

Ulla Leppänen

Development of Literacy
in Kindergarten
and Primary School



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and Primary School

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ABSTRACT

Ulla Leppänen

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Diss.

This dissertation examined the development of literacy skills and reading habits among Finnish-speaking children by using data from the Jyväskylä Entrance into Primary School study (JEPS; Nurmi & Aunola, 1999-2004). The original sample of 207 participants consisted of all the 5- to 6-year-old children, born in 1993, from two medium-sized communities in central Finland. Children were investigated every half year during their kindergarten year, their first year of primary school, and their second year of primary school, and once during grade 4. The results showed first that children with more advanced reading skills at the beginning of kindergarten became increasingly better readers during that year when compared to lower achieving peers. During grade 1, however, poor readers developed at a faster rate than good readers. Second, the results showed recursive cross-lagged impacts between reading and spelling: spelling skill at the beginning of kindergarten predicted reading skills during kindergarten and grade 1, whereas reading skills at the end of kindergarten and at the end of grade 1 predicted subsequent spelling skills. Moreover, phonological awareness at the beginning of kindergarten predicted early reading and spelling skills during kindergarten, whereas letter knowledge contributed to the increase in later spelling and reading during grade 1. Third, although phonological awareness and letter knowledge at the beginning of kindergarten predicted reading skills at the end of grade 4, these impacts were mediated via reading skills at the end of the kindergarten year and grade 1. Unexpectedly, the best predictor of reading skills at the end of grade 4 was counting ability at the beginning of the kindergarten year. Finally, the results suggest that, as early as at the beginning of the primary school, children's sentence comprehension, text reading and word chain reading skills contribute to the amount of reading books, magazines and to the ability to read the subtitles of TV programs. Alongside the overall finding that children's reading skills contribute to frequency of their out-of-school reading, a bidirectional prospective impact was also found between reading and reading habits: the higher the amount of book reading, and the more likely children were to read TV subtitles, the better word chain reading they showed later on.

Keywords: Literacy development, Antecedents of literacy skills, Reading habits, Kindergarten, Primary school, Longitudinal study

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CONTENTS

ABSTRACT

ACKNOWLEDGEMENTS

1	INTRODUCTION	9
1.1	Reading skills	10
1.2	Associations between reading and spelling skills	12
1.3	Antecedents of reading and spelling skills	13
1.4	Print exposure	15
1.5	Aims of the empirical studies	16
2	OVERVIEW OF THE ORIGINAL STUDIES	17
2.1	Method	17
2.2	Study I: Development of reading skills among preschool and primary school pupils	19
2.3	Study II: Development of reading and spelling Finnish from preschool to grade 1 and grade 2	19
2.4	Study III: Counting ability predicts fourth grade decoding and reading comprehension	20
2.5	Study IV: Beginning readers' reading performance and reading habits.....	21
3	GENERAL DISCUSSION.....	22
3.1	Development of reading skills during kindergarten and first grade	22
3.2	Associations between reading and spelling.....	25
3.3	Antecedents of literacy skills	26
3.3.1	Decoding and spelling	26
3.3.2	Reading comprehension	29
3.4	Reading habits.....	31
4	LIMITATIONS.....	34
5	PRACTICAL IMPLICATIONS.....	36
6	FUTURE DIRECTIONS.....	38
7	CONCLUSIONS.....	39
	TIIVISTELMÄ.....	40
	REFERENCES.....	42

LIST OF PUBLICATIONS

- I Leppänen, U., Niemi, P., Aunola, K., & Nurmi, J.-E. (2004). Development of reading skills among preschool and primary school pupils. *Reading Research Quarterly*, 39, 72-93.
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1 INTRODUCTION

Learning to read is among the most important skills that a child has to master in order to succeed later on at school. Early reading experiences are also essential in expanding development in different knowledge domains (e.g., Cunningham & Stanovich, 1997). Not surprisingly, literacy skills (that is, reading and spelling skills) have gained an enormous amount of attention during the recent decades. Also, their development has been studied.

Although studies conducted among English speakers have dominated the field of literacy research, recently the focus of attention has shifted towards the orthographical differences between languages, and how this impacts literacy acquisition. In a cross-linguistic comparison study, Seymour, Aro & Erskine (2003) showed that the deep orthography of English makes literacy acquisition slower than in the majority of European orthographies. In modelling reading acquisition among English speakers, the focus has been on both visual processing and letter-sound translation (Frith, 1985). However, Seymour et al. (2003) concluded, based on their cross-linguistic studies, that alphabetic processing only of words may be sufficient in transparent orthographies, whereas in deeper orthographies both alphabetic and logographic processes are necessary. A likely reading strategy for children acquiring reading ability in a transparent orthography would be phonological reading. Finnish beginning readers do not have the advantage of sight words because of two idiosyncracies of the language. Firstly, the number of monosyllabic words is only about 50. Secondly, because of the agglutinative nature of Finnish, words tend to be excessively long. Beginning Finnish readers have been found to decode words and nonwords equally well. Holopainen, Ahonen, Tolvanen and Lyytinen (2000) found a correlation of .93 between these two measures among their preschool readers. When assessing cross-linguistically the ability to decode nonwords, the advantage of a more transparent orthography is apparent. English-speaking first-graders show error rates between 40 % and 80 % (Juel, Griffith, & Gough, 1986; Treiman, Goswami, & Bruck, 1990), whereas in Finnish and German error rates are below 25 % (Holopainen, Ahonen, & Lyytinen, 2001; Wimmer & Hummer, 1990).

In Finland children enter kindergarten the year of their sixth birthday. Kindergarten is not compulsory, but almost all children attend it. In the Finnish kindergarten there is no formal teaching of literacy skills, and children are not expected to learn to read or spell during the kindergarten year. However, children are read to in kindergarten, with texts typically including fairytales, poems, and riddles. Children are also encouraged to play with language, for example making up rhymes and comparing words. In addition, children are also taught to follow instructions and to discuss the content of stories (Esiopetuksen opetussuunnitelman perusteet, opetushallitus, 1996; Korpilahden esiopetussuunnitelma, 1999).

Primary school begins when children become seven years old. In Finnish schools reading and spelling is taught through an alphabetic strategy, in which the learning of sound-symbol correspondences is important. This emphasis is explained by the fact that the orthography of Finnish is almost perfectly transparent, which makes reading and spelling acquisition parallel processes: spelling a phoneme is as consistent as pronouncing a grapheme. Reading and spelling instruction in Finland in general, and also in the classrooms of this particular study, includes learning of letter names as well as listening, segmenting, and blending phonemes and syllables (Holopainen, Ahonen, & Lyytinen, 2002). Teaching starts typically with the introduction of one letter-sound correspondence per week, which means it requires approximately six months to progress through all the 21 standard Finnish sounds. After a few letters and sounds have been mastered, they are combined into CV/VC syllables and CV/VC-CV/VC words. Words in ABC books are divided into syllables with a hyphen because of the agglutinative nature of the Finnish language. Thus, words in Finnish generally consist of many syllables. Also, strategies to enhance reading comprehension and learn text-generation rules are introduced. During grades 3 to 5, the focus of reading instruction is mainly on the comprehension of texts. Comprehension skills are trained through strategies involving instructions of text structures, making inference and evaluating written texts (Opetushallitus, 2004).

1.1 Reading skills

One of the most influential models of reading (Gough & Tunmer, 1986) combines beginning readers' listening comprehension and decoding skills in a multiplicative fashion. According to this *simple view of reading*, no reading comprehension is possible in the absence of either one of these basic skills. The aim of reading is comprehension of words and texts. Accepting this obvious fact, the picture of literacy acquisition becomes more complex. Reading ability consists of automatic word recognition (Perfetti, 1985) together with reading comprehension (Yuill & Oakhill, 1991). It has been suggested that reading comprehension includes two levels (Perfetti, 1985). Alongside the ability to

derive the meaning of a particular sentence, the reader must apply text-modelling processes based on general knowledge and inference making. Thus, the reader's prior knowledge (Anderson & Pearson, 1984) and ability to strategically process the text (Pressley & Wharton-McDonald, 1997) establish skilled comprehension. Both the decoding and comprehension components of reading are examined particularly in Study III.

Theories concerning developmental processes in learning to read suggest that children move from word recognition based on visual and contextual cues to the use of grapheme-to-phoneme correspondences (Ehri, 1995; Frith, 1985). In later stages of the development of literacy, the recognition of visual and contextual cues and the use of grapheme-to-phoneme correspondences become interlinked, and are applied flexibly and with great automaticity.

Recently it has been suggested that the application of reading strategies may vary depending on the features of a particular orthography. For example, Wimmer and Hummer (1990), examining German-speaking children, suggested that alphabetic skills develop earlier in an orthographically more regular language, perhaps indicating that such a language might not have as distinct reading processes as English.

