998). This is understandable because the mothers are still spending more time with their children in a day than are the fathers. In this sample, the mothers were reading more with their children in each group than were the fathers. This was true at both measurement points, at ages 4 and 5. The difference between the reading of the mothers and the fathers with their children was smallest in the control group (For example at age 4 the means were 3.19 and 2.73 in the control group, 3.30 and 2.17 in the MRD group, and 3.42 and 2.42 in the FRD group, for mother-child and father-child reading, respectively. These means were similar at age 5. The scale was from 1 to 5). Hence, the effect is most probably due to the social transmission not solely on genetic.

The study of Leseman et al. (1998) showed the importance of instruction quality, cooperation quality, and the opportunity. Laakso et al. (1999) suggested, that the difference between families with and without reading disabilities might be in the interactional mechanisms that are related to attention coordination during the interaction with printed materials. Their study showed that maternal strategies and sensitivity are

related to children's later language skills at very early age. The relationship was found to be positive in the control group and negative in the groups, where mothers were diagnosed as reading disabled. Furthermore, Scarborough and Fichtelberg (1993) found that there were more poorly formed sentences in the interaction of dyslexic mother's and their children, than was in the non-dyslexic group

On the basis of these results, the explanation of the differences in the correlation patterns of the shared reading factors and the emergent literacy skills between the MRD group and the other groups might be found from the qualitative differences of the mother-child interaction. It might be suggested that the amount and the frequency of shared reading interactions compensate the poorer quality of the interaction between the mother and the child in the MRD group. In other words, even though the quality of the interaction may not be as good as it is in the case of a normally reading mother, the more often and the longer periods of time the mother spends reading with the child, the better literacy skills the child will have. If the quality of interaction is poor and the child is read to rarely, the emergent literacy skills are also poor. On the contrary, if the quality of the interaction is poor, but the child gets frequent and longer periods of interaction experiences with the books, his or hers emergent literacy skills get better. The mother's of the FRD group had no difficulties in reading and the quality of the reading sessions was assumed to be often better than in the MRD group. This may be why the extra effort of the parents did not have an effect on the child's literacy skills in the FRD group but did in the MRD group. This conclusion is, of course, only suggestive. The qualitative differences were not directly studied here, and further study on the interactional mechanisms is needed.

In addition to the probable qualitative differences in the shared reading interaction, there were differences in the parent's own literacy activities and in the association of these components and the other home literacy facets. Mother's and father's own reading activities were significantly correlated with other home literacy environment factors (and with each other) only in the MRD group. It seemed like the environmental risks may have cumulated and therefore increased the risk of poorer emergent literacy skills. Mother's own reading activities were significantly correlated with almost all of the other home literacy environment facets in this group. And even when the correlation coefficients were not statistically significant, they were bigger than in other groups and close to the significance level. In this group mothers and fathers

own literacy activities were connected to both shared reading activities and child's own interest. When compared to the MRD group children whose mother was not such an active reader, the children of the MRD group, who had a mother with greater interest in reading had probably also a father who was a more active reader, had more frequent and longer shared reading experiences, and were spending more time with books by themselves. The fact that the intercorrelations of the home literacy facets were found only in this group may reflect the great influence of the RD mother's effort and motivation to facilitate the literacy development of her child. The mothers with reading difficulties, who were more actively trying to facilitate their children's language and literacy development through shared reading were probably also reading more themselves. Their children and husbands were also more interested in reading. The children of more active readers had better letter naming skills and they had longer and more frequent shared reading experiences than the children of the mothers who were not so interested in reading. In sum, the whole home environment may be rather 'reading-friendly' in some of the families and not that facilitative in others. Probably the effort and motivation of the RD mother has a particularly important role in this. The indirect effects of the dyslexic mother's own interest in reading may play an important part in the at risk child's literacy development.

