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**The Role of Part-time Special Education supporting Students with  
Reading and Spelling Difficulties from Grade 1 to Grade 2 in Finland**

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## **Abstract**

Previous studies show that many students with reading and spelling problems have a lack of progress in reading and spelling skills after years of special education services. The aim of the study is to evaluate the reading and spelling skills of Finnish children in grades 1 and 2 receiving part-time special education from special education teachers for reading and spelling difficulties (RSD) and for RSD with other learning difficulties. In this study the focus is in the roles of the form and the amount of part-time special education in reading and spelling skills development. Of 152 children involved in the study, 98 received part-time special education for RSD, and 54 did not have RSD and did not receive special education. The results showed that the reading and spelling skills of students with RSD lagged behind age level and that students with overlapping difficulties exhibited even slower development. Small group education and a moderate amount of part-time special education (approximately 38 hours per year) predicted faster skill development, whereas individual and a large amount of special education (more than 48 hours per year) were related to slower skill development and broader difficulties.

Keywords: *part-time special education, reading, spelling, support*

## **Introduction**

Reading acquisition primarily requires performance of the alphabetic principle formed by letter–sound knowledge and phonemic skills, followed by maintenance of the detected phoneme in short-term memory, the synthesis of all the read phonemes, and finally, recognition of word meaning after generating the phoneme sequence (Goswami 2002). Orthographic complexity also affects reading and spelling (RS) development. In orthographically consistent languages (e.g. Finnish), typically achieving children acquire reading accuracy by the middle of first grade, but this occurs almost two years later in irregular orthographies (Seymour, Aro and Erskine 2003; Ziegler and Goswami 2006). On the other hand, in consistent orthographies, the main problem is the reading fluency deficit (Holopainen, Ahonen and Lyytinen 2001; Lyytinen et al. 2006), which has been found to be highly persistent (Landerl and Wimmer 2008) and hard to remediate (Hintikka et al. 2008; Thaler et al. 2004).

The acquisition of spelling procedures is also affected by the orthographic consistency of the language the children are learning to spell in, as well as features of the oral language, the linguistic structure complexity (Serrano and Defior 2012). Less-skilled spellers experience the so-called phonological core deficit, in which their mental phonological representation of words is either underspecified or relatively less accessible. This deficit makes it harder to learn the links between phonemes and letters and to use these links to spell, especially unfamiliar words (Torppa et al. 2016; Vellutino et al. 2008).

The process of learning to read and spell is challenging for 5%–18% of school-age children depending on the criteria chosen to define reading and spelling difficulties (RSD) (Shaywitz and Shaywitz 2005). Moreover, evidence suggests that about 40% of school-aged children with one developmental disorder (e.g. dyslexia, language impairment, attention deficit/ hyperactivity disorder (ADHD) or developmental coordination disorder) will also suffer another developmental disorder (McArthur et al. 2000; Rochelle and Talcott 2006; Willcutt and Pennington 2000). A typical

example of this is co-occurrence is that children with preschool language impairment are at high risk of developing reading difficulties (Bishop and Snowling 2004) and children at family risk of dyslexia who later have reading difficulties are likely to have a history of oral language difficulties (e.g. Snowling, Gallagher and Frith 2003). Also, preschool attention problems have been found to predict later reading achievement, and children with spelling impairment and comorbid ADHD symptoms seem to have an increased risk of encountering further co-occurring difficulties (Rietz, Hasselhorn and Labuhn 2012).

Evidently, students need help and instruction from beginning of education to reach the proper level of RS skills and to develop these skills further. Many studies (e.g., Elbaum et al. 2000; Saine et al. 2010; Wanzek and Vaughn 2007) have provided evidence of effective reading instruction for students with RSD: (a) Students benefit from explicit and systematic instruction; (b) foundational skills, such as phonemic awareness and phonics/word study, are essential elements of instruction; (c) higher processing skills, such as fluency, vocabulary, and comprehension, are essential from the beginning of reading instruction; and (d) students who have difficulties benefit from smaller group instruction (5 or fewer students).

### ***Overview of support systems for RSD***

Ideally, the support for RSD should incorporate the features that was described above to be included in successful, cost-effective interventions. However, many studies show that students have a lack of progress in reading in different support settings, and even when gains in reading achievement are made, there is little evidence that these students meet grade-level expectations after years of special education services (Morgan, Farkas, and Wu 2011; Wanzek, Al Otaiba, and Petscher 2014; Vaughn et al. 2002). This raises up the question, is this a problem of assessment, organizing the support or the content of support? Swanson (2008) synthesized the findings from 21 classroom observation studies examining reading instruction for students with LD. The findings revealed that reading instruction for students with LD is generally of low quality and includes little to no explicit

instruction in phonics or comprehension strategies. Also, Swanson and Vaughn (2010) reported a series of observations conducted during reading instruction in special education resource rooms for students with LD. Teachers spent approximately the same amount of time on phonics and phonological awareness as on vocabulary and comprehension instruction. It is of considerable concern, that students in both special and general education settings spent large amounts of time during reading instruction on non-literacy activities, such as transitioning, discipline, games, and drawing or coloring without a specific literacy focus (Vaughn and Wanzek 2014).

The common belief is that students with RSD need instruction at a slower pace, that the amount of instruction should not be added. Vaughn and Fletcher (2012) pointed out that students with RSD benefit from intensive interventions and that many of these students require such interventions for multiple years. However, it has been found that special education system causes students to fall even further behind their classmates and children placed in special education tend to stay there for many years (Allington et al. 2010; Powell 2009; Slavin and Karweit 1993) which severely limits their future educational and occupational opportunities. Instead, students with RSD require diverse, systematic educational support from the beginning of their education through upper-secondary school (Hadley 2011) to avoid negative consequences (Willms 2003).

### ***Finnish educational system***

Finnish comprehensive school starts at age 7. One school year includes 38 weeks. There is also one year of pre-primary education for 6-year-old children (kindergarten), which should create a foundation for e.g. literacy skills. Systematic phonics-based teaching of reading begins in grade 1. The development of syllable reading is important for reading fluency because two-, three-, four-, and more multi-syllable words are frequent and the amount of one-syllabic words is very limited, as is the case in Finnish (Soodla et al. 2015; Suomi, Toivanen, and Ylitalo 2008).