According to some researchers, children of differing abilities show a widening of individual differences in reading performance across time (e.g., Stanovich, 1986; Williamson, Applebaum, & Enpanchin, 1991). In his classic article, Stanovich proposed that negative reading experiences among children with lesser ability create a downward spiral of failure that affects the subsequent development of reading skills and habits. Children who encounter problems while learning to read, read less, and without practice fall behind in reading skill development. Stanovich referred to this phenomenon as the Matthew effect (Stanovich, 1986), which suggests that early developmental differences in literacy ability expand as development proceeds. However, some researchers have proposed the alternative view (e.g., Aunola, Leskinen, Onatsu-Arvilommi, & Nurmi, 2002) that, children who begin learning to read with low literacy skills may accelerate their development and catch up with those who begin at a higher level, obviously as a consequence of effective teaching.

Previous research has found substantial stability in children's reading skills (e.g., Juel, 1988; Lundberg, 1984). However, studies have found evidence that individual differences in reading skills increase across time (e.g., Williamson, Appelbaum, & Enpanchi, 1991) and some have found evidence of the opposite pattern (e.g., Shaywitz et al., 1995). Study I of the present thesis examines how children's reading skills develop during the kindergarten year and the first primary school year. It was assumed that development may follow two alternative trajectories: a cumulative trajectory in which individual differences expand across time (Stanovich, 1986), or a compensatory trajectory with narrowing individual differences (Shaywitz et al., 1995). Stanovich's idea of the Matthew effect is also investigated in study IV, by examining the associations between reading habits and reading performance.

1.2 Associations between reading and spelling skills

Learning to read and spell are two sides of the same coin: acquiring literacy. Theoretical models of writing (Berninger, Abbott, Whitaker, Sylvester, & Nolen, 1995; Hayes & Flower, 1980) portray three processes. These include planning (i.e., goal-setting, generating and organizing) the text beforehand, translating (i.e., text generation, spelling) ideas into written text and reviewing (i.e., evaluating and revising) the produced text. In the present study the focus is on one aspect of the writing process: spelling. In the early stages of literacy development, word recognition and spelling competencies share several similarities, thus justifying the assumption of close developmental connections. For example, according to Fitzgerald and Shanahan (2000), the knowledge representations and cognitive processes underlying reading and spelling are very similar. There is some evidence in support of such a joint knowledge base (e.g., Langer, 1986). It has been shown, for example, that factors such as the ability to identify letters (Fitzgerald, 1990) and to recognize and produce meaningful syntax (Kellog, 1994) affect the development of both reading and spelling skills. Furthermore, Waters, Bruck and Seidenberg (1985) found that in both reading and spelling children apply spelling-to-sound correspondences.

A few theories have been proposed concerning the relationships between reading and spelling. According to Ehri (1995), there is a reciprocal cycle between reading and spelling. In her theory the accumulation of word-specific information affects reading and spelling continuously and in parallel, that is, reading skills influence spelling but at the same time spelling influences reading. Word-specific knowledge along with knowledge of the alphabet are seen as mediators; reading and spelling training and experiences feed into building up this knowledge, which in turn facilitates both reading and spelling. Moreover, Frith (1985) has suggested that reading and spelling take turns in influencing each other in distinct phases of literacy development. In other words, the direction of influence changes over time.

Previous studies on the reciprocal relationship between reading and spelling during the period when children are learning the basics of literacy skills have at least two limitations. First, the relationship between reading and spelling skills has been examined mainly during the primary (elementary) school years (e.g., Shanahan & Lomax, 1986; Waters, Bruck, & Seidenberg, 1985). In orthographically regular languages like Finnish, the process of acquiring basic literacy skills in school is quite rapid, extending over a period of about three to seven months from the beginning of formal instruction (e.g., Aunola, Nurmi, Niemi, Lerkkanen, & Rasku-Puttonen, 2002; Holopainen, Ahonen, & Lyytinen, 2001). Consequently, in such languages, it might be important to investigate the developmental processes between reading and spelling already before formal education. Second, most studies examining the reading-writing relationship have been based on cross-sectional data (e.g., Ferroli & Shanahan, 1987; Mann, Tobin, & Wilson, 1987), and no findings from cross-lagged

longitudinal studies have been reported. Consequently, the use of cross-lagged data would provide an opportunity to examine reciprocal relationships across time and the direction of the predictions between the constructs. Study II of the present thesis examines whether reading and spelling have different influences on one another at different points in time. The model proposed by Ehri (1995) would suggest continuous and parallel influences, whereas according to Frith's (1985) model the direction of influence would change over time.

1.3 Antecedents of reading and spelling skills

Several factors have been found to predict the development of reading and spelling. The associations between various candidate predictors and the outcome literacy skills have been found to vary depending on the selected measure of a particular skill. The strong relationship between phonological awareness (i.e., child's sensitivity of speech sounds) and decoding is widely acknowledged (Bradley & Bryant, 1983; Liberman, & Shankweiler, 1985; Lundberg, Olofsson, & Wall, 1980). Also the predictive association between these two skills is well established (e.g., Wagner & Torgesen, 1987). However, the construct of phonological awareness consists of disparate linguistic aspects. Goswami (2002), for example, suggested a distinction between the ability to detect onsets and rime in words and the ability to manipulate phonemes within syllables. It has been suggested that the awareness of phonemes is the strongest correlate of reading acquisition (Muter, Hulme, Snowling, & Taylor, 1997). Aro et al. (1999) found among Finnish-speaking children that the ability to identify initial phonemes in words was associated with the very early stages of reading development.

Knowledge of the alphabet has also been shown to predict later decoding ability (e.g., Adams, 1990; Muter et al., 1997; Scanlon & Vellutino, 1996). For example, Scanlon and Vellutino found that letter naming skills were strongly related to reading ability in grade 1. Moreover, children's listening comprehension abilities have been linked to the development of reading skills (Gough & Tunmer, 1986), especially to reading comprehension. For example, Juel (1988) found that children who had experienced problems in reading comprehension had often difficulties in listening comprehension together with problems in decoding. In addition, metacognitive skills, such as the ability to assess and monitor one's own progress in a particular task, are associated with reading comprehension skills (Perfetti, 1985; Wright & Jacobs, 2003). This suggestion is based on the idea that, in order to monitor comprehension, children need to become aware of possible problems in it, i.e., evaluate their reading process (Hacker, Plumb, Butterfield, Quathamer, & Heineken, 1994).

It has been suggested that visual-motor skills, such as automatic orientation of attention, provide a basis for subsequent decoding (Facoetti, Paganoni, Turatto, Marzola, & Mascetti, 2000; Kurdek & Sinclair, 2000). For

example, Facoetti et al. (2000) found that slower than normal readers were unable to shift their attention automatically in response to perceptual visual cues. Moreover, children's mathematical abilities have been found to be associated with learning to read. Light and DeFries (1995) showed that difficulties in arithmetic were associated with phonologically based problems in reading. One possible reason why mathematical skills may be associated with reading skills is that both require sufficient working memory abilities, i.e., processing and storing of information simultaneously (e.g., Ashcraft, 1987, 1992).

Moreover, factors like parental socioeconomic status (Fergusson & Lynskey, 1997) and educational level (Lewis, 2000) have been found to be associated with children's reading and spelling skills. Adams (1990) suggested that the socioeconomic status of a family is related to activities that promote the development of prereading skills, such as phonological awareness. Bowey (1995) found that children from low socioeconomic status (SES) environments showed poorer reading achievement than those from middle to upper SES environments. Gender differences in reading performance have also been reported (e.g., Elley, 1991; Holopainen, 1996). For example, girls were found to outperform boys in reading comprehension at ages 9 and 14 (Wagemaker, 1996). However, when reading document-type texts (i.e., processing information from maps, tables and charts), the difference becomes smaller or even reverses in favour of boys (e.g., Elley, 1991).

The skills underlying spelling ability have also been studied. For example, phonological awareness at the beginning of the first school year has been found to be associated with the subsequent development of spelling skill (Bradley & Bryant, 1983; Wimmer, Landerl, Linortner, & Hummer, 1991). Also, letter name knowledge has been found to predict children's spelling skills (Muter et al., 1997).

Previous research on the antecedents of literacy has one limitation: Despite the large number of studies on the associations between different antecedents and literacy skills (e.g., Bradley & Bryant, 1983; Vellutino & Scanlon, 1991), most have focused on children's phonological abilities. The data of the present study gave an opportunity to examine longitudinally a larger array of cognitive antecedents measured at kindergarten as precursors of later decoding, reading comprehension and spelling skills.

