Reading comprehension level and development in native and language minority adolescent low achievers

Roles of linguistic and metacognitive knowledge and fluency

Trapman, M.; van Gelderen, A.; van Schooten, E.; Hulstijn, J.

DOI
10.1080/10573569.2016.1183541

Publication date
2017

Document Version
Final published version

Published in
Reading & Writing Quarterly

READING & WRITING QUARTERLY
2017, VOL. 33, NO. 3, 239–257
http://dx.doi.org/10.1080/10573569.2016.1183541

Routledge
Taylor & Francis Group

Reading Comprehension Level and Development in Native and Language Minority Adolescent Low Achievers: Roles of Linguistic and Metacognitive Knowledge and Fluency

Mirjam Trapman,[1] Amos van Gelderen,[2,3] Erik van Schooten,[2,3] and Jan Hulstijn[2]

[1]Saxion University of Applied Sciences, Enschede, The Netherlands; [2]University of Amsterdam, Amsterdam, The Netherlands; [3]Rotterdam University of Applied Sciences, Rotterdam, The Netherlands

ABSTRACT

In a longitudinal design, we measured 50 low-achieving adolescents' reading comprehension development from Grades 7 to 9. There were 24 native Dutch and 26 language minority students. In addition, we assessed the roles of (a) linguistic knowledge, (b) metacognitive knowledge, and (c) reading fluency in predicting both the level and growth of reading comprehension. Students improved in reading comprehension, the language minority students more so than the native Dutch students. We can explain the level of reading comprehension by linguistic and metacognitive knowledge, whereas most fluency-related predictors appeared to be of minor importance. We can hardly explain the growth in reading comprehension by the predictors. Nevertheless, we found a significant interaction indicating that growth in vocabulary explained growth in reading comprehension for the language minority students. This finding seems to suggest that language minority students profit from gains in vocabulary, more so than native students.

Substantial numbers of adolescents do not have sufficient reading skills at their disposal for the tasks they are faced with (Dutch Education Inspectorate, 2008; Hacquebord, Linthorst, Stellingwerf, & De Zeeuw, 2004; Kamil, 2003; Organisation for Economic Co-operation and Development, 2003; Perie, Grigg, & Donahue, 2005). Low-achieving adolescents especially experience problems in reading comprehension. According to several studies, these problems may explain why these students do not acquire levels of comprehension necessary for their school curriculum, future professions, and citizenship (Alliance for Excellent Education, 2006; Baumert et al., 2001; Dutch Education Inspectorate, 2008; Hofman, Spijkerboer, & Timmermans, 2009; Organisation for Economic Co-operation and Development, 2000). Although it is acknowledged that the lack of sufficient reading skills is a serious problem among low-achieving adolescents, studies focusing on explaining individual differences in reading comprehension *within* the population of low-achieving adolescents are scarce (Braze, Tabor, Shankweiler, & Mencl, 2007). Therefore, the current study focuses on low-achieving adolescents' reading comprehension, in particular by addressing the question of to what extent individual differences in reading comprehension can be explained by individual differences in students' knowledge and fluency.

Students from minority backgrounds make up a large proportion of low-achieving adolescents (e.g., Dagevos, Gijsberts, & van Praag, 2003), and they require specific attention in an examination of reading comprehension in this target population. Adolescent language minority students' linguistic abilities in the target language are often less developed than those of their native peers. For example, Spanish-speaking language minority adolescents in U.S. schools have lower oral proficiency in

CONTACT Mirjam Trapman m.j.w.trapman@saxion.nl Saxion University of Applied Sciences, P.O. Box 70000, 7500 KB, Enschede, The Netherlands.
Color versions of one or more of the figures in the article can be found online at www.tandfonline.com/urwl.

English than their native peers (Carlo et al., 2004; Proctor, Carlo, August, & Snow, 2005) and are reported to have lower reading comprehension (Kieffer, 2008; National Center for Education Statistics, 2009) and smaller English vocabularies (Biemiller & Slonim, 2001; Farnia & Geva, 2011; García, 1991; Jean & Geva, 2009; Lesaux & Kieffer, 2010). Similar differences between native and language minority students (third to sixth grade) were found in The Netherlands (Aarts & Verhoeven, 1999; Verhoeven, 1990).

In some studies, it was observed that although language minority adolescents performed worse on oral proficiency, reading comprehension, and vocabulary than their native peers, they performed at an equal level on other reading-related measures, such as decoding fluency (speed of word recognition). Crosson and Lesaux (2010) showed that although fifth-grade language minority students performed below the national norms for English reading comprehension, vocabulary, and listening comprehension, they performed close to or even above the national norms on measures of decoding (combined speed and accuracy) both on the word level and on the text level. This discrepancy between knowledge- and fluency-related reading measures roughly corresponds to findings by Trapman, Van Gelderen, Van Steensel, Van Schooten, & Hulstijin (2014) in low-achieving seventh-grade adolescents in The Netherlands. Native Dutch students outperformed language minority students on knowledge measures but not on several measures of fluency (speed of word recognition and sentence reading) in Dutch. Because language minority students lag behind their native peers with respect to linguistic knowledge, but not with respect to such measures of fluency, it has been suggested that language minority students' lower levels of reading comprehension can be attributed to their limited linguistic knowledge.

Explaining reading comprehension level

Comprehending text is a complex process, according to several models of reading comprehension. A reader applies linguistic knowledge, such as vocabulary and grammar, to build an appropriate mental representation of a text (Anderson & Freebody, 1979; Gough & Tunmer, 1986; Kintsch, 1998; Perfetti, Landi, & Oakhill, 2005). In addition, fluency in word recognition plays an important part in reading comprehension (LaBerge & Samuels, 1974; Perfetti, 1999). Correlational studies have shown that individual differences in reading comprehension in heterogeneous samples of adolescents are associated with differences in knowledge of vocabulary and grammar (e.g., Van Gelderen et al., 2004). However, the predictive power of word recognition fluency on adolescents' reading comprehension has been found to be small or negligible (Ouellette & Beers, 2010; Tilstra, McMaster, Van den Broek, Kendeou, & Rapp, 2009; Van Gelderen et al., 2004; Verhoeven & Van Leeuwe, 2008). This suggests that adolescents are efficient in their word recognition to such an extent that this process no longer constrains reading comprehension.

Between different adolescent populations the explanatory power of linguistic knowledge and fluency (speed in word and sentence reading) for reading comprehension may vary. For instance, in several studies the association between vocabulary knowledge and reading comprehension has been found to be stronger for students from immigrant backgrounds than for their native peers (Babayigit, 2014; Droop & Verhoeven, 2003; Geva & Farnia, 2012; Gottardo & Muller, 2009; Trapman et al., 2014). Furthermore, the explanatory power of fluency measures might differ between native and language minority students. The contribution of speeded word- and sentence-level reading fluency on Dutch reading comprehension was found to be larger in low-achieving native Dutch seventh-grade students than in their language minority peers (Trapman et al., 2014). Results from Buly and Valencia (2002), Jenkins, Fuchs, van den Broek, Espin, and Deno (2003), and Crosson and Lesaux (2010) point in the same direction. Buly and Valencia showed that poor reading comprehension was related to weaknesses in word-level decoding in a subsample of students who failed a fourth-grade reading proficiency test. It is interesting that language minority students were underrepresented in this subsample of readers. The amount of variance in reading comprehension explained by both word-level and text-level reading fluency (accuracy and speed) was found to be larger for native students (71% found in Jenkins et al., 2003) than language minority students (20% found in Crosson & Lesaux, 2010). In addition, the relationship

between text-level reading fluency (accuracy and speed) and reading comprehension in Crosson and Lesaux's study was moderated by an interaction. For language minority students with more developed oral skills (scoring at or above the 75th percentile on a listening comprehension test), text-level reading fluency and reading comprehension were strongly related. In contrast, for the language minority students with poorly developed oral skills (scoring at or below the 25th percentile), fluent decoding of text did not explain reading comprehension. This suggests that in order to profit from decoding fluency, language minority readers have to attain a certain level of linguistic knowledge. Language minority students who have mastered more linguistic knowledge may be better able to benefit from decoding fluency in text comprehension. In addition, as suggested by Alderson (1984) and Bernhardt (2000), language minority readers have to acquire a minimal level of linguistic knowledge to be able to use reading strategies for text comprehension (the so-called threshold hypothesis; for a review, see Hulstijn, 2015).

