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The Predictors of Literacy Skills among Monolingual and Bilingual Finnish–Swedish Children During First Grade

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ABSTRACT

The aim of the study was to examine which predictor variables are related to literacy skills among monolingual Swedish ($n = 269$) and bilingual Finnish–Swedish ($n = 229$) children at the first grade in the Swedish-speaking schools in Finland. The participants were assessed in phonological awareness, letter knowledge, rapid automatized naming (RAN), word recognition, reading fluency, and spelling. The results showed that RAN was the most significant predictor of reading and spelling skills in both language groups, and monolingual children performed significantly better in RAN. Moreover, letter knowledge predicted reading and spelling skills in both groups. However, no significant differences between language groups in reading and spelling skills were observed. The results emphasize the importance of interpreting the pre-literacy screening, especially with bilingual children.

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Reading predictors; monolingual; bilingual; reading; spelling

In the 2018 Programme for International Student Assessment (PISA) survey, Finnish 15-year-olds were rated as one of the best groups in reading literacy among Organisation for Economic Co-operation and Development (OECD) countries. Furthermore, the differences between Finnish-speaking and Swedish-speaking pupils were significant, with Finnish speakers performing better. Especially, the reading literacy outcomes among Swedish-speaking boys were alarmingly low (Leino et al., 2019).

According to Finnish law, Finland's two official languages are Finnish and Swedish, with Swedish speakers comprising 5.4% of the population. The largest number of Swedish speakers lives along the coast in Southern Finland, which is mainly bilingual with a Finnish-speaking majority. In Ostrobothnia there are approximately as many Swedish speakers as in Southern Finland, but Ostrobothnia is more sparsely populated, and the Swedish-speaking population is the majority. Moreover, more than half of the population of Ostrobothnia speaks Swedish as a first language. There are also groups of Swedish-speakers that do not live along the coast but in unilingually Finnish-speaking towns, called "language islands". The Åland Islands is governed autonomously and the official language of the region is Swedish. In Finland, people belonging to the Swedish language minority have the right to attend school in their own language. Traditionally, a monolingual child grows up in a monolingual family, where the parents predominantly use one common language while a bilingual child's parents speak different languages, and the child begins to assimilate on these two languages from birth or shortly thereafter (Kohnert, 2013). In the current study

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the monolingual Swedish-speaking children have grown up in monolingual families, where the parents' primary language is predominantly Swedish, and the bilingual children have grown up in bilingual families, where one parent's primary language is Swedish and the other's is Finnish. The assumption is that the child has learned two languages in the bilingual family with native speakers of both languages or has used two languages simultaneously from birth. The first language is a personal choice for bilinguals, and in Finland there is no legal or clear linguistic definition of bilingualism at the individual level. Thus, it is more a question of whether or not individuals consider themselves bilingual (Strategy for the National Languages of Finland, 2012).

First, the current study is among the few studies focused on literacy development among minority language group of Swedish-speaking Finns. Second, because there are both monolingual (Swedish as the first language) and bilingual Finnish–Swedish children in Swedish-speaking schools, this is the first study to examine the differences in literacy development between these two language groups in Swedish-speaking classrooms. Third, this study adds to our knowledge on literacy development of monolingual and bilingual children among Swedish-speaking Finns in Finland. Finally, this longitudinal study includes a large sample of 565 Finnish–Swedish children, covering all Swedish speaking areas in Finland. Consequently, the aim of the study is to examine how Finnish-Swedish children with different language backgrounds differ in their predictors of literacy skills during their first school year and to examine the predictor variables of reading and spelling skills for monolingual versus bilingual children. The categorisations of monolingual and bilingual in the present study are based on the children's language backgrounds reported by parents.

Predictors of Reading and Spelling Skills

The development of reading and spelling skills are strongly associated with each other in Swedish and Finnish languages (e.g., Furnes & Samuelsson, 2011; Lerkkanen et al., 2004; Torppa et al., 2016) although orthographically in COST classification (Seymour et al., 2003) the Swedish language is situated between consistent and inconsistent languages while Finnish is highly consistent, Swedish syllabic complexity is more complex than Finnish and orthographic depth is between shallow and deep. However, the strongest predictors of learning to read and spell are phonological awareness (PA), letter knowledge (LK) and rapid automatized naming (RAN) in both languages (e.g., Furnes & Samuelsson, 2011; Hulme & Snowling, 2012; Solheim et al., 2021; Torppa et al., 2016).

Phonological awareness (PA) is reportedly one of the strongest predictors of reading development, especially in inconsistent orthographies (e.g., Furnes & Samuelsson, 2010; Parrila et al., 2004), but it´s association with reading in more consistent orthographies is not well understood. Studies conducted in orthographically consistent languages have shown that PA may be important only during the first one or two years of schooling (e.g., Landerl & Wimmer, 2000). Studies have also supported the key role of PA in predicting reading achievement in bilingual populations (Erdos et al., 2010). Additionally, several studies have reported better PA skills in bilingual than in monolingual children (Limbird et al., 2014). This could be because bilingual children are required to pay more attention to the phonemic properties of the language and, therefore, are assumed to develop higher levels of PA (Bialystok, 2001, 2002; Verhoeven, 2007). There is also increasing evidence that children transfer PA from their first to their second language (Durgonoğlu et al., 1993).