The present dissertation examines to what extent the different antecedent variables measured during kindergarten predict the development of literacy skills through grades 1 (Study I) and 2 (Study II) and reading skills at the end of grade 4 (Study III).

1.4 Print exposure

One important issue in learning to read is the extent to which exposure to and practice with reading-related materials outside school contribute to the development of reading performance. Sénéchal, LeFevre, Thomas and Daley (1998) suggested that children are exposed to two types of literacy experiences at home. The first includes informal literacy activities, that is, activities where the message contained in the print is of importance, not the print per se. The second type of literacy experiences at home are formal activities, where the print per se is the goal. In the present dissertation, the focus is on the informal literacy activities with print exposure defined as child's own interest in out-of-school reading (i.e., their reading habits).

As a part of his model of the Matthew effect in learning to read Stanovich (1986) suggested that reading skills and exposure to written language form a reciprocal cycle: the better skills the child has, the more he/she practices reading, and the more she/he reads, the more his/her skills develop. Many studies have examined the impact of exposure to printed materials, such as out-of-school reading, on children's literacy acquisition. In these studies, print exposure has been found to be associated with reading performance (e.g., Cipielewski & Stanovich, 1992; Cunningham & Stanovich, 1991; Greaney & Hegarty, 1987; Stanovich & Cunningham, 1992). For example, Cunningham and Stanovich (1990) found that reading outside school was associated with orthographic knowledge and word recognition ability even after IQ, memory ability and phonological awareness were controlled for. In addition, reading outside school has been found to be related to reading comprehension (Anderson, Wilson, & Fielding, 1988). Cipielewski and Stanovich (1992) found among third, fourth and fifth graders that, when earlier level of reading ability was controlled for, the subsequent level of reading ability was influenced by children's exposure to print. It has been shown that the amount of time children spend on out-of-school reading is relatively stable, indicating that children who read a lot retain their reading habits in later years as well (Wigfield & Guthrie, 1997). Typical out-of-school reading activities include reading books, magazines and comics (Linnakylä, 1993). However, in countries like Finland, where foreign TV programs are not dubbed, the reading of TV subtitles may also play a role in learning to read (e.g., Koolstra, van der Voort, van der Kamp, 1997). Linnakylä (1993), for example, found among 9-year-old Finnish children that those who watched TV 3 to 4 hours per day achieved the highest scores in reading tests.

Most previous studies of the relations between reading performance and reading habits have been cross-sectional, with only a few studies providing longitudinal data (Juel, 1988; Koolstra, et al., 1997). Although the major assumption has been that reading out of school has an impact on reading performance, it is also likely that reading skills contribute to how much and

what kind of material (books, magazines, comics and subtitles of TV programs) children read outside school.

It is also likely that children's reading habits contribute to reading performance earlier than in grade 3: to our knowledge no previous studies have investigated this possibility. Moreover, the prospective associations between reading skills and reading habits may depend on the stage of the child's reading career (i.e. child's level of decoding ability). For example, it might be assumed that the associations between reading performance and out-of-school reading habits become stronger as children's reading skills progress.

Following Stanovich's views, study III of the present thesis examines the cross-lagged associations between children's reading skills and their out-of-school reading habits. In addition, the possibility that these associations would be different depending on the stage of the reading career was examined. For example, does the level of reading skills contribute to children's reading habits and the kind of material they read? To what extent does out-of-school reading contribute to children's reading performance? Does the kind of material children read, e.g., books, comics or TV subtitles, matter when it comes to the consequences of out-of-school reading practice? The data used in the present dissertation provided an opportunity to examine the associations between children's reading skills and out-of-school reading habits during the first and second primary school years. This is particularly important in a society where the characteristics of the language make learning to decode print a relatively fast process (Lerkkanen, 1994; Lyytinen, 1994). Studies have shown that at least 20% of Finnish children are able to decode before the first grade (Holopainen, Ahonen, Tolvanen, & Lyytinen, 2000) and that by the end of the first grade Finnish children typically are rather fluent decoders (Aunola et al., 2002).

1.5 Aims of the empirical studies

The aim of this thesis was to examine the development of children's literacy skills during the transition from kindergarten to the primary school. The study was carried out in Finland, among Finnish-speaking children. In study I, the dynamics and trajectories of reading skill development and the cognitive and social antecedents of that development were examined. In Study II, the antecedents of reading and spelling skills as well as the reciprocal relationships between these skills were investigated. Study III examined the predictors of fourth graders' reading comprehension and word recognition. In Study IV, the prospective relationships between reading performance and reading habits among first and second graders were examined.

2 OVERVIEW OF THE ORIGINAL STUDIES

2.1 Method

The studies reported here are parts of the Jyväskylä Entrance into Primary School study (JEPS; Nurmi & Aunola, 1999-2004). The aim of the JEPS is to investigate the development of a broad range of cognitive, social, and motivational factors among children who are moving from kindergarten to primary school. The original sample of 210 participants consisted of all the 5- to 6-year-old children, born in 1993, from two medium-sized communities in central Finland. Parental permission to gather data from the children was obtained from the parents of 207 (111 boys, 96 girls) children.

Children were investigated each half year during their kindergarten year, that is, (a) in October 1999 (N= 207) and (b) in April 2000 (N=200); each half year during their first year of primary school, that is, (c) in October 2000 (N=196) and (d) in April 2001 (N=196); each half year of their second year of primary school, that is, (e) in October 2001 (N=197) and (f) in March 2002 (N=196); and once during grade 4, that is, (g) April 2004 (N=165). The attrition of children during kindergarten and grade 1 and 2 was due to the fact that the families of these children had moved to other districts and were not able to participate in the study later on. Attrition during grade 4 was due to both moving to other districts and/or refusals. Parents were sent a questionnaire annually assessing their educational level, well-being, beliefs, and parenting styles. Cognitive antecedents of children's literacy skills were assessed at the beginning of their kindergarten year and their basic academic skills in reading and spelling were assessed using various tests and teacher ratings during each measurement point.

In different studies diverse sets of variables were used. A summary of these variables and sample-sizes are reported in Table 1.

TABLE 1 Summary of the variables used in studies I-IV

Study	Participants	Concepts	Variables
Study I	196	<i>Reading skills</i> <i>Antecedents</i>	- Word and sentence reading - Sentence comprehension - Phonological awareness - Letter knowledge - Listening comprehension - Counting ability - Metacognition - Visual attention - Cognitive ability (Draw-a-Man) - Mothers' level of education
Study II	196	<i>Reading skills</i> <i>Spelling skills</i> <i>Antecedents</i>	- Word and sentence reading - Sentence comprehension - Word spelling - Sentence spelling - Phonological awareness - Letter knowledge - Listening comprehension - Visual attention - Mothers' level of education
Study III	165	<i>Reading skills</i> <i>Antecedents</i>	- Reading comprehension - Text reading - Word chains - Word and sentence reading - Sentence comprehension - Phonological awareness - Letter knowledge - Listening comprehension - Counting ability - Metacognitive awareness - Visual attention - Mothers' level of education
Study IV	196	<i>Reading skills</i> <i>Reading habits</i> <i>Antecedents</i>	- Sentence comprehension - Text reading - Word chains - Reading habits interview - Word and sentence reading

2.2 Study I: Development of reading skills among preschool and primary school pupils

Study I investigated the developmental dynamics and trajectories of kindergarten and first-grade children's development of reading skills, as well as the cognitive and social antecedents of that development. The sample of the study consisted of all the 196 children of the JEPS- study from whom data concerning reading skills had been gathered from all four measurement points from kindergarten to the end of grade 1. The data included measures of reading ability and its cognitive and social antecedents, and they were analyzed using Simplex and Piecewise Growth Curve Modeling. The results showed that during the kindergarten year individual differences in reading grew larger, and this growth was faster among those who entered kindergarten with already well-developed skills: initially better readers developed faster than the group of initially poorer readers. However, during the first grade individual differences in reading diminished. The results suggest that systematic reading instruction in primary school is more beneficial for children with less developed literacy skills, whereas children with more developed reading skills gain relatively less from reading instruction in the first grade. Phonological awareness was found to predict the level of reading skills in kindergarten, whereas letter knowledge and counting ability predicted the growth of reading skills during the kindergarten year. The only antecedent variable that was found to predict reading development in grade 1 was listening comprehension. 6 % of the children participating in this study had problems in learning to read, reflected in slower gains in reading ability at the beginning of primary school. All of these children were assigned to a special class or received special education.

