Early Prediction of Reading Trajectories of Children with and without Reading Instruction in Kindergarten: A Comparison Study of Estonia and Finland

Minna Torppa

(ORCID: https://orcid.org/0000-0003-3834-9892)

Department of Teacher Education, University of Jyväskylä

Piret Soodla

School of Natural Sciences and Health, Tallinn University

Marja-Kristiina Lerkkanen

Department of Teacher Education, University of Jyväskylä and

Faculty of Education and Humanities, University of Stavanger

Eve Kikas

School of Natural Sciences and Health, Tallinn University

Corresponding author: Minna Torppa, e-mail: minna.p.torppa@jyu.fi

Phone: +358-408053538

Postal address: P.O. Box 35, 40014 University of Jyväskylä, Finland

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Keywords: Reading fluency, Reading comprehension, Cross-country comparison, Reading difficulties

Abstract

Background: The present study examined differences in the prediction of reading development and reading difficulties in Estonia (n = 348) and Finland (n = 344). These neighbouring countries share many similarities in terms of their language, orthography and educational system; however, they differ in the timing of the onset of reading instruction, which is kindergarten in Estonia and Grade 1 in Finland.

Methods: Children's skills were assessed three times – fall and spring in Grade 1 and spring in Grade 2.

Results: The results showed that school-entry rapid automatized naming (RAN) and reading fluency predicted the development of fluency in Grade 2, but reading fluency was a stronger predictor in Estonia than in Finland. In addition, school-entry reading fluency was the strongest predictor of reading comprehension in Grade 2. Furthermore, listening comprehension was a stronger predictor of reading comprehension in the Finnish sample than in the Estonian sample. Finally, high-risk children were identified based on their slow reading and RAN at school-entry. In Estonia, the reading development of high-risk children was declining compared to their peers, while the Finnish high-risk children were catching up with their peers. The high-risk children in the Finnish sample also had reading difficulties less often than the Estonian sample.

Conclusions: The findings suggest that the skills at school entry are stronger predictors of reading development in Estonia than in Finland. The reasons for this could be the earlier onset of reading instruction in kindergarten in the Estonian sample or differences in reading instruction practices between Estonian and Finnish schools.

Keywords: Reading fluency, Reading comprehension, Cross-country comparison, Reading difficulties

Implications for Practice

What is already known about this topic

• Estonian children have better reading skills in grade 1 than Finnish children despite similar instructional practices, languages, and orthographies.

• The better reading skills in Estonia mostly reflect the earlier onset of reading instruction in Estonia than in Finland

• The Finnish children catch up their Estonian peers in later grades, however.

What this paper adds

• This paper adds to the previous studies by focusing on the at-risk children for difficulties in reading development.

• We examine if Kindergarten reading instruction supports identification of the at-risk children

• The findings showed that the at-risk status at school entry skills was a stronger predictor of reading development in Estonia than in Finland.

Implications for theory, policy or practice

• Although Kindergarten reading instruction does not seem to provide long-lasting advantage in reading skills, it can be beneficial for early identification of poor readers

• Early identification is beneficial only if children receive effective support in school.

Introduction

There is an ongoing debate about the time to start systematic reading instruction and the benefits of beginning very early (Suggate, 2012). At the same time, it has been argued that support should be given to at-risk children as early as possible, because early intervention efforts are considered to be particularly effective (Ehri, 2012). However, empirical studies focusing on whether early reading instruction for children at risk for reading difficulties is beneficial for their reading development at school age are lacking. Countries vary in how they organise reading instruction onset, but comparative studies are challenged by the many cultural, linguistic, instructional and educational system differences across countries. The present study focuses on a comparison between two neighbouring countries with highly similar language and educational systems, Estonia and Finland. This presents the opportunity to examine how the timing of reading instruction is related to reading development, especially among children who are at risk for reading difficulties.

The Estonian and Finnish School Systems, Languages and Orthographies

Estonia and Finland are neighbouring countries with many similarities in culture, language and educational systems (Kikas & Lerkkanen, 2011). When Finnish and Estonian children turn seven years of age, they are required to enter school. Before that, one year of kindergarten education is offered. However, there is a clear difference in the timing of the onset of reading instruction, which is Grade 1 in Finland and kindergarten in Estonia. If the onset of reading instruction in kindergarten is beneficial for identifying high-risk children, we should see a stronger prediction in Estonia than in Finland. We will examine if school-entry skills, parental education, and the child's age at school entry predict reading skill development similarly in Estonia and Finland. We will also identify children with poor skills at school entry (possibly having high risk for reading difficulties) and examine their reading

development, as well as the number of children with poor reading skills at the end of Grade 2 in these two countries.

Finnish and Estonian are also very similar languages in terms of phonology, syntax, morphology and lexicon (see Dasinger, 1997). Both have a transparent orthography with consistent grapheme-phoneme conversion rules, with each grapheme corresponding to one phoneme (see Aro, 2017 for Finnish; Viise, Richard, & Pandis, 2011 for Estonian). Both use quantity markings in orthography; that is, phonetic speech-sound durations that carry meaning and are marked in writing. However, while Finnish has short and long quantities in speech-sound duration represented by single and double letters, Estonian has also a third quantity. In Estonian, short sounds are represented by single letters, whereas both long and overlong vowels and consonants (except plosive consonants) are represented by double letters. The orthography of plosive consonants is more transparent: Short consonants are marked with the letters g, b and d, long consonants with the letters k, p, and t, and overlong consonants with the double letters kk, pp and tt. Reading acquisition is quick in both countries, which is typical of reading development in orthographies with high levels of consistency between sounds and letters (e.g., Seymour, Aro, & Erskine, 2003) and well-developed reading instruction methods (Lerkkanen, 2007). In both countries, reading instruction is based on grapheme–phoneme correspondence (phonics), and special education support is provided in schools for students with reading disabilities.

However, in Estonia, children get reading instruction in kindergarten and are expected to enter school with basic reading skills. A large majority of Estonian children in kindergarten can read – 84% according to a teacher questionnaire (Jürimäe, 2004) and over 90% can read at least some words (Soodla et al., 2015). In Finland, the kindergarten curriculum does not include systematic reading instruction. In Finnish kindergartens, pre-literacy skills are practiced through play-centred activities and by listening, speaking, discussing and shared

reading activities, and no systematic reading instruction takes place (Finnish National Board of Education, 2014). This difference is reflected in the beginning reading skill levels in Estonia and Finland in favour of Estonia, although this early benefit seems to fade later on (e.g., Must, Must, & Raudik, 2001; Soodla et al., 2015). In Finland, despite the lack of systematic instruction in kindergarten, more than one-third of children entering school are able to read at least words (e.g., Lerkkanen et al., 2004; Soodla et al., 2015; Torppa et al., 2013).

Early Identification of At-Risk Children for Reading Difficulties

In the prediction of reading development and in the identification of children who may need extra support with learning to read, certain cognitive skills can be informative. The literature on the pre-literacy predictors shows that phonological awareness, letter knowledge and rapid automatized naming (RAN) are strong early pre-literacy predictors of reading accuracy and fluency development (e.g., Ho et al., 2002; Kirby, Georgiou, Martinussen, & Parrila, 2010; Landerl et al., 2013; Vellutino, Fletcher, Snowling, & Scanlon, 2004). However, because the current study intends to identify at-risk children close to school entry in two transparent orthographies, phonological awareness as a pre-literacy predictor of reading development is not included. The effect of phonological awareness on reading development is shown to be weak among transparent orthographies (e.g., Aarnoutse, van Leeuwe, & Verhoeven, 2005; Babayiğit & Stainthorp, 2007; Georgiou et al., 2012; Silvén, Poskiparta, Niemi, & Voeten, 2007) and limited to the very beginning of reading acquisition (e.g., de Jong & van der Leij, 2002; Landerl & Wimmer, 2000; Leppänen, Niemi, Aunola, & Nurmi, 2006; Lyytinen et al., 2006; Papadopoulos, Georgiou, & Kendeou, 2009).