In basic education, students do not need a formal diagnosis to receive special educational services, teachers and parents with students themselves assess the need for support (Björn et al.

2016). Most special educational services are provided in schools for free, and the most common form is part-time special education given by a special education teacher (Statistics Finland 2005). It is a form of educational support in which students study in general education classes and receive support for 1–2 hours per week from a special education teacher. Typically, this support is aimed for contemporary reading, spelling and mathematical problems and is put into practice in a small group (3–4 students at the same time) or individually, if the problems are long-lasting, more severe or if the student has multiple learning problems. Usually special education teachers teach reading and spelling simultaneously with phonics-based method motivating students by board games or computer programs. Another main approach in teaching Finnish students with RSD is focusing in foundation processes, like phonological and memory skills (Hintikka, Aro and Lyytinen 2005; Uusitalo-Malmivaara 2009).

### ***Research questions***

This study examines the development of RS skills among Finnish children in grades 1 and 2 who receive part-time special education for RSD from special education teachers. The focus is in the form and amount of special education and whether students have overlapping difficulties with RSD.

The research questions are as follows:

- (1) Are there differences in the RS skills development of students in grades 1 and 2 who (a) receive part-time special education for RSD and (b) have no RSD and do not receive special education support? Is mean-level skill development different between children with only RSD and those with overlapping difficulties (e.g., difficulties with mathematics, attention, language)?
- (2) To what extent do the amount and the form of special education and the presence of only RSD or RSD and overlapping difficulties predict RS development among children who receive special education for RSD?

### **Method**

#### ***Participants and procedure***

This study is part of an extensive longitudinal study (authors' names removed for review purposes, 2006) which follows a community sample of children ( $n = 1,879$ ) entry into kindergarten through primary school in three medium-sized towns and one municipality. The participants of this study are 152 children (63 girls, 89 boys). At the beginning of the study, the children's parents and teachers were asked for written consent to participate.

The sample of this study ( $n = 152$ ) was selected from a more intensively followed subsample of 608 students (mean number of study participants per classroom across grades 1–4 = 3.21,  $SD = 0.12$ ) drawn from the whole sample of 1,880 students. 608 students included both students identified as being at-risk for RSD and not at risk for reading problems (control children). The control children were randomly selected children from the same classrooms as children identified as being at-risk for RSD. Risk for RSD was determined in kindergarten based on three tests (letter knowledge, phonemic awareness, and rapid automatized naming) and parents' self-reported reading difficulties (mothers or fathers indicated on a questionnaire that they had mild or severe problems in reading at school age). These variables were suggested by meta-analyses and familial dyslexia follow-up studies (e.g., Lyytinen et al. 2006). Children were identified as at risk for RSD if they scored at or below the 15<sup>th</sup> percentile in at least two of the measured skill areas or if they scored at or below the 15<sup>th</sup> percentile in one of the skill areas, and the parental questionnaire indicated family risk (see also Kiuru et al. 2012; Lerkkanen et al. 2011).

Part-time special education teachers working in the four target towns ( $n = 35$ ; mean age: 45.6, mean years working as special education teachers: 15.2) were sent a list of the students that were followed more intensively in their schools but they did not know which group (at risk for RSD or not) the individual children belonged to. In the present study, 98 children were identified as at risk for RSD already in kindergarten and received part-time special education for RSD in grade 1. Out of these children 56 received special education only for RSD, 15 for RSD and attention difficulties, 14 for RSD and language difficulties and 13 for RSD and other difficulties, such as

math. For the present study, also 54 intensively followed control children with no RSD risk from same classrooms as the risk for RSD children, who received no special education, were randomly selected. 54 control students out of 321 were chosen to ensure relatively equal group sizes in our analyses comparing control students with students with only RSD and RSD and overlapping difficulties. Table 1 describes how received special education for RSD is divided across different measurement points.

The special education teachers were asked to rate the students that had received part-time special education during the first grade. Data on students' RS skills were collected during the fall of grade 1 (September, T1), the spring of grade 1 (April, T2), and the spring of grade 2 (April, T3). Questionnaires for the reasons for special education, and the amount and form of special education were determined from special education teachers two times in grade 1 (December and May).

[Table 1 near here]

### ***Measures***

*Reading Skills.* Children's reading skills were measured by a group-administered subtest of the nationally normed reading test battery (ALLU; Lindeman 1998), which assessed word-level reading accuracy and fluency. In this speed test, a maximum of 80 trials could be attempted within the 2-minute time limit. For each item, the child was asked to read four (phonologically similar) words and draw a line connecting a picture and the semantically matching word. The following alternative forms of the subtest were used at the three testing points: Form B with capital letters at T1, Form A with lowercase letters at T2, and Form B with lowercase letters at T3. The score used in the analyses was constructed by calculating the number of correct answers (the maximum value was 80). The Kuder-Richardson reliability coefficient was 0.97 in grade 1 and 0.82 in grade 2. The alternate-form correlation between forms A and B was 0.84.

*Spelling Skills.* Spelling was assessed by eight dictated non-words that students had not previously heard: one-syllable non-words (2 items), three-syllable non-words (3 items), and four-

syllable non-words (3 items). These words were orally presented twice before students attempted to spell them (Häyrynen, Serenius, and Korkman 1999). The score was based on the number of non-words spelled correctly. The Kuder-Richardson reliability coefficient was 0.92 in the fall of grade 1, 0.83 in the spring of grade 1, and 0.72 in grade 2.

*Reasons for Part-Time Special Education.* When part-time special education special had started in fall first grade special education teachers had rated the students' reading and spelling performance on 3-point scale (1 = "clear problem", 2 = "mild problem", 3 = "no problems") by using reading and spelling tests. Also, special education teachers were asked to assess the other problems of the target children with RSD receiving part-time special education with similar 3-point scale (1 = "clear problem", 2 = "mild problem", 3 = "no problems"). The alternatives were: language and speech problems, attention problems, mathematical problems, motoric problems, socio-emotional problems, and some other problems. Based on this information, four dummy-coded variables were created: (a) only RSD ( $n = 56$ ); (b) RSD and attention difficulties ( $n = 15$ ); (c) RSD and language difficulties ( $n = 14$ ); and (d) RSD and other difficulties, such as difficulties in math ( $n = 13$ ).