Despite the acknowledged contribution of LK to reading, the reason it is related to reading may differ across languages (e.g., Foulin, 2005). In inconsistent orthographies, LK may be important because it provides children with a nameable referent to associate with phonemes (e.g., Ehri, 2005) or because it reflects accuracy in the representations and discrimination of individual letters (e.g., Adams, 1990), skills that are necessary for accurate word recognition. In highly consistent orthographies, all letter names provide the sound of the letter, which is independent of the context where the letter occurs. Knowledge of letter names (and thus of sounds) and phonemic assembly are requirements for successful decoding (e.g., Aro, 2006). LK has shown to predict monolingual children's decoding skills, and it may also predict literacy outcomes for bilingual children (e.g., Erdos et al., 2010).

Rapid automatized naming (RAN) refers to the ability to name rapidly and effortlessly serially presented visual stimuli. It primarily assesses the rate of access to and retrieval of stored phonological information in long-term memory or speed of lexical access (e.g., Torgesen et al., 1997). Readers of consistent orthographies may decode by applying grapheme–phoneme conversion rules (e.g., Goswami, 2002). RAN may thus be related to reading because the phonological representation of each grapheme should be retrieved quickly for the grapheme–phoneme decoding strategy to be effective. It has also been proposed that serial naming speed is related to reading through orthographic processing in inconsistent languages and readers decode by recognizing chunks of letter strings (Bowers & Wolf, 1993). Studies have shown that RAN predicts the development of reading fluency (Georgiou & Parrila, 2013) also in bilingual learners (Geva et al., 2000). Studies have indicated that RAN remains a robust predictor of word reading whether it is measured in a child's first or second language (e.g., Durgonoğlu et al., 1993; Geva & Yaghoub Zadeh, 2009). Studies have also shown that bilingual children are slower namers compared to monolinguals in picture-naming tests even when the test was carried out in their first and dominant language (Ivanova & Costa, 2008). However, it is still unclear how bilingualism affects the RAN of language items. Similar to reading, it is unclear whether spelling acquisition relies upon the same cognitive processing skills across languages. It is clear that PA and LK predict spelling across languages (e.g., Bialystok, 2017; Caravolas et al., 2001; Chiappe et al., 2007). However, the relationship between these skills and spelling might be stronger in consistent languages than in inconsistent orthographies (e.g., Georgiou et al., 2020; Leppänen et al., 2006; Rønneberg & Torrance, 2019).

Being able to segment any given word into its constituent phonemes and apply the phoneme–grapheme conversion rules would result in proficient spelling ability. RAN, in turn, should be related to spelling across languages, as it aids in forming high-quality orthographic representations (Bowers & Wolf, 1993), which spelling relies upon. PA has been found to be strongly associated with spelling skills development for monolingual children (e.g., Caravolas et al., 2001), bilinguals (Chiappe et al., 2007) and bilinguals with various L1 backgrounds (Chiappe et al., 2002). LK and RAN have been shown to predict spelling in monolingual (Furnes & Samuelsson, 2009; Harrison et al., 2016) and bilingual samples (Harrison et al., 2016), suggesting that the processes underlying the development of spelling skills are similar for both monolingual and bilingual children.

Reading and Spelling Skills of Bilingual and Monolingual Children

Researchers have provided compelling evidence that bilinguals might have a reading advantage over monolinguals (Bialystok, 2005). Additionally, some studies found no significant differences in decoding skills between bilingual and monolingual readers (Lesaux et al., 2007). Durgonoğlu et al. (1993) found that bilingual children who had strong L1 decoding skills were similarly proficient at reading both words and non-words in their L2.

Studies specifically focusing on spelling in bilinguals have revealed distinct outcomes, with some research suggesting positive cross-language facilitation, while others have identified negative literacy skills transference across languages (Bialystok, 2017). Transference across two languages with similar alphabets may result from bilinguals developing a single orthographic representation for words (Van Heuven et al., 2008). Language transference is one of the key outcomes from research on bilinguals' literacy acquisition, suggesting that both languages might have an impact on the representation of the other (Dixon et al., 2010).

The aim of the Present Study

Our aim is to increase knowledge regarding the reading and spelling of monolingual versus bilingual children at Swedish-speaking schools in Finland.

First, we will examine how monolingual and bilingual children differ in reading and spelling skills at the end of the first grade. Second, we will investigate how monolingual and bilingual children differ with regard to the predictors of reading and spelling skills in first grade. Finally, we will examine the extent to which a variety of predictor variables, such as PA, LK and RAN, are related to reading and spelling skills at the end of Grade 1 in both language groups.

The research questions and hypothesis are as follows:

(1) Do monolingual and bilingual children differ in their reading and spelling skills at the end of first grade? Based on the previous studies we expected no significant differences in decoding and spelling skills between bilingual and monolingual children in the end of the first school year (Lesaux et al., 2007) (Hypotheses 1).
(2) Do monolingual and bilingual children differ with regard to the predictor variables of reading and spelling skills in first grade? We expected that bilingual children would be slower in RAN than bilingual children (e.g., Durgonoğlu et al., 1993; Geva & Yaghoub Zadeh, 2009) (Hypothesis 2).
(3) To what extent are a variety of predictor variables (e.g., PA, LK and RAN) related to the reading and spelling skills of monolingual and bilingual children at the end of Grade 1? We expected PA, LK and RAN to remain robust predictors of all reading and spelling tasks for both monolingual and bilingual children (e.g., Catts et al., 2002; Durgonoğlu et al., 1993; Geva & Yaghoub Zadeh, 2009; Torppa et al., 2016) (Hypothesis 3).