Apart from linguistic knowledge and decoding fluency, metacognitive knowledge is of importance for comprehending texts (Perfetti, Landi, & Oakhill, 2005). Metacognitive knowledge has been found to be related to reading comprehension in adolescents (Baker & Brown, 1984; Biancarosa & Snow, 2006; Van Gelderen et al., 2003; Van Gelderen, Schoonen, Stoel, De Glopper, & Hulstijn, 2007). We define *metacognitive knowledge* as knowledge about useful strategies for forming text representations and knowledge about text characteristics. Van Gelderen et al. (2007) conducted a longitudinal study into the role of several knowledge and fluency variables in reading comprehension among adolescents. The findings indicated that reading comprehension ability in Grade 8 was related to (a) metacognitive knowledge (knowledge of text characteristics and knowledge of reading and writing strategies), (b) linguistic knowledge (knowledge of grammar and vocabulary), and (c) speed of sentence processing. In subsequent years (Grades 9–10), metacognitive knowledge and vocabulary knowledge were still significantly related to reading comprehension level when previously measured reading comprehension (in Grades 8 and 9) was accounted for. These components thus had additional explanatory power for reading comprehension proficiency in Grades 9–10, which was not the case for fluency measures. In analyses by Van Gelderen et al. (2007), associations between knowledge and fluency variables and level of reading comprehension were investigated within the same grades. Therefore, the outcomes did not establish the explanatory power of *growth* in the predictors for *growth* in reading comprehension.

Explaining the development of reading comprehension

With respect to the question of whether *growth* in linguistic and metacognitive knowledge and fluency can explain *growth* in low-achieving adolescents' reading comprehension, the empirical literature has produced no findings hitherto. This question is particularly of interest in addition to the explanatory value of the knowledge and fluency components for low-achieving adolescents' reading comprehension proficiency at different moments in time because it pertains to the importance of growth in the components of reading comprehension in specific time periods. It is important to find out whether low-achieving adolescents' reading development may profit from growth in any of the mentioned components in more or less specified educational periods (e.g., from Grades 7 to 9).

Reading comprehension develops from the very first of reading experiences of young children. Some studies have been conducted in which English native speakers were followed from childhood to adolescence (Catts, Bridges, Little, & Tomblin, 2008; Francis, Shaywitz, Stuebing, Shaywitz, & Fletcher, 1996). These studies demonstrated that children's reading comprehension growth rates slow down over time. In a study conducted among 445 students (of whom 84% were Caucasian) in the United States, Francis et al. (1996) reported a plateau in reading comprehension growth near sixth grade. Catts et al. (2008) reported faster growth between second and fourth grades than in later grades (fourth to tenth grades).

In addition, different findings have been reported for patterns of growth in reading comprehension for native speakers and language minority speakers. Francis et al. (1996) reported that the pattern of growth of language minority students' (from Grade 1 to Grade 9) reading comprehension was rather

similar to that of native speakers. Mancilla-Martinez, Kieffer, Biancarosa, Christodoulou, and Snow (2011) also found that in a group of middle school language minority speakers, reading comprehension was still developing between fifth and seventh grades but that the growth rate slowed down over time, which is in line with the findings of Francis et al. and Catts et al. (2008). However, Kieffer (2008) found that the growth rate in language minority students (from kindergarten to Grade 5) slowed down more than that of their native peers, suggesting that the gap between these populations increases.

On the basis of previous findings we may expect growth in reading comprehension in an adolescent population, although one might expect that this growth would be smaller than for younger students. However, in the case of low-achieving students, it is not quite clear what to expect. On the one hand, there are predictions that poor adolescent readers have developed poor reading habits, because of a prolonged period of reading failure in their educational history (e.g., Stanovich, 1986), which would lead to arrested development of reading comprehension. On the other hand, for the group of low-achieving students we can expect more progress than in the more heterogeneous samples of the studies just reviewed, because these low-achieving students start at a lower level, and there is simply more to gain. Similarly, whether differences in growth rates exist between native and language minority low-achieving students is an open question. On the one hand, in accordance with Kieffer's (2008) results, language minority students may display less growth than their native peers. On the other hand, because their initial proficiency in reading comprehension is lower, there is more opportunity for growth.

In this study, we examine to what extent the reading comprehension proficiency of a sample of low-achieving students progresses in the first 3 years of secondary school (Grades 7–9). We also investigate the explanatory power of level and development in linguistic and metacognitive knowledge and fluency for level and development in reading comprehension proficiency. This analysis allows us not only to determine which components are important in explaining reading comprehension proficiency among low-achieving adolescents but also to determine how the components relate to *development* in reading comprehension from Grades 7 to 9. Furthermore, we investigate whether there are differences between native Dutch and language minority low-achieving adolescents in their development of reading comprehension and in the roles of (a) linguistic and metacognitive knowledge and (b) fluency.

Research questions

1. Do low-achieving language minority students and native Dutch students in Grades 7 to 9 differ in their levels of reading comprehension proficiency, linguistic and metacognitive knowledge, and fluency?
2. Does the reading comprehension proficiency of adolescent low achievers improve from Grades 7 to 9, and do native Dutch and language minority students develop similarly?
3. To what extent is the reading comprehension *level* and *development* from Grades 7 to 9 of adolescent low achievers related to level and development of component skills: (a) linguistic and metacognitive knowledge and (b) fluency?
4. To what extent are these relations different for native Dutch and language minority students?

Note that whereas Research Questions 3 and 4 form the main questions, Research Questions 1 and 2 are preliminary to the main research questions of this study.

Method

Participants

Eleven schools for prevocational secondary education in urban areas in the western part of The Netherlands volunteered to participate in this study. In The Netherlands, students in the lowest prevocational track are among the 30% lowest achieving on a national school aptitude test of reading, language, and mathematical skills. This group of students also contains the poorest readers in the population. A detailed description of the language curriculum that these students received was given by De Milliano (2013).

We recruited students from seventh-grade classes, which is the first year of secondary education in The Netherlands. For student selection, two types of data were used. First, information from school records enabled us to select a sample of students not suffering from diagnosed learning or behavioral disorders and to check their national school aptitude test scores.[1] Furthermore, immigrant students who had studied in a Dutch primary school for fewer than 3 years were excluded in order to keep the immigrant sample homogeneous with respect to previous schooling experiences and related opportunities for acquisition of Dutch.

Second, data on the ethnic and linguistic backgrounds of the students (country of birth of students and parents, languages spoken at home, and frequency of use of these languages in contacts at home) were obtained by means of a questionnaire that was filled out by the students themselves. Students were selected for the native Dutch group if both parents had been born in The Netherlands,[2] if they were native speakers of Dutch, and if Dutch was their dominant home language (i.e., most language contacts within the home had to be in Dutch). Students were selected for the language minority group if both parents had been born outside The Netherlands and if students spoke another language than Dutch with their parents for half of the time or more. This decision was based on information about the language spoken in interactions with the father and/or mother. Most students in the language minority group (21 students) had learned to read and write in the other home language to some extent. However, the first language they had learned to read and write in was Dutch.

Most of the 26 language minority students had Moroccan ($n = 9$) or Turkish ($n = 7$) backgrounds; the remainder had Surinamese ($n = 3$), Antillean ($n = 3$), Cape Verdian ($n = 3$), and Chinese ($n = 1$) backgrounds.[3] All but five of the language minority students had been born in The Netherlands; most students were thus second-generation immigrants.

In the first year of the longitudinal study, the sample consisted of 63 students (36 boys and 27 girls) from 10 classes in nine different schools, of whom 32 students had a native Dutch background. For 50 of these 63 students (in Grade 9 divided over 11 schools) we had complete data in Grades 7, 8, and 9.[4] For our analyses we chose to investigate only the students with complete data: 28 boys and 22 girls, of whom 24 were of a native Dutch and 26 a language minority background. The two groups (i.e., the native Dutch and the language minority students) did not differ significantly in nonverbal cognitive ability as measured by Raven's Standard Progressive Matrices.

Instruments

We measured reading comprehension and its components receptive vocabulary, grammatical knowledge, metacognitive knowledge, word recognition efficiency, word recognition speed, and sentence verification speed. All assessments were in Dutch.

Reading comprehension

Reading comprehension was assessed using the reading part of the SALSA Literacy Test (SALT; Van Steensel, Oostdam, & Van Gelderen, 2013). The test consists of nine assignments covering different genres from several media types. The topics of the texts were selected on the basis of their relevance for the students' sociocultural and educational environment. The test consisted of 65 items (57

[1] In some cases these scores were not available. In those cases we used scores from IQ tests to determine whether students fit within the criteria for the lowest track of prevocational education.

[2] We allowed two exceptions to this rule. Two native students had one parent who had been born outside The Netherlands. We decided to include these students after we verified that Dutch was the only language spoken at home for these students.

[3] In The Netherlands, most language minority secondary school students are second-generation Turkish and Moroccan immigrants. In general, their families have low socioeconomic status, low levels of education, and low levels of professional training (Tesser & Iedema, 2001). At home, the language spoken by their parents is often the ethnic group language, although Dutch may be used alongside this home language. Outside the domestic environment (e.g., at school), Dutch is the language that is primarily used.