RAN (Denckla & Rudel, 1976; Kirby et al., 2010) is included in the present study as a school-entry cognitive skill for the prediction of reading development. RAN has been frequently shown to predict reading fluency in several orthographies, including Finnish (e.g.,

Eklund et al., 2013; Landerl et al., 2013; Torppa, Georgiou, Lerkkanen, Niemi, Poikkeus, & Nurmi, 2016) and Estonian (Lukanenok, 2011). It is thus not a surprise that RAN is a strong predictor of reading difficulties in the transparent orthographies where reading difficulties are typically manifested by slow struggling reading and rarely by erroneous reading (e.g., Eklund, Torppa, Aro, Leppänen, & Lyytinen, 2015; Landerl, Wimmer, & Frith, 1997). However, there are no previous studies on the predictive usefulness of RAN in Estonian. Theories about the reason for the strong link between RAN and reading speed are developing (for a recent discussion, see e.g., Georgiou et al., 2016).

Moreover, somewhat different skills are informative when considering the early prediction of reading comprehension development. According to the Simple View of Reading (SVR; Gough & Tunmer, 1986), reading comprehension is the product of efficient decoding ability and listening comprehension. The SVR model has gathered evidence from several orthographies (e.g., Babayiğit & Stainthorp, 2011; Florit & Cain 2011; Kendeou, Papadopoulos, & Kotzapoulou, 2013; Kirby & Savage, 2008; Stuart, Stainthorp, & Snowling, 2008; Torppa et al., 2016). In the transparent orthographies, reading fluency, rather than reading accuracy, is the best choice for the decoding measure. This is because decoding is learned quickly in the transparent orthographies where reading accuracy hits a ceiling quite soon after formal reading instruction begins (e.g., Seymour et al., 2003). By the time reading comprehension can be reliably assessed, reading fluency is a more sensitive measure of decoding than accuracy, and its effect on reading comprehension can be estimated already in the early grades (e.g., Torppa et al., 2016). However, there are no previous studies on SVR in Estonian. In the present study, following the SVR model, we will include both reading fluency and listening comprehension as predictors of reading comprehension in Finnish and Estonian contexts.

In addition to reading fluency, RAN, letter knowledge, and listening comprehension skills, we will add parental education and the child's age as predictors of reading development. A child's chronological age may be an important predictor in the Finnish and Estonian systems where children enter Grade 1 of elementary school at age seven in August/September. (In Finland, children must turn seven years of age before the end of the following December, while in Estonia, it is before the start of the following October). Hence, there could be nearly a one-year age difference between children in a class in both countries, depending on the month they were born. It is possible that age differences cause differences between children's skills or other school readiness factors (Blair, 2002; Datar & Gottfried, 2013). Parental education is included as a proxy of socio-economic status (SES), which has been shown to be a strong predictor of many offspring outcomes, including cognitive skills and academic attainment (Bradley & Corwyn, 2002).

Although a few previous studies have reported on reading development comparisons between Estonian and Finnish children (e.g., Soodla et al., 2015), none have focused on the identification or development of high-risk children. The previous studies showed that on average, the early start did not lead to better reading development in Estonia compared to Finland on average (e.g., Soodla et al., 2015). However, it is possible that the early start is beneficial for the early identification of children who are at risk for difficulties in reading development. If children enter school without systematic reading instruction in kindergarten, as in Finland, school-entry identification of at-risk children might be challenging. This is because many children are not reading at that point, but they will easily reach an average level after being taught to read in school. For these children, the reason for poor reading skills may not be difficulties in learning to read but the lack of teaching.

The Present Study

The present study examines if school entry RAN, letter knowledge, reading fluency, listening comprehension, parental education and child's age predict children's reading fluency and reading comprehension at the end of Grade 2 similarly in Estonia and Finland, despite the differences in the onset of reading instruction. We will also describe the reading development of high-risk children in the two countries. More specific research questions and hypotheses are:

1. Are school-entry skills strong predictors of Grade 2 *reading fluency* in Estonia and Finland? School-entry reading skills are expected to be stronger predictors of Grade 2 reading fluency in Estonia than in Finland because the earlier reading instruction in Estonian kindergartens increases the predictive power.
2. Are Grade 1 reading fluency and listening comprehension strong predictors of Grade 2 *reading comprehension* in Estonia and Finland? According to the SVR model, we expect that reading fluency and listening comprehension would be significant predictors of reading comprehension in both countries. In addition, we expect that school-entry reading fluency would be a stronger predictor of reading comprehension in Estonia than in Finland because the earlier reading instruction in Estonian kindergartens increases the predictive power.
3. Are the children with poor pre-literacy and reading skills at different levels of risk for reading difficulties in Estonia and Finland? Because of the kindergarten reading instruction, we expect that Estonian children identified as high risk for developing reading difficulties based on their poor school-entry skills would have reading difficulties more often than Finnish high-risk children.

Method

Participants

The Estonian sample included 348 children (175 boys and 173 girls). The children came from 22 classrooms with a mean size of 23.82 (sd = 2.50) students per classroom. All of the children had attended kindergarten and Estonian was their home language. *The Finnish sample* included 344 children (175 boys and 169 girls) who participated in a follow-up study (Lerkkanen et al., 2006) of about 1,800 children. In order to balance the sample size in the two countries, we randomly selected 27 classrooms among the Finnish sample classrooms. As with the Estonian sample, we included classrooms where there were more than eight children per classroom. There were on average 21.63 (sd = 2.88) students per classroom in the Finnish data. All of the children had attended kindergarten and Finnish was their home language. Parental education levels in the samples were fairly representative of the Finnish and Estonian populations, although the number of parents with a low level of education was diluted in comparison to the general averages in both countries (Eurostat, 2013).

Procedure

In both countries, the principals and teachers of the schools were first contacted to inform them of the project and invite them to participate. Parents were then asked to give written informed consent for their child's participation. Information on background variables, i.e. parental education, child's gender and age, and kindergarten attendance, was collected from the parents. The children's skills were assessed at three time points: at the beginning of Grade 1 (the fifth week after school started in September); during the spring term of Grade 1 (in April, seven months after school started); and during the spring term of Grade 2 (in April). Reading fluency was assessed at all time points and reading comprehension during the spring of Grades 1 and 2. RAN was assessed in the fall of Grade 1 in Estonia and end of Kindergarten in Finland, and listening comprehension was assessed at the spring assessment in Grade 1. Group-administered assessments were carried out in the classroom by trained

examiners during the school day. For RAN and letter knowledge, children were assessed individually (day care or school settings).

Measures

All assessment instruments were originally developed and validated in the Finnish language. They were then translated and adapted into the Estonian language as no standardised reading tests were available in Estonian.

Reading fluency. The word recognition test (ALLU, a normative test battery for first through sixth grades, 6- to 12-year-old students; Lindeman, 2000) was administered as a group test in Grade 1 fall, Grade 1 spring and Grade 2 spring. *The test taps both word reading accuracy and speed. However, at the first assessment point the task taps only accuracy for many Finnish children and some Estonian children whose decoding skill is just emerging. We will for the matter of convenience use term reading fluency for all these assessments.* The task consisted of 80 items, with one picture and four alternative words for each item. Words were printed in uppercase letters (at the beginning of first grade) or lowercase letters (at the end of first and second grade). The child's task was to identify as many correct picture–word pairs as possible within two minutes. The target words for both languages were highly similar in terms of word frequency, number of syllables (one- to four-syllable words), and phonological structures (Soodla, Vija, & Pajusalu, 2013). The test battery includes two alternative versions of items, version A was used in time-points 1 and 3 for the Finnish sample and in all time-points in the Estonian sample. Version B was used for time-point 2 in the Finnish sample. The sum score of correctly matched items was used as the word reading fluency measure (maximum score = 80). The Pearson test re-test correlation coefficients were between Grade 1 fall to Grade 1 spring assessments .67 in Finland and .70 in Estonia and between Grade 1 spring to Grade 2 spring assessments .65 in Finland and .68 in Estonia.