Children start nine-year comprehensive school in Finland in the fall of the year in which they turn seven. Six-year-old children are entitled to kindergarten education for one year before school entrance. More bilingual families are presenting their children as Swedish speaking and are choosing Swedish-language schools for their children (Harju-Luukkainen & Nissinen, 2011). Systematic literacy instruction using phonics-based methods does not begin before Grade 1, but PA, LK and interest in reading are supported in kindergarten (Lerkkanen et al., 2012).

Method

Participants

The participants were part of a longitudinal study of Finnish–Swedish children, "Inlärning och stöd i finlandssvenska skolor och daghem: ILS" (Learning and support in the Finnish-Swedish schools and kindergartens). Random sampling was used to recruit the participants from four traditional and different areas of Swedish Finland – Ostrobothnia, Åland, a metropolitan area and the rest of the country – where the majority of Swedish-speaking Finns live. This is the traditional way of distributing Swedish Finland geographically and consistent with the language environment used in the research (Lindgren & Laine, 2016). The participants were from 22 different schools and 49 different classrooms.

The sample consisted of 565 Finnish–Swedish children (291 boys). The children were followed from the beginning of the fall semester of Grade 1 (September 2015) to the end of the spring semester of Grade 1 (April 2016). There were 269 (142 boys) monolingual Swedish-speaking children (47.7%, age 7.29 years, SD = 0.46) and 229 (120 boys) bilingual Finnish–Swedish children (40.6%, age 7.31, SD = 0.47). Children with other language backgrounds, Finnish language, multilingual or bilingual other than Finnish–Swedish (11.7%) in the participating schools were not included in the sample. The sample was comparable to the general population in Finland in terms of parental educational level: 5% had nine-year compulsory education, 20% had completed secondary education, 40% had a bachelor ́s or vocational college degree and 35% had a master's degree or higher (Statistics Finland, 2019).

Procedure

First, the heads of the local education departments were contacted to inform them of the project. Then, the principals and teachers were contacted and invited to participate. Parents were asked to give written informed consent for their child's participation in the study. Of the families, 80% agreed to participate in the study. Information on background variables was obtained from the parents, including the guardiańs native language, child's gender and age, preschool and kindergarten attendance and language background. The parents also reported on the child's first language and whether the child was monolingual Swedish, monolingual Finnish, bilingual (Swedish and Finnish) or multilingual. This information was used to form the language groups in the study. The data were collected at two measurement points: at the beginning of Grade 1 after three weeks of school entry in September (Time 1) and at the end of the school year in April (Time 2). At Time 1, children's PA was assessed with two group tasks: an initial phoneme identification task and a phoneme counting task. LK was tested in groups with a letter writing task, and individually with a letter naming task. Reading skill was tested with a word recognition task. At Time 2, the children were tested in groups with a word chains task, two sentence reading tasks and a word spelling task. Individually, the children's reading accuracy was tested with a pseudoword reading task, and the reading fluency was tested by two word reading and two text reading tasks. Finally, the RAN was tested individually.

Most assessment instruments were developed in the ILS project in the Swedish language. The assessments took place in the schools during normal lessons on 2–3 days in the fall and again in the spring. Three sessions with 15 min breaks between a group-administered assessments and 3 min breaks between each task (total 3 h) was carried out in the classroom by trained examiners. After the group tasks, the children were assessed individually for about 10–15 min in a separate room by trained examiners. The aim was to do the individual tasks on a different day than the group-based assessments. If this was not possible, the children were given at least an hour break between individual and group assessments. The trained testers were special needs teachers or undergraduate students in education or psychology. The testers were given eight hours of training, including theory and practical exercises. In addition, the testers practiced testing with children for three hours.

Measures

Predictor Measures

Of the predictor measures, initial phoneme identification, phoneme counting and letter naming and writing were taken at the beginning of the Grade 1, while RAN tasks were performed at the end of Grade 1.

Phonological Awareness Measures

An initial phoneme identification task from the Individuell Läsning och Skrivning (ILS) test (Risberg et al., 2019) was used to assess PA. Each child was shown four pictures of objects that were named by the experimenter. The child was asked to select the correct picture based on the oral presentation of the initial phoneme relating to one target. There was no time limit. The score was the number of correct items (maximum value of 15). (Cronbach's $\alpha = .92$).

The phoneme counting task from the ILS test (Risberg et al., 2019) was used to assess PA. Each child was shown a picture of an object that was named by the experimenter. The child was asked how many sounds they could hear in the word based on the oral presentation. The child was asked to pull a line for each sound. The score was the number of correct items (maximum value of 17). There was no time limit. (Cronbach's $\alpha = .86$).

Letter Knowledge Measures

Letter naming was assessed using the ILS test (Risberg et al., 2019), which contained 29 letters (the Swedish alphabet). The experimenter presented 29 uppercase letters divided into 10 rows in random order. The children were asked to name the letters one row at a time. The score was the number of correct items (maximum value of 29). There was no time limit. (Cronbach's α = .95).

Letter writing was assessed using the ILS test (Risberg et al., 2019). The experimenter said aloud 29 letters in random order. The children wrote the letters one at a time. The score was the number of correct items (maximum value of 29). There was no time limit. (Cronbach's α = .96).

RAN Measure

Rapid automatized naming (RAN) was assessed with the Test i Snabb Seriell Benämning (SSB) material (Salmi et al., 2019), using the standard procedure of RAN (Denckla & Rudel, 1976), where the child is asked to name a semi-randomly arranged series of five items as rapidly and accurately as possible. The tasks included RAN objects (pictures of a car, house, fish, pencil and ball), numbers (2, 4, 6, 7 and 9) and letters (O, A, S, T and P). Total matrix (five rows with 10 items) completion time in seconds was used as the score.

