Do reading disabilities explain the increase of depressive symptoms in late adolescence?

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The present study examined how depressive symptoms change in late adolescence and whether reading disabilities (RD) affect the level or change of the symptoms. The sample consisted of 293 Finnish adolescents (150 girls, 143 boys; 58 with RD). Participants completed a screening test for reading and spelling skills in ninth grade (age 15), and a depression screening test three times during upper secondary education (ages 16–18). Longitudinal data were analysed using repeated measures ANOVA. Adolescents’ self-reported level of depressive symptoms increased in late adolescence \((p < 0.001)\). RD did not directly affect the level or change of depressive symptoms. Girls reported a greater increase in depressive symptoms than boys, and this interaction effect held especially for girls with RD.

Keywords: depressive symptoms; reading disabilities; adolescence; upper secondary education; follow-up data

Introduction

Several studies have suggested that reading and spelling problems have many secondary effects on a person’s psychological well-being, such as increased frustration and anxiety, low self-esteem, lack of confidence, or school stress (Carroll & Iles, 2006; Maughan, 1995; McNulty, 2003; Raskind, Goldberg, Higgins, & Herman, 1999; Riddick, Farmer, & Sterling, 1997). Furthermore, general learning disabilities (LD) have been seen as a risk factor for increased depressiveness (e.g., Maag & Reid, 2006), but there are relatively few studies that have explored the relationship between specific reading disabilities (RD) and depressiveness (for review, see Haverinen, 2008). Moreover, virtually all earlier studies have been conducted with participants reading in a non-transparent language such as English.

This study addresses several issues that have gained relatively little attention in previous studies on RD and depressive symptoms. First, RD are clearly defined and assessed. Second, the focus is shifted from childhood to adolescence. Third, students’ depressive symptoms have been followed up through one educational level. Fourth, the relationship between RD and depressive symptoms is examined in the context of a transparent language, in this case Finnish.

Depressive symptoms in the context of adolescent development

Depressiveness is a major psychological problem among young people: 11–18% of adolescents report at least a moderate level of depressive symptoms (Fröjd et al., 2008;...
Navarrete, 1999). Depressive symptoms include sad or depressed mood, loss of interest, feelings of worthlessness, helplessness, or hopelessness, low self-esteem, and sleep disorders. In adolescents, depression may also manifest as irritability, intense and rapid changes in mood, extended boredom, and restlessness (American Psychiatric Association, 1994).

Adolescence presents a challenging life stage: It entails considerable changes in the physical, social, and psychological domains of development. Adolescents are prone to stress elicited by these life changes, and thus adolescence marks an increase in the incidence and prevalence of several psychiatric disorders (Compas, 2004). Manifestation of depressive symptoms changes in adolescence. First, gender differences in experiencing depressive symptoms emerge, and during middle and late adolescence (ages 15–18), girls begin to report a higher level of symptoms than do boys (Hankin et al., 1998; Nolen-Hoeksema & Girgus, 1994; Petersen, Sarigiani, & Kennedy, 1991). Second, the average level of depressive symptoms increases during the same period and the increase is higher for girls than boys (Hankin et al., 1998; Petersen et al., 1991). Furthermore, adolescent psychopathology, including depression, shows moderate continuity into adulthood. A high level of self-reported psychological problems in adolescence predicts a high level of problems and a greater likelihood of psychiatric disorders in adulthood (Hofstra, Van der Ende, & Verhulst, 2001).

Reading disabilities

Reading disabilities refer to difficulties in learning to read and spell, and to problems in fluent and accurate reading and spelling performance in later school years (Lyon, Shaywitz, & Shaywitz, 2003; Vellutino, Fletcher, Snowling, & Scanlon, 2004). Approximately 8–10% of the population suffers from RD, but the amount of reading and spelling disabilities decreases from childhood to adult age. RD are more common among males than females (Berninger, Nielsen, Abbott, Wijsman, & Raskind, 2008; Liederman, Kantrowitz, & Flannery, 2005). Although RD may be compensated for to varying degrees after the initial school years, the difficulties of adolescents and adults with RD typically include slow speed of reading and phonetic spelling as well as poor written expression (Hatcher, Snowling, & Griffiths, 2002). These general patterns apply to RD in Finnish children and adolescents with the following specifications.

The Finnish language is highly transparent and regular in its grapheme-phoneme correspondence (i.e., orthographical depth), and consequently, most Finnish-speaking children learn to read and write (i.e., decode and recode) accurately even before school entry or during the first school year (Aro, 2006; Lyytinen et al., 2006). Whereas accurate word reading skills are fairly effortless to gain due to shallow orthography, the complicated and opaque morphology of Finnish requires rapid phonological decoding skills for fluency acquisition. Word reading cannot be excessively based on logographic strategies since recognising word roots is not sufficient: Depending on the word, it can have several thousands of derivational forms, and compound words are extremely common (e.g., Aro, 2004).