*Amount of Part-Time Special Education.* In addition, special education teachers were asked to report the number of hours of part-time special education they gave each target student weekly during the first grade. Based on this information, the hours of special education students received throughout grade 1 was calculated ( $M = 49.83$ ,  $SD = 46.90$ , range: 4–90 hours). Three dummy-coded variables were used in the subsequent analyses: low amount of special education ( $\leq 28.93$  hours, 31%, meaning less than the whole school term, once a week), medium amount of special education ( $> 28.94$  &  $\leq 47.89$  hours; 34%, on average one school term, when support is given once a week), and large amount of special education ( $> 47.90$  hours; 34%, which is more than once a week during the first grade).

*Form of Part-Time Special Education.* Special education teachers were asked about the form of part-time special education they gave each target student. The alternatives were: individually, in a small group (and the number of students in a group was asked) or both. Three dummy-coded variables were used in the subsequent analyses: only small-group special education (44%, n = 42), only individual special education (17%, n = 16), and both small-group and individual special education (39%, n = 39).

### ***Analysis strategy***

To answer the first research questions, the SPSS, Version 19.0, random sampling method, was used. The second research questions were answered separately for reading and spelling skills by conducting two sets of repeated Multivariate Analysis of Variances (MANOVAs). In the first set of analyses, the between-subject factor was defined as RSD and special education (n = 98) vs. no RSD or special education (n = 54). In the second set of analyses, the following variable was used as the between-subject factor: 1 = only RSD, 2 = RSD and attention difficulties, 3 = RSD and language problems, 4 = RSD and other learning difficulties, and 5 = no RSD or special education. The third research question was answered by using latent growth modeling (LGM) (Bollen and Curran 2006; Muthén and Muthén 1998-2013). LGM enabled simultaneously analyzing changes in mean-level development and individual variations across the means. In addition, LGM allowed predicting the growth components with various predictors (e.g., the form and amount of special education).

## **Results**

### ***Reading and spelling development***

Table 2 presents the means and standard deviations for RS skills for children with RSD and special education and for children without RSD or special education. We first carried out repeated MANOVAs to investigate the extent to which RS skills developed over time and whether this development differed for these groups.

[Table 2 near here]

The results show no time x group interaction ( $p > .05$ ) for reading skills. However, statistically significant main effects of time ( $F(2, 142) = 440.87, p < .001, \text{partial } \eta^2 = .86$ ) and group ( $F(1, 143) = 47.38, p < .001, \text{partial } \eta^2 = .25$ ) were detected. The results show that children's reading skills developed significantly during the follow-up period. Furthermore, the difference in reading skills favoring children without RSD remained relatively large across the follow-up period.

The results of repeated MANOVA for spelling skills, in contrast, show a significant time x group interaction (*Wilks' Lambda*:  $F(2, 141) = 12.39, p < .001, \text{partial } \eta^2 = .15$ ). The contrast analyses indicate that the time x group interaction was significant from the spring of grade 1 to the spring of grade 2 (T2-T3,  $p < .001$ ) but not from the fall of grade 1 to the spring of grade 1 (T1-T2,  $p = .15$ ). Spelling skills developed faster, especially from T2 to T3 among children with RSD who received part-time special education ( $p < .001, \text{partial } \eta^2 = .83$ ) compared to children without RSD who received no special education ( $p < .001, \text{partial } \eta^2 = .51$ ). The skill difference favoring children with no RSD was statistically significant in the fall of grade 1 ( $p < .001$ ) and the spring of grade 1 ( $p < .001$ ) but only marginally significant in the spring of grade 2 ( $p = .06$ ). In other words, students with RSD who received part-time special education partly caught up to the level of other students.

Table 2 shows the means and standard deviations for: (a) children with only RSD; (b) children with RSD and attention difficulties; (c) children with RSD and language problems; (d) children with RSD and other learning difficulties; and (e) children with no RSD or special education support. Next, we carried out repeated MANOVAs to investigate the extent to which RS skills developed across time and whether this development was different for these groups. The estimated marginal means of each group's reading skills in grades 1 and 2 are shown in Figure 1.

[Figure 1 near here]

The results of the repeated MANOVA for reading skills show a significant time x group interaction (*Wilks' Lambda*:  $F(8, 278) = 2.11, p = .035, \text{partial } \eta^2 = .06$ ). The contrast analyses indicate that the time x group interaction was significant from the spring of grade 1 to the spring of grade 2 (T2-T3,  $p = .04$ ) but not from the fall of grade 1 to the spring of grade 1 (T1-T2,  $p = .16$ ). The follow-up analyses reveal that the development of reading skills from T2 to T3 was fastest among children with only RSD who received part-time special education ( $p < .001, \text{partial } \eta^2 = .91$ ) and slowest among children with RSD and language problems ( $p < .001, \text{partial } \eta^2 = .73$ ). The reading skills of the other groups—children with RSD and attention difficulties ( $p < .001, \text{partial } \eta^2 = .84$ ), children with RSD and other learning difficulties ( $p < .001, \text{partial } \eta^2 = .85$ ), and children with no RSD or special education ( $p < .001, \text{partial } \eta^2 = .83$ )—developed by about the same extent from T2 to T3 but slower than those of children with only RSD and faster than those of children with RSD and language problems.

Comparisons between the groups at different time points reveal that children with no RSD or special education had better reading skills than all the other groups at every time points ( $p < .05$ ). In addition, children with RSD and attention difficulties had marginally significantly better ( $p < .10$ ) reading skills than students with RSD and language difficulties and students with RSD and other learning difficulties. Also, in the spring of grade 2, students with only RSD and students with RSD and attention difficulties had better reading skills than students with RSD and language problems and students with RSD and other learning difficulties ( $p < .05$ ).