Although many of the Finnish children were not yet fluent readers, many were able to accurately decode several words at the beginning of Grade 1 (Lerkkanen, Ahonen, & Poikkeus, 2011). In a few months, most of them will be reading words accurately at various speeds (Lerkkanen, Rasku-Puttonen, Aunola, & Nurmi, 2004). To determine whether the emerging readers in the sample were merely guessing, we examined the number of attempted items. There were four answer options; thus, by guessing, the chance of the readers getting the items correct was one-quarter (25%). Only four children in the sample had zero items correct; it is certain they were guessing because they had tried to answer several items. Those who had one item correct (n = 13) were also often guessing; of them, five (38.4%) were performing at or below the guessing level. The percentage of guessers (7.8% on average) was very similar among the children who had two to six items correct (n = 102). Of these 102 readers, only 8 were performing at or below the chance limit, and 76% had more than half of the items correct. Among those who had more than six items correct, only one (0.4%) was performing below the chance level. Altogether, only 18 of the 344 children (5.2%) in the Finnish sample were performing at or below the chance level. Thus, guessing was not a common strategy among them; they had at least attempted to decode words.

Muotoiltu: Korosta

Reading comprehension. Reading comprehension was assessed in a group condition (ALLU, a normative test battery for first through sixth grades, 6- to 12-year-old students; Lindeman, 2000). At both grade levels, the tests consisted of an expository text and 12 comprehension tasks: 11 multiple choice tasks with four alternative answers for each task and one task requiring students to order the informational units according to the text.

The Estonian versions of the reading comprehension tests were translations of the original Finnish tests. The translated Estonian versions were also back-translated to Finnish. The original and back-translated texts and tasks were highly similar in terms of length, i.e.

number of words, characters, and sentences, lexical difficulty (average length of words) and syntactic complexity (average length of sentences in words). The Estonian version of the Grade 1 test was also adapted culturally, by replacing information about Finland with the same information about Estonia in two sentences and one respective test item. In Grade 1 the Estonian and Finnish texts were similar in length, consisting of 18 sentences in both languages (150 words in Estonian and 143 words in Finnish). The texts were also similar in terms of syntactic complexity: the mean sentence length in Estonian was 8.33 (SD = 3.11) and in Finnish, 8.00 words (SD = 3.05), $t(34) = 0.32$, $p = .747$. In Grade 2, the Estonian and Finnish texts were also similar in length, consisting of 14 sentences in both languages (114 words in both languages). The texts were also similar in terms of syntactic complexity: the mean sentence length in Estonian was 8.14 (SD = 4.66) and in Finnish 8.14 words (SD = 4.57), $t(26) = 0.00$, $p = 1.000$. Scoring was based on the total number of correct responses on the test (maximum score = 12). Lindeman (2000) reported Kuder–Richardson reliability coefficients of .85 in the first grade and .80 in the second grade. In the current study, Cronbach's alphas in the first and second grades were .86 and .86 in Estonian, and .79 and .88 in Finnish, respectively.

RAN. RAN was assessed in the beginning of Grade 1 Estonia and at the end of Kindergarten in Finland using the standard procedure (Denckla & Rudel, 1976). The children were asked to name as rapidly as possible a series of five pictures of objects in a matrix with five rows of 10 items. The completion time in seconds was used as the score. In Finnish and in Estonian, two of the five items were equal, one was very close to equal, and one had the same CVCV structure: pallo-pall, auto-auto, talo-maja, kynä-pliiats, and kala-kala (Finnish-Estonian).

Listening comprehension. In the spring term of Grade 1, a group-administered test developed at the Centre for Learning Research, University of Turku, was used to assess

listening comprehension. A story with 130 words was read aloud twice to the children in the classroom setting. There were six multiple-choice questions based on the text. Pictures accompanied the questions (four of the questions had three choices and two questions had four choices). The children selected a picture that would best fit the story. Two points were given for each correct answer (max = 12). Cronbach's alphas were .38 in Finland and .35 in Estonia.

***Letter knowled*ge**. Letter knowledge was assessed using letter naming task (ARMI test battery; Lerkkanen, Poikkeus, & Ketonen, 2006). Letter naming was an individually administered test containing all letters in the Estonian or Finnish alphabets (i.e., 32 letters in Estonian and 29 letters in Finnish). The experimenter showed the uppercase letters, divided into rows, in random order, and the children were asked to name the letters, one row at a time. For the present study, three foreign letters (*š*, *z*, and *ž*) were excluded from the analysis of the Estonian data to ensure the equality of the measures. Thus, in both languages, data for 29 letters (i.e., 23 of their own plus 6 foreign letters in both languages) were used for the present analysis. The score was the number of correctly named letters (max = 29). Cronbach's alphas were .87 in Estonian and .89 in Finnish.

Parental education. Parental education was assessed via parental questionnaires and categorised in the following manner: low education level (nine years of formal education, Grades 1–9); medium education level (high school, Grades 10–12, or vocational education based on secondary education); and high education level (at least three years of education at a university or professional higher education institution of applied sciences). The measure of the highest educational level in the family was used in the analyses.

Data analyses

We built path models in each country to predict Grade 2 reading fluency and reading comprehension. After identifying the best fitting model in each language, we examined if the model estimates were different in the two countries by imposing equality constraints to each estimate one-by-one with multi-group models. Model comparisons were based on chi-square difference testing. The model with all paths estimated freely served as the baseline model against which the other models' fit were compared. All models were estimated with the maximum likelihood (ML) estimator using Mplus 7.3 (see Muthén & Muthén, 1998–2010). Finally, we identified high-risk children using reading fluency and RAN measures assessed at the end of kindergarten/beginning of Grade 1 (fall), and described their reading development in Grades 1 and 2 as well as the frequencies of poor readers at the end of Grade 2.

Results

Descriptive Statistics and Country Comparisons

Parental education did not differ between the Estonian and Finnish samples, χ^2 (2) = .06, p = .97. A total of 3.9% (general population = 12%) of the Finnish families had a low education level, 46.7% (general population = 46%) had a medium education level, and 49.4% (general population = 42%) had a high education level. The respective Estonian percentages were 3.5% (general population = 10%), 46.6% (general population = 52%), and 49.9% (general population = 37%). The Estonian children (M = 87.4 months, SD = 3.90) were on average older than the Finnish children (M = 86.7 months, SD = 3.70), F(1,690) = 22.82, p < .001. The Estonian and Finnish samples did not differ from each other in terms of the children's gender, χ^2(1) = 0.24, p = .88. This finding was expected based on the school-entry criteria difference (in Finland, all children that turn seven years of age before the end of December start school in August, while in Estonia, children who turn seven by the beginning of October start school in September). However, the difference was only about one month, and the effect size was negligible (Cohen's d = .18).

On average, the Estonian children were faster readers both at the beginning of Grade 1 and in Grade 2 spring (see Table 1), while Finnish children had higher scores in reading comprehension in Grade 2 spring. There was no significant difference in Grade 1 spring reading skills. All effects sizes were, however, small or negligible. The country comparison results for reading skills were the same with or without including parental education and child's age as covariates in the model.

Prediction of Reading Development with School-Entry Skills, Age and Parental Education

Path models predicting Grade 2 reading fluency and reading comprehension were estimated. See Table 2 for correlation coefficients between the measures separately in each sample. Figure 1 represents the starting point, the two baseline models, one for each sample (Finnish and Estonian), which are saturated.

In order to examine if the predictive paths were similar across countries, each predictive path was set equal one-by-one (equality constraints) in the Finnish and Estonian samples, and the effects of each equality constraint to model fit were examined (chi-square difference testing). Model fit was excellent for all the equality constraint models except for the one where the path from Grade 1 fall reading fluency to reading fluency was set equal ($\chi^2(1) = 11.17$, $p < .001$). This suggests that while the prediction estimates of age, parental education, letter knowledge, and RAN on reading skills were similar in Estonia and Finland, Grade 1 fall reading fluency was a stronger predictor of Grade 2 spring reading fluency in Estonia than in Finland. The final model (Figure 2) where all paths other than the path from Grade 1 reading fluency to Grade 2 reading fluency and the error covariance of the endogenous variables were set equal across countries fitted the data well (Figure 2), $\chi^2(11) = 6.94$, $p = .80$, RMSEA = .00, CFI = 1, TLI = 1, SRMR = .01.

Reading Development in the High-Risk and Low-Risk Groups

Finally, we examined if we could identify already at school entry the children who will have reading difficulties and if the prediction is as accurate in Estonia and Finland. We used the best predictors of the model for Grade 2 reading fluency (Grade 1 fall reading fluency and RAN) to identify high-risk children. Letter knowledge was not added as it was heavily skewed in both samples. We conducted, however, an additional analysis in the Finnish sample where there was still some variance left. The children who were among the lowest 20th percentile in their own country's sample in both reading fluency and RAN were chosen for the high-risk group (n = 26 in the Estonian sample and n = 24 in the Finnish sample). The rest of the children were included in the low-risk group (n = 321 in the Estonian sample and n = 317 in the Finnish sample). In the early identification of the high-risk children, only reading fluency predictors were utilised as we did not have assessments of listening comprehension before the end of Grade 1.