Thus, reading accuracy is not the main issue for adolescents reading in Finnish, but the speed of decoding and reading fluency remain as challenges for those children and youth who have a RD. Furthermore, fluency problems seem to sustain through school years. Finnish third graders with poor reading comprehension skills showed the poorest performance in comprehension within their school class still in the ninth grade (Holopainen, 2003). Furthermore, the gender difference in reading skills increases during school years (Lindeman, 1998), and at age 15 boys are remarkably over-represented among poor readers (13% of boys vs. 3% of girls; Sulkunen & Nissinen, 2012).
The most straightforward secondary consequences of RD are problems in reading comprehension and reduced reading experience (Lyon et al., 2003). These consequences may significantly impede or slow down acquiring knowledge through reading – a function essential for academic study. Moreover, RD are even more disadvantageous in the present-day society as obtaining information from printed and electronic sources plays a critical role in our lives, and not least in education (Zeffiro & Eden, 2000). In adolescence, the increasing demands, expectations, and requirements of learning and studying can be very stressful and challenging. In addition to problems in reading comprehension, other secondary effects, such as lack of confidence, low self-esteem, or increased levels of anxiety or depression, may affect school performance (Carroll & Iles, 2006; Riddick et al., 1997).

Reading disabilities and depressive symptoms

While the relationship between broadly defined LD and depressive symptoms has been studied extensively, studies on the effect of specific reading disabilities on depressiveness are scarce. Research reviews on the effect of LD on depressiveness show that young persons with LD report a higher level of depressive symptoms than do young persons without LD (Bender, Rosenkrans, & Crane, 1999; Bender & Wall, 1994; Greenham, 1999; Huntington & Bender, 1993; Maag & Reid, 2006). However, findings from studies of the effect of RD on depressive symptoms are not as straightforward as for LD.

While Arnold et al. (2005), Boetsch, Green, and Pennington (1996), and Willcutt and Pennington (2000) found that children and adolescents with RD reported more depressive symptoms than their peers without RD, other researchers have reported only a partial relationship between RD and depressive symptoms, for instance, in boys or a certain age group only. In their follow-up study of 7–14-year-old boys, Maughan, Rowe, Loeber, and Stouthamer-Loeber (2003) found that those with RD reported more depressive symptoms than those without RD only in the age group of 7–10, while there were no differences among 11–14-year-olds. Carroll, Maughan, Goodman, and Meltzer (2005) reported a difference in depressiveness between students with and without RD in 11–15-year-old boys but not for girls in a national sample of over ten thousand children in the UK. Furthermore, Heiervang, Stevenson, Lund, and Hugdahl (2001), as well as Miller, Hynd, and Miller (2005), studied the level of internalising problems in school-aged children, and children with or without RD reported similar levels of symptoms.

Much of the earlier research on the effects of RD on depressiveness has concentrated on children, and to a lesser extent on adolescents. Because the findings on the internalising problems of children are not straightforwardly applicable to adolescents, Carroll and Iles (2006) raised concerns about what happens to those students with RD who remain within the educational system after compulsory education. Also, all above-mentioned studies with the exception of Heiervang and others’ study were conducted in English-speaking contexts. Less is known about the relationship between RD and depressiveness in the context of more transparent languages. One further challenge in previous findings is that they are based on the use of cross-sectional data, which may not catch the full picture of depressive symptoms in the turbulent developmental stage of adolescence.

Thus, the purpose of this study is to explore how depressive symptoms of youth change in late adolescence, and whether RD in Finnish language affect the level of depressive symptoms or the changes in the level of depressive symptoms over a three-year period of follow-up in late adolescence. Specific research questions are as follows:

1. How stable is the level of depressive symptoms in upper secondary education students?
(2) Does the mean level of depressive symptoms change during upper secondary education?
(3) Do reading disabilities affect the level and change of depressive symptoms during upper secondary education?
(4) Does gender or secondary educational track affect the relationship between RD and depressive symptoms during upper secondary education?

Method

The context: Finnish educational system

The compulsory education in Finland consists of nine grades with a national curriculum, and normally school entry is at the age of seven. During the last year of compulsory education, at the age of 15–16 years, adolescents make their choice about further education, that is, upper secondary education. Finnish upper secondary education consists of two different educational tracks. Upper secondary academic education (hereafter referred to as the academic track) is the more academically oriented education, for which students are selected by their school grades. Institutions of upper secondary vocational education (hereafter the vocational track) offer an education that gives qualifications for various occupations, such as practical nurses, cooks, technicians, or drivers. Different upper secondary education institutions have different threshold levels of acceptance, for instance, according to the popularity of a specific school on the academic track, or to the popularity of study field on the vocational track. Thus, on both tracks there are students with higher and lower grade averages from basic education.