[4] Thirteen students dropped out of the study for different reasons (chronic illness, stuttering, change of school, and the burden of the requirements of research participation). *t* tests showed no significant difference between the students who dropped out and the remaining students in our sample on any of the measured variables.

multiple choice and eight open ended). The test items were based on the distinction between lower, intermediate, and higher levels of understanding, labeled *retrieving* (21 items), *interpreting* (26 items), and *reflecting* (18 items), respectively. Cronbach's alphas for this test were .77 (Grade 7), .82 (Grade 8), and .82 (Grade 9) for these 50 students. Students were given sufficient time to complete the test.

Receptive vocabulary

This paper-and-pencil test, based on the receptive vocabulary test of Van Gelderen et al. (2003), consisted of 73 multiple-choice questions testing knowledge of the meanings of nouns, verbs, adjectives, and adverbs belonging to the 23,000 words in a dictionary for junior high school students (see Hazenberg & Hulstijn, 1996, for details). Each item consisted of a neutral carrier sentence with a target word in bold print. The students had to choose between four options, one of which represented a correct synonym of the target word. Cronbach's alpha coefficients for this test were .85 (Grade 7), .88 (Grade 8), and .86 (Grade 9).

Grammatical knowledge

In this 50-item paper-and-pencil test, based on the grammatical knowledge test of Van Gelderen et al. (2003), students completed sentences containing a word gap with the correct form of verbs, adjectives, anaphoric references, comparatives, or articles. Students had to put words or phrases in the correct order, taking into account the correct form for number, tense, aspect, and agreement. There were both fill-in-the-blank and multiple-choice items on this test. Cronbach's alphas for this test were .72 (Grade 7), .81 (Grade 8), and .66 (Grade 9).

Metacognitive knowledge

Metacognitive knowledge was measured by means of a paper-and-pencil questionnaire consisting of statements about text characteristics and about reading and writing strategies. The questionnaire was based on the metacognitive knowledge test used by Van Gelderen et al. (2003). Items consisted of correct or incorrect statements. Students had to check whether they agreed or disagreed with a statement. The test consisted of 45 items, and Cronbach's alpha coefficients were .50 (Grade 7), .61 (Grade 8), and .55 (Grade 9). These relatively low reliabilities were probably caused by the difficulty of the task for our population (the average scores being 28, 28, and 30, with a guessing score of 23).

Word recognition efficiency

To test the students' word recognition efficiency we used a subtest of the so-called Three Minutes Test (*Drie-Minuten-Toets;* Verhoeven, 1995), a standardized test frequently used in The Netherlands. This subtest consists of a list of 120 multisyllabic words. The words increase in length and difficulty as the students proceed through the test. However, all are high-frequency words assumed to be familiar to the students. Students are asked to read aloud as many words as they can in 1 min. The score on the task is the number of words that a student reads aloud correctly; it thus measures a combination of speed and accuracy.

Speed of written word recognition

Speed of word recognition was tested by means of a computer-administered lexical decision task identical in format to the one used by Van Gelderen et al. (2003) and Van Gelderen et al. (2007). The stimuli (a selection from the test used by Van Gelderen et al., 2003; 2007) consisted of 119 letter strings (3–8 letters), 59 of which were existing (well-known) words; the remainder consisted of phonologically correct pseudowords. Students were asked to decide as quickly as possible whether the stimulus was an existing word and press the corresponding key on the keyboard. Responses were automatically coded in terms of both accuracy and latencies (from the onset). The mean accuracy was 94%. The latency measure was computed using only correct responses to existing words (hits). Extremely fast or extremely slow responses were coded as missing values, following the scoring instructions

described for this test in Van Gelderen et al. (2004). Cronbach's alphas for this speed test were .82 (Grade 7), .89 (Grade 8), and .81 (Grade 9).

Speed of sentence verification

Speed of sentence verification was measured using the same lexical decision paradigm as described for word recognition speed. This computer-administered task was identical to the test used by Van Gelderen et al. (2003) and Van Gelderen et al. (2007). All words of a sentence were displayed at once on the screen. Students decided as quickly as possible whether the sentence made sense by pressing one of two keys. Half of the 72 items made sense, and the other half did not make sense. The sentences referred to common knowledge that Grade 7 students can be assumed to have. An example of a sensible item is "The man went to bed because he wanted to sleep." An example of a nonsensical item is "Most bicycles have seven wheels." The average accuracy on the true assertions was 98%. Responses were automatically coded in terms of both accuracy and latencies. Latencies were measured from the onset of the stimulus. The latency measure was computed only on the basis of correct responses to the 36 true assertions (hits). Extremely fast or extremely slow responses were coded as missing values, following the scoring instructions described for this test in Van Gelderen et al. (2004). Cronbach's alphas for this speed test were .95 (Grade 7), .95 (Grade 8), and .96 (Grade 9).

Procedure

All tests were administered three times: in Grade 7 (February–June 2008), in Grade 8 (January–May 2009), and in Grade 9 (January–April 2010). It was necessary to use such wide windows for testing because this study was combined with other studies[5] that required students' participation and school schedules did not allow for a less distributed administration. In order to prevent large differences in time intervals for each instrument, we took care to keep the order of administration the same from year to year. The word recognition efficiency test was administered individually, the reading comprehension test was administered to whole classes in three sessions of 45 min, and the other tests were administered to small groups of three or four students in three or four sessions of 45 min. We scheduled no more than two sessions per day in order to minimize test weariness. All sessions were introduced by a researcher or a trained test assistant. The reading comprehension classroom sessions were also attended by a teacher.

Analyses

To answer the first research question, we tested by means of (multilevel) regression analyses whether language background significantly explained reading comprehension or any of the predictors. We checked whether these analyses should include a school level or whether a unilevel analysis would suffice by testing whether models including the school level explained significant variance for each predictor and reading comprehension. It was necessary to perform multilevel regression analyses for four of the 21 comparisons (see Table 1). Therefore, we included the school level in these four analyses.

To answer the second research question, we first checked for school-level variance in reading comprehension development. School level turned out not to be necessary for explaining reading development. Therefore, a repeated measures analysis of variance (ANOVA) was used to estimate reading comprehension development. In order to investigate differences in development between native Dutch and language minority students, we tested an interaction between grade and language background using a factorial repeated measures ANOVA.

[5]The Study into Adolescent Literacy of Students At-Risk project consisted of three smaller projects in addition to the present one. The first was directed at the students' educational context (De Milliano, 2013). The second was directed at their home literacy (Van Kruistum, 2013). The third involved the longitudinal measurement of reading comprehension and writing abilities (Van Steensel et al., 2013).

Table 1. Explained variance (R^2) of language background on students' ($N = 50$) performance on reading comprehension and the six predictors.

Variable	Grade 7	Grade 8	Grade 9
Reading comprehension	.13*[a]		
Receptive vocabulary	.25***	.23***	.35***
Grammatical knowledge	.24***[a]	.14**[a]	.14**[a]
Metacognitive knowledge	.13*	.09*	
Word recognition efficiency			
Word recognition speed (ms)			
Sentence verification speed (ms)	.12*	.16*	.22*

[a]Includes school level.
*$p < .05$. **$p < .01$. ***$p < .001$.

To answer the third research question, we checked whether the analysis should include a school level for multilevel regression analysis of growth in reading comprehension. Including a school level did not significantly improve model fit. Therefore, multilevel models were fit with a *student* level (variance between students) and an *occasion* level (variance within students between times of measurement; cf. Rasbash et al., 2000). In these analyses the three repeated measures for the dependent variable and three repeated measures for each of the predictors were nested within students. For appropriate estimates of student- and occasion-level variance, time of measurement was included in the model as a predictor as suggested by Hox (2010).

To test whether the relation between reading comprehension and the components of reading comprehension differ for native Dutch and language minority students (the fourth research question), we estimated interaction effects between language background and each of the repeatedly measured components. For these analyses interaction variables were created consisting of the product of language background (language minority or not) and the continuous variables measuring the six components; they were included (one by one) as predictors.

Results

Means and standard deviations for reading comprehension and the predictors are presented for each occasion (Grades 7–9) in Table A-1 in the Appendix. To answer Research Question 1, we performed regression analyses with language background as a predictor. Table 1 presents the results of these regression analyses. These analyses showed that in Grade 7, native Dutch and language minority students differed significantly on reading comprehension, grammatical knowledge, receptive vocabulary, metacognitive knowledge, and sentence verification speed. On all aforementioned variables native Dutch students performed better than language minority students. No significant differences were found in Grade 7 for word recognition efficiency or word recognition speed. In Grade 8, an almost similar pattern of results was obtained. The only difference with the results for Grade 7 was that reading comprehension did not differ significantly between native Dutch and language minority students. In Grade 9, native Dutch and language minority students did not differ significantly in reading comprehension, word recognition efficiency, word recognition speed, or metacognitive knowledge, indicating that differences between both groups diminished over time from Grade 7 to Grade 9.