Table 3 reports reading fluency and reading comprehension scores in the Finnish and Estonian samples, and Figure 3 describes the group differences as within-country standardised values (z-scores). The within-country z-scores describe the skill levels of the high-risk children with respect to their own country peers, which helps to avoid biases due to possible differences in measurements in two languages. The analysis suggests that the high-risk group deviance for their respective country average is similar in both countries in all measures, with the exception of Grade 2 reading comprehension where the group difference in Finland was less than half a standard deviation and no longer significant. In the Finnish sample, the high-risk sample approached the average group also in reading fluency, whereas in the Estonian sample, the high-risk group lagged behind in both reading fluency and reading comprehension.

Finally, cross-tabulations presented in Tables 4 and 5 describe how many of the high-risk and low-risk group children were poor, below average and above average readers at the

end of Grade 2. Poor readers were children whose score was one standard deviation or more below their respective sample average (Finnish/Estonian); below average readers were reading below average but less than one standard deviation from their respective sample average; and good readers were reading above average. The results showed that being in the high-risk group at school entry predicted reading fluency and reading comprehension difficulties better in the Estonian sample than in the Finnish sample. In the Estonian sample, the chi-square tests suggested a significant link between the school-entry high-/low-risk grouping and both Grade 2 reading fluency ($\chi^2(2) = 51.78$, $p < .001$) and reading comprehension($\chi^2(2) = 12.14$, $p < .01$). In the Finnish sample, however, the chi-square tests were not significant for either reading fluency ($\chi^2(2) = 4.12$, $p=.13$) or reading comprehension ($\chi^2(2) = 3.54$, $p=.17$).

Although not all high-risk children developed reading difficulties in either country, in the Estonian sample, 65.4% of the high-risk children had difficulties in reading fluency in Grade 2 spring compared to 25% in the Finnish sample. In both samples, about 13% of the low-risk group had difficulties in reading fluency, and the difference compared to the high-risk group was thus clear in the Estonian sample but not so much in the Finnish sample. Seven (30%) of the Finnish high-risk children had above average reading fluency in Grade 2, whereas there was only one (4%) in the Estonian sample.

The cross-tabulation for the school-entry risk grouping and Grade 2 reading comprehension showed weaker but similar links as for reading fluency. In both countries, about one-third of the high-risk group children had difficulties in reading comprehension compared to 15–18% of the low-risk children. The main difference between the samples was that in the Finnish sample, the above average reading comprehension scores were more common than in the Estonian sample among the high-risk children. Of the high-risk children,

46% in the Finnish sample had above average reading comprehension in Grade 2 spring, whereas the respective percentage was 27% in the Estonian sample.

Because many of the Finnish children were non-readers or beginning readers at school entry we conducted additional analysis to see if inclusion of letter knowledge as an identifier of risk would improve the identification rates in the Finnish sample. For this analysis we identified the children with the poorest letter knowledge similarly as for RAN and reading fluency (20^{th} percentile), which corresponded to knowing 23 or less of the 29 letters. To be identified at high risk, children had to belong to the lowest 20% in two out the three measures; letter knowledge, RAN, and/or reading fluency. Of the children 55 (16%) were identified based on this criterion as high risk children. The cross-tabulation with the grade 2 reading fluency difficulty showed that of them 27.3% belonged to the poor readers group, 43.6% to below average group, and 29.1% to the above average group. The chi-square difference test was significant ($\chi^2(2) = 12.56$, $p<.01$). The cross-tabulation with the grade 2 reading comprehension difficulty showed that of the high risk children 38.2% belonged to the poor readers group, 25.5% to below average group, and 36.4% to the above average group. The chi-square difference test was significant ($\chi^2(2) = 19.00$, $p<.001$).

Discussion

The present study examined if school-entry pre-literacy and reading skills, parental education and child's age are similarly predictive of reading development and reading difficulties in two countries, Estonia and Finland. Although these countries share many similarities in language and educational systems, they differ in reading instruction onset. In Estonia, reading instruction starts in kindergarten, whereas in Finland it is Grade 1. Previous studies have suggested that the earlier onset of reading instruction does not give Estonian children long-lasting benefits in reading skills on average compared to Finnish children (Soodla et al., 2015). However, the early onset may be beneficial in other ways. In this study, we set out to examine if the early onset could support the early identification of children who

are at a high risk for reading difficulties. For the Estonian children who did not develop reading skills similarly to their peers despite kindergarten reading instruction, it should be a strong risk marker for reading difficulties. If this is the case, the school-entry skills of the Estonian children should be more predictive of their reading development than those of the Finnish children. The findings suggested that this was the case, but further studies are needed to specify if differences in the instruction in Grades 1 and 2 for children with poor school-entry skills (high-risk group) differs between the countries.

The findings showed, as expected, that the Estonian children were on average stronger readers than Finnish children at school entry. This was expected because the Estonian children were taught to read in kindergarten. While the Estonian children were also faster readers after two years in school, in Grade 2 spring, the Finnish children were on average better in reading comprehension. A similar reading comprehension difference has also been reported in other studies comparing children and adolescents from Estonia and Finland (Must, 1997; OECD, 2014, 2016). However, the reading comprehension levels in Estonia have also been reported to be at or above the international average (e.g., Must, 1997; OECD, 2014, 2016). The reason for the difference is not clear. Measurement issues most probably do not explain the difference, as similar findings have been reported with different measures of reading comprehension in previous studies. One possibility is that Finnish kindergarten education, which does not focus on explicit reading instruction, allows more time for activities that support language development, which in turn supports reading comprehension (e.g., Florit & Cain, 2011; Kirby & Savage, 2008; Stuart et al., 2008). It is also possible that the samples differed in how reading comprehension development was supported in schools. Recent studies in Finnish schools have shown that children's poor performance in reading at the beginning of Grade 1 was associated with a high amount of the teacher's attention and support for that particular child during lessons (Kiuru et al., 2015;

Silinskas et al., 2015) as well as more time for remedial support and special education (Lerkkanen, Poikkeus, & Kiuru, 2012).

The predictors of reading skills in Grade 2 were for the most part the same in Estonia and Finland. School-entry reading fluency, letter knowledge, and RAN were significant predictors of reading fluency in both samples similar to many previous studies (Georgiou, Parrila, Manolitsis, & Kirby, 2011; Landerl et al., 2013). As expected, based on SVR studies (e.g., Kirby & Savage, 2008; Stuart, et al., 2008; Torppa et al., 2016), listening comprehension, letter knowledge, and reading fluency predicted reading comprehension. Listening comprehension was a weak predictor, which fits previous findings showing that at the early stages of reading development, reading fluency is a stronger predictor of reading comprehension than linguistic measures (e.g., Florit & Cain, 2011). The role of listening comprehension will probably increase in higher grades, however. After decoding becomes automatized and effortless, more cognitive resources can be allocated to comprehension (e.g., Perfetti, 1985) and the effect of decoding diminishes (e.g., Georgiou, Das, & Hayward, 2009; Torppa et al., 2016). However, the effect of listening comprehension can be underestimated in the present study as the listening comprehension measure had a short scale and was assessed as a group test, which can affect the reliability of the measure. In addition to child skills, parental education was an additional predictor of reading comprehension in both countries. Parental education may reflect both parental skills that have supported their own educational careers and are transmitted to their children (e.g., van Bergen, van der Leij, & de Jong, 2014), but also environmental differences supporting, for example, their prior knowledge and vocabulary (e.g., Bradley & Corwyn, 2002).