However, as a whole, the student population of the academic track is more academically oriented, and studying is academically more challenging than on the vocational track. The two tracks are somewhat different contexts for studying, and due to admission by grade average, the students are academically more homogeneous within one track than between the two tracks. The age cohort that was studied here completed compulsory education in spring 2004. Nationwide in Finland, 54% of the age cohort in question started its upper secondary education studies on the academic track, whereas 38% continued onto the vocational track (Statistics Finland, 2005).

Participants

This study was a part of the on-going longitudinal study Staying on Track of Learning (see Savolainen & Holopainen, 2008) which follows an age cohort of adolescents ($N = 515$) from a middle-sized town in eastern Finland. At the beginning of data gathering (Time 0), the participants were in the ninth grade of comprehensive school (chronological mean age = 15.69 years, SD = 0.37). Those who continued after compulsory education in upper secondary education in the same town were included in the follow-up for three subsequent years (Times 1–3). The tests were group-administered in the classroom during regular school hours early in the spring term of each school year. Thus, in practice only those students who were present at school on the day of assessment could be included in the sample. At the initiation of data collection, an informed consent was received from participants and their parents.

The sample of the present study was formed by those students who were measured for their depressive symptoms at all three times during the follow-up ($N = 293$; 56.9% of the original sample). In this sample, there were slightly more girls ($n = 150$; 51.2%) than boys ($n = 143$; 48.8%). Approximately two thirds of the students ($n = 201$; 68.6%) studied in upper
secondary academic education and one third in vocational education (n = 92; 31.4%), as reported at Time 2. These figures concur with the general data on how this age cohort continued its studies in the upper secondary education in Finland (Statistics Finland, 2005).

The majority of participants (n = 288; 98.3%) were Finnish-speaking, and 1.4% (n = 4) had some other mother tongue. One participant did not report his mother tongue. These figures agree well with the mother tongue ratios both nationally in Finland and in the region in question. The educational levels of students’ mothers and fathers as measured on a six-point scale were used as indicators of their socio-economic status (SES).

As the study was based on longitudinal data, there was some attrition of participants during the follow-up period. In order to analyse the attrition, the 293 participants included in the final analysis were compared to those 138 participants who were excluded from the analysis. The excluded participants had continued on to the upper secondary education and had data about depressive symptoms at Time 1, but did not have complete data on both Time 2 and Time 3. There were no differences in the proportion of students with or without RD between those who were included and those who were excluded from the final analysis, \( \chi^2(1, N = 431) = 2.69, p > 0.05 \). Students’ SES did not play a role in attrition either (mother’s educational level \( t(315) = 0.60, p > 0.05 \); father’s educational level, equal variances not assumed for the groups, \( t(170.17) = 1.25, p > 0.05 \)).

**Measures and procedure**

**Depressive symptoms**

Depressive symptoms were measured with a Finnish depression screening scale, the Depression Scale (DEPS; Salokangas, Stengård, & Poutanen, 1994). The DEPS scale has proven to be a valid screening instrument, in terms of both predicting and diagnosing depression in primary healthcare patients (Poutanen, Koivisto, Joukamaa, Mattila, & Salokangas, 2007). Even though the DEPS has been developed primarily for use in adult population, it has also been used in research for assessing depressive symptoms in late adolescence (e.g., Kiuru, Leskinen, Nurmi, & Salmela-Aro, 2011; Salmela-Aro, Savolainen, & Holopainen, 2009). The DEPS consists of 10 short statements, each of which describes a depressive symptom (e.g., I suffered from insomnia; I felt sad; I felt hopeless about the future). The participants were asked to consider whether they had experienced the symptom during the past month, and rate the frequency on a four-point scale (0 = not at all; 3 = very much). The scale was administered to the participants as part of a larger questionnaire three times during their upper secondary education, at approximately one-year intervals (Times 1–3).

The score of each DEPS measurement was coded into a mean variable with values varying between 0 and 3. Some participants had not completed the whole scale of 10 statements, and finally the mean score of depressive symptoms was calculated for all the participants who had data on at least six statements out of 10. Mean scores were rescaled into the original sum scale of 0–30. On this scale, the cut-off for the risk of clinical depression is at nine points (Salokangas et al., 1994). For the purposes of exploring the level of depressive symptoms, the mean variable was used as a continuous variable, and its reliability was 0.91 for every measurement point as indicated by Cronbach’s \( \alpha \).