Additional Measures

Word recognition was assessed at the beginning of Grade 1 using the ILS test (Risberg et al., 2019). The children were asked to select the written word that corresponded to a picture from four alternative words. The task included a total of 18 pictures, which was the maximum score in the task. The experimenter said the names of the pictures aloud, and the pupils selected the corresponding word in their booklets. For example, one item included a picture of mat (food), and the following alternative words were mot (against), tam (tame), mat (food) and not (note). There was no time limit. (Cronbach's α = .82).

Outcome Measures

All outcome measures were committed at the end of Grade 1.

Group Reading Measures

Word chains reading was assessed with the Reading Chains-2 test (Jacobson, 2014). The items were presented as three-word chains written without spaces. The task was to mark vertical lines in word boundaries within a two-minute time limit. The score was the number of correctly identified items within the time limit, and the maximum score was 80.

Sentence reading was assessed with two group-administered tasks from the ILS test material (Risberg et al., 2019). The pupils read silently as many statements as possible within 2-min time limit and verified the truthfulness of as many sentences as possible by marking either R (correct) or F (false). The score was the number of correctly marked sentences, and the maximum score was 70. The correlation between these two tasks was .82.

A word spelling task of 20 words was assessed using the ILS test (Risberg et al., 2019). The score was the number of correctly written items. There was no time limit. (Cronbach's α = .82).

Individual Reading Measures

Word reading was assessed with two word reading tasks from the ILS test (Risberg et al., 2019). Each child read as many words as possible aloud within 45 s. The words were presented in vertical columns, arranged in order of increasing difficulty. All words were highly common in Swedish. The total score was the number of correctly read words within the time limit. The maximum score was 120. The correlation between the tasks was .96.

Pseudoword reading was assessed with the ILS test (Risberg et al., 2019). Each child read as many printed pseudowords aloud as possible within 45 s. The words were presented in vertical columns and arranged in order of increasing difficulty. The word list was constructed based on existing Swedish words. In each word, one or more letters were replaced. The score was the number of correctly read items within the time limit, and the maximum score was 120.

Text reading was assessed with two text reading tasks from the ILS test (Risberg et al., 2019). The pupils were asked to read aloud a text about a hedgehog and a fox as quickly and accurately as possible in 60 s. The score was the number of correctly read words within the time limit. The maximum score was 272. The correlation between these two tasks was .96.

Data Analysis

IBM SPSS Statistics 26 was used to conduct a one-way analysis of variance (ANOVA) to compare the two language groups (monolinguals vs. bilinguals) with respect to predictor and outcome measures. Pearson's correlation between predictors and outcomes was used in both groups.

Multi-group confidential factor analysis (MGCFA) was used to investigate the language group (monolingual and bilingual) differences in measurement model (predictors and outcomes) and in a structural equation model (SEM) between predictor and outcome factors. This was done with Mplus version 8.4. These structural equation models were built based on explorative factor analysis (EFA) results which were data driven. Theory and correlation table (Table 3) also supported the latent literacy predictive factors which were PA, LK and RAN. Correlation tables supported also outcome factors i.e., group and individual reading factors. Individually administered reading tasks correlated very highly with each other, whereas group administered reading tasks had lower correlations. Group administered tasks can be more affected by factors such as attention and concentration ability, especially at the first grade.

We removed good readers (62 bilingual and 87 monolingual children who made 0 or 1 error in the word recognition task in the school entry) from the SEM model analyses to investigate the predictors of reading and spelling skills in children who could not read or were emergent or mediocre readers at the beginning of school. This was done because there is evidence that LK do not predict reading skills development of children who can already read (Lerkkanen et al., 2004) and relationship between the development of PA and reading skill is also interactive (Landerl et al., 2019). Removing good readers from model also reduced kurtosis in variables. A total of 176 monolinguals and 160 bilinguals were analysed with SEM.

Results

Differences in Reading and Spelling Skills

First, we examined if monolingual and bilingual children differed in their reading and spelling skills at the end of Grade 1. The ANOVA analyses revealed that there were no significant differences between the children in reading and spelling outcomes (see Table 1).

Differences in Reading and Spelling Predictors

Second, we examined whether monolingual and bilingual children differed with regard to the predictor variables of reading and spelling skills. The means of the monolingual children were significantly better in RAN objects and RAN numbers tasks (see Table 2). The effect size was small in the RAN objects and numbers tasks.

Table 1. Descriptive estimates, the ANOVA results and the effect sizes of the outcome variables in language groups at the end of Grade 1.