The findings of the study showed that school-entry skills, reading fluency in particular, were stronger predictors of Grade 2 reading fluency in Estonia than in Finland. The children with the lowest reading fluency and RAN scores at school entry (called the high-risk

group) had a lagging developmental pathway in Estonia, whereas the high-risk children in the Finnish sample were on average catching up with the low-risk children (in both fluency and comprehension). Of the high-risk children in the Estonian sample, many were slow readers in Grade 2 (65%) and only one had above average reading fluency (4%), whereas in the Finnish sample, prediction was less accurate: 25% were slow readers in Grade 2 and 29% were performing above average. Inclusion of letter knowledge improved the prediction in the Finnish sample, but only by few percentages. These findings suggest that poor school-entry skills are better risk markers in Estonia than in Finland as expected. Because of the many similarities between the countries, a likely reason for this difference is the Estonian kindergarten literacy instruction. However, we cannot rule out differences in reading instruction. Based on the very good progress in reading fluency among the Estonian children on average, the difference in the quality of the reading instruction overall should not explain the country differences. It can be, however, that the instructional differences affect children at different skill levels differently.

It seems that the early start can be particularly beneficial for those children who have strong skills and/or the motivation to learn to read before school entry. When most children are readers at school entry, as in Estonia, it is possible to focus early on reading fluency instruction. There is, however, a potential risk that the poorest readers, who would still need basic decoding support, may suffer from too early a focus on advanced skills and materials. Future studies should examine the instructional differences with a particular focus on the point of view of the struggling children. In addition to classroom instruction, this research should also focus on special education methods and practices. Estonia and Finland share many similarities in special education. Extra support is provided by special education teachers in the schools of both countries. In Estonia, special education is provided outside classroom lessons in small groups (Riigikogu, 2014), while in Finland in addition to small groups, extra

support is also provided in classrooms during lessons and individually (Lerkkanen, 2007) as well as part-time special education outside the classroom (Holopainen, Kiuru, Mäkihonko, & Lerkkanen, 2017). In both countries, the need for special education support is identified by a special education teacher and the classroom teacher, and is provided with the parents' agreement. Neither in Estonia nor Finland is a formal diagnosis of a reading difficulty needed to receive special education support for reading development

Similar findings on the difficulties to reliably identify at-risk children in Finland have been recently reported in other studies using both tests and teacher reports (Virinkoski et al., 2017). However, identification accuracy may be improved with additional measures. Letter knowledge improved the prediction a little but it was at ceiling also in the Finnish sample and its predictive utility was not very high. Listening comprehension measure suffered from low reliability and it might have been a stronger predictor had we had a more reliable measure. Prediction levels may be increased also by adding more measures to improve reliability. In the present study we used single measures for each construct. Furthermore, it is clear that the use of arbitrary cut-offs introduces errors when we continuously distribute skills like we typically have. However, the use of cut-offs has a practical utility, as in schools we need to identify children who need extra support to keep up with peers. Based on these findings, the school entry single-word identification fluency measure, RAN objects, and letter knowledge are not enough for the early identification of poor readers, particularly in Finland. Despite the measurement issues, we think that our findings suggest that it is important to keep following the reading development of children and provide support flexibly throughout the school years. This has been shown to be important beyond the early grades, too, because although reading difficulties are often stable, there are also a considerable number of late-emerging cases (e.g., Catts, Compton, Tomblin, & Bridges, 2012; Leach, Scarborough, & Rescorla, 2003; Lipka, Lesaux, & Siegel, 2006; Torppa, Eklund, van Bergen, & Lyytinen, 2015).

To conclude, the findings of the present study suggest that kindergarten reading instruction may help to identify poor readers early on but that further studies are needed, particularly on the instruction differences. Early identification is beneficial only if children receive effective support in school. Based on the findings of these analyses, we do not know if Estonian high-risk children received the support they needed or if their skills would have improved faster with more or with different kinds of support. In the case of the Estonia and Finland comparison, a careful reading instruction comparison study is a next important step. However, as the reading skills of the children in these samples were very similar, the early start of reading instruction does not seem to be particularly beneficial for reading skills on average. Although in these transparent orthographies the early onset of reading instruction does not seem to be beneficial overall for reading development, it should be noted that it may be needed in more opaque orthographies where learning to decode is more difficult and takes more time (e.g., Seymour et al., 2003).

References

Aarnoutse, C., van Leeuwe, J., & Verhoeven, L. (2005). Early literacy from a longitudinal perspective. *Educational Review and Research, 11,* 253–275. doi: 10.1080/08993400500101054

Aro, M. (2017). Learning to read Finnish. In L. Verhoeven & C. Perfetti (Eds.). *Learning to read across languages and writing systems* (pp. 416–436). Cambridge: Cambridge University Press.

Babayiğit, S., & Stainthorp, R. W. (2010). Component processes of early reading, spelling, and narrative writing skills in Turkish: A longitudinal study. *Reading and Writing, 23,* 539–568. doi: 10.1007/s11145-009-9173-y

Babayiğit, S., & Stainthorp, R. (2011). Modeling the relationships between cognitive–linguistic skills and literacy skills: New insights from a transparent orthography. *Journal of Educational Psychology, 103,* 169–189. doi:10.1037/a0021671

Blair, C. (2002). School readiness – Integrating cognition and emotion in a neurobiological conceptualization of children's functioning at school entry. *American Psychologist, 57*, 111–127. doi:10.1037//0003-066X.57.2.111

Bradley, R. H., & Corwyn, R. F. (2002). Socioeconomic status and child development. *Annual Review of Psychology, 53*, 371–399. doi: 10.1146/annurev.psych.53.100901.135233

Catts, H. W., Compton, D., Tomblin, J. B., & Bridges, M. S. (2012). Prevalence and nature of late-emerging poor readers. *Journal of Educational Psychology, 105*, 166–181. doi: 10.1037/a0025323

Dasinger, L. (1997). Issues in the acquisition of Estonian, Finnish, and Hungarian: A cross-linguistic comparison. In D. I. Slobin (Ed.), *The crosslinguistic study of language acquisition* (Vol. 4, pp. 1–86). Mahwah, NJ: Lawrence Erlbaum Associates.

Datar, A., & Gottfried, M. (2013). *School entry age and children's social-behavioral skills: Evidence from a national longitudinal study of US kindergartners* (CESR-Schaeffer Working Paper No. 2013–013). doi:10.2139/ssrn.2354649

Denckla, M. B., & Rudel, R. G. (1976). Rapid ''automatized'' naming (R.A.N.): Dyslexia differentiated from other learning disabilities. *Neuropsychologia, 14,* 471–479. doi: 10.1016/0028-3932(76)90075-0

de Jong, P. F., & van der Leij, A. (2002). Effects of phonological abilities and linguistic comprehension on the development of reading. *Scientific Studies of Reading, 6*, 51–77. doi: 10.1207/S1532799XSSR0601_03

Ehri, L. C. (2012). Why is it important for children to begin learning to read in kindergarten. In S. Suggate & E. Reese (Eds.), *Contemporary debates in childhood education and development* (171–180). New York: Routledge.

Eklund, K.,Torppa, M., Aro, M., Leppänen, P.H.T., & Lyytinen, H. (2015). Literacy skill development of children with familial risk for dyslexia through Grades 2, 3, and 8. *Journal of Educational Psychology, 107*, 126–140. doi: 10.1037/a0037121

Eklund, K.M., Torppa, M., & Lyytinen, H. (2013). Predicting reading disability: Early cognitive risk and protective factors. *Dyslexia, 19*, 1–10. doi: 10.1002/dys

Eurostat. (2013). European Social Statistics. 2013 edition. Retrieved 15.12.17 from http://ec.europa.eu/eurostat/en/web/products-pocketbooks/-/KS-FP-13-001

Finnish National Board of Education (2014). *National curriculum for basic education 2014*. Finnish National Board of Education Publication 2016:5.

Florit, E., & Cain, K. (2011). The Simple View of Reading: Is it valid for different types of alphabetic orthographies? *Educational Psychology Review, 23,* 553–576. doi: 10.1007/s10648-011-9175-6

Georgiou, G., Aro, M., Chen-Huei, L., & Parrila, R. (2016). Modeling the relationship between rapid automatized naming and literacy skills across languages varying in orthographic consistency. *Journal of Experimental Child Psychology, 143,* 48–64. doi: 10.1016/j.jecp.2015.10.017

Georgiou, G., Das, J. P., & Hayward, D. (2009). Revisiting the "simple view of reading" in a group of children with poor reading comprehension. *Journal of Learning Disabilities, 42,* 76–84. doi:10.1177/0022219408326210

Georgiou, G. K., Parrila, R., Manolitsis, G., & Kirby, J. R. (2011). Examining the importance of assessing rapid automatized naming (RAN) for the identification of children with reading difficulties. *Learning Disabilities: A Contemporary Journal, 9*, 5–26.