**Reading disabilities**

The present study employed a concept of reading disabilities that does not imply any diagnosis, and still refers to deficits in the core processes of reading, such as word decoding,
reading fluency, and spelling skills. The participants were assessed for their reading and spelling skills at the end of the ninth grade (Time 0). The assessment method used was the Finnish dyslexia screening test for youth and adults (Holopainen, Kairaluoma, Nevala, Ahonen, & Aro, 2004), which is a standardised screening test for persons aged 15 or more. For the present study, the word reading and word spelling sub-tests were used. In one word reading sub-test, participants are supposed to mark with a vertical line as many spelling errors in 100 words as possible in 3.5 minutes. The other word reading sub-test is a word-chain test where participants are to separate the 100 words that have been written together in clusters of four words without spaces in-between, as many as possible in 1.5 minutes. In addition, spelling skills were measured with two sub-tests, in which participants are supposed to write down, from dictation, 20 words or pseudo-words, respectively.

To identify students with RD, the scores of the sub-tests were recoded into two dichotomous variables of reading and spelling according to the cut-off scores established in the standardisation study of the dyslexia screening test (see Holopainen et al., 2004). The cut-off used was the score that separated the lowest scoring 12% of the sample in the standardisation study. The participants scoring lower than the cut-off score in either word reading or spelling sub-tests were identified as having RD \( n = 58; 19.8\% \) of the present sample. Among students with RD, as expected, there were more males \( n = 40 \) than females \( n = 18 \) (\( \chi^2(1, N = 293) = 11.76, p < 0.01 \)), and the majority of students with RD were studying on the vocational track \( n = 40 \) vs. \( n = 18 \) on the academic track; \( \chi^2(1, N = 293) = 47.38, p < 0.01 \). Students with or without RD did not differ in terms of chronological age \( t(267) = 1.45, p > 0.05 \) or SES (mother’s educational level \( t(215) = 1.60, p > 0.05 \); father’s educational level \( t(204) = 1.39, p > 0.05 \).

Statistical analyses
The statistical analyses were conducted using the SPSS statistical package (version 17.0). In order to answer the first research question, the stability of depressive symptoms was explored by calculating Pearson’s correlation coefficients between measurement points of depressive symptoms separately for girls and boys. Subsequently, the longitudinal data were analysed by using the repeated measures analysis of variance (ANOVA). To answer the second and the third research question, we conducted a repeated measures ANOVA with time as a within-subjects factor (three measurements of depressive symptoms at Times 1–3) and RD as a between-subjects factor (time \( \times \) RD). In order to address the fourth research question, we added the two covariates, gender and educational track, to the basic design described above, thus creating two new designs: time \( \times \) RD \( \times \) gender, and time \( \times \) RD \( \times \) educational track. However, some of the cross-tabulated group sizes were fairly small (18 girls with RD, and 18 students of academic track with RD), and consequently the ANOVA results may be underpowered. Thus, to further analyse the effect of RD on depressive symptoms, we conducted two more repeated measures ANOVAs (time \( \times \) gender, and time \( \times \) educational track) separately for the groups of students with RD and without RD. The effect sizes were measured with partial eta squared (\( \eta^2_p \)), which indicates the proportion of variance in the dependent variable explained by the variance of the independent variable.

Results
Descriptive statistics
Means and standard deviations of depressive symptoms for the whole sample and different sub-groups of RD, gender, and educational track are shown in Table 1. The overall mean
The level of depressive symptoms varied between 5.33 and 7.20 points on the scale of 0–30 from Time 1 to Time 3. There were altogether four mean scores that pass the cut-off level of nine points indicating increased risk for depression: in the group of all girls of the sample at Time 3 (M = 9.05), in the sub-group of girls with RD at Time 2 (M = 9.04) and Time 3 (M = 10.56), and in the sub-group of students on the academic track with RD at Time 3 (M = 9.67). The significance of differences in the mean level of depressive symptoms in sub-groups of gender, educational track, and RD were also tested with independent samples t-test. Girls reported significantly more depressive symptoms than boys at all three measurement points, as did students on the academic track in comparison with the vocational track (see Table 1). The difference between RD groups was significant only at Time 1: Students without RD reported more depressive symptoms than did students with RD.

### Stability of depressive symptoms

The first research question tackled the stability of depressive symptoms of the participants during the follow-up period, and it was explored with correlation coefficients calculated separately for girls and boys (because of different levels of depressive symptoms of the two genders). Correlations between Times 1–2, Times 2–3, and Times 1–3 were 0.62, 0.60, and 0.55 for girls, and 0.34, 0.46, and 0.57 for boys, respectively. All the correlations were significant at the \( p < 0.01 \) level, and the coefficients indicate that the phenomenon is relatively stable from one year to another.