The results of the repeated MANOVA for spelling skills show a significant time x group interaction (*Wilks' Lambda*:  $F(8, 276) = 3.62, p = .001, \text{partial } \eta^2 = .10$ ). The contrast analyses indicate that the time x group interaction was significant from the spring of grade 1 to the spring of grade 2 (T2-T3,  $p < .001$ ) but not from the fall of grade 1 to the spring of grade 1 (T1-T2,  $p = .30$ ). The follow-up analyses reveal that development of spelling skills from T2 to T3 was fastest among

children with only RSD who received part-time special education ( $p < .001$ , partial  $\eta^2 = .82$ ) and slowest among children without RSD and special education ( $p < .001$ , partial  $\eta^2 = .53$ ). The spelling skills of the other groups—children with RSD and language problems ( $p < .001$ , partial  $\eta^2 = .71$ ), children with RSD and attention difficulties ( $p < .001$ , partial  $\eta^2 = .70$ ), and children with RSD and other learning difficulties ( $p < .001$ , partial  $\eta^2 = .74$ )—developed at about the same extent from T2 to T3 but slower than those of children with only RSD and faster than those children without RSD. Comparisons between groups at different time points reveal that children without RSD or special education had better spelling skills than all other groups at T1 ( $p < .05$ ). At T2, children without RSD or special education had better spelling skills than all the other groups ( $p < .05$ ), except for children with RSD and attention difficulties ( $p > .05$ ). It is noteworthy that, in non-word spelling skills at T3, children without RSD or special education were no longer significantly different than the children in any other group (Figure 2).

[Figure 2 near here]

### ***Predictors of reading and spelling development among students with RSD***

We constructed LGM to investigate RS skills development and its predictors in more detail among students who received special education for RSD ( $n = 98$ ). The correlations between predictors (the amount and form of special education, presence of overlapping difficulties) and RS skills are shown in Table 3.

[Table 3 near here]

*Reading.* The final LGM for reading skills (Table 4) fit the data well ( $\chi^2(1) = 1.54, p = 0.88$ ;  $CFI = 0.99$ ;  $RMSEA = 0.07$ ;  $SRMR = 0.04$ ). In this model, the non-significant residual variances at T1 and T3 were fixed to equal. The two growth components (level and nonlinear change) described the shape of change well. The results at the mean level show that children's initial level of reading skills at the beginning of grade 1 differed from 0. In addition, reading skills improved significantly

across time. There was significant individual variation in the change but not the initial level of reading skills. In other words, after accounting for measurement error, there were no significant inter-individual differences between the students with RSD who received part-time special education in their reading skills in the fall of grade 1 but they differed in the rate of change in reading skills from the fall of grade 1 to the spring of grade 2. The residual variance of reading was significant only at T2.

Next, the form and amount of part-time special education and the presence of overlapping difficulties were added as predictors to the model. First, the groups of children who received a high amount of part-time special education, who received both small-group and individual special education, and who had RSD and other learning difficulties were used as reference groups. Second, the groups of children who received a low amount of special education, who received only small-group special education, and who had only RSD were used as reference groups. The results of these two predictor models are shown in Figure 3. A medium amount of special education predicted faster reading skills development than a small or large amount of special education. In addition, having only RSD and having RSD and attention difficulties predicted faster reading skills development compared to RSD with another learning difficulty.

[Figure 3 near here]

*Spelling.* The final LGM for spelling (Table 4) fit the data perfectly because the model was saturated. The two growth components (level and nonlinear change) described the shape of change well. The results at the mean level show that children's initial level of spelling skills at the beginning of grade 1 differed marginally but significantly from 0. Spelling skills significantly improved across time. There was significant individual variation in the change but not the initial level of spelling skills. In other words, after accounting for measurement error, there were no significant inter-individual differences between students with RSD who received part-time special education in their spelling skills, but they did differ in the rate of change in their spelling skills from

the fall of grade 1 fall to the spring of grade 2. Residual variance in spelling skills was significant only at T2.

[Table 4 near here]

Next, the form and amount of special education and the presence of overlapping difficulties were added as predictors in the previous model. First, children who received a high amount of special education, who received both small-group and individual special education, and who had RSD and other learning difficulties were used as reference groups. Second, children who received a low amount of special education, who received only small-group special education, and who had only RSD were used as reference groups. The results of these two predictor models are shown in Figure 4. Receiving only small-group special education predicted faster spelling skills development compared to receiving only individual special education or receiving both individual and small-group special education. In addition, receiving a medium amount of special education predicted faster spelling skills development than receiving a large amount of special education and receiving a large amount of special education predicted a slower spelling skills development than receiving a small amount of special education. Finally, having only RSD predicted marginally significantly faster spelling skills development than having RSD with another learning difficulty or having RSD with attention difficulties.

[Figure 4 near here]

## **Discussion**

The results showed, first, that students with RSD lagged behind age level in reading skills during the follow-up period, but after two years, the control group had not achieved better spelling skills than those with RSD. Furthermore, we found that students with only RSD partly attained age-level RS skills, whereas students with other difficulties exhibited clearly slower development, depending which overlapping difficulties they had. Finally, the results revealed that small-group interventions

(3–4 students) and a medium amount of part-time special education predicted faster development in the RS skills of RSD students, whereas individual special education and large amount of special education were associated with slower skill development.

Multiple observation studies have produced consistent findings that instruction for students with reading difficulties in both the general and the special education settings across grades has not met the needs of the students (e.g., Connor, Morrison, and Katch 2004; Morgan et al. 2011; Swanson 2008; Vaughn and Wanzek 2014). Although the sample of RSD students was relatively small in our study, the above mention finding was seen also here in the reading results. A number of previous studies have shown that reading accuracy is quite easy to achieve in a transparent orthography like Finnish (e.g. Lerkkanen et al. 2011; Lyytinen et al. 2006; Seymour et al 2003; Soodla et al. 2015). However, Finnish is a strongly inclined, agglutinating language, which makes the words very long, causing the main feature of Finnish RSD, dysfluent reading (Aro 2006; Holopainen et al. 2001), a problem which is quite persistent (Hintikka et al. 2008). In the present study, the reading tests measured both accuracy and fluency that, despite of support given, might partly explain the slower development in reading of RSD students compared to their classmates. In addition, when special education teachers had identified RSD with other learning difficulties (e.g. attention problems or language impairment) at initial stage of basic education the development of students' reading skills was even slower compared to their peers without RSD. This result goes along with studies by Bishop and Snowling (2004), Rietz et al. (2012) and Willcut and Pennington (2000) of co-occurrence of developmental learning disabilities achievement: these students seem to have an increased risk of encountering further co-occurring difficulties and need various forms of support.