Georgiou, G. K., Torppa, M., Manolitsis, G., Lyytinen, H., & Parrila, R. (2012). Longitudinal predictors of reading and spelling across languages varying in orthographic consistency. *Reading and Writing, 25,* 321–346. doi: 10.1007/s11145-010-9271-x

Gough, P. B., & Tunmer, W. E. (1986). Decoding, reading, and reading disability. *RASE: Remedial & Special Education, 7*, 6–10. doi:10.1177/ 074193258600700104

Ho, C. S.-H., Chan, D. W.-O., Tsang, S.-M., & Lee, S.-H. (2002). The cognitive profile and multiple-deficit hypothesis in Chinese developmental dyslexia. *Developmental Psychology, 38,* 543–553. doi: 10.1037/0012-1649.38.4.543

Holopainen,L.K., Kiuru, N.H., Mäkihonko, M-K., & Lerkkanen, M.-K. (2017): The role of part-time special education supporting students with reading and spelling difficulties from grade 1 to grade 2 in Finland. *European Journal of Special Needs Education.* doi: 10.1080/08856257.2017.1312798

Jürimäe, M. (2004). 6-7aastaste laste koolivalmiduse pilootuuringu 1. osa tulemuste analüüs [Analysis of the 1st part of pilot study of 6-7-year-old children's school readiness]. Retrieved 15.12.17, from https://www.ht.ut.ee/sites/default/files/ht/aruanne_koolivalmidus_i_osa_i_etapp.pdf

Kendeou, P., Papadopoulos, T. C., & Kotzapoulou, M. (2013). Evidence for the early emergence of the simple view of reading in a transparent orthography. *Reading and Writing, 26,* 189–204. doi:10.1007/s11145-012-9361-z

Kikas, E., & Lerkkanen, M.-K. (2011). Education in Estonia and Finland. In M. Veisson, E. Hujala, P. K. Smith, M. Waniganayake, & E. Kikas (Eds.), *Global perspectives in early childhood education: Diversity, challenges and possibilities* (pp. 33–46). Frankfurt am Main: Peter Lang.

Kirby, J., Georgiou, G., Martinussen, R., & Parrila, R. (2010). Naming speed and reading: From prediction to instruction. *Reading Research Quarterly, 45,* 341–362. doi: 10.1598/RRQ.45.3.4

Kirby, J. R., & Savage, R. S. (2008). Can the simple view deal with the complexities of reading? *Literacy, 42*, 75–82. doi:10.1111/j.1741-4369.2008.00487.x

Kiuru, N., Nurmi, J.-E., Leskinen, E., Torppa, M., Poikkeus, A.-M., Lerkkanen, M.-K., & Niemi, P. (2015). Elementary school teachers adapt their instructional support according to students' academic skills: A variable and person-oriented approach. *International Journal of Behavioral Development, 39*, 391–401. doi:10.1177/0165025415575764

Landerl, K., Ramus, F., Moll, K., Lyytinen, H., Leppänen, P. H. T., Lohvansuu, K., … Schulte-Körne, G. (2013). Predictors of developmental dyslexia in European orthographies with varying complexity. *Journal of Child Psychology and Psychiatry, 54,* 686–694. doi:10.1111/jcpp.12029

Landerl, K., & Wimmer, H. (2000). Deficits in phoneme segmentation are not the core problem of dyslexia: Evidence from German and English children. *Applied Psycholinguistics, 21,* 243–262. doi:10.1017/S0142716400002058

Landerl, K., Wimmer, H., & Frith, U. (1997). The impact of orthographic consistency on dyslexia: A German-English comparison. *Cognition, 63,* 315–334. doi:10.1016/S0010-0277(97)00005-X

Leach, J. M., Scarborough, H. S., & Rescorla, L. (2003). Late-emerging reading disabilities. *Journal of Educational Psychology, 95*, 211–224. doi:10.1037/0022-0663.95.2.211.

Leppänen, U., Niemi, P., Aunola, K., & Nurmi, J.-E. (2006). Development of reading and spelling Finnish from preschool to Grade 1 and Grade 2. *Scientific Studies of Reading, 10,* 3–30. doi: 10.1207/s1532799xssr1001_2

Lerkkanen, M.-K. (2007). The beginning phases of reading literacy instruction in Finland. In P. Linnakylä, & I. Arffman (Eds*.), Finnish reading literacy. When quality and equity meet* (pp. 155–174). Jyväskylä: University of Jyväskylä, Institute for Educational Research.

Lerkkanen, M.-K., Ahonen, T., & Poikkeus, A.-M. 2011. The development of reading skills and motivation and identification of risk at school entry. In M. Veisson, E. Hujala, P.K. Smith, M. Waniganayake, & E. Kikas, (Eds.). *Global perspectives in early childhood education: Diversity, challenges and possibilities. Baltische Studien zur Erziehungs- und Sozialwissenschaft.* (pp. 237-258). Frankfurt am Main: Peter Lang.

Lerkkanen, M.-K., Niemi, P., Poikkeus, A.-M., Poskiparta, M., Siekkinen, M., & Nurmi, J.-E. (2006-2016). The ongoing First Steps study [Alkuportaat]. Jyväskylä, Finland: Universities of Jyväskylä, Joensuu, and Turku. See www.jyu.fi/alkuportaat

Lerkkanen, M.-K., Poikkeus, A.-M., & Ketonen, R. (2006). ARMI Luku- ja kirjoitustaidon arviointimateriaali 1. luokalle [ARMI. A tool for assessing reading and writing skills in grade 1]. Helsinki: WSOY.

Lerkkanen, M.-K., Poikkeus, A.-M., & Kiuru, N. 2012. Opettajan tuen yhteys riskilasten lukutaidon kehitykseen [The role of teacher support on at-risk children's reading development]. In P. Atjonen (Ed.). *Oppiminen ajassa - kasvatus tulevaisuuteen* [Today's learning – Education for the future]. Joensuun vuoden 2011 kasvatustieteen päivien parhaat esitelmät artikkeleina. Suomen kasvatustieteellinen seura. Kasvatusalan tutkimuksia 61 [Studies in Education], pp. 23–35.

Lerkkanen, M.-K., Rasku-Puttonen, H., Aunola, K., & Nurmi, J.-E. (2004). Predicting reading performance during the first and the second year of primary school. *British Educational Research Journal, 30,* 67–92. doi: 10.1080/01411920310001629974

Lindeman, J. (2000). *Ala-asteen lukutesti: käyttäjän käsikirja*. [The comprehensive school reading test]. Oppimistutkimuksen keskus, Turun yliopisto. [Center for Learning Research, Turku University].

Lukanenok, K. (2011). Relationship between rapid naming speed and reading speed as a marker of reading difficulties of Estonian children from 6 to 8 years. *Journal of Teacher Education for Sustainability, 13(1),* 113–128. doi: 10.2478/v10099-011-0009-x

Lyytinen, H., Erskine, J., Tolvanen, A., Torppa, M., Poikkeus, A.-M., & Lyytinen, P (2006). Trajectories of reading development: A follow-up from birth to school age of children with and without risk for dyslexia. *Merrill-Palmer Quarterly, 52*, 514–546. doi: 10.1353/mpq.2006.0031

Must, O. (1997). Literacy: The case of Estonia. *Trames, 2,* 40–65.

Must, O., Must, A., & Raudik, V. (2001). Lugemiskirjaoskus [Reading literacy]. Akadeemia, 13(7), 1431–1448.

Muthén, L. K. & Muthén, B. (1998–2010). *Mplus user's guide. Version 6.* Los Angeles, CA: Muthén & Muthén.