						Skewness		Kurtosis			F value[a]
	Language group	*n*	Range	Mean	*SD*	Value	S.E	Value	S.E	d_{Cohen}	(df)
Word chains reading (G)	monolingual	261	0–31	9.74	5.53	0.81	0.15	0.72	0.30	0.07	0.52
	bilingual	227	0–31	10.12	5.95	0.92	0.16	0.76	0.32		(486)
Sentence reading 1 (G)	monolingual	262	0–38	12.53	6.14	0.82	0.15	1.54	0.30	0.10	1.10
	bilingual	226	0–40	13.14	6.74	1.07	0.16	1.47	0.32		(486)
Sentence reading 2 (G)	monolingual	261	0–33	14.26	5.84	0.48	0.15	0.28	0.30	0.06	0.47
	bilingual	227	2–37	14.64	6.41	0.63	0.16	0.33	0.32		(486)
Word reading 1 (I)	monolingual	266	2–73	34.68	14.34	0.29	0.15	−0.23	0.30	0.09	1.00
	bilingual	227	0–76	36.00	14.84	0.50	0.16	−0.22	0.32		(491)
Word reading 2 (I)	monolingual	266	2–71	31.36	14.35	0.45	0.15	−0.11	0.30	0.04	0.18
	bilingual	227	0–81	31.91	14.85	0.73	0.16	0.26	0.32		(491)
Pseudoword reading (I)	monolingual	266	0–54	24.98	11.15	0.22	0.15	−0.24	0.30	0.21	5.13
	bilingual	227	0–63	27.31	11.63	0.68	0.16	0.43	0.32		(491)
Text reading 1 (I)	monolingual	265	0–190	58.66	37.18	1.20	0.15	1.50	0.30	0.02	0.04
	bilingual	227	4–168	59.33	35.14	1.15	0.16	0.67	0.32		(490)
Text reading 2 (I)	monolingual	265	3–177	56.05	34.20	1.10	0.15	1.37	0.30	0.00	0.01
	bilingual	227	2–169	56.05	31.26	1.06	0.16	1.12	0.32		(490)
Word spelling (I)	monolingual	262	1–20	10.74	3.53	0.42	0.15	0.31	0.30	−0.10	1.23
	bilingual	227	1–20	10.37	3.67	0.45	0.16	0.01	0.32		(487)

Note: [a]Statistical significance corrected for Type I error with Holm-Bonferroni correction. All comparisons N.S. after correction. Group test (G) and Individual test (I).

Predicting Reading and Spelling Outcomes in Grade 1

Finally, we tested the extent to which a variety of predictor variables are related to monolingual and bilingual children's reading and spelling skills at the end of Grade 1. All of the predictors correlated significantly with other predictors in the bilingual group, and all predictors except one correlated significantly with other predictors in the monolingual group (see Table 3). All correlations between the predictors and outcomes were significant and varied from weak to moderate in the monolingual and bilingual groups. All outcome measures correlated with each other in both groups, with correlations varying from moderate to strong.

To find out the possible differences between the language groups we built up a structural equation model (SEM) in Mplus with latent factors of the predictors and the outcomes. The latent predictors were PA, LK and RAN and the latent outcomes were group administered reading and individual reading. The multi-group confidential factor analysis (MGCFA) was used as a method and we followed the procedure presented by Vandenberg and Lance (2000). As can be seen from the Table 4 full configural invariance (M1) and full metric invariance (M2) was supported, which are the necessary options to be fulfilled when making meaningful group comparisons. The scalar invariance (M3) was not met and this revealed significant group differences in some factor means.

Bilingual group appeared to have a significantly higher factor mean score in serial naming speed and in individual reading, respectively in standardized score differences were $\Delta M = 0.33$, $p = .01$ and $\Delta M = 0.29$, $p = .01$. The invariances of factor variances and path coefficients were accepted (Table 4). The structural model path coefficients were statistically significant in both compared groups when individual reading ($b = -0.95$, $p < .001$) and group reading ($b = -0.15$, $p < .001$) were regressed on RAN and when group reading ($b = -0.18$, $p = .01$) was regressed on LK. The direct effects of group and individual reading tasks on PA were not statistically significant ($b = 0.20$, $p = 0.12$) and ($b = 1.22$, $p = 0.13$), respectively. PA still had an indirect effect to outcome latent via LK and RAN. The final model with standardized coefficients can be seen in Figure 1.

Table 2. Descriptive estimates, the ANOVA results and the effect sizes of the predictive variables and word recognition task in language groups.

						Skewness		Kurtosis			F value[a]
	Language group	*n*	Range	Mean	*SD*	Value	S.E	Value	S.E	d_{Cohen}	(df)
Initial phoneme identification (G)	monolingual	264	0–15	13.08	3.37	−2.014	0.15	3.26	0.30	0.10	1.19
	bilingual	221	1–15	12.73	3.61	−1.66	0.16	1.53	0.33		(483)
Phoneme counting (G)	monolingual	264	0–17	12.62	4.03	−1.45	0.15	1.60	0.30	0.13	2.12
	bilingual	220	1–17	12.09	3.96	−0.94	0.16	−0.13	0.33		(482)
Letter naming (I)	monolingual	266	0–29	25.95	5.31	−2.40	0.15	5.63	0.30	0.07	0.54[b]
	bilingual	221	3–29	25.63	4.30	−2.64	0.16	8.84	0.33		(485)
Letter writing (G)	monolingual	265	5–29	25.53	5.87	−1.80	0.15	2.21	0.30	−0.02	0.08[b]
	bilingual	221	3–29	25.67	4.74	−2.23	0.16	5.57	0.33		(483)
RAN objects[c] (I)	monolingual	264	33.57-105	55.28	10.74	1.00	0.15	1.83	0.30	−0.42	21.0***
	bilingual	218	35.25-97.37	60.00	11.85	0.55	0.16	0.21	0.33		(480)
RAN numbers[c] (I)	monolingual	264	22.28-102.94	40.97	9.74	1.49	0.15	5.79	0.30	−0.30	10.5**
	bilingual	218	25.86-92.59	43.94	10.33	1.29	0.16	3.11	0.33		(480)
RAN letters[c] (I)	monolingual	262	19.61-102.87	38.12	10.49	2.06	0.15	8.74	0.30	−0.06	0.43
	bilingual	218	20.19-81.76	38.73	9.65	1.14	0.16	2.76	0.33		(478)
Word recognition[d] (G)	monolingual	263	1–18	14.64	3.43	−1.55	0.15	2.18	0.30	0.11	1.31
	bilingual	222	6–18	14.29	3.25	−0.94	0.16	−0.07	0.33		(483)

Note: [a]Statistical significance corrected for Type I error with Holm-Bonferroni correction.
[b]Welch t test. ** $p < .01$. *** $p < .001$.
[c]Measured at the end of Grade 1 concurrently with outcome measures.
[d]Selective measure ≤16.
Group test (G) and Individual test (I)

Table 3. Pearson correlations of the predictive and outcome variables in language groups.