The results for the development of spelling skills by RSD students and RSD students with other difficulties compared to their classmates was faster than the development of reading skills. Contrary to previous research (e.g. Serrano and Defior 2012), RSD students receiving special

education started to catch up with their peers in grade 2. We have to keep in mind that in the present study non-words spelling task, where the items resemble Finnish words in their basic forms, was used. This places all children, regardless of written literacy experiences, in the same situation. One explanation for the spelling result might be found from the highly transparent Finnish orthography, in which each phoneme has a letter correspondence. Theoretically, after learning letter–sound connections, Finnish speakers can write any word they hear without knowing its meaning (Lyytinen et al. 2004). Moreover, the non-word spelling test in this study was not time limited, not measuring spelling fluency. Finally, phonological recoding is encouraged by phonics-based classroom instruction both in general and special education, focusing first on letter–sound correspondences and then recoding syllables (Soodla et al. 2015), which may have an effect on basic spelling accuracy skills.

The development of RS skills among students with RSD was predicted by the amount and the form of part-time special education. Interpretation of these results is limited because only teachers' self-reports were available and such data are not always entirely objective, although teacher evaluations are known to correlate very strongly with test results (Lerikkanen et al. 2011). There were large variations in the amount of part-time special education received, and in the analyses, it was categorized into small, medium, and large amounts of support. The LGM results were interesting and showed that students with RSD who received part-time special education did not differ from other groups in their reading skills when entering grade 1, but their rate in reading skills from the fall of grade 1 to the spring of grade 2 did differ. Regarding the amount of part-time special education, the results show that receiving a medium amount of special education and having only RSD or having RSD and attention difficulties was associated to faster reading development than having RSD and other learning difficulties. As has been shown e.g. by Snowling et al. (2003) and Willcutt et al. (2007), comorbid learning disabilities seem to be more resilient. Thus, keeping in

mind that this group is quite small, this result could just indicate the heterogeneity of this group (seen especially in spelling results at the second grade), not the (non)effectiveness of support.

The results of the LGM analyses predicting spelling skills showed that receiving small-group special education, receiving a medium amount of special education, and having only RSD predicted faster spelling development. Interestingly, receiving individual special education, receiving a large amount of special education, and having RSD and attention difficulties or other learning difficulties was associated to slower spelling skill development. The logical interpretation of this result is that special education teachers identify students with spelling difficulties in need of support, but with some students the difficulties are broader and more persistent and they would need more intensified or long-lasting support; 1–2 hours a week at first grade is not enough. As Allington et al. (2010) have showed, some students placed in special education fall even further behind their classmates. Moreover, the important question, when the students that had slow development in RS skills, is if these students are “non-responders”, “resilient” or “difficult to remediate” (Niemi et al. 2011; Vellutino et al. 2008). To answer this would need more information of the quality of part-time special education given.

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Table 1. Receiving special education for RSD at different time points.

	Special education for RSD at none of the time points of grade 1 fall, grade 1 spring and grade 2 spring		Special education for RSD only at one time point of grade 1 fall, grade 1 spring and grade 2 spring		Special education at two time points of grade 1 fall, grade 1 spring and grade 2 spring		Special education at all three time points, that is, grade 1 fall, grade 1 spring and grade 2 spring	
	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%
No RSD & no spec. ed.	54	100	0	0	0	0	0	0
Only RSD	0	0	7	13	23	41	26	46
RSD + attention diff.	0	0	3	20	8	53	4	27
RSD+ lang. diff.	0	0	0	0	4	29	10	71
RSD + other LD	0	0	1	8	4	31	8	61

Table 2. Descriptive statistics

Variable	RSD and spec. ed. ( <i>n</i> = 98)		Only RSD ( <i>n</i> = 56)		RSD + attention diff. ( <i>n</i> = 15)		RSD+ lang. diff. ( <i>n</i> = 14)		RSD + other LD ( <i>n</i> = 13)		No RSD & no spec. ed. ( <i>n</i> = 54)	
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
Reading skills (T1, grade 1 fall)	3.39	3.32	3.35	3.17	10.35	7.92	4.07	4.48	2.77	3.22	3.38	2.66
Reading skills (T2, grade 1 spring)	11.39	6.01	11.09	5.34	18.89	10.01	15.33	9.24	9.29	2.95	10.31	5.01
Reading skills (T3, grade 2 spring)	19.28	6.40	20.19	5.48	25.81	7.38	21.20	7.72	17.14	7.34	15.62	5.97
Spelling skills (T1, grade 1 fall)	0.16	0.80	0.15	0.68	2.83	2.72	0.47	1.55	0.00	0.00	0.00	0.00
Spelling skills (T2, grade 1 spring)	3.18	2.23	3.33	2.03	5.26	2.57	3.53	2.72	3.00	2.45	2.31	2.21
Spelling skills (T3, grade 2 spring)	5.76	2.08	6.07	1.79	6.38	1.71	5.46	2.70	5.57	2.31	5.00	2.12

*Note.* RSD = Reading and spelling difficulties, LD = learning difficulties

Table 3. Correlations between predictor variables and reading and spelling skills among students who receive special education for RSD in grade 1 (n = 98)

Predictor variable	Reading skills	Reading skills	Reading skills	Spelling skills	Spelling skills	Spelling skills
	(T1)	(T2)	(T3)	(T1)	(T2)	(T3)
Small group special education	.18+	.27**	.29**	.18+	.27**	.39**
Individual special education	-.07	-.10	-.15	-.07	-.02	-.23*
Small group and individual special education	-.13	-.29*	-.18+	-.13	-.26**	-.22*
Small amount of special education	.23	.10	.13	.09	.18	.10
Medium amount of special education	-.001	.18+	.15	-.17	.10	.12
Large amount of special education	-.15	-.22*	-.20	-.07	-.28**	-.23*
Only RSD	-.02	-.05	.16+	-.02	-.08	.17+
RSD and attention difficulties	.09	.28**	.13	.17+	-.07	-.06
RSD and language difficulties	-.07	-.15	-.14	-.08	-.03	-.04
RSD and other LD	.00	-.07	-.23*	-.07	-.15	-.14