2.3 Study II: Development of reading and spelling Finnish from kindergarten to grade 1 and grade 2

Study II had two aims: first, to examine the antecedents of reading and spelling, and, second, to investigate reciprocal relationships between these skills during the early reading career. Data included reading and spelling measures from six time points of JEPS -study. 196 children were studied every half year from the beginning of kindergarten till the end of grade 2. The results showed, first, that the level of spelling skills at the beginning of kindergarten predicted the level of reading skills at the end of the kindergarten year and at the end of grade 1, after controlling for the previous level of reading skills. However, reading skills at the end of kindergarten and grade 1 predicted subsequent spelling skills. Second, the antecedents of reading and spelling skills were similar: phonological awareness predicted reading and spelling in kindergarten, whereas letter knowledge contributed to both skills during grade 1. Children's

phonological awareness and letter knowledge, in turn, were associated with mother's educational level. The results suggest that there are recursive impacts between reading and spelling when children move from kindergarten to primary school. However, when phonological awareness at the beginning of kindergarten was controlled for, early spelling no longer predicted reading skills at the end of kindergarten, suggesting that the impact of spelling on reading during the kindergarten year seems to be due to children's phonological awareness skills. Moreover, at an early stage of emerging literacy phonological awareness seemed to play a key role, whereas letter knowledge contributes to reading and spelling only later on after reading instruction had started.

2.4 Study III: Counting ability predicts fourth grade decoding and reading comprehension

Study III examined to what extent literacy-related antecedents, such as phonological awareness, letter knowledge and listening comprehension, predict children's text reading and word chain reading, and reading comprehension at the end of grade 4. Moreover, the impact of other antecedents, such as counting ability, metacognitive awareness, and visual attention, as well as mother's educational level and child's gender, on the development of children's reading comprehension, and text reading and word chain reading were examined. Reading skill predictors in 165 5 - to 6 - years - old children participating in the JEPS -study were measured during the fall term of their kindergarten year. Children's reading skills were also measured at the end of kindergarten and during grades 1 and 4. The results showed, first, that children's counting ability at the beginning of kindergarten predicted their text reading, word chain reading and reading comprehension at the end of grade 4. Moreover, children's metacognitive awareness and gender, and mother's level of education were also found to predict reading comprehension. Word chain reading skills were also predicted by visual attention abilities. The impact of phonological awareness and letter knowledge on the reading skill variables were mediated by previous reading skill development. Overall, counting ability proved to be the most powerful predictor of both basic reading skills and more complex reading abilities. The results suggest that although phonological awareness and letter knowledge measured at the beginning of kindergarten were associated with reading skills at the end of grade 4, these impacts were mediated via reading skill at the end of the kindergarten year and grade 1.

2.5 Study IV: Beginning readers' reading performance and reading habits

Study IV investigated the prospective relationships between reading performance and reading habits among Finnish children during the first and second grades of primary school. Data included reading measures from three time points in the JEPS -study: 196 children were examined twice during their first primary school year and once during the spring term in Grade 2. Reading habits were measured twice: once during the spring term in Grade 1 and again during the spring term in Grade 2. The results showed, first, that children's reading skills predicted their reading habits: the more competent as readers children were at the end of Grade 1, the more likely they were to engage in out-of-school reading one year later, that is, reading books, magazines and comics and reading TV subtitles. Second, reading habits also predicted reading skills: the amount of out-of-school reading at the end of Grade 1 contributed to the development of word chain reading. The results showed also that out-of-school reading habits, that is, their reading of magazines and comics and reading of TV subtitles, showed some stability across the two measurement points, whereas the habit of reading books was not yet stable at this point in the reading career. Overall, the results suggest that it is children's reading skills that influence the amount of their out-of-school reading although there also were some associations between out-of-school reading habits and later reading performance.

3 GENERAL DISCUSSION

This dissertation examined the development of literacy skills and reading habits among Finnish-speaking children. Overall, the results showed that learning to read is a rapid process that takes place relatively effortlessly. Approximately one third of the participants decoded words already at the beginning of grade 1, before they had received formal teaching. The remaining participants acquired reading ability by the end of grade 1. On the basis of these findings it is justifiable to state that the possible problems in reading that Finnish children face concern fluency of reading and reading comprehension. It should be noted, however, that there were 11 children in our sample whose reading skill development was slow enough to warrant special education.

3.1 Development of reading skill during kindergarten and first grade

The results of the present study suggest that, in general, the development of word and sentence reading as well as sentence comprehension in kindergarten resembles the cumulative trajectory hypothesized by Stanovich (1986). The evidence for this conclusion was the increasing differences across time between individuals who varied in their earlier abilities. This conclusion was also supported by the positive association observed between the initial level of reading competence and its growth during the kindergarten year. Overall, these results are in accordance with Stanovich's (1986) notion that reading development proceeds as predicted by the Matthew effect. The results are also in line with the findings of Bast and Reitsma (1997), who found that early decoding abilities predict acceleration in the growth of later decoding skills.

However, the results also indicate an alternative compensatory trajectory in the first grade. This conclusion was evidenced by decreasing skill difference between individuals of differing ability during the first grade. It was also supported by the negative association found between the initial level of reading

and its growth during first grade. Moreover, rapid growth during the kindergarten year was associated with slow growth in the first grade, suggesting that the development of reading competence during the first grade was particularly rapid among those whose development was slow during the kindergarten year. These results suggest that the development of good readers' reading performance decelerates during the first year of primary school, at least in the conditions studied here. Although good readers remain better readers at the end of the first grade, the gap between the two groups tended to narrow, which is consistent with the results of Aunola et al. (2002). Likewise, the results revealed that during the first grade, those who initially lagged behind rapidly caught up with the better readers. One may wonder whether this result is due to the shallow structure of Finnish language. However, similar results have been found among English-speaking children. In a study by Parrila, Aunola, Leskinen, Nurmi and Kirby (2005) the reading skill development of Canadian children was examined from Grade 1 through Grade 5. Their results suggested that the growth of reading skills was not linear and rather supported the compensatory model of reading development. The authors concluded that also among English-speaking children education has a potential to reduce individual differences in reading.

The results of the cluster-by-cases analysis in the current study aimed at identifying homogeneous groups with similar developmental trajectories produced similar results. The first group (36 %) identified consisted of children who had some initial knowledge of reading and developed rapidly during the kindergarten year, but who, during the first grade, showed relatively slow development. The second group (58 %) consisted of children who had poor reading skills at the beginning of kindergarten and showed slow development during it, but who made relatively greater gains in reading during the first grade. The third group (6 %) consisted of 11 children who did not read until the first grade and whose reading skills developed relatively slowly.

There are several possible explanations for the finding that learning to read resembles a cumulative trajectory during the kindergarten year but apparently shifts to a compensatory one during the first grade. The first possibility is that during kindergarten and grade 1 children are at an age when they are sensitive to learning basic reading skills. However, going beyond this level of performance may require substantially more practice than was needed for the initial acquisition of the basic skills. If so, this might lead to a deceleration in development during the first grade among those who have already acquired basic reading ability during kindergarten. Second, a related explanation for the result is that children who develop rapidly during the kindergarten year reach a plateau of reading competence during the first grade. Such a ceiling may not be absolute, but may only mean that those children who have not yet developed the skill will do so with much less effort than is required from already good readers to develop further.

A third possibility is that learning to read is a nonlinear process. Because it presupposes many initial subskills, it may be that it is only after all these

subskills have been acquired that a rapid improvement can occur. Such a development may explain the two reading trajectories found in this study. When early readers reach the point of having developed all the subskills needed during the kindergarten year, this is reflected in a rapid increase in their reading skill. Because among the slow readers, there is no change at the same time in reading skills, this means increasing interindividual variance in the whole sample. The skill level at the beginning of kindergarten is likely to predict who will first make the transition to reading. When students of lesser initial ability have acquired all subskills needed to learn to read, there is a rapid increase in their reading performance. In this study, this happened in Grade 1. The rapid increase in the reading performance of this group (i.e., students of lesser initial ability) also means a decrease in the interindividual variance in the total sample, particularly because the relative reading performance of early readers begins to decelerate at the same time. The results of the cluster analysis lend some support to this possibility. Overall, this interpretation suggests that learning to read may be a similar process for the majority of children, featuring a rapid qualitative change in the transition from a nonreader to a reader. It is only the timing of reading development that varies.

A fourth possibility is that the instruction provided by first grade teachers was less effective for good readers. For example, children with relatively good reading skills may not have received challenging enough instruction to match their needs. Moreover, it is possible that teachers spend less time with good than poor readers. To examine this possibility in detail would require an experimental design where good readers are provided with teaching without the presence of poor readers, although this approach would be contrary to what occurs in most classrooms. Then, later on, they would be compared to a matched comparison group who had participated in normal classroom teaching.