The repeated measures ANOVAs performed to answer the second research question showed a general significant improvement in reading comprehension, $F(2, 96) = 38.35$, $p < .001$, $\eta_p^2 = .44$. Given that a partial eta-squared value of .14 is considered a large effect (Cohen, 1988), this effect size can be called very large. The improvement was significant for both intervals (Grades 7 to 8, $p < .01$; Grades 8 to 9, $p < .001$, with Bonferroni adjustment). Also, a significant interaction effect was obtained between language background and growth in reading comprehension, $F(2, 96) = 3.66$, $p < .05$, $\eta_p^2 = .07$. This means that language minority students' improvement in reading comprehension was greater than that of native Dutch students (see Figure 1).

To answer the third research question, we used multilevel growth models with a student level and an occasion level. Results are presented in Table 2. Whereas Model 0 included only time of measurement,

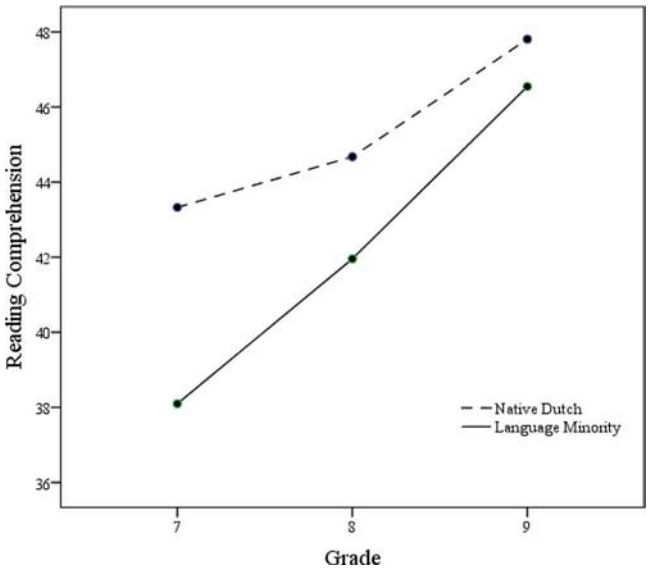

Figure 1. Mean reading comprehension scores for native Dutch and language minority students from Grades 7 to 9.

Model 1 also included language background. In Models 2a to 2f predictors were included one at a time, and in Model 2 g all predictors were included simultaneously. Models 2a to 2 g were each compared to Model 1. Predictors explained different proportions of student and occasion variance. The amount of explained student variance (see "Explained variance" in the upper half of Table 2) indicates to what extent predictors explained the differences between students in reading comprehension proficiency level. The amount of explained occasion variance indicates to what extent differences in growth of the predictors (repeatedly measured) explained differences in reading comprehension development (repeatedly measured). Table 2 shows that in Model 0 (no predictors), 75.6% of the variance in reading comprehension pertained to the level of students, whereas the remaining variance (24.4%) pertained to the level of occasion (development independent of between-student variance). In addition, Table 2 shows that in Model 1, level of and growth in reading comprehension were not significantly predicted by language background. Four of the six regression coefficients for the repeatedly measured predictors of reading comprehension (see Models 2a–2f) were significant. These were receptive vocabulary, grammatical knowledge, metacognitive knowledge, and word recognition speed. The proportions of explained between-student variance in reading comprehension (student level) ranged from 0% (word recognition efficiency, Model 2d) to 39.6% (receptive vocabulary, Model 2a). The proportions of explained variance in reading at the occasion level were nihil or very low (metacognitive knowledge: 2.8%, word recognition speed: 3.5%). The main predictors of *level* of reading comprehension appeared to be receptive vocabulary (39.6%) and grammatical knowledge (31.5%). The contribution of metacognitive knowledge to the prediction of reading comprehension level was also substantial (15.2%), whereas word recognition speed had a quite low predictive power (4.0%). Word recognition efficiency and sentence verification speed did not significantly predict reading comprehension (level and growth).

The last column of Table 2 contains a model (2 g) in which all predictors were included. This model shows that in the multiple regression five variables still made significant contributions to reading comprehension proficiency (total explained variance = 45.1%). This means that all predictors combined explained almost half of the variance in reading comprehension level and growth. Of the total variance in student *level,* 60.4% was explained by the predictors. Of the total variance in reading comprehension *growth,* none was explained by all predictors together. Although some of the predictors in the combined model (Model 2 g) did not exhibit significant contributions, this does not mean that they are

Table 2. Results of multilevel analyses.

Model characteristics	Variance components	0	1	2a	2b	2c	2d	2e	2f	2 g
Variance	Student	44.5 (9.9)	42.2 (9.4)	25.5 (6.2)	28.9 (6.8)	35.8 (8.1)	42.8 (9.5)	40.5 (9.1)	39.3 (8.8)	16.7 (4.3)
	Occasion	14.4 (2.0)	14.4 (2.0)	15.4 (2.2)	15.0 (2.1)	14.0 (2.0)	14.3 (2.0)	13.9 (2.0)	14.7 (2.1)	14.4 (2.1)
	Total	58.9	56.6	40.9	43.9	49.8	57.1	54.4	54.0	31.1
Distribution of variance	Student	75.6%	74.6%	62.3%	65.8%	71.9%	75.0%	74.4%	72.8%	53.7%
	Occasion	24.4%	25.4%	37.7%	34.2%	28.1%	25.0%	25.6%	27.2%	46.3%
Explained variance	Student		5.2%	39.6%	31.5%	15.2%		4.0%	6.9%	60.4%
	Occasion	42.6%				2.8%	0.7%	3.5%		
	Total	10.9%	3.9%	27.7%	22.4%	12.0%		3.9%	4.6%	45.1%
Intercept		40.4 (1.1)	42.0 (1.4)	23.7 (4.3)	28.1 (3.9)	32.0 (3.3)	43.2 (4.4)	49.2 (3.5)	45.9 (3.9)	20.7 (7.6)
Main effects		Coef (*SE*)	Coef (*SE*)	Coef (*SE*)	Coef (*SE*)	Coef (*SE*)	Coef (*SE*)	Coef (*SE*)	Coef (*SE*)	Coef (*SE*)
Time of measurement		3.3*** (0.4)	3.3*** (0.4)	2.4*** (0.4)	2.8*** (0.4)	2.9*** (0.4)	3.4*** (0.5)	2.9*** (0.4)	2.9*** (0.5)	1.3* (0.6)
Language background			−3.1 (1.9)	−0.10 (1.7)	−1.3 (1.7)	−2.2 (1.8)	−3.1 (2.0)	−3.0 (1.9)	−2.5 (1.9)	1.8 (1.5)
Receptive vocabulary				0.34*** (0.08)						0.3*** (0.07)
Grammatical knowledge					0.39*** (0.10)					0.3* (0.1)
Metacognitive knowledge						0.35*** (0.11)				0.3** (0.1)
Word recognition efficiency							−0.014 (0.049)			−0.03 (0.04)
Word recognition (ms)								−0.008* (0.004)		−0.007 (0.004)
Sentence verification (ms)									−0.001 (0.001)	−0.001 (0.001)
Fit (−2×log likelihood)		941.9	939.5	925.0	928.0	929.3	939.4	934.5	938.5	901.0
Difference −2×log likelihood			2.4	14.5***	11.5***	10.2**	0.1	5.0*	1.0	38.5***
Difference *df*			1	1	1	1	1	1	1	6

Note. The dependent variable is reading comprehension (repeatedly measured). Predictors are the six components (repeated measurements of knowledge and fluency), time of measurement, and language background. There were 50 students and three measurement times. Coef = coefficient.
*$p < .05$. **$p < .01$. ***$p < .001$.

Table 3. Results of multilevel analyses.