OECD (2014). What students know and can do—student performance in mathematics, reading and science (Volume I, Revised edition, February 2014). OECD Publishing. doi: 10.1787/9789264208780-8-en

OECD (2016). PISA 2015 Results: Excellence and Equity in Education (Volume I). PISA, OECD Publishing. Retrieved from: https://www.oecd.org/education/pisa-2015-results-volume-i-9789264266490-en.htm

Papadopoulos, T. C., Georgiou, G., & Kendeou, P. (2009). Investigating the double-deficit hypothesis in Greek: Findings from a longitudinal study. *Journal of Learning Disabilities, 42,* 528–547. doi: 10.1177/0022219409338745

Perfetti, C. A. (1985). Reading ability. New York: Oxford University Press

Riigikogu [Parliament] (2014). Põhikooli- ja gümnaasiumiseadus [Law for Basic and High School]. Retrieved from: https://www.riigiteataja.ee/akt/115032014037

Seymour, P. H. K., Aro, M., & Erskine, J. M. (2003). Foundation literacy acquisition in European orthographies. *British Journal of Psychology, 94,* 143–174. doi: 10.1348/000712603321661859

Šilinskas, G., Dietrich, J., Pakarinen, E., Kiuru, N., Aunola, K., Lerkkanen, M.-K., Hirvonen, R., Muotka, J., & Nurmi, J.-E. (2015). Children evoke similar affective and instructional responses from their teachers and mothers. *International Journal of Behavioral Development, 39*, 432–444. doi:10.1177/0165025415593648.

Silvén, M., Poskiparta, E., & Niemi, P. (2004). The odds of becoming a precocious reader of Finnish. *Journal of Educational Psychology, 96*, 152–164. doi: 10.1037/0022-0663.99.3.516

Soodla, P., Lerkkanen, M. K., Niemi, P., Kikas, E., Silinskas, G., & Nurmi, J. E. (2015). Does early reading instruction promote the rate of acquisition? A comparison of two transparent orthographies. *Learning and Instruction, 38*, 14–23. doi: 10.1016/j.learninstruc.2015.02.002

Soodla, P., Vija, M., & Pajusalu, R. (2013). Eesti ja soome sõnalugemistestide võrdlus. [Comparison of Estonian and Finnish word reading tests]. *Eesti Rakenduslingvistika Ühingu aastaraamat,* 9, 279–296.

Stuart, M., Stainthorp, R., & Snowling, M. (2008). Literacy as a complex activity: Deconstructing the simple view of reading. *Literacy, 42*, 59–66. doi: 10.1111/j.1741-4369.2008.00490.x

Suggate, S. P. (2012). Watering the garden before a rainstorm. In S. Suggate & E. Reese (Eds.), *Contemporary debates in childhood education and development* (181–190). New York: Routledge.

Torppa, M., Georgiou, G. K., Lerkkanen, M.-K., Niemi, P., Poikkeus, A.-M., & Nurmi, J.-E. (2016). Examining the simple view of reading in a transparent orthography: A longitudinal study from kindergarten to Grade 3. *Merrill-Palmer Quarterly, 62*, 179–206. doi: 10.13110/merrpalmquar1982.62.2.0179

Torppa, M., Parrila, R., Niemi, P., Poikkeus, A.-M., Lerkkanen, M.-K., & Nurmi, J.-E. (2013). The double deficit hypothesis in the transparent Finnish orthography: A longitudinal study from Kindergarten to Grade 2. *Reading and Writing. 26*, 1353–1380. doi: 10.1007/s11145-012-9423-2

Torppa, M., Eklund, K., van Bergen E., & Lyytinen, H. (2015). Late-emerging and resolving dyslexia: A follow-up study from kindergarten to grade. *Journal of Abnormal Child Psychology,* 43*,* 1389–1401. doi: 10.1007/s10802-015-0003-1

van Bergen, E., van der Leij, A., & de Jong, P. F. (2014). The intergenerational multiple deficit model and the case of dyslexia. Frontiers in Human Neuroscience, 8(JUNE), [346]. doi: 10.3389/fnhum.2014.00346

Vellutino, F. V., Fletcher, J. M., Snowling, M. J., & Scanlon, D. M. (2004). Specific reading disability (dyslexia): What we have learned in the past four decades. *Journal of Child Psychology and Psychiatry, 45,* 2–40. doi: 10.1046/j.0021-9630.2003.00305.x

Viise, N. M., Richards, H. C., & Pandis, M. (2011). Orthographic depth and spelling acquisition in Estonian and English: A comparison of two diverse alphabetic languages. *Scandinavian Journal of Educational Research, 55,* 425–453. doi: 10.1080/00313831.2011.587327

Virinkoski, R., Lerkkanen, M.-K., Eklund, K., Holopainen, L., & Aro, M. (2017). Teacher's ability to identify children at early risk for reading difficulties in Grade 1. *Early Childhood Education Journal.* doi: 10.1007/s10643-017-0883-5

Table 1

Descriptive Statistics and the Between Country Comparisons (One-Way ANOVAs)

	Finland			Estonia			ANOVA F (1,688-690)	Effect size [a]
	N	M	SD	N	M	SD		
Reading Fluency								
Reading Fluency, Grade 1 fall	344	9.51	6.82	348	11.78	6.44	20.28***	.34
Reading Fluency, Grade 1 spring	344	17.93	8.14	348	17.18	6.76	1.76	.10
Reading Fluency, Grade 2 spring	344	23.90	7.49	348	27.20	7.72	32.38***	.43
Reading comprehension								
Reading Comprehension, Grade 1 spring	344	5.93	3.05	348	5.93	2.85	.00	.00
Reading Comprehension, Grade 2 spring	344	8.85	2.42	348	7.95	2.36	38.51***	-.38
Cognitive skills								
Letter knowledge	344	25.08	4.33	348	26.59	2.32	32.88***	.44
Rapid automatized naming	344	67.88	16.01	348	61.10	13.34	36.71***	-.46
Listening comprehension	344	10.32	1.65	347	9.69	1.93	21.51***	-.35

Note. [a] The effect size estimate is Cohen's *d*, calculated with pooled standard deviations.

*** $p < .001$

Table 2

Pearson Correlation Coefficients Separately for Estonia (Above the Diagonal) and Finland (Below the Diagonal)

	1	2	3	4	5	6	7	8
1 Child's age		-.12*	-.10	.08	-.12*	.00	.04	.00
2 Parental education	-.04		-.15*	.17**	.16**	.20***	.15**	.18**
3 RAN, school entry	-.11*	-.12*		-.26***	-.29***	-.11*	-.29***	-.20***
4 Letter knowledge	.05	.09	-.27***		.32***	.09	.39***	.30***
5 Reading fluency, school entry	.15**	.16**	-.35***	.37***		.23***	.67***	.40***
6 Listening comprehension, Grade 1 spring	.17**	.05	.11*	.22***	.18**		.12*	.19**
7 Reading fluency, Grade 2 spring	.05	.13*	-.29***	.30***	.46***	.13*		.41***
8 Reading comprehension, Grade 2 spring	.08	.19***	-.23***	.36***	.40***	.32***	.30***	

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

Table 3

Reading Development among High-Risk and Low-Risk Groups in Estonia and Finland

	Finland						Estonia					
	High-risk group (n = 24)		Low-risk group (n =320)				High-risk group (n = 26)		Low-risk group (n = 322)			
	M	sd	M	sd	Effect size	ANOVA F(1,342)	M	sd	M	sd	Effect size	ANOVA F(1,346)
Reading Fluency												
Grade 1 fall	2.08	0.88	10.06	6.74	1.66	33.48***	4.65	1.50	12.35	6.34	1.67	38.04***
Grade 1 spring	11.29	4.62	18.43	8.14	1.08	18.01***	11.46	2.61	17.60	6.78	1.20	21.29***
Grade 2 spring	19.67	5.35	24.22	7.53	0.70	8.44**	18.12	5.23	27.93	7.43	1.53	43.61***
Reading Comprehension												
Grade 1 spring	3.75	3.05	6.09	2.99	0.78	13.65***	4.42	2.44	6.05	2.85	0.61	7.97**
Grade 2 spring	7.92	2.10	8.92	2.43	0.44	3.83	6.12	1.95	8.10	2.33	0.92	17.87***
Cognitive skills												

Letter knowledge	20.50	4.62	25.43	4.11	31.54***	24.73	3.27	26.75	2.16	19.15***
Rapid automatized naming	92.17	8.79	66.06	14.91	71.57***	82.27	13.69	59.39	11.76	88.71***
Listening comprehension	10.29	1.63	10.33	1.66	.009	9.58	2.04	9.70	1.92	.09

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

Table 4

Cross-Table for Risk Groups at School Entry and Grade 2 Reading Fluency Groups in Estonia and Finland

			Grade 2 Reading Fluency Groups			
School-Entry Risk Groups			Poor readers[a]	Below average readers[b]	Above average readers	Total
High risk	Finland	Count	6 (25.00%)	11 (45.80%)	7 (29.20%)	24
		ASR	1.6	0.7	-1.8	
	Estonia	Count	17 (65.40%)	8 (30.80)	1 (3.80%)	26
		ASR	6.9	-0.4	-4.8	
Low risk	Finland	Count	43 (13.40%)	123 (38.40%)	154 (48.10%)	320
		ASR	-1.6	-0.7	1.8	
	Estonia	Count	41 (12.70%)	112 (34.80%)	169 (52.50%)	322
		ASR	-6.9	0.4	4.8	

Note. ASR = Adjusted Standardised Residual. [a] The poor readers were reading one standard deviation or more below the average of their respective sample (Finnish/Estonian). [b] The below average readers were reading below the average of their respective sample (Finnish/Estonian) but less than one standard deviation below the average.