	Initial sound	Phoneme counting	Letter naming	Letter writing	RAN objects	RAN numbers	RAN letters	Word chains	Sentence reading 1	Sentence reading 2	Word reading 1	Word reading 2	Pseudoword reading	Text reading 1	Text reading 2	Word spelling
Initial sound (G)	1	.667***	.615***	.684***	−.181***	−.254***	−.375***	.320***	.423***	.388***	.406***	.404**	.385***	.387***	.397***	.414***
Phoneme counting (G)	.444***	1	.578***	.560***	−.108	−.196**	−.280***	.253***	.322***	.240***	.238***	.242***	.266***	.247***	.244***	.289***
Letter naming (I)	.618***	.427***	1	.846***	−.158*	−.253***	−.310***	.379***	.438***	.407***	.449***	.410***	.390***	.410***	.438***	.442***
Letter writing (G)	.601***	.460***	.854***	1	−.170**	−.242***	−.288***	.374***	.439***	.388***	.425***	.398***	.385***	.400***	.425***	.454***
RAN objects (I)	−.271***	−.199**	−.310***	−.316***	1	.589***	.480***	−.331***	−.369***	−.349***	−.363***	−.351***	−.336***	−.345***	−.349***	−.293***
RAN numbers (I)	−.364***	−.318***	−.409***	−.475***	.569***	1	.714***	−.353***	−.450***	−.418***	−.409***	−.376***	−.373***	−.377***	−.362***	−.287***
RAN letters (I)	−.369***	−.232**	−.400***	−.416***	.522***	.607***	1	−.378***	−.495***	−.464***	−.508***	−.514***	−.504***	−.441***	−.468***	−.346***
Word chains (G)	.336***	.251***	.358***	.375***	−.400***	−.299***	−.439***	1	.674***	.730***	.661***	.651***	.653***	.703***	.720***	.635***
Sentence reading 1 (G)	.403***	.279***	.395***	.404***	−.397***	−.382***	−.495***	.803***	1	.760***	.750***	.733***	.701***	.766***	.755***	.652***
Sentence reading 2 (G)	.390***	.284***	.423***	.455***	−.442***	−.419***	−.550***	.817***	.834***	1	.788***	.794***	.746***	.809***	.814***	.654***
Word reading 1 (I)	.409***	.263***	.423***	.410***	−.454***	−.383***	−.575***	.760***	.785***	.812***	1	.959***	.912***	.901***	.918***	.655***
Word reading 2 (I)	.386***	.241***	.403***	.403***	−.421***	−.366***	−.564***	.772***	.790***	.826***	.964***	1	.930***	.903***	.924***	.636***
Pseudoword reading (I)	.377***	.220**	.376***	.359***	−.450***	−.348***	−.578***	.754***	.803***	.795***	.912***	.923***	1	.868***	.890***	.600***
Text reading 1 (I)	.359***	.247***	.393***	.388***	−.423***	−.375***	−.542***	.820***	.827***	.857***	.932***	.934***	.903***	1	.952***	.699***
Text reading 2 (I)	.377***	.247***	.402***	.403***	−.418***	−.391***	−.548***	.830***	.833***	.871***	.923***	.935***	.904***	.968***	1	.711***
Word spelling (G)	.425***	.281***	.470***	.471***	−.247***	−.241***	−.389***	.678***	.665***	.672***	.654***	.666***	.636***	.730***	.727***	1

Note: Upper triangle Monolingual (n = 256–266), lower triangle Bilingual (n = 212–227); * $p < .05$, ** $p < .01$, *** $p < .001$
Group test (G) and Individual test (I)

Table 4. Comparison of the measurement (M1-PM3) and structural (M4 and M5) invariance models.

	χ^2 *(df)*	$\Delta\chi^{2\,a}$ *(Δdf)*	CFI[b] *(ΔCFI)*	*TLI*[b]	*RMSEA*[b]	*SRMR*[b]	Comparison	Desicion
M0: $\sum_1 \neq \sum_2$	4967.75	-	.000	.00	0.34	0.46	-	-
Covariance matrix equality	(240)	(-)	(-)					
M1	369.91	-	0.96	.95	0.08	0.05	-	-
Configural invariance	(184)	(-)	(-)					
M2	380.46	14.26	0.96	.95	0.08	0.05	M2 vs. M1	Accepted
Metric invariance	(195)	(11)	(0.00)					
M3	428.64	49.13	0.95	.95	0.08	0.05	M3 vs. M2	Rejected
Scalar invariance	(206)	(11)	(−0.01)					
PM3	395.93	15.67	0.96	.95	0.08	0.05	PM3 vs. M2	Accepted
Partial scalar invariance	(204)	(9)	(−0.00)					
M4	401.63	7.22	0.96	.95	0.07	0.10	M4 vs. PM3	Accepted
Factor variance invariance	(209)	(5)	(0.00)					
M5	400.59	3.41	0.96	.95	0.07	0.06	M5 vs. PM3	Accepted
Structural model paths invariance	(210)	(6)	(0.00)					

Note: [a] Khii square difference was counted according to Satorra & Bentler (2001).
[b]Goodness of fit indexes: Comparative Fit Index (CFI); >.90 acceptable fit, >.95 good fit (Hu & Bentler, 1999), Tucker-Lewis index (TLI); TLI>.95 good fit (Hu & Bentler, 1999), root mean square error of approximation (RMSEA); <.06 good fit; < .08 reasonable fit, >.1 poor fit (Lubke & Muthen, 2004), standardized root mean square residual (SRMR); <.08 excellent fit, >.1 upper limit (Hu & Bentler, 1999).