The final possibility presented here relates to the nature of the Finnish language. Finnish has a highly regular orthography with consistent letter-sound correspondence (e.g., Dasinger, 1997; Lyytinen, 1994). Teachers, therefore, almost always use phonics in teaching reading. The dominance of this approach may explain why the majority of pupils quickly learn the basics of reading, during either kindergarten or first grade. However, this does not explain the decrease in the growth of reading ability after this time. One relevant factor may be the agglutinative nature of Finnish. In other words, suffixes are used in inflections, which easily results in words with more than 10 letters. This may make the development of reading performance substantially more difficult once the basic skill has been learned.

The results of Study I also identified a group of 11 children (6 %) who did not read until the first grade and whose reading skills developed relatively slowly. The children in this group showed lower levels of visual motor and perceptual abilities at the age of 5 compared to the other children. It could be that among these children the major problem is in accurately perceiving and storing the letter images. For example, Facchetti et al. (2000) found that children

with reading problems had difficulties in sustaining the focus of attention which may hamper visual processing efficiency. Moreover, in another Finnish study Holopainen, Ahonen, and Lyytinen (2006) found that the performance on a visual analogical reasoning test was significantly lower among delayed readers than their normally reading peers.

3.2 Associations between reading and spelling

Research on reading and spelling has identified several processes that these skills have in common (e.g., Fitzgerald, 1990; Kellog, 1994), as well as some separate mechanisms (e.g., Bryant & Bradley, 1980). Unfortunately, although a large number of studies have examined the association between reading and spelling skills, most of this research has been cross-sectional, and thus has not allowed examination of the directionality of the relationships between these two skills.

The results of the present cross-lagged longitudinal study showed, first, that reading skills measured with tests of word and sentence reading and sentence comprehension predicted subsequent word and sentence spelling skills, both from the end of kindergarten to the beginning of the first grade and from the end of grade 1 to the beginning of the second grade. This result was found after controlling for previous level of spelling. It is consistent with the findings of Juel (1988), who showed that during the first four school years the level of reading ability tended to predict later achievements in writing. In the present study reading was also found to have an impact on spelling from the end of the first school year to the beginning of grade 2. One possible explanation for this result is that children who are good readers in the spring practice reading during the summer break, which in turn contributes to their later spelling performance.

Second, the results showed that spelling skills also contributed to subsequent reading performance: spelling skills at the beginning of kindergarten predicted achievement in reading at the end of kindergarten, and at the end of grade 1, after controlling for the previous level of reading. However, after taking into account the level of phonological awareness measured at the beginning of kindergarten, the early prospective association from spelling at the beginning of kindergarten to reading skills at the end of kindergarten disappeared. This result suggests that, although spelling skills contribute to reading performance early in the reading career, the early association from spelling to reading is due to the fact that children's spelling skills are closely related to their phonological skills, which are strong predictors of both spelling and reading abilities. In other words, children who show a high level of phonological awareness develop rapidly during the kindergarten year in both spelling and reading, as is shown by the impact of spelling on reading in kindergarten. Similar results were obtained by Stage and Wagner (1992),

who found that phonological awareness almost completely explained the association between spelling and decoding skills among first-graders.

Frith (1985) has suggested that reading and spelling take turns in influencing each other as children's literacy skills develop. In contrast, Ehri (1995) suggested that bi-directional continuous influences operate in reading and spelling during literacy skill development. The results of the present study provide some support for both notions. On the one hand, reading and spelling were found to take turns in influencing each other, particularly in the early period of literacy acquisition, providing evidence for Frith's notion. On the other hand, the associations found in the present study do not corroborate the whole cyclic pattern predicted by Frith. The fact that there were bi-directional influences between reading and spelling is also in accordance with Ehri's view. Yet, continuous bi-directional influences suggested by Ehri were not found. The results showed further that, after controlling for children's phonological awareness, early spelling skills predicted reading only at the end of grade 1, whereas previous level of reading contributed to later spelling at the end of both grade 1 and grade 2.

It has to be taken into account, however, that the results of the present study may reflect the orthography of Finnish. Frith's and Ehri's theories were developed on the basis of data on English-speaking children. It is possible that at the very early stages of literacy development the beneficial effects of spelling skills on later reading are less important in a highly transparent orthography, once children have grasped the basic idea of phonological awareness and started to crack the code. By contrast, in less regular orthographies, such as English, reading and spelling training and experiences help build word-specific knowledge, which in turn facilitates reading and spelling (Ehri, 2000). Given the possibility that Ehri's and Frith's theories are language-specific, an interesting developmental comparison could be made in a language featuring regular letter-to-sound mappings as opposed to irregular ones from sound to letter. For example, German-speaking children become early accurate readers early on whereas their spelling accuracy takes longer to develop (Wimmer & Mayringer, 2002).

3.3 Antecedents of literacy skills

3.3.1 Decoding and spelling

The antecedents of literacy skills were investigated in Study I, Study II and Study III. According to several studies, two powerful predictors of word recognition skills are phonological awareness and letter knowledge (e.g. Bradley & Bryant, 1983; Stahl & Murray, 1994; Wagner & Torgesen, 1987). The results of the present study supported these findings by showing that phonological awareness at the beginning of kindergarten was not only

associated with word and sentence reading and sentence comprehension during grade 1 (Study I and Study II) but also predicted the level of word chain reading at the end of grade 4 (Study III). When reading skills at the end of kindergarten and grade 1 were entered into the path model (Study III), the results showed that phonological awareness had an indirect effect on reading skills in grade 4 via the earlier stages of reading development. The results of the present study add to previous research by showing that phonological awareness is closely associated with early reading skills, and only via them to later skill development. There are two possible explanations for these results. First, phonological awareness might be interpreted as the first sign of decoding rather than an antecedent skill. Second, the lack of reading instruction in Finnish kindergarten and the highly transparent orthography of Finnish may explain why phonological awareness predicted early reading skills in particular, whereas its impact decreased later on when reading instruction begun and the children started to progress rapidly in learning sound-spelling correspondences.

Moreover, letter knowledge in kindergarten contributed to the development of reading (Study I, Study II and Study III), particularly after the basics of literacy skills had been learned: letter knowledge predicted word and sentence reading and sentence comprehension skills in grade 1 and was associated with word chain reading and text reading skills at the end of grade 4. When word and sentence reading skills at the end of grade 1 were entered into the path model (Study III), letter knowledge had an impact on grade 4 text reading via the earlier level of reading skills. These results are consistent with those showing that letter knowledge is associated with literacy acquisition in children (e.g., Adams, 1990; Aro, Tolvanen, Poikkeus & Lyytinen, 2006; Scanlon & Vellutino, 1996). The results of the present study are in line with these findings by showing that knowing letters is of particular importance in grade 1 when basic reading ability is acquired. For example, Muter et al. (1997) found among English-speaking children that letter-name knowledge predicted reading skills during grade 1, but after that phase it started to lose its importance. Holopainen et al. (2001) showed that by the end of the first grade Finnish children have learnt the basics of reading. It could be that, after this time-point, it is the speed of reading rather than reading accuracy that results in individual differences in literacy development (Aro et al., 2006). Although letter knowledge is an important antecedent of reading accuracy, it may play a less crucial role in the development of fluency in literacy skills.

The results of the present study showed, unexpectedly, that counting ability was the most powerful predictor of word chain and text reading performance in grade 4 (Study III). After it was included in the path model predicting text reading and word chain reading in grade 4, the impact of letter knowledge was no longer statistically significant. One possible explanation for the result that word chain reading and text reading were predicted by counting ability is that working memory plays an important role in both counting skills and reading. Working memory has been thought to contribute to the ability to

count (e.g., Logie & Baddeley, 1987). The importance of the phonological loop is in the support it gives to the counting processes. Also, the central executive is involved in coordinating the activities associated with counting (Bull, Johnston, & Roy, 1999). Similarly, working memory plays a role in text reading. For example, Ashcraft (1987, 1992) found that the retrieval of arithmetic facts from the long-term memory, and the underlying memory representations, resemble the representation and retrieval of verbal information from semantic memory. It has also been found that working memory, and phonological loop and central executive functioning in particular (Baddeley & Hitch, 1974), are important in maintaining and processing verbal information. Another possible explanation for the fact that counting ability predicted text reading and word chain reading is that both mathematical skills and reading performance are influenced by general cognitive ability. However, when we controlled for the effect of general cognitive ability (Study III), measured with the Draw-a-Man test, the results showed that entering general cognitive ability into the models did not change the associations found previously.

The results of the present study showed that also listening comprehension predicted word and sentence reading and sentence comprehension development in grade 1 (Study I). This result is in accordance with Juel's (1988) finding of an association between listening comprehension and reading. Similarly, Gough and Tunmer (1986) showed that listening comprehension is a significant prerequisite for reading comprehension.