Table 5

Cross-Table for Risk Groups at School Entry and Grade 2 Reading Comprehension Groups in Estonia and Finland

			Grade 2 Reading Comprehension Groups			
School-Entry Risk Groups			Poor readers[a]	Below average readers[b]	Above average readers	Total
High risk	Finland	Count	8 (33.30%)	5 (20.80%)	11 (45.80%)	24
		ASR	1.8	0	-1.5	
	Estonia	Count	8 (30.80%)	11 (42.30)	7 (26.90%)	26
		ASR	2.0	2.3	-3.5	
Low risk	Finland	Count	58 (18.10%)	67 (20.90%)	195 (60.90%)	320
		ASR	-1.8	0	1.5	
	Estonia	Count	50 (15.50%)	73 (22.70%)	199 (61.80%)	322
		ASR	-2.0	-2.3	3.5	

Note. ASR = Adjusted Standardised Residual. [a] The poor readers were reading one standard deviation or more below the average of their respective sample (Finnish/Estonian). [b] The below average readers were reading below the average of their respective sample (Finnish/Estonian) but less than one standard deviation below the average

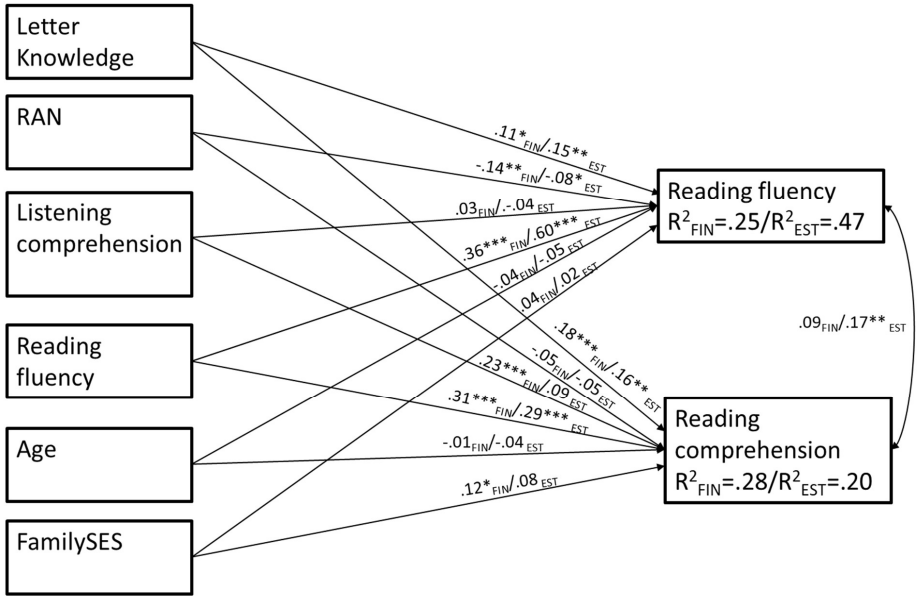

Fig 1 Path models predicting Grade 2 reading fluency and reading comprehension with the Kindergarten and Grade 1 skills in separate models for Estonia and Finland. All estimates are standardized. Note that the subscript FIN refers to the Finnish sample and the subscript EST refers to the Estonian sample

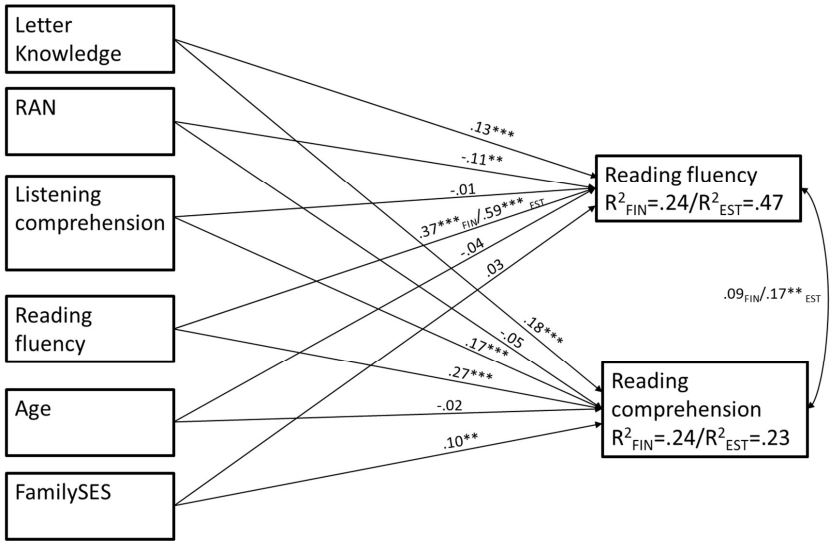

Fig 2 The final path model for the prediction of reading fluency and reading comprehension in Finland and Estonia. All estimates are standardized. Note that the subscript FIN refers to the Finnish sample and the subscript EST refers to the Estonian sample. The pathway estimates without subscript were set equal across samples

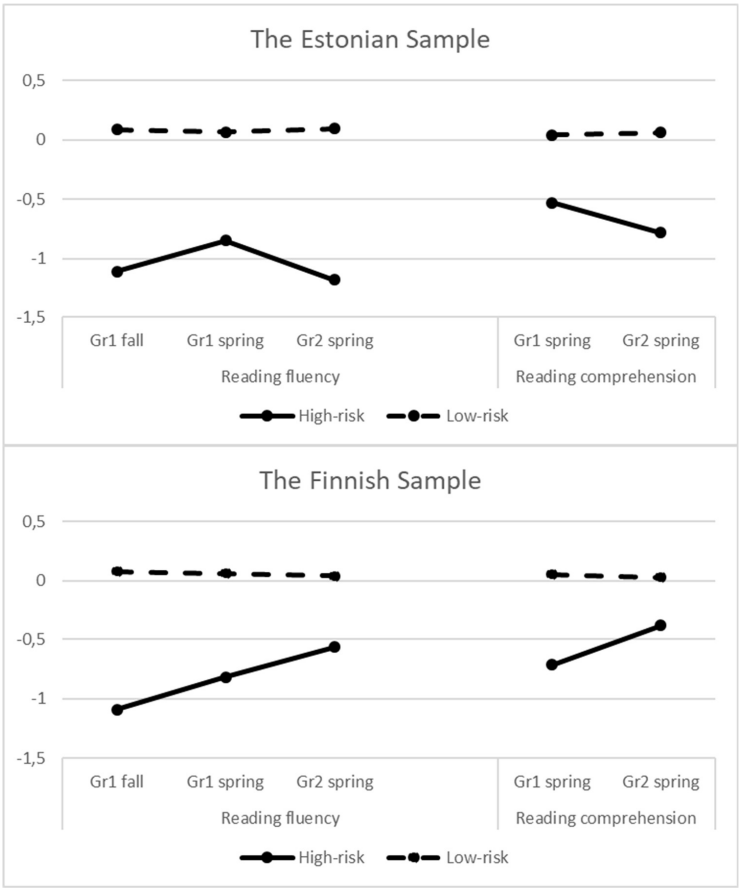

Fig 3 Reading development (standardized values) among high-risk and low-risk groups based on their school entry skills in reading fluency and RAN. Note that the values were standardized within each country