Note. \*\*  $p < .01$ , \*  $p < .05$ , +  $p < .10$  (two-tailed test)

Table 4. Latent growth models for reading and spelling skills for students with RSD and special education

	Reading skills	Spelling skills
Growth parameters	Estimate (S.E)	Estimate (S.E)
Means		
Level	3.36(0.34)***	0.16(0.08)+
Trend	8.25(0.59)***	2.99(0.22)***
Variances		
Level	10.04(7.05)	0.52(0.36)
Trend	10.02(3.45)**	2.99 (0.22)***
Covariance (Level, trend)	-2.06 (3.07)	-0.13(0.12)
Residual variances		
T1 (Grade 1 fall)	0.696(4.77)	0.11(0.14)
T2 (Grade 1 spring)	17.36(3.83)***	3.51(0.47)***
T3 (Grade 2 spring)	0.696(4.77)	0.28(0.56)

Note. \*\*\*  $p < .001$ , \*\*  $p < .01$ , \*  $p < .05$ , +  $p < .10$  (two-tailed test)

### **Figure captions**

Figure 1. Estimated means for reading and spelling skill development among children with RSD and part-time special education and children without RSD and no special education.

Figure 1(a). Reading skills.

Figure 1(b). Spelling skills.

Figure 2. Estimated means for reading and spelling skill development among children with RSD and part-time special education and children without RSD and no special education.

Figure 3. Latent growth model for reading skills with predictors for students who receive special education for RSD in grade 1. Standardized estimates are presented. \*\*\*  $p < .001$ , \*\*  $p < .01$ , \*  $p < .05$ ,  $p < .10$  (two-tailed test)

Figure 3(a): High groups as reference groups.

Figure 3(b). Low groups as reference groups.

Figure 4. Latent growth model for spelling skills with predictors for students who receive special education for RSD in grade 1. Standardized estimates are presented. \*\*\*  $p < .001$ , \*\*  $p < .01$ , \*  $p < .05$ ,  $p < .10$  (two-tailed test)

Figure 4a: High groups as reference groups.

Figure 4b. Low groups as reference groups.

Figure 1.

Figure 1(a).

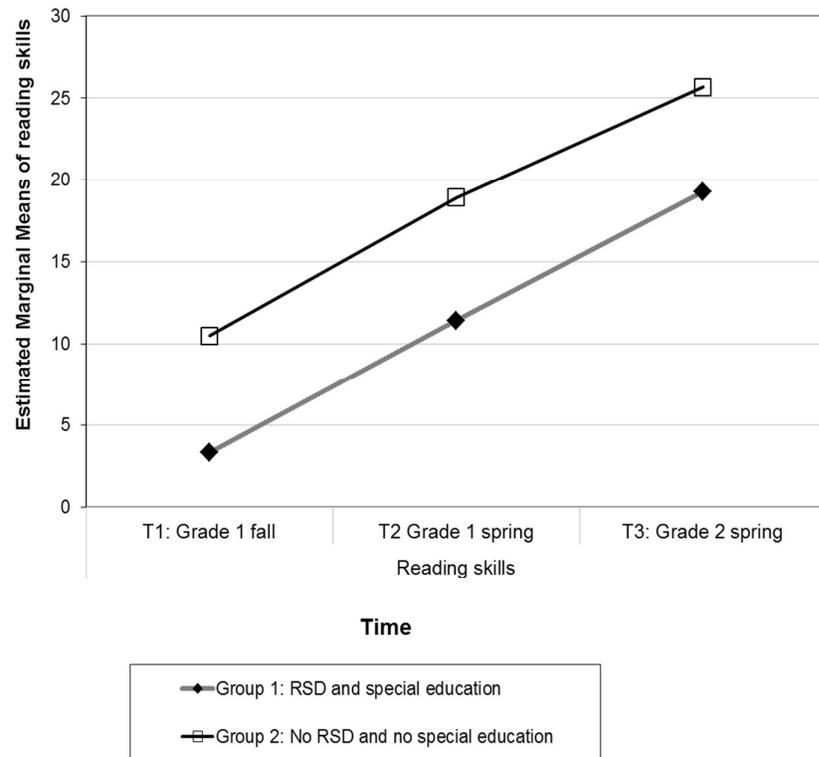


Figure 1(b).

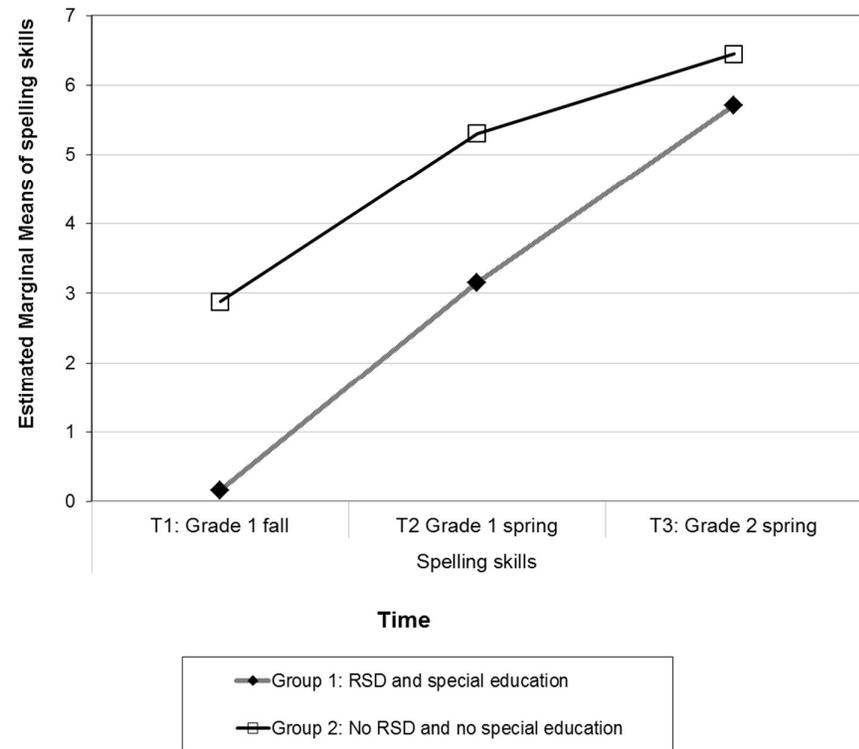


Figure 2.