### Table 1. Depressive symptoms at ages 16–18 in sub-groups of RD, gender, and educational track.

| Group         | n\(^a\) | T1: Age 16 |          | T2: Age 17 |          | T3: Age 18 |          |
|---------------|---------|------------|----------|------------|----------|------------|----------|
|               |         | M  | SD    | M  | SD    | M  | SD    |
| Girls         | 150     | 6.66| 4.96  | 8.33| 6.16  | 9.05| 6.09  |
| With RD       | 18      | 5.51| 3.64  | 9.04| 4.50  | 10.56| 6.99  |
| Without RD    | 132     | 6.81| 5.11  | 8.23| 6.37  | 8.84| 5.96  |
| Boys          | 143     | 3.93| 4.54  | 4.64| 4.91  | 5.27| 5.51  |
| With RD       | 40      | 3.43| 4.37  | 4.13| 4.68  | 4.50| 5.10  |
| Without RD    | 103     | 4.12| 4.61  | 4.84| 5.01  | 5.56| 5.66  |
| t-test\(^b\) girls vs. boys |         |     |       | \( t = 4.91^{***} \) | \( t = 5.69^{***} \) | \( t = 5.56^{***} \) |
| Academic track| 201     | 6.18| 4.95  | 7.26| 5.94  | 7.96| 6.15  |
| With RD       | 18      | 5.40| 3.75  | 8.11| 5.00  | 9.67| 7.51  |
| Without RD    | 183     | 6.26| 5.05  | 7.18| 6.03  | 7.79| 6.00  |
| Vocational track| 92     | 3.45| 4.41  | 4.92| 5.43  | 5.54| 5.69  |
| With RD       | 40      | 3.48| 4.35  | 4.54| 4.84  | 4.90| 5.22  |
| Without RD    | 52      | 3.43| 4.50  | 5.21| 5.88  | 6.04| 6.04  |
| t-test academic vs. vocational track |         |     |       | \( t = 4.53^{***} \) | \( t = 3.22^{**} \) | \( t = 3.19^{**} \) |
| All with RD   | 58      | 4.08| 4.24  | 5.65| 5.12  | 6.38| 6.35  |
| All without RD| 235     | 5.63| 5.07  | 6.74| 6.04  | 7.40| 6.04  |
| t-test RD vs. non-RD |         | \( t = -2.16^{*} \) | \( t = -1.27, ns \) | \( t = -1.14, ns \) |
| All           | 293     | 5.33| 4.94  | 6.53| 5.88  | 7.20| 6.11  |

\(^a\) ns in the table are for the repeated measures analyses when depressive symptoms at Times 1–3 and RD were included.

\(^b\) Degrees of freedom for t-tests were 291 if not indicated otherwise.

\(^c\) t-value and degrees of freedom (282.2) when equal variances were not assumed (Levene’s test for equality \( p < 0.01 \)).
Change in depressive symptoms and the effect of RD

The change in depressive symptoms and the effect of RD were explored by a repeated measures ANOVA with depressive symptoms (measured at Times 1, 2, and 3) as the within-subjects factor, and RD as a between-subjects factor. Time had a significant within-subjects main effect (F(2, 582) = 14.42, p < 0.001, \( \eta^2_p = 0.047 \)), indicating an increase in the mean level of students’ depressive symptoms in late adolescence. According to the contrast comparisons, the trend of growth in depressive symptoms was linear (F(1, 291) = 29.80, p < 0.001). Furthermore, the level of depressive symptoms increased specifically between Times 1 and 2 (F(1, 291) = 12.28, p < 0.001), but the change between Times 2 and 3 was not statistically significant (F(1, 291) = 3.01, p = 0.084, ns). On the other hand, the between-subjects effect of RD was not statistically significant (F(1, 291) = 3.07, p = 0.081, ns), and there was no interaction between time and RD. Thus, RD alone did not affect the level or change of depressive symptoms during upper secondary education.

Effects of gender and secondary educational track on depressive symptoms

Further analysis was conducted to explore more in detail the factors related to the highest mean levels in the population under study: Girls with RD reported the highest means of depressive symptoms at Times 2 and 3, and the increase of symptoms seemed to be greater for them than in any other group. Results from the repeated measures ANOVAs with RD and gender or educational track as between-subjects factors replicate some of these cross-sectional mean differences over the three-year period (see Table 2).