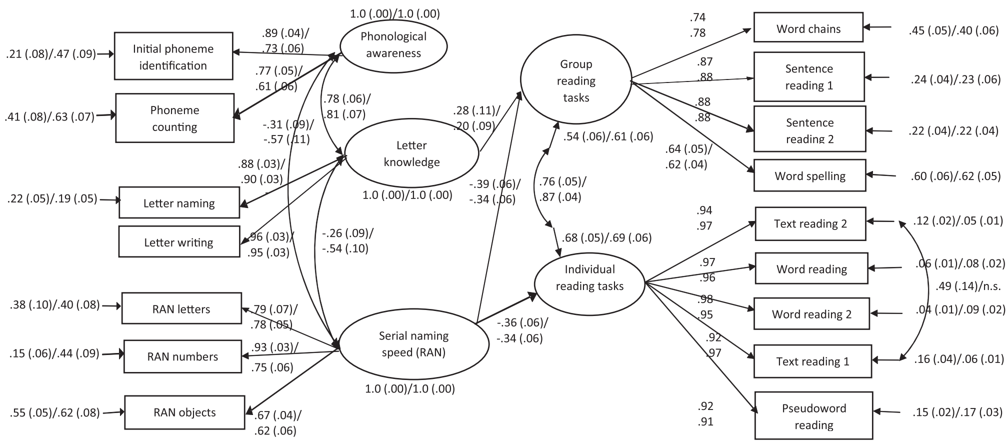

Figure 1. Statistically significant standardized coefficients (monolingual/bilingual) of multigroup confidential factor analyze (MGCFI) after partial scalar and structural paths invariance (M5).

Discussion

The aim of this study was to compare the reading and spelling skills of monolingual and bilingual Finnish–Swedish children: how they differ in outcomes and predictor variables of reading and spelling skills and how predictor variables are related to these skills in the end of Grade 1. The ANOVA results showed no significant differences between monolingual and bilingual children in reading and spelling skills, but monolingual children were significantly better in RAN. The SEM model showed that RAN predicted reading and spelling skills in both groups and LK group-administered reading and spelling tasks in both groups.

First, we studied whether monolingual Swedish and bilingual Finnish–Swedish children differed in reading and spelling skills at the end of the first grade. Our hypothesis that there would be no significant differences in reading and spelling skills between bilingual and monolingual children in the end of Grade 1 was partly confirmed. The ANOVA results showed no significant differences between monolingual and bilingual children in reading and spelling skills. Conversely, our SEM analyses showed differences in the latent variable for individual reading tasks. Using partial measurement invariance, we determined that the difference was due to bilinguals being better than monolinguals at the pseudoword reading task and one of the word reading tasks. This difference might be explained by the fact that good readers were removed from the SEM analyses. The findings of bilinguals being better or as good as monolinguals at reading tasks and similar in spelling tasks are consistent with previous studies. Research exploring reading development in monolingual and bilingual children has found that bilingual children have strong decoding skills both in their L1 and in their word and non-word reading skills in their L2 (e.g., Durgonoğlu et al., 1993). Bilinguals have also been shown to have better decoding skills than monolinguals in pseudoword reading tasks (Bialystok, 2005). Bialystok (2005) hypothesized that bilingualism makes two contributions to children's early acquisition of literacy: a general understanding of reading and writing and its basis in a symbolic system of print, how the system works and how the forms can be decoded into meaningful language. The similarity in spelling performance between bilingual and monolingual children might indicate that transference across two languages with similar alphabets led bilinguals to develop a single orthographic representation for words (Van Heuven et al., 2008) and become as proficient at spelling as monolinguals.

Second, we examined whether the predictive variables differed between monolingual and bilingual children. The results partly confirmed our hypothesis that bilingual children would be slower than monolingual children in RAN. According to our results the means of the monolingual children were significantly better in the RAN objects and RAN numbers tasks. Bilingual children have also shown slower reaction times than monolinguals in picture naming tests in previous studies (Ivanova & Costa, 2008). A possible explanation for this bilingual disadvantage could be that words from the language not used for production in a given test are, nevertheless, activated and compete for selection with the lexical representations of the language being used (e.g., Hermans et al., 1998). In earlier studies, bilingual children showed slower reaction times in discrete picture naming tests with several low-frequency items (Ivanova & Costa, 2008) but not in RAN tests with a few high-frequency items. Compared to RAN objects, RAN numbers and their alphanumeric stimuli come from even more closed sets, with small numbers of distinct members and unambiguous names. Nevertheless, the lexical selection problem hypothesis could still explain the results in the RAN objects task and the RAN numbers task because of two competitive language representations when retrieving names in these tasks.