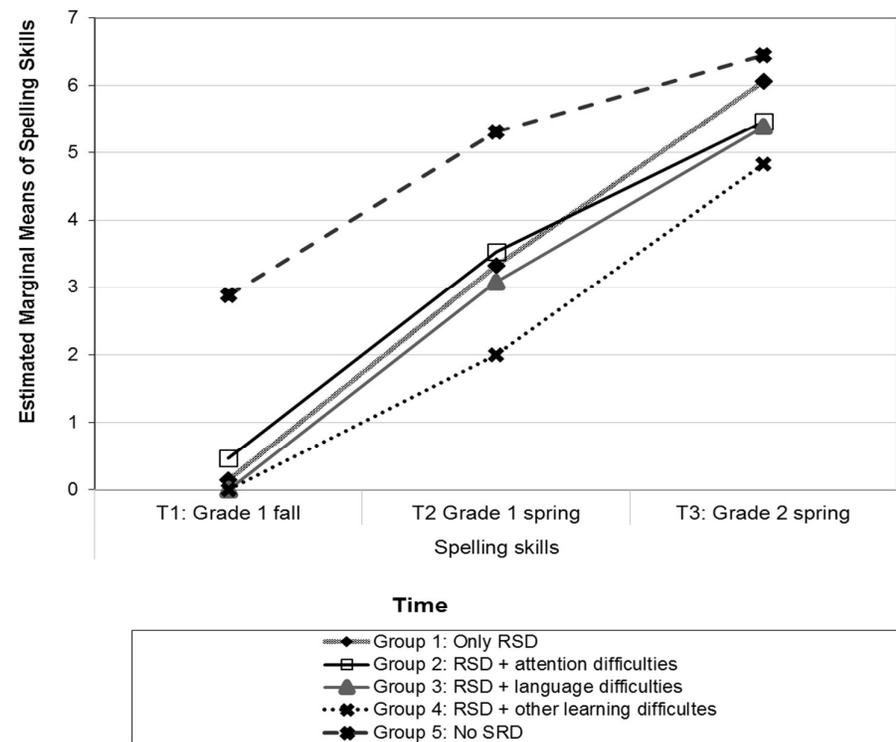
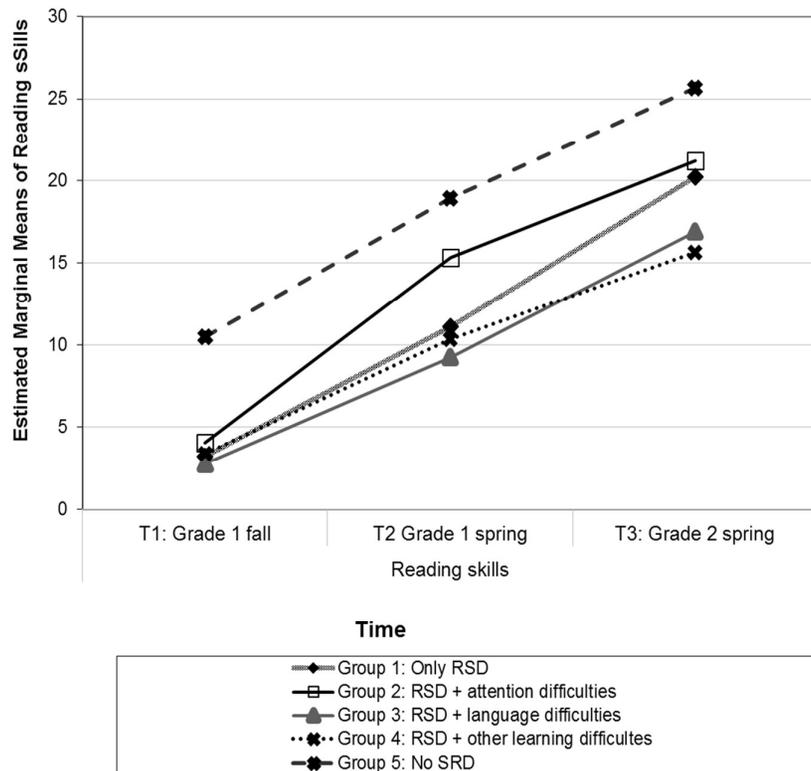


Figure 3.

Figure 3(a).