The results showed further that mother's educational level predicted their children's phonological awareness, letter knowledge and counting ability at the beginning of kindergarten, which in turn predicted either the level or growth of subsequent word and sentence reading and sentence comprehension skills (Study I). Because mothers with different levels of education were not found to differ in the amount of reading-related activities they practised with their children, there is an evident need for future research to examine the mechanisms that may account for the effect of mothers' educational level. For example, among English-speaking third grade children reading aloud to their mothers, Tracey and Young (2002) found differences in the comments the mothers made during the children's reading. High-school educated mothers more often used error corrections, whereas college-educated mothers were more likely to ask questions during the reading practice.

Word chain reading in grade 4 was predicted by visual attention (Study III). One explanation for this result is that the demands of the two tasks used in our study are somewhat alike. In both tasks, the child is asked carefully to scan either words written in combination or pictures depicted on a sheet of paper and then to detect either the boundaries of the words or choose one target picture. The result of the present study is in accordance with previous findings showing that word reading is associated with visually-based skills (e.g., Ellis & Large, 1988).

In addition, the present results (Study II) showed that reading and spelling skills share closely similar antecedents. Phonological awareness was found to

play an important role in both early spelling and early reading performance: it predicted the level of reading and spelling skills at the beginning of the kindergarten year, as well as their development during it. It is important to note here that phonological awareness did not contribute to later improvements in reading and spelling when the previous levels of these skills were controlled for. One possible explanation for this result is that although phonological awareness is important in emerging literacy (see also Holopainen, Ahonen, & Lyytinen, 2006), its influence fades rapidly in a highly regular orthography (e.g., Cossu, Shankweiler, Liberman, Katz, & Tola, 1988).

In the present studies, phonological awareness was measured with the recognition and naming of the initial sound of words. This is consistent with earlier findings showing that, in a wide range of phonological subskills, the awareness of phonemes is the strongest correlate of reading and spelling acquisition (Muter et al., 1997). The Finnish study by Aro et al. (1999) also found that the ability to identify initial phonemes in words was associated with the very early stages of reading development. Overall, these results suggest that phonological awareness is important in emergent reading ability particularly in the absence of formal reading instruction. In fact, the lack of reading instruction in kindergarten and the highly transparent orthography of Finnish may explain why phonological awareness predicted early reading and spelling skills in particular, whereas its impact decreased later on when reading and spelling instruction begun and the children started to progress rapidly in learning sound-spelling correspondences. This may then have obscured the effects of early phonological awareness.

The results of the present study may, however, partly reflect the characteristics of Finnish orthography. The training of literacy skills in less transparent orthographies often combines both alphabetic and logographic processes (Seymour et al., 2003). By contrast, in Finland the training of reading is based on phonics, that is, direct instruction in phonological decoding (e.g., Holopainen et al., 2001). By the end of the first grade Finnish children have typically learned the basics of reading and spelling (e.g., Holopainen et al., 2001). Although phonological awareness is an important antecedent of reading and spelling accuracy, it may play a less crucial role in developing fluent literacy. Letter name knowledge, in turn, may tap into a learning process that is similar to the development of fluency, and, as a consequence, it becomes an important predictor of literacy skills during the later reading career.

3.3.2 Reading comprehension

According to the simple view of reading, the two most important factors behind reading comprehension are previous decoding abilities and listening comprehension skills (Gough & Tunmer, 1986). The results of the present study showed that although listening comprehension at the beginning of kindergarten was positively associated with reading comprehension in grade 4, this association disappeared when gender was taken into account (Study III). The association between reading comprehension and listening comprehension was

due to the fact that girls outperform boys in both listening comprehension and in reading comprehension, and this caused the association. This is an important finding, because it suggests that there is a need to control for gender whenever the aim of a study is to investigate the association between listening and reading comprehension. The result that gender predicted reading comprehension fits well with previous findings of Finnish studies showing that girls are better at text comprehension than boys (Holopainen, 1996; Linnakylä, 1995; Vähäpassi, 1987). Also, in a cross-linguistic study girls were found to perform better than boys in reading comprehension (Wagemaker, 1996).

In addition, the results of the present study showed that the level of children's reading skills at the end of grade 1 predicted reading comprehension at the end of grade 4. This result is well in line with earlier findings suggesting that automaticity in word reading is a fundamental factor in fluent reading ability which, in turn, predicts subsequent reading comprehension (e.g., Gough & Tunmer, 1986; Perfetti, 1985). For instance, Juel, Griffith and Gough (1986) showed that during the first and second school year children's decoding skills were associated with their reading comprehension ability.

Further, the results of the present study showed that letter knowledge at the beginning of kindergarten predicted children's reading comprehension in grade 4. However, after entering counting ability into the path model, this association turned out to be non-significant. Children's counting ability at the beginning of kindergarten was found to predict reading comprehension at the end of grade 4, even after controlling for reading skills in kindergarten and grade 1. As in the case of word recognition, one possible explanation for the predictive association between counting ability and reading comprehension is that the functional capacity of the working memory and the representations of information in the long-term memory play a role in processing both verbal and mathematical information. As Perfetti (1985) has suggested, in order to comprehend text, one needs to operate on both the local and text-modeling levels, involving working memory and long-term memory inputs. Similar processes are involved in performing a counting task (Bull, Johnston, & Roy, 1999).

The results showed further that mother's educational level predicted their children's performance in reading comprehension at the end of grade 4 (Study III). These findings support those of other studies suggesting that parents' educational level is a good predictor of the development of literacy in their children (e.g., Lewis, 2000). Also, Adams (1990) suggested that family's socioeconomic status and activities related to reading skill development were associated. What was particularly interesting in the results of the present study was that mother's level of education predicted the level of reading comprehension in grade 4 even after controlling for children's reading skills in grade 1. However, this effect was relatively small.

Children's metacognitive awareness measured at the beginning of the kindergarten year predicted their reading comprehension skills at the end of grade 4 (Study III). This result is in accordance with Perfetti's (1985) suggestion

that children's metacognitive knowledge is an important factor in reading awareness. Reading awareness refers to a child's ability to apply strategies in comprehending text, to understand the essential parts of texts and to notice contradictions in texts. Also, in the study by Baker and Brown (1984) children's metacognition was found to be related to their reading comprehension abilities. The training of metacognitive strategies, such as predicting, clarifying, summarizing, and questioning have also been found to improve the ability to respond to questions concerning comprehension (Palincsar & Brown, 1984). It should be noted that in Study I no association was found between early metacognition and reading skill level at the beginning of kindergarten or the growth of reading during kindergarten and grade 1. It is possible that the reading skill measures used in Study I (i.e., word and sentence reading and sentence comprehension) did not tap features of reading skills related to children's metacognitive awareness that are more strategic in nature.

Overall, according to the findings of the present study, a child's ability to manipulate numbers i.e., processing and storing simultaneously, is a major prerequisite for both decoding and reading comprehension. It may be speculated that the foundation of literacy is laid by the acquisition of letter-sound correspondences, and that after this initial stage the ability to simultaneously process and store letter-level information becomes important. The agglutinative nature of the Finnish language with its limited number of monosyllabic words means that memory functions are emphasized even in basic reading.

3.4 Reading habits

One aim of the present study was to examine to what extent children's out-of-school reading habits contribute to the development of their reading performance as measured with tests of sentence comprehension, text reading and word chain reading, and to what extent their reading skills predict their subsequent reading habits. Overall, the results showed (Study IV) that children's reading skills did influence the amount of their out-of-school reading. However, bidirectional prospective impacts were found between children's word chain reading skills and reported book and TV subtitle reading. The results showed also that out-of-school reading habits, that is, reading magazines and comics and TV subtitles, showed some stability across the two measurement points, whereas the habit of reading books was not yet stable at this point in the reading career.

The results of the present study extend previous knowledge of the prospective relationships between reading performance and out-of-school reading habits to children who are just beginning their reading career. It is children's reading skills that contribute to their subsequent out-of-school reading habits rather than vice versa: the more competent the children were in

sentence comprehension, text reading and word chain reading at the end of Grade 1, the higher the amount of book and magazine reading, and the more likely they were to read the subtitles of TV programs. These results are in accordance with a previous suggestion that it is reading ability that mainly contributes to the amount of out-of-school reading (Stanovich, 1986). The present study adds to the previous literature by examining the prospective impacts with longitudinal data, and by showing that reading skills contribute to reading habits already during the first years of primary school.