Further analysis was then focused on the MRD groups. The effect of other important variables, mother's education and child's IQ (Griffin & Morrison, 1997) on the associations found, were tested. Mother's education served as a measure of SES and performance IQ was selected over verbal IQ to avoid the shared variance with the emergent literacy measures. The associations between letter naming and the shared reading factors stayed significant after partialing out the effects of mother's education and child's IQ measure at age 5. The amount of time spent reading with the child at age 4 had a positive effect on the letter naming skills of the child at age 4 ½ despite the differences in IQ or other's education. The same was true for the connection between letter naming skill at age 4 ½ and frequency of shared reading at age 5. The connection between unaccompanied reading and letter naming, however, dropped under the significance level. The correlations between mother's own reading activities and letter naming that were present before introducing the controlling effects, stayed correlated with letter naming skill at age 4 ½ and at age 5 ½. Other correlations between the home literacy activities and the inside-out emergent literacy skills stayed insignificant.

The controlling of mother's education and child's IQ changed the magnitude of the relationship between phonology composite and the two home literacy environment factors ('duration of reading session & total amount of reading in a day with a parent', and 'frequency of joint reading with a parent'). Phonological skills and the two home literacy environment factors were both found to be significantly correlated with the child's IQ, and somewhat correlated with mother's education measure. These associations explained the significant connections between the phonology factor and the shared reading facets. No statistically significant correlations were found between phonological skills and child's interest in reading (reading alone), or parent's own reading activities neither before the controlling of child's IQ and mother's education nor afterwards. These results were similar to the results of Cunningham and Stanovich (1993). They found that the exposure to print accounted for significance variance in orthographic processing, but not to phonological processing. They suggested that these findings indicated that print exposure might foster the environmentally linked orthographic variance, but that it may not be tied to the phonological processing differences, which are possibly more heritable. The effect of the performance IQ (and mother's education) on the phonology factor and on the correlation between the phonology factor and shared reading factors supports this suggestion. The letter naming skill was connected to the environmental facets despite the effects of the controlling variables.

The distinction of the home literacy facets, based on the categorisation of Teale and Sulzby (1986), was fruitful. Different relationships with the emergent literacy skills were found. The effects of the mothers own literacy activities were found to facilitate the letter naming skills but not the phonological skills in the MRD group. Father's own literacy activities were significantly correlated with neither the letter naming nor the phonological skills of their children. The shared reading factors were both related to the letter naming and phonology before the effects IQ and mother's education were controlled. Afterwards the significant relationship was present only with letter naming. The effect of the letter naming skills on the frequency and time the child spent reading alone had disappeared after the effects of the controlling variables were introduced. According to Scarborough and Dobrich (1994), the motivational factors and child's interest in reading has been neglected in the research on reading development. The factor of child's unaccompanied reading was considered here to reflect the child's

interest in reading. As mentioned already earlier, there was no indication that this factor would have had an effect on the children's emergent literacy skills. The reason for this might, however, have been the fact that the unaccompanied reading factor does not reflect fully the child's amount of interest in reading. The influences of the shared reading factors were the largest. This is consistent with the theory of Vygotsky on the importance of the interaction with more competent other in the zone of proximal development. The importance of the shared reading has been found also in earlier research (e.g. Bus et al, 1995; Crain-Thoreson et al., 1992; Payne et al, 1994).

Additionally of interest was whether the direction of the causality could be inferred. Unfortunately a firm causal inference was impossible here due to violations of assumptions of the cross-lagged method and the small sample size. A reciprocal relationship between the variables seems to be the most consistent conclusion in the light of the results of the partial correlation and cross-lagged analysis. The perceived skills of the child are probably affecting the interest of the child and the quality and frequency of shared reading sessions. The home literacy features are in turn facilitating the emergent literacy skills of the child.