Model characteristics	Variance components	0	1	2	3
Variance	Student	44.5 (9.9)	42.2 (9.4)	25.5 (6.2)	24.9 (5.9)
	Occasion	14.4 (2.0)	14.4 (2.0)	15.4 (2.2)	12.9 (1.8)
	Total	58.9	56.6	40.9	37.8
Distribution of variance	Student	75.6%	74.6%	62.3%	65.9%
	Occasion	24.4%	25.4%	37.7%	34.1%
Explained variance	Student		5.2%	39.6%	2.4%
	Occasion				16.2%
	Total		3.9%	27.7%	7.6%
Intercept		40.4 (1.1)	42.0 (1.4)	23.7 (4.3)	42.4 (5.5)
Main effects		Coef (*SE*)	Coef (*SE*)	Coef (*SE*)	Coef (*SE*)
Time of measurement		3.3*** (0.4)	3.3*** (0.4)	2.4*** (0.4)	2.5*** (0.4)
Language background			−3.1 (1.9)	−0.1 (1.7)	−31.1*** (6.8)
Receptive vocabulary				0.34*** (0.08)	0.01 (0.10)
Language Background × Receptive Vocabulary					0.58*** (0,13)
Fit (−2×log likelihood)		941.9	939.5	925.0	904.9
Difference −2×log likelihood		57.7***	2.4	14.5***	21.1***
Difference *df*		1	1	1	1

Note. The dependent variable is reading comprehension (repeatedly measured). Predictors are time of measurement, language background, receptive vocabulary (repeatedly measured), and the interaction variable created by receptive vocabulary and language background. There were 50 students and three measurement times. Coef = coefficient.
***$p < .001$.

unimportant for the explanation. Their predictive power, however, was limited in this model because of intercorrelations between the seven predictors. Nevertheless, it seems that the knowledge variables (receptive vocabulary, metacognitive knowledge, and grammatical knowledge) had quite strong predictive power in comparison to the other predictors. On the basis of the results of the models with singular predictors (Models 2a, 2b and 2c), it seems that almost all variance explained by these knowledge variables was on the student level (39.6%, 31.5%, and 15.2%), whereas the explanation on the occasion level was negligible.

Furthermore, we investigated whether there is a difference between native Dutch and language minority students in the predictive power of the components (Research Question 4). Almost all analyses showed no significant interaction. The only significant interaction found was between language background and receptive vocabulary (see Table 3). In Table 3, Model 0 included no predictors, except grade; Model 1 included the main effect of language background; Model 2 included the main effects of both language background and receptive vocabulary; and Model 3 included both main effects and the interaction of language background and receptive vocabulary. Almost all explained variance of the interaction (see Model 3) was on the occasion level of reading comprehension (16.2%). The regression weights of receptive vocabulary (0.01) and the interaction variable (0.58) in this model indicate that the effect of receptive vocabulary on reading comprehension growth was much larger for language minority students (coded as 1) than for native Dutch students (coded as 0). Additional regression analyses on the difference scores (both for reading comprehension and for vocabulary between Grades 7 and 9) indicated that the reading comprehension growth in the language minority students was significantly related to vocabulary growth ($R^2 = .15$, $\beta = .39$, $t = 2.1$, $p = .05$) but not to level of vocabulary. Thus, we can conclude that the effect was an effect of growth in vocabulary, not the level of receptive vocabulary skill.

Discussion

In this study we investigated the role of several components of reading comprehension of low-achieving adolescents (Grades 7 to 9). In addition, we investigated whether there are differences between native Dutch and language minority students with respect to the contribution of these components. We first investigated whether native Dutch and language minority students differed

in their levels of reading comprehension, linguistic and metacognitive knowledge, and fluency and whether the development of the two groups in reading comprehension from Grades 7 to 9 was similar (Research Questions 1 and 2). These research questions were preliminary and served as background for our main research questions, which focused on the prediction of reading comprehension level and development from Grades 7 to 9 by the level and development of the components (linguistic and metacognitive knowledge and fluency) and whether there are differences in this prediction between native Dutch and language minority students (Research Questions 3 and 4). We first discuss the results for our first two research questions.

It was found that native Dutch low achievers significantly outperformed their language minority peers in Grades 7–9 in receptive vocabulary, grammatical knowledge, and sentence verification speed. Native Dutch students also had significant advantages in reading comprehension and metacognitive knowledge, but these were limited to the Grade 7 level (reading comprehension) or to Grades 7 and 8 (metacognitive knowledge). There were no significant differences in word recognition efficiency or speed in any of the three grades between the two groups. These results are similar to findings in other studies of differences between native and language minority students in The Netherlands (Aarts & Verhoeven, 1999; Droop & Verhoeven, 2003; Van Gelderen et al., 2003; Verhoeven, 1990). Nevertheless, the finding that the reading comprehension of the low-achieving language minority students was not significantly lower than that of the native Dutch students in Grades 8 and 9 is somewhat surprising. There appeared to be some catching up going on in these later years for this group of language minority low achievers. This picture is also apparent when we look at metacognitive knowledge through the years. Mastery of this component, which appeared exceptionally important for predicting reading comprehension in Van Gelderen et al.'s (2007) study, differed for both groups of low achievers in Grade 7, but in Grade 9 the difference had diminished.

The reading comprehension ability of the low-achieving students improved significantly between Grade 7 and Grade 9. The growth had an effect size (partial eta-squared) of .44, which is large. In addition, native Dutch as well as language minority students improved significantly in reading comprehension in both of the 1-year intervals. One explanatory thought concerns the educational context of these low-achieving students. From a study by De Milliano (2013) directed at the same sample of students as we studied, the following picture of their literacy curriculum emerges. In language arts lessons, a "strong focus on explicit skills instruction" (p. 72) exists directed merely at spelling, grammar, and vocabulary. In social studies lessons, however, literacy practices are "predominantly content oriented and instrumental for learning subject matter" (p. 72). In addition, De Milliano found that in all lessons, group work for literacy practices hardly occurred, in contrast to whole-class instruction and individual seatwork. We cannot conclude from these observations that this type of reading education caused the positive development in reading comprehension. Nevertheless, it is plausible that sustained literacy practice in such lessons as language arts and social studies fulfills a positive function and may lead to low-achieving adolescents' growth in reading. From another study conducted with the same sample of low achievers, we know that these students' out-of-school reading is very infrequently directed toward the traditional epistemic reading goals favored in school (Van Kruistum, 2013). For that reason, it seems plausible that the substantial growth in reading comprehension observed in this study is more related to the reading that these students do in the educational context of school than outside school. The fact that these low achievers are strongly improving in reading comprehension is in contrast with pessimistic expectations uttered in other studies (Dutch Education Inspectorate, 2008). In line with the so-called Matthew effect, researchers have hypothesized that poor readers have poor prospects for growth in reading proficiency, because they are assumed to be caught in a vicious cycle of poor reading skills, leading to poor reading habits, and therefore to stagnation or even a decrease in reading skills (Stanovich, 1986). Empirical evidence for this effect, however, is quite inconclusive (see, e.g., Bast & Reitsma, 1998; Parrila, Aunola, Leskinen, Nurmi, & Kirby, 2005), and our study shows that in our group of low-achieving adolescents in The Netherlands, such stagnation or decrease is certainly not apparent.

Another finding is that language minority low-achievers initially started at a lower level of reading comprehension than their native Dutch classmates but that they caught up with a faster growth rate

from Grades 7 to 9. Although this difference in growth rate was not expected on the basis of earlier studies (Francis et al., 1996; Kieffer, 2008), we can speculate that the language minority students succeeded in catching up with their native peers by increasing their proficiency in the component skills analyzed in our study.[6] We return to this issue later.

The main questions of our study pertained to the contribution of (a) linguistic knowledge, (b) metacognitive knowledge, and (c) fluency of word and sentence reading to the explanation of reading comprehension proficiency, both in level and in development (growth). Regarding the *level* of reading comprehension, our analyses indicate that grammatical knowledge, receptive vocabulary, and metacognitive knowledge have large contributions, whereas the contributions of word recognition efficiency, word recognition speed, and sentence verification speed (all fluency components) are negligible. These findings mean that, in particular, the knowledge-related components of reading (vocabulary, grammar and metacognitive knowledge) explain low achievers' proficiency in reading comprehension at a given moment in time. The fluency-related components do not appear to have an important role in explaining reading comprehension proficiency level. These results confirm similar findings with adolescent readers of the same age (but from a more heterogeneous sample) published in Van Gelderen et al. (2004) and Van Gelderen et al. (2007). In those studies, knowledge variables such as vocabulary, grammar, and metacognitive knowledge also had important roles in explaining reading comprehension proficiency, whereas word recognition fluency had a negligible role. It seems therefore that the components explaining reading comprehension proficiency level for low achievers are nearly the same as for adolescent readers in general and that these components are mainly knowledge related (both linguistically and strategically: knowledge of good strategies for reading and writing). The only exception to this generalization appeared to be sentence verification speed, which was significantly related to reading comprehension in the heterogeneous group of adolescents (Van Gelderen et al., 2007) but not in the low-achieving group.