The main effect of time remained significant even when the between-subject effects of gender or educational track were included in the model with RD. Gender and educational

Table 2. Main and interaction effects in repeated measures ANOVAs with RD and gender or educational track as between-subjects factors.

| Within-subjects | Between-subjects | df   | F        | p       | \( \eta^2_p \) |
|-----------------|------------------|------|----------|---------|----------------|
| Time            |                   | 2, 578 | 17.71 | 0.000*** | 0.058          |
| Time × RD       |                   | 2, 578 | 1.45 | 0.236 | 0.005          |
| Time × gender   |                   | 2, 578 | 4.26 | 0.015* | 0.015          |
| Time × RD × gender |              | 2, 578 | 2.19 | 0.113 | 0.008          |
| RD              | Gender           | 1, 289 | 0.09 | 0.768 | 0.000          |
| RD              | RD × gender      | 1, 289 | 28.37 | 0.000*** | 0.089          |
| Time × RD × track |         | 2, 578 | 17.19 | 0.000*** | 0.056          |
| Time × track    | RD               | 2, 578 | 0.43 | 0.650 | 0.001          |
| Time × RD × track |                | 2, 578 | 0.54 | 0.583 | 0.002          |
| RD              | Track            | 1, 289 | 2.72 | 0.067 | 0.009          |
| RD × track      |                  | 1, 289 | 13.73 | 0.000*** | 0.045          |

\*p < 0.05; \**p < 0.01; \***p < 0.001.

\( a \) ns in the analysis: students with RD 58, without RD 235, girls 150, boys 143, girls with RD 18, girls without RD 132, boys with RD 40, boys without RD 103.

\( b \) ns in the analysis: academic track 201, vocational track 92, students with RD on academic track 18, students with RD on vocational track 40, students without RD on academic track 183, students without RD on vocational track 52.
track also showed significant main effects on the level of depressive symptoms, explaining 9% and 5%, respectively, of the variance in the mean level of depressive symptoms. Girls reported higher levels of depressive symptoms than boys, and students on the academic track reported more symptoms than students on the vocational track of upper secondary education. Furthermore, gender and time of measurement had a significant interaction effect on depressive symptoms, and the linear contrast \( F(1, 289) = 8.37, p < 0.01 \) described this relationship better than the quadratic contrast. As seen in Figure 1, the level of depressive symptoms increased more for girls than boys.

The results of further repeated measures ANOVAs separately for students with RD and without RD replicated the main effects of time (within-subjects) as well as of gender and educational track (between-subjects). The interaction effect of time and gender was significant only in the group of students with RD \( F(2, 112) = 4.33, p < 0.05, \eta^2_p = 0.072 \).

**Discussion**

There is very little research on the relationship between specific reading disabilities and depressive symptoms in the adolescent population, and the results remain mixed. This study aimed at examining the relationship in a sample of upper secondary education students using a longitudinal approach to catch the changing phenomenon of depressiveness in adolescence. The main purposes of the study were to find out how the depressive symptoms of youth change in late adolescence and whether RD in Finnish language affect the level and change of depressive symptoms. Adolescents’ self-reported level of depressive symptoms increased during upper secondary education but RD did not have a direct effect on the level or change of depressive symptoms in late adolescence. However, girls experienced a greater increase in depressive symptoms than boys during the follow-up period, and this trend seemed to be especially true among girls with RD. The main findings of the present study will be discussed in the order of research questions and the statistical analyses conducted, proceeding from general findings to the more specific ones.

![Figure 1](image-url)  
**Figure 1.** Interaction between measurement time and gender: Changes in depressive symptoms between ages 16 and 18 for girls \((n = 150)\) and boys \((n = 143)\).
**Stability and change of depressive symptoms**

The level of depressive symptoms varied a lot among the adolescent population studied. However, adolescents’ self-reported depressive symptoms showed substantial stability across the three measurement points. This finding suggests that adolescent depressiveness is not only a transient or random expression of internalised problems. Especially, students who struggle with a stable, high level of depressive symptoms are at a high risk for continued problems since adolescent depression tends to recur (Marttunen, Haarasilta, Aalto-Setälä, & Pelkonen, 2003). One main purpose of the study was to examine how the depressive symptoms change in late adolescence. It was found that the mean level of symptoms increased during upper secondary education, specifically from the first to the second year of studies. This finding is consistent with earlier findings on the adolescent development of depression and other psychiatric disorders (see Compas, 2004; Hankin et al., 1998).

**Effect of reading disabilities on the level and change of depressive symptoms**

Another major research question concerned the effect of RD on the level and change of depressive symptoms in late adolescence. Positively, it was found that RD did not have a direct effect on the level nor the change in depressive symptoms during upper secondary education. Earlier findings concerning the effect of RD on the level of depressiveness are contradictory and will be discussed next. However, the relationship between RD and the change in depressive symptoms during adolescence has not been discussed in the research literature before.