The main result of this study was the different associations between the shared reading, parents own reading activities and child's emergent literacy skills when the MDR group and the other groups were compared. The MRD group preschoolers whose home provided fewer and shorter shared reading sessions, and whose parents were engaging less in reading activities, were themselves less interested in reading and had poorer letter naming skills even after controlling for the effects of mother's education and child's performance IQ. The suggestion that the significant correlations would have emerged only in this group because the more frequent shared reading and the reading interest of the motivated mother had compensated the poorer quality of the mother-child interaction, needs further research. The fact that there were correlations among the various home environment facets in this group (and only in this group) was also an interesting finding. It was seen as an indicator of the cumulating of the literacy facilitating features in these families. The results found might also indicate that the group of dyslexic mothers is not a homogenic group, but that there are different subgroups. Some of these mothers are themselves more interested in reading than the others, and they probably also make some extra effort in shared reading. These mothers would probably transmit a more positive attitude to their children and probably also

read more with their children. These qualitative differences in the MRD families might be causing the associations between the quantitative home literacy factors of this study and the emergent literacy skills. Whether this is the case could not be resolved within this study design. In future research, the relationship between the emergent literacy skills and the qualitative features of the interaction between the dyslexic mothers and their preschool-age children should be examined more thoroughly and together with the quantitative features.

There were some limitations in this study. First, the sample sizes were relatively small in the two risk groups, and these results should be replicated with larger samples. Second, the use of the questionnaire data has been criticised because of the social desirability effects on the answers of the parents (e.g. Senechal et al., 1998). Others have, however, concluded that parents appeared to be reliable reporters of the home environment (Bus et al., 1995) and concerning children's interest in reading (Lyytinen et al., 1998). Lyytinen et al. (1998) suggested that the parental reports in the JLD sample can be considered reliable because the parents are committed participants of a long-running study and because of this they probably pay more attention to the objectivity of their answers than parents usually do. Third, this study did not include some other possibly important facets of the home literacy environment than the ones reviewed. These most promising alternative features that are missing here are the age when the reading with the child began (e.g. Burgess, 1997), the frequency of library visits (e.g. Payne et al., 1994), and various cultural features (Leseman et al., 1998).

REFERENCES

- Adams, M.J. (1990). *Beginning to Read: Thinking and Learning About Print*. Cambridge, Massachusetts: The MIT Press.
- Burgess, S. (1997). The role of shared reading in the development of phonological awareness: A longitudinal study of middle to upper class children. *Early Child Development and Care*, 127-128, 191-199.
- Bus, A.G., van Ijzendoorn, M.H., & Pellegrini, A.D. (1995). Joint book reading makes for success in learning to read: A meta-analysis on intergenerational transmission of literacy. *Review of Educational Research*, 65(1), 1-21.
- Briggs, C. & Elkind, D. (1977). Characteristics of early readers. *Perceptual and Motor Skills*, 44, 1231-1237.
- Byrne, B. (1998). *The Foundation of Literacy: The Child's Acquisition of the Alphabetic principle*. Psychology Press Ltd.
- Crain-Thoreson, C., & Dale, P.S. (1992). Do early talkers become early readers? Linguistic precocity, preschool language, and emergent literacy. *Developmental Psychology*, 28(3), 421-429.
- Cunningham, A.E. & Stanovich, K.E. (1993). Children's literacy environments and early word recognition subskills. *Reading and Writing*, 5(2), 193-204.
- Cunningham, A.E. & Stanovich, K.E. (1997). Early reading acquisition and its relation to reading experience and ability 10 years later. *Developmental psychology*, 33, 934-945.

- Dunning, D.B., Mason, J.M., & Steward, J.P. (1994). Reading to preschoolers: A response to Scarborough and Dobrich (1994) and recommendations for future research. *Developmental Review*, 14, 324-339.
- Elbro, C., Borstrom, I., & Petersen, D.K. (1998). Predicting dyslexia from kindergarten: The importance of distinctness of phonological representations of lexical items. *Reading Research Quarterly*, 33(1),
- 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*, 41(2), 203-213.
- 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.
- Jordan, G.E., Snow, C.E., & Porche, M.V. (2000). Project EASE: The effect of family literacy project on kindergarten student's early literacy skills. *Reading Research Quarterly*, 35(4), 524-546.
- Kenny, D.A. (1975). Cross-lagged panel correlation: A test for spuriousness. *Psychological Bulletin*, 82(6), 887-903.
- Laakso, M-L. (1995). Mother's and father's communication quality and teaching strategies with their school-aged children. *Journal of Applied Developmental Psychology*, 3, 445-462.
- Laakso, M-L., Poikkeus, A-M., & Lyytinen, P. (1999). Shared reading interaction in families with and without genetic risk for dyslexia: Implications for toddlers' language development. *Infant and Child Development*, 8, 179-195.
- Leary, M.R. (1995). *Introduction to Behavioral Research Methods*. Pacific Grove (CA).