Regarding the growth of reading comprehension, however, our results show a quite different pattern. At first sight, it appears that the knowledge and fluency components are not important in explaining reading comprehension growth in low-achieving students. However, we found an interesting interaction effect of language background and vocabulary knowledge on growth in reading comprehension. This interaction indicates that there is an effect of gains in vocabulary on gains in reading comprehension for the language minority students but not for the native Dutch students. Findings from other studies (e.g., Babayigit, 2014; Geva & Farnia, 2012) point toward a stronger association between *level* of vocabulary knowledge and *level* of reading comprehension in language minority students than in their native peers. The results of this current study establish that in addition to the association between *level* of vocabulary knowledge and *level* of reading comprehension, there are associations between *development* in vocabulary and development in reading in low-achieving adolescents.

The vocabulary of both groups improved substantially ($\eta_p^2 = .31$, which is a large effect). This interaction effect may explain the fact that we found the language minority students approaching the native Dutch level in reading comprehension in Grade 9, despite the fact that their absolute level of vocabulary knowledge (and other component skills) remained lower than that of their native Dutch peers. Apparently, the language minority students profited more from gains in vocabulary than the native Dutch students did for their reading comprehension. The mechanism behind this differential effect of vocabulary knowledge is, however, not quite clear. It may point to a so-called threshold of linguistic knowledge that has to be surpassed by the language minority students (Alderson, 1984; Bernhardt, 2000). In that case, the language minority students were below that threshold at the start of the study in Grade 7, which seriously inhibited their reading comprehension, and crossed that threshold somewhere later on (in Grades 8–9). An alternative explanation may be that language minority students

[6]Repeated measures ANOVAs on each of the components of reading comprehension showed that all students improved on these components, although there were no significant differences in growth between the native Dutch and the language minority students.

make better strategic use of their increased vocabulary for text comprehension, for example because they become more metalinguistically aware of the value of words because of their experience learning a second language (see, e.g., Bruno, 2001; Corder, 1979; Thomas, 1988). To our knowledge, no other studies have been published analyzing these longitudinal relationships between component skills on the one hand and growth in the reading comprehension of low-achieving adolescents on the other. Therefore, it is not yet possible to compare our results and possible explanations to other studies.

Vocabulary gains seem to explain growth in reading comprehension in the language minority students. It is hard to decide whether the relation should be interpreted as reciprocal or causal. Although it is tempting to view growth in vocabulary as a condition for improving reading comprehension, an interpretation supported by the finding that vocabulary also explains individual differences in reading comprehension proficiency, it is impossible to exclude reciprocity on the basis of our results. Therefore, we prefer to postpone a decision on this important question and leave room for both interpretations. Experimental interventions for low-achieving adolescent readers have shown positive effects on reading comprehension of training programs directed at vocabulary knowledge (Edmonds et al., 2009). Therefore, we may assume that causality in that direction (knowledge comes first) is involved. However, given the 2-year time span of our study (much longer than most experimental intervention studies) it is at least plausible that causality in the other direction (from increased reading experience to gains in comprehension and vocabulary knowledge at the same time) also takes place. Gains in vocabulary have been shown to result from reading experience. For example, Cunningham and Stanovich (1991) found that the amount of time spent on reading contributed significantly to vocabulary knowledge for students in Grades 4, 5, and 6. In addition, several studies have estimated that large parts of students' vocabulary result from incidental word learning while reading (Nagy, Anderson, & Herman, 1987; Nagy, Herman, & Anderson, 1985; Swanborn & De Glopper, 1999).

Our analysis shows that many components in our study significantly explain the reading comprehension of these low-achieving adolescents. The components (together with language background) explained 45.1% of the total variance in reading comprehension (60.4% at the student level, and hardly any variance at the occasion level). In Van Gelderen et al.'s (2004) study, the total variance in reading comprehension explained by a similar set of components was 74% (in Grade 8). However, that study involved a heterogeneous sample of adolescents containing both low and high achievers. Given that our sample was much more homogeneous in terms of proficiency, the total amount of explained variance can be regarded as quite high, indicating that even in this group of low achievers individual differences in reading comprehension are large enough to be reliably explained by differences in (especially) knowledge components.

This study of low-achieving adolescents' reading comprehension offers some valuable additions to knowledge about reading comprehension in a more general sense (especially in heterogeneous samples). First, it shows that for this group of low achievers, in contrast to what has been suggested in studies probing the so-called Matthew effect, considerable improvement in reading comprehension is feasible (from Grades 7–9). Second, it demonstrates that the language minority students—although starting at a lower level of reading comprehension—appear to catch up in the two following years and profit more from growth in vocabulary than their native Dutch classmates do. In addition, and more important, we have found that linguistic and metacognitive knowledge play substantial roles in the explanation of reading comprehension in the course of 3 years of schooling. In part (particularly as regards the explanation of reading comprehension level), the findings for the low-achieving students are similar to findings in previous studies with heterogeneous groups of adolescent readers. Linguistic and metacognitive knowledge make relatively large contributions to the explanation of differences in reading comprehension, whereas the contributions of fluency-related components (word recognition speed and efficiency, and sentence verification speed) are negligible. Furthermore, the knowledge and fluency components do not generally explain growth in reading comprehension, except that in the language minority students growth in vocabulary explains growth in reading comprehension.

Implications for future research

The fact that growth in reading comprehension cannot be explained by most components suggests that for these low-achieving adolescents from Grade 7 to Grade 9 there is no additive effect of linguistic knowledge, metacognitive knowledge, or fluency on reading comprehension growth. Neither development (within-student variance) nor level (between-student variance) of the components could explain differences in reading comprehension growth in this study. Therefore, differences in reading comprehension between these low-achieving adolescents seem determined by differences in the components that already existed from the beginning of our study. Whether this is generally the case, however, will have to be determined in follow-up studies using other—preferably larger—samples of low-achieving adolescents in order to be able to identify statistically smaller effects than was possible in our study.

The findings pose some challenging questions regarding the directionality of causation. Future research should be directed to this type of question, which can most profitably be studied in experimental intervention studies. However, given the present state of knowledge, the safest assumption for the relations between the component skills and reading comprehension is that they are not simply unidirectional. There is reason to believe that there are other paths of causation that could not be directly tested in our study. Gains in vocabulary may have quite a direct effect on poor readers' reading comprehension (as demonstrated in numerous intervention studies), but such gains can also be a *result* of increased experience in reading that lies at the basis of both gains in knowledge and reading comprehension.

Educational implications

Fluency did not explain individual differences in reading comprehension in low-achieving adolescents, suggesting that educational attention toward improving fluency for this group of students should not be prioritized. More beneficial effects can be expected from educational interventions emphasizing vocabulary, grammar, and metacognitive knowledge involved in reading comprehension, given that these components did show substantive relations with the reading proficiency of the low-achieving students. The fact that we did not find general effects of these knowledge variables on all students' *growth* in reading comprehension means that individual growth in the components is yet not productive in supporting reading development. However, the fact that interindividual differences in level of linguistic and metacognitive knowledge explain differences in reading comprehension indicates that many low-achieving students would potentially profit from extra educational attention in these areas. In addition, for language minority students, growth in vocabulary knowledge appeared to be related to growth in reading comprehension. Educational interventions that enable these low-achieving students to enrich their vocabulary are therefore promising for helping these students improve their reading comprehension. Because, presumably, associations between vocabulary and reading comprehension are not unidirectional but reciprocal, interventions directed at improving vocabulary knowledge in direct connection with reading activities seem most promising. Finally, given the low frequency of reading for epistemic functions outside school among these low-achieving students (Van Kruistum, 2013), our findings give ample support for schools' function of compensating this lack of practice in reading by providing more time to read texts directed at academic knowledge acquisition, preferably within meaningful learning contexts and with strategic and linguistic support.

Limitations

A limitation of the current study concerns the small sample size ($N = 50$). However, our study used a precisely defined and focused sample, in which we controlled for quite a lot of variables (see Participants section). For that reason we selected a small group of students from within classrooms instead of selecting all students in those classrooms. This procedure has the advantage that the characteristics of students in our sample (e.g., the languages spoken at home) were much more sharply defined than is usual in larger samples. Furthermore, testing of all predictors occurred in individual or small-group sessions throughout

the whole study (see "Procedure"), which ensured that students understood their tasks well and carried them out according to the instructions. In addition, the use of repeated measures analyses provided us with extra statistical power, using 150 instead of 50 data points for each variable. Therefore, although research to replicate our findings is highly recommended, we believe that the current study offers a valuable and valid starting point for such replications with other samples and other educational contexts.

Acknowledgment

This study was part of the larger research project Study into Adolescent Literacy of Students At-Risk (SALSA). The main aim of the SALSA project was to investigate low-achieving adolescents' reading and writing development from different angles (i.e., by investigating linguistic knowledge and skill, educational variables, and students' out-of-school media use) and to provide insights into how to account for individual differences in literacy that exist within the population of low-achieving adolescents.