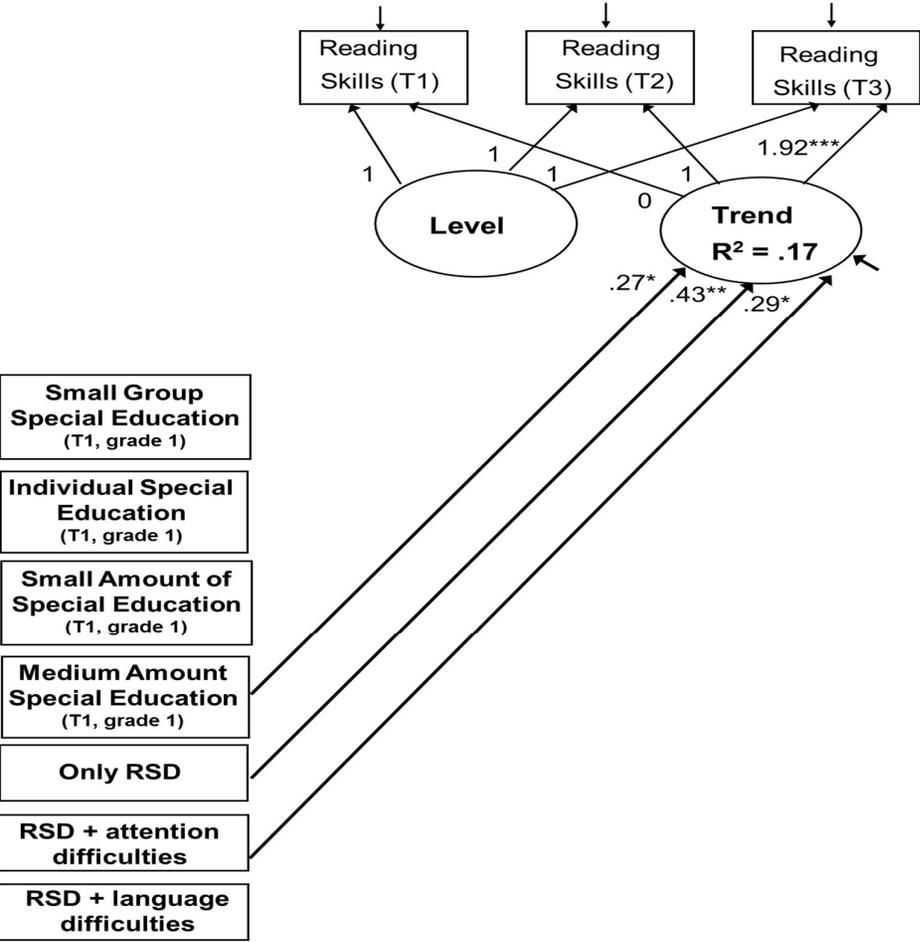


Figure 3(b).

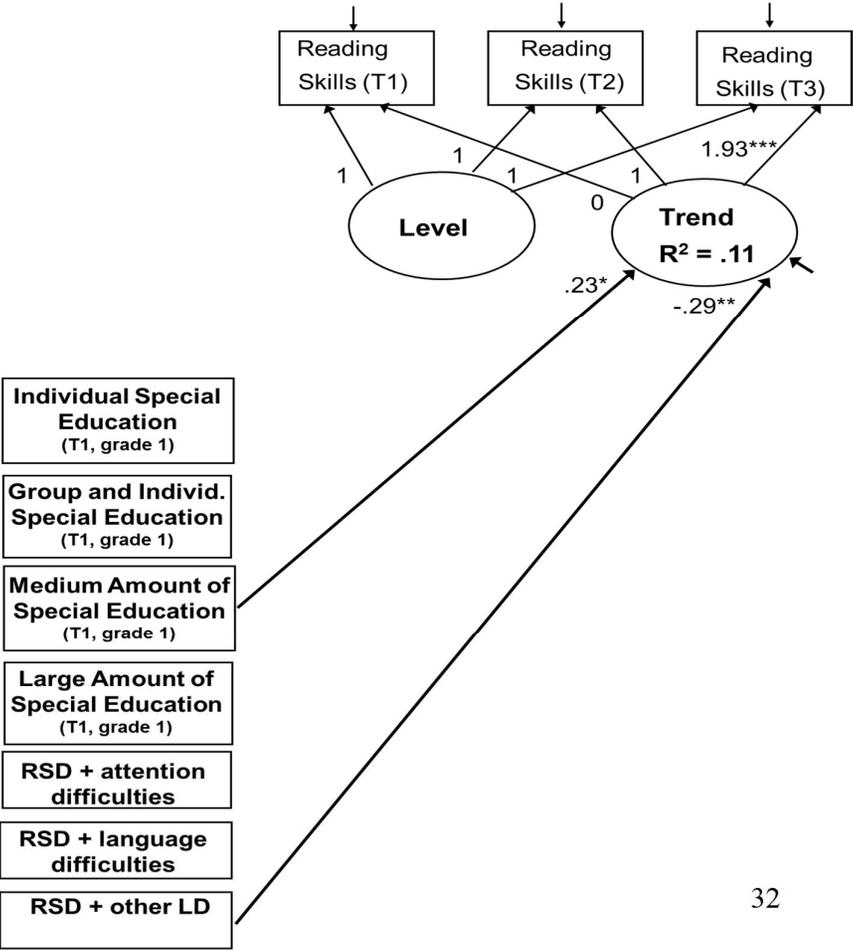


Figure 4.

Figure 4(a).

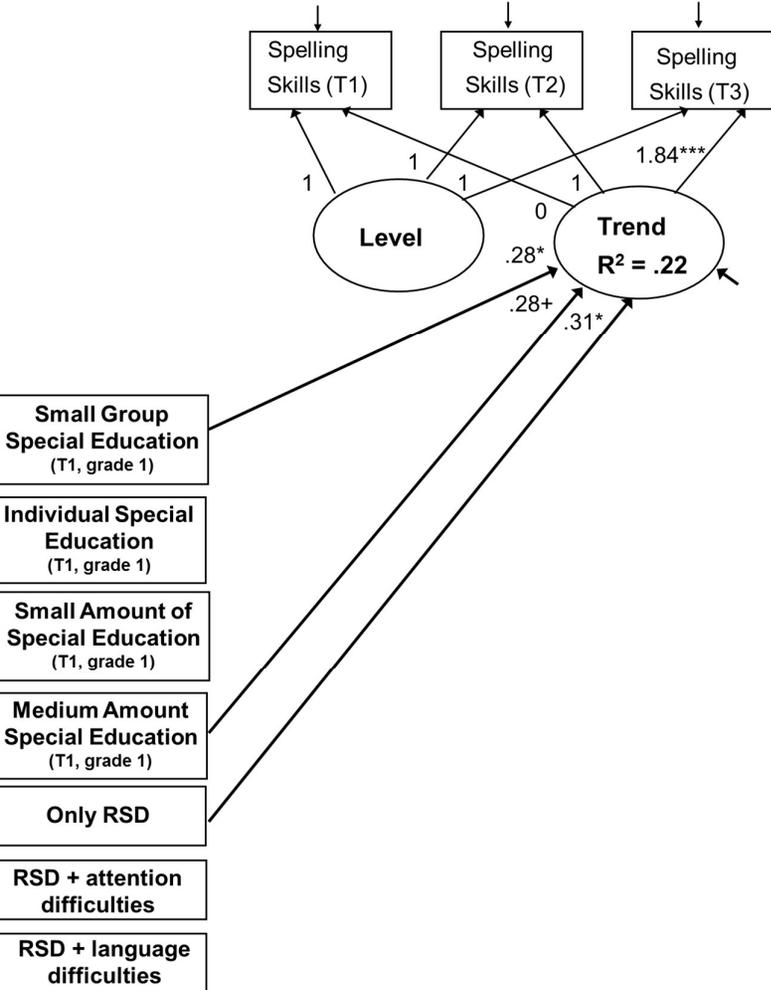


Figure 4(b).