- Leinonen, S., Müller, K., Leppänen, P.H.T., Aro, M., Ahonen, T., & Lyytinen, H. (2001). Heterogeneity in adult dyslexic readers: Relating processing skills to the speed and accuracy of oral text reading. *Reading and Writing: An Interdisciplinary Journal* 14, 265-296.
- Leseman, P.P.M., & de Jong, P.F. (1998). Home literacy: Opportunity, instruction, cooperation and social-emotional quality predicting early reading achievement. *Reading Research Quarterly*, 33(3), 294-318.
- Lonigan, C.J. (1994). Reading to preschoolers exposed: Is the emperor really naked. *Developmental Review*, 14, 303-323.
- Lonigan, C.J., Burgess, S.R., & Anthony, J.L. (2000). Development of emergent literacy and early reading skills in preschool children: Evidence from a latent-variable longitudinal study. *Developmental Psychology*, 36(5), 596-613.
- Lyytinen, H., Ahonen, T., Eklund, K., Guttorm, T.K., Laakso, M-L., Leinonen, S., Leppänen, P.H.T., Lyytinen, P., Poikkeus, A-M., Puolakanaho, A., Richardson, U. & Viholainen, H. (2001). Developmental pathways of children with and without familial risk for dyslexia during the first years of life. *Developmental Neuropsychology*, 20(2), 539-558.
- Lyytinen, P., Laakso, M-L., & Poikkeus, A.-M. (1998). Parental contribution to child's early language and interest in books. *European Journal of Psychology of Education*, 13(3), 297-308.
- McNemar, Q. (1969). *Psychological statistics* (fourth edition). John Wiley and Sons, Inc., New York - London - Sydney - Toronto. 1969
- Payne, A.C., Whitehurst, G.J., & Angell, A.L. (1994). The role of home literacy environment in the development of language ability in preschool children from low-income families. *Early Childhood Research Quarterly*, 9, 427-440.

- Pennington, B.F., Gilger, J.W., Pauls, D., Smith, S.A., Smith, S.D., & DeFries, J.C. (1991). Evidence for major gene transmission of developmental dyslexia. *Journal of the American Medical Association*, 266, 1527-1534.
- Pennington, B.F., & Lefly, D.L. (2001). Early reading Development in Children at Family Risk for Dyslexia. *Child Development*, 72(3), 816-833.
- Pellegrini, A.D., Galda, L., & Charak, D. (1997). Bridges between home and school literacy: Social bases for early school literacy. *Early Child Development and Care*, 127-128, 99-109.
- Rowe, K.J. (1991). The influence of reading activity at home on students' attitudes towards reading. Classroom attentiveness and reading achievement: an application of structural equation modelling. *British Journal of Educational Psychology*, 61, 19-35.
- Saracho, O.N. (1997). Using the home environment to support emergent literacy. *Early Child Development and Care*, 127-128, 201-216.
- Saracho, O.N. (2000). Literacy development in the family context. *Early Child Development and Care*, 163, 107-114.
- Scarborough, H.S., Dobrich, W., & Hager, M. (1991). Pre-school literacy experience and later reading achievement. *Journal of Reading Disabilities*, 24(8), 508-511.
- Scarborough, H.S. & Fichtelberg, A. (1993). Child-directed talk in families with incidence of dyslexia. *First Language*, 13, 51-67.
- Scarborough, H.S., & Dobrich, W. (1994). On the efficacy of reading to preschoolers. *Developmental Review*, 14, 245-302.