References

Aarts, R., & Verhoeven, L. (1999). Literacy attainment in a second language submersion context. *Applied Psycholinguistics*, *20*, 377–393. doi:10.1017/S0142716499003033

Alderson, J. C. (1984). Reading in a foreign language: A reading or a language problem? In J. C. Alderson & A. H. Urquhart (Eds.), *Reading in a foreign language* (pp. 1–24). London, UK: Longman.

Alliance for Excellent Education. (2006). *2006 alliance annual report*. Seattle, WA.

Anderson, R. C., & Freebody, P. (1979). *Vocabulary knowledge and reading. Reading Education Report No. 11*. Urbana-Champaign: University of Illinois.

Babayigit, S. (2014). The role of oral language skills in reading and listening comprehension of text: A comparison of monolingual (L1) and bilingual (L2) speakers of English language. *Journal of Research in Reading*, *37*(S1), 22–47. doi:10.1111/j.1467-9817.2012.01538.x

Baker, L., & Brown, A. L. (1984). Metacognitive skills and reading. In P. D. Pearson (Ed.), *Handbook of reading research* (Vol. *1*, pp. 353–394). New York, NY: Longman.

Bast, J., & Reitsma, P. (1998). Analyzing the development of individual differences in terms of Matthew effects in reading: Results from a Dutch longitudinal study. *Developmental Psychology*, *34*, 1373–1399. doi:10.1037/0012-1649.34.6.1373

Baumert, J., Klieme, E., Neubrand, M., Prenzel, M., Schiefele, U., Schneider, W., … Weiß, M. (2001). *PISA 2000. Basiskompetenzen von Schülerinnnen und Schülern im internationalen Vergleich* [PISA 2000. Basic competencies of students in international comparison]. Opladen: Leske & Buderich.

Bernhardt, E. B. (2000). Second-language reading as a case study of reading scholarship in the 20th century. In P. B. Mosenthal, M. L. Kamil, P. D. Pearson, & R. Barr (Eds.), *Handbook of reading research* (Vol. *3*, pp. 791–811). Mahwah, NJ: Erlbaum.

Biancarosa, C., & Snow, C. E. (2006). *Reading next: A vision for action and research in middle and high school literacy. A report to Carnegie Corporation of New York (*2nd ed., pp. 12–20). Washington, DC: Alliance for Excellent Education.

Biemiller, A., & Slonim, N. (2001). Estimating root word vocabulary growth in normative and advantaged populations: Evidence for a common sequence of vocabulary acquisition. *Journal of Educational Psychology*, *93*, 498–520. doi:10.1037/0022-0663.93.3.498

Braze, D., Tabor, W., Shankweiler, D. P., & Mencl, W. E. (2007). Speaking up for vocabulary: Reading skill differences in young adults. *Journal of Learning Disabilities*, *40*, 226–243. doi:10.1177/00222194070400030401

Bruno, G. I. (2001). Metacognitive reading awareness of trilingual readers in Barcelona. In J. Cenoz, B. Hufeisen, & U. Jessner (Eds.), *Looking beyond second language acquisition: Studies in tri- and multilingualism* (pp. 137–151). Tubingen, Germany: Stauffenburg Verlag.

Buly, M. R., & Valencia, S. W. (2002). Below the bar: Profiles of students who fail state reading. *Educational Evaluation and Policy Analysis*, *24*, 219–239. doi:10.3102/01623737024003219

Carlo, M. S., August, D., McLaughlin, B., Snow, C. E., Dressler, C., Lippman, D. N., … White, C. E. (2004). Closing the gap: Addressing the vocabulary needs of English language learners in bilingual and mainstream classrooms. *Reading Research Quarterly*, *39*, 188–215. doi:10.1598/RRQ.39.2.3

Catts, H. W., Bridges, M. S., Little, T. D., & Tomblin, J. B. (2008). Reading achievement growth in children with language impairments. *Journal of Speech, Language and Hearing Research*, *51*, 1569–1579. doi:10.1044/1092-4388(2008/07-0259)

Cohen, J. (1988). *Statistical power analysis for the behavioural sciences* (2nd ed.). Hillsdale, NJ: Erlbaum.

Corder, S. P. (1979). Language distance and the magnitude of the learning task. *Studies in Second Language Acquisition*, *2*, 27–36. doi:10.1017/S0272263100000930

Crosson, A. C., & Lesaux, N. K. (2010). Revisiting assumptions about the relationship of fluent reading to comprehension: Spanish-speakers' text-reading fluency in English. *Reading and Writing*, *23*, 475–494. doi:10.1007/s11145-009-9168-8

Cunningham, A. E., & Stanovich, K. E. (1991). Tracking the unique effects of print exposure in children: Associations with vocabulary, general knowledge, and spelling. *Journal of Educational Psychology*, *83*, 264–274. doi:10.1037/0022-0663.83.2.264

Dagevos, J., Gijsberts, M., & Van Praag, C. (2003). *Rapportage Minderheden 2003* [Report minorities 2003]. The Hague, The Netherlands: Sociaal Planbureau.

De Milliano, I. (2013). *Literacy development of low-achieving adolescents: The role of engagement in academic reading and writing* (Unpublished doctoral dissertation). University of Amsterdam, The Netherlands.

Droop, M., & Verhoeven, L. (2003). Language proficiency and reading ability in first- and second-language learners. *Reading Research Quarterly*, *38*, 78–103. doi:10.1598/RRQ.38.1.4

Dutch Education Inspectorate. (2008). *Basisvaardigheden taal in het voortgezet onderwijs. Resultaten van een inspectieonderzoek naar taalvaardigheid in de onderbouw van het vmbo en praktijkonderwijs* [Basic language skills in secondary education]. Utrecht, The Netherlands: Inspectie van het Onderwijs.

Edmonds, M. S., Vaughn, S., Wexler, J., Reutebuch, C., Cable, A., Tackett, K. K., & Schnakenberg, J. W. (2009). A synthesis of reading interventions and effects on reading comprehension on older struggling readers. *Review of Educational Research*, *79*(1), 262–287. doi:10.3102/0034654308325998

Farnia, F., & Geva, E. (2011). Cognitive correlates of vocabulary growth in English language learners. *Applied Psycholinguistics*, *32*, 711–738. doi:10.1017/S0142716411000038

Francis, D. J., Shaywitz, S. E., Stuebing, K. K., Shaywitz, B. A., & Fletcher, J. M. (1996). Developmental lag versus deficit models of reading disability: A longitudinal, individual growth curves analysis. *Journal of Educational Psychology*, *88*, 3–17. doi:10.1037/0022-0663.88.1.3

García, G. E. (1991). Factors influencing the English reading test performance of Spanish-speaking Hispanic children. *Reading Research Quarterly*, *26*, 371–392. doi:10.2307/747894

Geva, E., & Farnia, F. (2012). Developmental changes in the nature of language proficiency and reading fluency paint a more complex view of reading comprehension in ELL and EL1. *Reading and Writing*, *25*, 1819–1845. doi:10.1007/s11145-011-9333-8

Gottardo, A., & Muller, J. (2009). Are first- and second-language factors related in predicting second-language reading comprehension? A study of Spanish-speaking children acquiring English as a second language from first to second grade. *Journal of Educational Psychology*, *101*, 330–344. doi:10.1037/a0014320

Gough, P. B., & Tunmer, W. E. (1986). Decoding, reading, and reading disability. *Remedial and Special Education*, *7*(1), 6–10. doi:10.1177/074193258600700104

Hacquebord, H. I., Linthorst, R., Stellingwerf, B., & De Zeeuw, M. (2004). *Voortgezet taalvaardig* [Language skills in secondary education]. Groningen, The Netherlands: Etoc, Rijksuniversiteit Groningen.

Hazenberg, S., & Hulstijn, J. H. (1996). Defining a minimal receptive second-language vocabulary for non-native university students: An empirical investigation. *Applied Linguistics*, *17*, 145–163. doi:10.1093/applin/17.2.145

Hofman, R. H., Spijkerboer, A. W., & Timmermans, A. C. (2009). *Ervaren deficiënties door havo- en mbo-opleiding in de basisbagage van vmbo'ers* [Experienced deficiencies in basic skills of vocational education's students]. The Hague, The Netherlands: Onderwijsraad.

Hox, J. J. (2010). *Multilevel analysis: Techniques and applications* (2nd ed.). New York, NY: Routledge.

Hulstijn, J. H. (2015). *Language proficiency in native and non-native speakers: Theory and research*. Amsterdam, The Netherlands: John Benjamins.