However, children's subsequent word chain reading skills were also predicted by the amount of reading books and TV subtitles: the higher the amount of book reading, and the more likely children were to read TV subtitles, the higher level of word chain reading they showed later on. This result is in accordance with previous findings suggesting that exposure to print contributes to reading performance (e.g., Cunningham & Stanovich, 1990). One interesting question, however, is why word chain reading was influenced by book reading and TV subtitle reading, but sentence comprehension and text reading were not? A possible explanation for this result is that the word chain reading test is more sensitive to the decoding component that develops in the early stages of book reading (Hoover, & Gough, 1990). It might also be argued that accumulation of reading experience is reflected in children's vocabulary development and, via this association, affects their performance on the word chain reading test. Reading books and TV subtitles might be assumed to contribute first to the 'mechanical' skills of word recognition. The fact that word chain reading at the end of the second school year was enhanced by reading TV subtitles at the end of Grade 1, may also reflect the contribution that TV subtitle reading makes to the automatization of these 'mechanical' word recognition skills. To be able to read subtitles from TV programs requires rapid and automatized word reading ability, the very skill that is tested in the word chain reading test.

One aim of the present study was to examine to what extent a given stage of reading acquisition would affect the prospective relationships between children's reading skills and their reading habits. The results showed that in the group of early readers, reading magazines and comics contributed to children's subsequent reading performance: the higher the amount of magazine and comic reading the early readers reported at the end of Grade 1, the better their sentence comprehension was at the end of Grade 2. This prospective prediction was not found among the late readers. One possible explanation for the result is that those children who still are at the point of acquiring basic reading skills are not able to get involved with the kind of leisure time reading that would benefit their reading competence later on. Children who already know the basics of reading at the beginning of Grade 1 begin to increase their reading of comics and magazines, which in turn strengthens their reading skills.

The early readers' sentence comprehension skills also contributed to the amount of magazine and comic reading they reported engaging in. This result suggests that there is a bidirectional relationship between reading skills and

out-of-school reading once the basics of reading have been learned. One reason why such a bidirectional relationship is typical of reading of magazines and comics is that in both kinds of reading the child is faced with visual cues that help in the process of understanding the text. By contrast, book reading and text reading are similar in another respect: neither of them necessarily includes additional visual cues.

When out-of-school reading habits were predicted simultaneously with word chain reading, text reading and sentence comprehension performance, sentence comprehension at the end of Grade 1 had the strongest impact on later reading habits. This result may be due to the fact that, because sentence comprehension is a key factor in understanding the content of the material being read, it is also the reading skill most likely to contribute to the increase in out-of-school reading. The result that word chain reading was also found to predict later TV subtitle reading may reflect the different nature of the TV subtitle reading task compared to book and magazine reading. In addition to accuracy, fluent decoding is needed to read rapidly changing subtitles.

4 LIMITATIONS

The findings of this thesis's are subject to several limitations. First, the present study was carried out among children who were learning to read in Finnish. Although learning to read Finnish is analogous to learning to read in other transparent orthographies, such as Italian and Greek, the process is likely to be different in less transparent languages such as English and French.

Second, the scope of the antecedents of reading and spelling might have been wider. For example, it has been suggested that rapid visual naming plays an important role in both learning to read and write (Wolf, 2001). Moreover, orthographic processing has received increasing attention and it is often included in studies as an antecedent measure of literacy development (e.g., Cunningham, Perry, & Stanovich, 2001). However, the concept of orthographic processing is problematic in a language like Finnish. The nearly perfect correspondences between graphemes and phonemes make it quite difficult to assess orthographic processing in isolation from phonological processes. In one attempt, Holopainen, Ahonen, and Lyytinen (2002) found that among Finnish children reading is based on single letter-phoneme mappings instead of using analogies based on larger units.

Third, in the present studies phonological awareness was measured using tests that focused on the recognition and naming of the initial sounds of words. However, the construct of phonological awareness consists of other aspects as well. For example, Goswami (2002) made a distinction between the ability to detect onsets and rimes in words and the ability to manipulate phonemes within syllables. Also, phonemic segmentation and blending skills have been found to be important forms of phonological awareness affecting reading and spelling acquisition (The National Reading Panel, 2000). Consequently, the results of the present studies might have been different had the phonological awareness measures covered a broader field.

Fourth, there are also alternative ways to assess children's reading and TV viewing habits than those deployed in this study (e.g., Guthrie & Greaney, 1991; Anderson, Wilson, & Fielding, 1988; Mikulecky, 1982; Cunningham & Stanovich, 1990). In the present study, a guided interview was used to explore children's out-of-school reading. It is possible, as suggested by Sharon (1973-

74), that the desire to make a socially desirable impression affects the answers children give in this kind of measure. Therefore, the findings reported here would need to be replicated by the use of other techniques, such as the diary method. A method such as this, however, would make more demands on the participants, and, therefore, also increase the rate of attrition (Price, Ritchie, Roberts, & Lieberman, 1986).

Fifth, in study IV only the amount of children's book and magazine reading was assessed. However, not only the quantity of reading but also the kind of books and magazines children read, that is, the quality of material, may also play a role. Understanding better the kind of material that would optimally contribute to children's reading skills might also have important pedagogical implications in guiding teachers to select appropriate material for children.

Sixth, in Study II the focus was on examining the development of basic reading and spelling performance rather than more general literacy skills, such as vocabulary and verbal reasoning. The aim was to examine the development of basic reading skills as measured by a word and sentence reading test, and a sentence comprehension test, and to examine basic spelling ability as measured by word and sentence transcription tests. It is possible, however, that more complex skills, such as reading fluency and text comprehension or productive story writing, might have shown developmental patterns different from those found in the present study.

Finally, the fact that study was carried out in one country with a relatively homogenous system of education, means that we cannot rule out the possibility that some of the developmental patterns found in the study are, in fact, the consequence of particular instruction practices.

5 PRACTICAL IMPLICATIONS

Overall, the Finnish school system seems to work well in teaching children the basic decoding skills. The phonics method used in Finnish schools reinforces grapheme-phoneme correspondences, and mastery of those correspondences gives children the opportunity to decode any word. This teaching method is also reflected in the fast development of spelling skills.

Nevertheless, the results of the present study have some implications for instruction practice. First, more attention and instruction should perhaps be aimed towards reading comprehension. Barton and Hamilton (1990), for example, have pointed to the fact that both functional and critical reading ability have become the focus of reading research. Both of these skills have been shown to be less well developed among Finnish children (Linnakylä, 1990).

Second, the present studies showed that children's metacognitive awareness measured at the beginning of the kindergarten year predicted their reading comprehension skills at the end of grade 4. This result is in accordance with Perfetti's (1985) suggestion that children's metacognitive knowledge is an important factor in reading awareness. Training of metacognitive strategies have also been found to improve the ability to respond to questions concerning comprehension (Palincsar & Brown, 1984). In the present study children's metacognitions were assessed according to their views of learning processes. The children were asked to name and explain the most effective way of learning a new task. The results imply that as early as at the beginning of the kindergarten year children's conceptions of learning begin to influence their ability to gain most from text reading. This finding emphasizes the importance of giving instruction about learning as a process already at the beginning of the school career.

Third, it seems to be that playing with numbers already during kindergarten year may be positively associated with later reading ability. It could be that the associations formed between number names and their ordering also enhances the forming of associations between letter names and their sounds, as well as the forming of associations between larger units of written text: words in a sentence, sentences in a paragraph and paragraphs in a

whole text. Consequently, in addition to the demands on the working memory that are included in counting ability, counting skills may also enhance the processes needed in storing and processing when decoding and comprehending written text.

Fourth, the clustering-by-cases analysis identified the existence of a small group of children (6% of the participants in this study) who had serious problems in learning to read. Although their skills improved, they were still relatively poor readers at the end of the first grade. This proportion of children in the sample accords well with findings suggesting that the prevalence of severe reading difficulties varies from 3 to 10 % (Lefly & Pennington, 1996). Because the reading development of these children continues to be slow during the first school year, there is perhaps added justification for the more concentrated attention afforded by special education programs. In our sample, all of these children attended a special class or received special education, indicating that the early diagnosis of learning difficulties is working well in Finnish kindergartens and primary schools.

6 FUTURE DIRECTIONS

The results of the present studies imply that more needs to be known about the characteristics of the measure of counting ability. More precise knowledge of this measure would help us to understand better the nature of reading ability. The strong predictive power of the counting ability measure justifies the assumption of a close association between the two abilities. In order to develop good reading skill, the abilities captured in the counting ability measure are essential.

The characteristics of the listening comprehension measure also need further consideration. In the present studies the measure of listening comprehension differed from that used in Gough and Tunmer's studies on the simple view of reading. This difference may explain the divergent results obtained concerning the power of listening comprehension in reading ability.