Contrary to many previous studies (Bialystok, 2001, 2002; Verhoeven, 2007), we found that bilingual Finnish–Swedish children did not show superior PA compared to their monolingual Swedish peers. However, some findings are in line with ours, showing that differences between language groups in PA could depend on the phonological complexity of the language used in the tests. Loizou and Stuart (2003) found that bilingual English–Greek children significantly outperformed monolingual English children, but this pattern was not replicated when comparing bilingual Greek–English and monolingual Greek children. The researchers suggested that an advantage in PA for bilingual children over monolingual children might depend on the relative phonological complexity of the child's first and second languages (Loizou & Stuart, 2003). They theorized that, when the second language is phonologically simpler than the first, this can facilitate the development of PA. However, in our sample, bilingual children had both Finnish and Swedish as their first language. It may be that Swedish spoken in Finland could be more similar to Finnish language than Swedish spoken in Sweden because Finnish-Swedish pronunciation approaches the pronunciation of the Finnish majority language (Melin-Köpilä, 1996). It may also be that orthographic complexity does not affect PA before reading acquisition because PA is about identifying parts of the spoken language, not of written language. These could explain why there were no differences in phonological skills between the monolingual and bilingual language groups in the present study.

Finally, we examined how predictor variables were related to reading and spelling skills at the end of Grade 1 in both language groups. Our hypothesis that PA, LK and RAN remain robust predictor variables of all reading and spelling tasks for both monolingual and bilingual children was partly confirmed. Our results showed that all predictor variables (i.e., PA, LK and RAN) were significantly correlated with reading and spelling skills in both language groups. Previous studies of reading have revealed similar findings in normal samples (e.g., Catts et al., 2002; Torppa et al., 2016) and in bilingual and monolingual samples (Erdos et al., 2010; Geva et al., 2000). The same predictor variables have been shown to be connected with spelling in both language groups (Caravolas et al., 2001). In our study, the SEM model showed that RAN was the most significant predictor variable of reading and spelling skills in both groups, and PA predicted outcomes only indirectly through LK and RAN factors. Similarly, RAN has been shown to explain more of the variances in different reading tests than phonological skills, especially in more transparent orthographies like Finnish and Greek as well as in less transparent languages like Swedish (Furnes & Samuelsson, 2010; Torppa et al., 2016). Additionally, RAN has been found to be more closely linked to reading fluency than to decoding (Kirby et al., 2010; Torppa et al., 2012). In our study, in addition to word, sentence and text reading fluency, RAN tasks were also connected with pseudoword reading speed. Moll and Landerl (2009) found that naming speed was at least as strongly related to pseudoword reading speed as to real-word reading speed in the transparent German language. The authors concluded that naming speed was related to the automaticity of orthography to phonology associations at the letter and letter cluster levels. As in our study, RAN has also been found to predict spelling in previous studies with monolingual samples (e.g., Furnes & Samuelsson, 2009) as well as with bilingual samples (e.g., Harrison et al., 2016). This may indicate that the processes that explain spelling skills are similar for both language groups. However, it has to be noticed that two of the predictors (LK and PA) were tested at the beginning of Grade 1 whereas RAN was tested at the end of the first grade. Although RAN is less likely to be influenced by instruction than the other two pre-literacy skills (Norton & Wolf, 2012), this could have affected the results by emphasizing the relationship between RAN and the outcome measures.

Interestingly, we also noticed that LK predicted group-administered reading and spelling tasks in the both groups. However, if we didn't require invariance when group reading task was regressed on LK, only the path on the monolingual group was significant. One possible explanation for this small difference between groups could be that some vowels are pronounced differently in Swedish than in Finnish. This makes LK, reading and spelling easier for monolingual and more confusing for bilingual children, and thus explains the difference between language groups.

We found that RAN predicted reading and spelling skills which is in line with previous studies (Furnes & Samuelsson, 2011). Moreover, we found that monolinguals outperformed bilinguals on RAN which might be because monolinguals do not have representations for stimulus in two languages. However, no differences were found between monolingual and bilingual groups in reading ability. This may be due to the fact that in consistent orthographies accurate word reading is relatively easy to accomplish, and the differences between the readers are evident mainly in their reading speed (Landerl & Wimmer, 2008).

This study has some limitations. First, some of the tasks dealing with predictors were carried out concurrently with the outcome measures. PA and LK knowledge were measured in the fall of Grade 1 when the children started school, whereas RAN tasks were measured during spring in Grade 1 at the same time as outcome measures. However, it has been found that RAN is less likely to be influenced by instruction than the pre-literacy skills measured at school entry (Norton & Wolf, 2012). Second, the participants were selected in the language groups based on parents' reports. The Swedish-speaking Finns in this study may not all be "classical" monolinguals, as they grew up in a country where the dominant language is Finnish. Hence, they were probably exposed to this language very early, although their parents speak only Swedish to them. The same applies to bilingual children, who might have been exposed to Finnish and Swedish to varying degrees or even some other language in their school or childcare environment and with peers. It would be interesting to study the effect of various language backgrounds on children's reading skills development in more details in the future.

Conclusion

Although there were no differences between language groups in reading and spelling skills, the language groups differed in reading and spelling predictors. Educators and psychologists should be aware of the importance of children's language background when assessing the predictors of reading and spelling skills. It would also be interesting to observe the reading and spelling development of monolingual and bilingual children throughout their school years and to determine the predictive ability of LK, PA and RAN in the long run. Future research could assess the role of vocabulary in reading and spelling development and the language skill variance between bilingual and monolingual children. This could provide new information about bilingual children's reading development as a function of age and language exposure, which has implications for optimal learning of reading for children with diverse language backgrounds.

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