Overall, students with RD were not at a greater risk for depression than students with normal reading ability. This finding contradicts some earlier research findings on the relationship between RD and depressive symptoms in children and youth (Arnold et al., 2005; Boetsch et al., 1996; Carroll et al., 2005; Maughan et al., 2003; Willcutt & Pennington, 2000), but is completely in line with the findings of Miller et al. (2005) and Heiervang et al. (2001) studies on internalising problems of children with or without RD. Possible reasons for the absence of the relationship between RD and depressiveness in the present study and the contradictory findings among different studies are discussed in the following.

First, we turn to issues such as adjustment, coping, and special educational support. RD tend to be developmental, and difficulties persist into adulthood showing large inter-individual variation in coping with the problems in these skills (Finucci, 1986; McNulty, 2003). Thus, it is probable that students with RD have already struggled with similar problems for years before adolescence. While earlier research has mostly covered school-aged children, it remains unclear what kind of coping processes are present during adolescence in students with RD (Carroll & Iles, 2006). It has been found that stress related to LD decreases with age from elementary school years to adulthood, and especially from adolescence to adulthood (Raskind et al., 1999). This may apply to the present study as well, as the participants were late adolescents moving toward early adulthood.

One reason for the decrease in the stress related to difficulties may be that these young people have had time to adapt to the situation and develop compensatory strategies and skills for coping with their reading problems. Moreover, in the Finnish context, the systematic special education provided during the compulsory years may successfully promote adaptation and coping processes for struggling students while maintaining their positive self-esteem in spite of the difficulties they experience. Children with reading
problems usually receive extensive support by special education teachers in general education during the first school years, and if the difficulties persist, support is offered throughout the compulsory education (e.g., Takala, Pirttimaa, & Törnänen, 2009). Yet another opportunity for adaptation is at the transition from compulsory education to upper secondary education: Adolescents have the choice between academic and vocational tracks, which offers a possibility for coping with one’s disability by choosing the track that better suits each person. In fact, almost two thirds of the students with RD in the present study chose the vocational track, which may be the less demanding option with respect to literacy skills.

Second, the contradictions between the findings of the present and earlier studies may be due to methodological issues. There are controversial perspectives on how to define and assess RD, specifically with respect to the discrepancy between performed and expected reading level (for discussion, see, Aaron, Joshi, Gooden, & Bentum, 2008; Lyon et al., 2003; Samuelsson, Lundberg, & Herkner, 2004). In the present study, RD refer to the low-performing tail in the continuum of reading and spelling skills. The difficulties were assessed with a group screening test and students with RD were identified using a cut-off criterion on reading performance, irrespective of one’s intellectual ability.

Among those earlier studies that found differences in depressiveness between individuals with RD and without RD, two used the discrepancy definition for RD (Boetsch et al., 1996; Willcutt & Pennington, 2000) and three used a definition based solely on reading achievement, similar to the definition used in the present study (Arnold et al., 2005; Carroll et al., 2005; Maughan et al., 2003). On the other hand, Miller et al. (2005) used both models for identifying children with RD (discrepancy between reading and IQ level, and cut-off criteria of reading achievement) and found no differences in internalising problems between the groups of school-aged children with or without RD. Furthermore, the findings of earlier studies are mostly based on cross-sectional data whereas the present study employed follow-up data to assess adolescents’ depressive symptoms longitudinally. As the level of depressive symptoms tend to increase during adolescence, it is necessary to take this development into account in the study design.

**Differences in depressive symptoms between genders and educational tracks**

Gender has proven to be a significant factor in differentiating between depressed and non-depressed young people. In our study, adolescent girls reported more depressive symptoms than boys, and the increase in the level of depressive symptoms was more pronounced for girls than boys. This is highly consistent with the findings of earlier studies (Hankin et al., 1998; Petersen et al., 1991). These findings may reflect general differences in the way females and males react to problems: females tend to internalise and males to externalise them.

More specifically, it seems that RD may play a role in the effect of gender on depressive symptoms: The interaction between time and gender was replicated only in the sub-group of students with RD but not in students without RD. However, this result must be interpreted with caution since the three-way interaction of time × gender × RD did not reach statistical significance in repeated measures ANOVA. This may be due to low statistical power since the number of observations in the sub-group of girls with RD was small (n = 18). It may be hypothesised that girls with RD encounter greater challenges in studies and are more prone to school stress, and thus react with symptoms characteristic of depression. Thus, although RD did not directly affect the development of depressive symptoms, they seem to moderate the effect of gender on depressive symptoms. Yet, this moderator effect should be further examined in a larger data set.
Furthermore, gender effects may be intertwined with the effect of educational track as girls form a majority among the student population on the academic track. In general, students on the academic track reported more depressive symptoms than students on the vocational track. It was the sub-groups of girls and students on the academic track that reported mean levels of depressive symptoms greater than the cut-off point for the depression scale used, and thus they seem to be at a great risk for depression.