The fact that over 20 % of kindergarten-aged children have already acquired basic reading ability and by the end of grade 1 almost all Finnish children are able to read makes the assessment of reading skills rather complex. Because of this rapid development in reading skill, measurements sensitive both to the early stages of reading and to more advanced reading skills are needed.

In addition, the results of the present study suggest that children who are good readers at kindergarten do not benefit from the first primary school year to the same extent as do poorer readers. Children who were initially ahead in reading ability progressed rapidly during the kindergarten year, but their development slowed during the first-grade year of school relative to the children of lesser ability. This result points to the need to examine further why this group does not continue its rapid development in decoding. Such research may require developing new instructional methods for this group of readers and carrying out intervention studies to test their effectiveness.

7 CONCLUSIONS

The present dissertation showed that in a transparent orthography, such as Finnish, decoding accuracy is mastered relatively easily and rapidly. Some children were able to read already at the beginning of the kindergarten year, although the majority of children learned to decode by the end of grade 1. During the kindergarten year the differences in children's reading skills were found to follow a cumulative trajectory (Matthew effect), but soon after the start of formal reading instruction the differences in the children's performance started to decrease.

The results showed further that children's reading ability and their reading habits started to interact during grades 1 and 2. Children's competence in reading affected their amount of out-of-school reading habits, although the opposite pattern was also found, but to a lesser extent.

The development of reading skills was found to be closely associated with the development of spelling skills. In addition to the reciprocal associations found between these two skills, the antecedent variables of reading and spelling were found to be similar. Phonological awareness contributed to reading and spelling development during the kindergarten year, whereas letter knowledge predicted reading and spelling during grade 1.

One of the most surprising results of the present thesis was the power of counting ability as a predictor of later reading decoding and reading comprehension. It looks as children's counting ability reflects a more extensive combination of abilities that go beyond mere mathematical knowledge. It may, for example, include a strong language component. Also, both counting abilities and reading performance set demands on children's short- and long- term memory.

TIIVISTELMÄ

Ensimmäisessä osatutkimuksessa tarkasteltiin lasten sanojen ja lauseiden lukutaidon sekä lauseiden ymmärtämisen taidon kehittymistä esikoulun alusta ensimmäisen kouluvuoden loppuun. Tätä kehitystä mallinnettiin latentin kasvukäyrän menetelmällä. Tulokset osoittivat, että lasten lukutaito kehittyi esikouluvuoden aikana kumulatiivisesti: erot lasten lukutaidossa kasvoivat. Ne lapset, joilla lukutaito oli paremmalla tasolla esikouluvuoden alussa, kehittivät esikouluvuoden aikana lukutaidossa enemmän kuin ne lapset, joilla lukutaito oli heikommalla tasolla esikouluvuoden alussa. Ensimmäisen kouluvuoden aikana erot lasten lukutaidossa pienenevät: ne lapset, jotka esikouluvuoden alussa olivat heikommalla tasolla lukemisessa, kehittivät ensimmäisellä luokalla nopeammin kuin ne lapset, joilla lukutaidon taso oli ollut korkeampi esikouluvuoden alkaessa. Näyttää siis siltä, että sanojen ja lauseiden lukemisen ja lauseiden ymmärtämisen tehtävien mittaamassa lukutaidossa ensimmäisellä luokalla annettava opetus toimii tehokkaasti ja tasoittaa lasten välisiä taitoeroja. Tämä tulos saattaa heijastella Suomen kielen selkeää kirjain-äänne vastaavuutta ja sitä kautta sanojen dekodauksen nopeaa kokonaisvaltaista oppimista. Toisaalta tulos herättää kysymyksen siitä, onnistuuko koululaitos tarjoamaan kaikkia oppilaita maksimaalisesti hyödyttävää opetusta.

Toisessa osatutkimuksessa tarkasteltiin lasten luku- ja kirjoitustaidon välisiä yhteyksiä esikoulun ja kahden ensimmäisen kouluvuoden aikana. Lasten lukutaitoa arvioitiin sanojen ja lauseiden lukemisen ja lauseiden ymmärtämisen tehtävillä ja oikeinkirjoitustaitoa arvioitiin sanojen ja lauseiden kirjoittamisen tehtävillä. Tulokset osoittivat, että varhainen lukutaito ennusti myöhempää oikeinkirjoitustaitoa: esikouluvuoden lopun lukutaito ennusti ensimmäisen luokan alun kirjoitustaitoa ja ensimmäisen luokan lopun lukutaito ennusti kirjoitustaitoa toisen kouluvuoden alussa. Myös kirjoitustaidon todettiin ennustavan myöhempää lukutaitoa: esikouluvuoden alussa arvioitu kirjoitustaito ennusti lukutaitoa sekä esikouluvuoden lopulla että ensimmäisen luokan lopulla. On kuitenkin huomioitava, että kun malleihin otettiin mukaan esikouluvuoden alussa mitattu fonologisen tietoisuuden taito, yhteys varhaisesta kirjoitustaidosta esikouluvuoden lopun lukutaitoon katosi. Tämä tulos on mahdollista tulkita niin, että lasten alkava kirjoitustaito on hyvin vahvasti yhteydessä heidän fonologiseen tietoisuuteen, mikä puolestaan on merkittävä osa lasten varhaista luku- ja kirjoitustaitoa.

Kolmannessa osatutkimuksessa tarkasteltiin lasten lukutaitoa neljännellä luokalla ennakoivia alkuvalmiuksia. Neljännellä luokalla lukutaitoa arvioitiin kolmella tehtävällä: luetun ymmärtämisen, tekstin lukemisen ja sanaketjujen lukemisen tehtävillä. Alkuvalmiuksina mitattiin esikouluvuoden alussa lasten fonologinen tietoisuus, kirjaintuntemus, kuullun ymmärtäminen, lukujonotaidot, metakognitiivinen tietoisuus ja visuaalinen tarkkaavuus. Lisäksi mukana malleissa oli äidin koulutustaso ja lapsen sukupuoli. Tulokset osoittivat, että voimakkaimmin lasten neljännen luokan teknistä lukutaitoa ja luetun

ymmärtämistä ennakoivat varhaiset lukujonotaidot. Metakognitiivisen tietoisuuden, äidin koulutustason ja lapsen sukupuolen havaittiin ennakoivan myöhempää luetun ymmärtämistä. Visuaalisen hahmottamisen taidot puolestaan ennakoivat lasten suoriutumista sanaketju-tehtävässä. Kun malliin lisättiin lasten aiempi luku-taidon taso esikouluvuoden ja ensimmäisen luokan lopussa, havaittiin, että fonologinen tietoisuus ja kirjaintuntemus esikouluvuoden alussa ennustivat neljännen luokan lukutaitoa varhaisten lukemisen taitojen kautta. Tulokset osoittivat, hieman yllättäen, että lukujonotaidot oli voimakkain lasten myöhempää lukutaitoa ennakoiva valmius.

Neljännessä osatutkimuksessa tarkastelun kohteena olivat lasten lukutaidon ja lukutottumusten väliset yhteydet ensimmäisen ja toisen kouluvuoden aikana. Lasten lukutaitoa arvioitiin lauseiden ymmärtämisen, tekstin lukemisen ja sanaketju-tehtävän avulla. Lasten kirjojen, sarjakuvien ja lehtien sekä tv-ohjelmien tekstien lukutottumuksia puolestaan kartoitettiin haastattelulla. Tulokset osoittivat, että lasten lukutaito ensimmäisen luokan lopulla ennakoivat heidän lukutottumuksiaan toisen luokan lopulla: mitä parempi lukutaito lapsella oli ensimmäisen luokan lopulla, sitä enemmän lapset lukivat toisen luokan lopulla kirjoja, sarjakuvia ja lehtiä ja sitä paremmin he pystyivät lukemaan myös tekstejä tv-ohjelmista. Myös lasten lukutottumusten todettiin ennakoivan heidän myöhempää lukutaitoa. Tulokset osoittivat, että jo aivan peruskoulun alussa lukutaito ja lukutottumukset vaikuttavat vastavuoroisesti toisiinsa, lukutaidon vaikutuksen lukemistottumuksiin ollessa kuitenkin voimakkaampi.

Tulosten perusteella voidaan todeta, että suomalaiset lapset oppivat sanojen dekodauksen varhain, osa jo esikouluvuoden aikana. Esikoulussa syntyneet erot lukutaidossa kuitenkin tasoittuvat ensimmäisen kouluvuoden aikana. Myöhempään lukutaitoon ja erityisesti luetun ymmärtämiseen näyttää olevan yhteydessä varhaiset luku-jonotaidot ja metakognitiivinen tietoisuus, mikä korostaa näiden taitojen varhaisen harjaannuttamisen merkitystä myöhemmälle lukutaidolle.

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