Jean, M., & Geva, E. (2009). The development of vocabulary in English as a second language children and its role in predicting word recognition ability. *Applied Psycholinguistics*, *30*(1), 153–185. doi:10.1017/S0142716408090073

Jenkins, J. R., Fuchs, L. S., van den Broek, P., Espin, C., & Deno, S. L. (2003). Sources of individual differences in reading comprehension and reading fluency. *Journal of Educational Psychology*, *95*, 719–729. doi:10.1037/0022-0663.95.4.719

Kamil, M. L. (2003). *Adolescents and literacy: Reading for the 21st century*. Washington, DC: Alliance for Excellent Education.

Kieffer, M. J. (2008). Catching up or falling behind? Initial English proficiency, concentrated poverty, and the reading growth of language minority learners in the United States. *Journal of Educational Psychology*, *100*, 851–868. doi:10.1037/0022-0663.100.4.851

Kintsch, W. (1998). *Comprehension: A paradigm for cognition*. New York, NY: Cambridge University Press.

LaBerge, D., & Samuels, S. J. (1974). Toward a theory of automatic information processing in reading. *Cognitive Psychology*, *6*, 293–323. doi:10.1016/0010-0285(74)90015-2

Lesaux, N. K., & Kieffer, M. J. (2010). Exploring sources of reading comprehension difficulties among language minority learners and their classmates in early adolescence. *American Educational Research Journal*, *47*, 596–632. doi:10.3102/0002831209355469

Mancilla-Martinez, J., Kieffer, M. J., Biancarosa, G., Christodoulou, J. A., & Snow, C. E. (2011). Investigating English reading comprehension growth in adolescent language minority learners: Some insights from the simple view. *Reading and Writing*, *24*, 339–354. doi:10.1007/s11145-009-9215-5

Nagy, W. E., Anderson, R. C., & Herman, P. A. (1987). Learning word meanings from context during normal reading. *American Educational Research Journal*, *24*, 237–270. doi:10.3102/00028312024002237

Nagy, W. E., Herman, P. A., & Anderson, R. C. (1985). Learning words from context. *Reading Research Quarterly*, *20*(2), 233–253. doi:10.2307/747758

National Center for Education Statistics. (Ed.). (2009). *Reading 2009: National assessment of educational progress at grades 4 and 8*. Washington, DC: Institute of Education Sciences.

Organisation for Economic Co-operation and Development. (2000). *Literacy in the information age: Final report of the international adult literacy survey*. Paris, France.

Organisation for Economic Co-operation and Development. (2003). *The PISA 2003 assessment framework: Mathematics, reading, science and problem solving knowledge and skills*. Paris, France.

Ouellette, G., & Beers, A. (2010). A not-so-simple view of reading: How oral vocabulary and visual-word recognition complicate the story. *Reading and Writing*, *23*, 189–208. doi:10.1007/s11145-008-9159-1

Parrila, R., Aunola, K., Leskinen, E., Nurmi, J. E., & Kirby, J. R. (2005). Development of individual differences in reading: Results from longitudinal studies in English and Finnish. *Journal of Educational Psychology*, *97*, 299–319. doi:10.1037/0022-0663.97.3.299

Perfetti, C. A. (1999). Comprehending written language: A blueprint of the reader. In C. M. Brown, & P. Hagoort (Eds.), *The neurocognition of language* (pp. 167–208). Oxford, UK: Oxford University Press.

Perfetti, C. A., Landi, N., & Oakhill, J. (2005). The acquisition of reading comprehension skills. In M. J. Snowling, & C. Hulme (Eds.), *The science of reading: A handbook* (pp. 227–247). London, UK: Blackwell.

Perie, M., Grigg, W., & Donahue, P. (2005). *The nation's report card: Reading 2005*. Washington, DC: National Center for Education Statistics.

Proctor, C. P., Carlo, M., August, D., & Snow, C. (2005). Native Spanish-speaking children reading in English: Toward a model of comprehension. *Journal of Educational Psychology*, *91*, 246–256. doi:10.1037/0022-0663.97.2.246

Rasbash, J., Browne, W., Goldstein, H., Yang, M., Plewis, I., Healy, M., … Lewis, T. (2000). *A user's guide to mlwin*. London, UK: Institute of Education.

Stanovich, K. E. (1986). Matthew effects in reading: Some consequences of individual differences in the acquisition of literacy. *Reading Research Quarterly*, *21*, 360–407. doi:10.1598/RRQ.21.4.1

Swanborn, M. S. L., & De Glopper, K. (1999). Incidental word learning while reading: A meta-analysis. *Review of Educational Research*, *69*, 261–285. doi:10.3102/00346543069003261

Tesser, P. T. M., & Iedema, J. (2001). *Rapportage minderheden 2001* [Report minorities 2001]. Den Haag, The Netherlands: Sociaal Cultureel Planbureau.

Thomas, J. (1988). The role played by metalinguistic awareness in second and third language learning. *Journal of Multilingual and Multicultural Development*, *9*, 235–246. doi:10.1080/01434632.1988.9994334

Tilstra, J., McMaster, K., Van den Broek, P., Kendeou, P., & Rapp, D. (2009). Simple but complex: Components of the simple view of reading across grade levels. *Journal of Research in Reading*, *32*, 383–401. doi:10.1111/j.1467-9817.2009.01401.x

Van Gelderen, A., Schoonen, R., De Glopper, K., Hulstijn, J., Snellings, P., Simis, A., & Stevenson, M. (2003). Roles of linguistic knowledge, metacognitive knowledge and processing speed in L3, L2 and L1 reading comprehension: A structural equation modelling approach. *International Journal of Bilingualism*, *7*, 7–25. doi:10.1177/13670069030070010201

Van Gelderen, A., Schoonen, R., De Glopper, K., Hulstijn, J., Snellings, P., Simis, A., & Stevenson, M. (2004). Linguistic knowledge, processing speed and metacognitive knowledge in first and second language reading comprehension: A componential analysis. *Journal of Educational Psychology*, *96*, 19–30. doi:10.1037/0022-0663.96.1.19

Van Gelderen, A., Schoonen, R., Stoel, R. D., De Glopper, K., & Hulstijn, J. (2007). Development of adolescent reading comprehension in language 1 and language 2: A longitudinal analysis of constituent components. *Journal of Educational Psychology*, *99*, 477–491. doi:10.1037/0022-0663.99.3.477

Van Kruistum, C. (2013). *Changing engagement of youth in old and new media literacy: Patterns, functions and meanings* (Unpublished doctoral dissertation). Utrecht University, The Netherlands.

Van Steensel, R., Oostdam, R., & Van Gelderen, A. (2013). Assessing reading comprehension in adolescent low achievers: Subskills identification and task specificity. *Language Testing*, *30*(1), 3–21. doi:10.1177/0265532212440950

Verhoeven, L. T. (1990). Acquisition of reading in Dutch as a second language. *Reading Research Quarterly*, *25*, 90–114. doi:10.2307/747596

Verhoeven, L. (1995). *Drie-minuten-toets* [Three minute test]. Arnhem, The Netherlands: Cito.

Verhoeven, L., & Van Leeuwe, J. (2008). Prediction of the development of reading comprehension: A longitudinal study. *Applied Cognitive Psychology*, *22*, 407–423. doi:10.1002/acp.1414

Appendix

Table A-1. Means and standard deviations for native Dutch ($n = 24$) and language minority ($n = 26$) students in Grades 7, 8, and 9.

	Grade 7		Grade 8		Grade 9	
Variable	Native Dutch	Language minority	Native Dutch	Language minority	Native Dutch	Language minority
Reading comprehension	43.3 (5.7)	38.1 (8.0)	44.7 (7.1)	42.0 (8.9)	47.8 (6.4)	46.5 (8.8)
Receptive vocabulary	54.3 (7.0)	46.0 (7.6)	56.7 (6.6)	48.0 (9.4)	60.3 (3.1)	50.9 (8.5)
Grammatical knowledge	36.5 (3.8)	31.2 (5.6)	36.5 (4.3)	31.8 (7.2)	37.8 (4.2)	34.4 (4.6)
Metacognitive knowledge	29.2 (3.9)	26.3 (3.9)	30.0 (4.8)	27.2 (4.3)	30.9 (3.6)	29.2 (4.9)
Word recognition efficiency	83.5 (12.4)	78.7 (16.9)	93.4 (11.4)	88.6 (18.5)	97.4 (11.3)	92.6 (17.4)
Word recognition (ms)	834.0 (129.6)	842.8 (114.8)	819.7 (112.2)	826.3 (97.2)	745.2 (147.3)	753.7 (143.3)
Sentence verification (ms)	4,089.9 (654.7)	4,587.8 (706.8)	3,565.1 (659.4)	4,103.3 (593.7)	3,128.1 (617.5)	3,774.8 (628.2)