The two educational tracks differ in terms of academic demands and challenges, the academic track being generally more challenging than the vocational track. In addition, how teaching and learning are approached differs between tracks. On one hand, the studies on academic track are more theoretically oriented and lead to a matriculation examination. Students are prepared for the final examination throughout the studies. On the other hand, vocational education offers more practical skills training and a wider range of ways to demonstrate one’s proficiency.

These differences may be reflected, for instance, in the level of school burnout symptoms on the two tracks. Students on the academic track experience more school burnout symptoms than students on the vocational track (e.g., Salmela-Aro, Kiuru, & Nurmi, 2008). Furthermore, as Salmela-Aro et al. (2009) concluded, school burnout predicts later depressive symptoms rather than vice versa in upper secondary education students. Thus, it is possible that increasing educational demands lead to exhaustion and other school burnout symptoms, and this contributes to an increase in depressive symptoms after compulsory education.

However, this does not necessarily mean that studying on the academic track per se makes adolescents depressed. Another kind of mechanism is also possible: Students who choose the academic track already have or are prone to have more depressive symptoms, and the students’ problems continue and increase during the secondary education years. This interpretation is supported by two findings. First, as girls are in the majority on the academic track, also the mean level of depressiveness is elevated in comparison with the vocational track. Second, Salmela-Aro et al. (2009) found that both depressive and school burnout symptoms are stable during the transition from compulsory to upper secondary education, and the stability is stronger in students who continue on to the academic track after compulsory schooling.

In conclusion, higher academic demands may partly explain the higher mean level of depressive symptoms among students on the academic track. As mentioned before, the choice of vocational track by students with RD may mitigate the effect of RD on depressive symptoms. Transition to vocational track would be adaptive in the sense that students with RD may choose themselves an environment that better fits their abilities and needs.

Practical implications
Considering the high prevalence of depressive symptoms in the adolescent population, it would be important to identify students at an elevated risk for depression as early as possible. In this early identification, practitioners who work long hours with adolescents, such as teachers, have a key role. Teachers may perceive changes in adolescents’ mood and schoolwork. In the light of the present and earlier studies, it is of great importance to better identify girls’ depressiveness, as their problems typically are manifested in a more internalised way than for boys. Furthermore, the role of academic demands set by secondary education studies should be reconsidered and evaluated from the viewpoint of adolescent development.
Late adolescence is a significant life stage in terms of taking a direction for one’s future. At the age of 19, the majority of the age group has completed upper secondary education and faces the transition to either higher education or working life. In the transition, students have many opportunities, but deciding on one’s future may also be challenging, particularly for individuals facing psychological problems such as depressive symptoms.

Limitations and future challenges
The present study utilised a longitudinal approach and the sample size was relatively large. However, at least four limitations need to be considered when interpreting the findings. First, the sample consisted of an age group in only one Finnish town, and thus caution should be exercised in generalising the results. Second, due to a fairly large sample size, it was possible to use only a screening test for identifying students with RD. This sets limitations for comparing the results with those previous studies that discuss individually tested and diagnosed dyslexia. Third, because of a natural cohort sample, the number of participants identified as having RD was relatively small for conducting statistical analyses more in-depth. Fourth, information about adolescents’ depressive symptoms was obtained solely from a self-reporting instrument. Self-report questionnaires often give, to some extent, a different picture of internalising problems than measurements made by other evaluators, such as parents, teachers, or peers (e.g., Pulkkinen, Kaprio, & Rose, 1999; Worchel et al., 1990).

The present study is based on a variable-oriented approach only, and in the future, it is necessary to broaden the viewpoint toward a more person-oriented approach, for instance, by exploring individual trajectories in the development of depressive symptoms. This way, it would be possible to better analyse who is at elevated risk for depression and which factors affect this development. This kind of information would help in early identification of students at risk for depression. Moreover, according to the present study, the level of depressive symptoms seems to be related more to factors other than RD. Thus, it may be relevant to explore further which school- or learning-related factors predict adolescent depressiveness or moderate the effect of RD on depressive symptoms, and this way try to find measures for early identification and intervention within the school context.

Conclusion
The findings of this study showed that adolescents’ self-reported level of depressive symptoms increased during the three years of post-compulsory secondary education. RD did not have a direct effect on the level or change of depressive symptoms during late adolescence. Girls were more depressed than boys, and students on the academic track of upper secondary education reported more symptoms than students on the vocational track. Furthermore, girls experienced a more pronounced increase in the level of depressive symptoms during upper secondary education, and this risk seemed to be especially true for girls with RD.

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