- Senechal, M. LeFevre, J. Thomas, E. & Dale, P.S. (1998). Differential effects of home literacy experiences on the development of oral and written language. *Reading Research Quarterly*, 33(1), 96-116.
- Snow C.E., Burns, M.S., & Griffin, P (Eds.) (1998). *Preventing Reading Difficulties in Young Children*. Washington. National Academy Press.
- Snowling, M. (2000). *Dyslexia* (2nd edition). Blackwell Publishers
- Stainthorp, R., and Hughes, D. (2000). Family literacy activities in the homes of successful young readers. *Journal of Research in Reading*, 23, 41-54.
- Stanovich, K.E. (1986). Matthew effects in reading: Some consequences of individual differences in the acquisition of literacy. *Reading Research Quarterly*, 21(4), 360-406.
- Teale, W.H., & Sulzby, E. (1986). Emergent literacy as a perspective for examining how young children become writers and readers. In Teale, W.H., & Sulzby, E. (Eds.) *Emergent Literacy: Writing and Reading*. Norwood, NJ: Ablex.
- Valsiner, J. (1998). The development of the concept of development: Historical and developmental perspectives. In Damon, W. & Lerner, R.M. (Eds.) *Handbook of Child Psychology, Vol. 1, Theoretical models of human development*, pp. 207-213. New York.: Wiley.
- Wagner, R.K., Torgesen, J.K., & Rashotte, C.A. (1994). Development of reading-related phonological processing abilities: New evidence of bi-directional causality from a latent variable longitudinal study. *Developmental Psychology*, 30(1), 73-87.
- Wechsler, D. (1989). Wechsler Preschool and Primary Scale of Intelligence-R

- Whitehurst, G.J., Epstein, J.N., Angell, A.L., Payne, A.C., Crone, D.A., & Fischel, J.E. (1994). Outcomes of an emergent literacy intervention in Head Start. *Journal of Educational Psychology*, 86(4), 542-555.
- Whitehurst, G.J., & Lonigan, C.J. (1998). Child development and emergent literacy. *Child Development*, 69, 848-872.
- Whitehurst, G.J., & Lonigan, C.J. (1999). Child development and emergent literacy. *Annual Progress in Child Psychiatry and Child Development*.

APPENDIX

1. Looks at book/magazine independently

- 1: Not at all/seldom,
- 2: 1-2 times per week,
- 3: Several days per week,
- 4: Once a day,
- 5: Several times every day

2. Asks to be read to

- 1: Not at all/seldom,
- 2: 1-2 times per week,
- 3: Several days per week,
- 4: Once a day,
- 5: Several times every day

3. Child "reads" the story to oneself or to

- 1: Not at all/seldom,
- 2: 1-2 times per week,
- 3: Several days per week,
- 4: Once a day,
- 5: Several times every day

4. Story is read to the child

- 1: Not at all/seldom,
- 2: 1-2 times per week,
- 3: Several days per week,
- 4: Once a day,
- 5: Several times every day

5. Joint looking at pictures

- 1: Not at all/seldom,
- 2: 1-2 times per week,
- 3: Several days per week,
- 4: Once a day,
- 5: Several times every day

6. Mother reads to the child

- 1: Not at all/seldom,
- 2: 1-2 times per week,
- 3: Several days per week,
- 4: Once a day,
- 5: Several times every day

7. Father reads to the child
 - 1: Not at all/seldom,
 - 2: 1-2 times per week,
 - 3: Several days per week,
 - 4: Once a day,
 - 5: Several times every day

8. Duration of reading episode 1: Alone
 - 1: Less than 5 min,
 - 2: 5 - 15 min,
 - 3: 15 - 30 min,
 - 4: 30 - 45 min,
 - 5: Longer than 45 min

9. Duration of reading episode 2: With parent
 - 1: Less than 5 min,
 - 2: 5 - 15 min,
 - 3: 15 - 30 min,
 - 4: 30 - 45 min,
 - 5: Longer than 45 min

10. Total reading per day 1: Alone
 - 1: Less than 5 min,
 - 2: 5 - 15 min,
 - 3: 15 - 30 min,
 - 4: 30 - 45 min,
 - 5: Longer than 45 min

11. Total reading per day 2: With adult
 - 1: Less than 5 min,
 - 2: 5 - 15 min,
 - 3: 15 - 30 min,
 - 4: 30 - 45 min,
 - 5: Longer than 45 min

