Read Writ (2015) 28:1381–1405
DOI 10.1007/s11145-015-9575-y

Language skills and reading comprehension in English monolingual and Spanish–English bilingual children in grades 2–5

Rebecca D. Silverman[1] · C. Patrick Proctor[2] · Jeffrey R. Harring[1] · Anna M. Hartranft[1] · Brie Doyle[1] · Sarah B. Zelinke[1]

Published online: 29 July 2015

Abstract The present study investigated language skills and reading comprehension with English monolingual and Spanish–English bilingual children in grades 2–5. Of the 377 children in the sample, 207 were English monolingual and 170 were Spanish–English bilingual. Data were collected within a cohort-sequential design for two academic years in the fall and spring of each year. Growth modeling was used to estimate initial status on measures of vocabulary breadth, vocabulary depth, morphological awareness, and syntactic skill. A latent variable was created to capture the construct of reading comprehension, and growth modeling was used to estimate growth and ending status in latent reading comprehension. Analyses controlling for initial status in word recognition investigated relationships between initial status in language skills and growth and ending status in reading comprehension. Results showed that initial status on vocabulary breadth was related to growth in reading comprehension and initial status in vocabulary depth and syntactic skill were related to ending status in reading comprehension. Limitations and implications for future research are discussed.

Keywords Vocabulary · Morphology · Syntax · Comprehension · Bilingual

Introduction

Over the past few decades, educators have become increasingly concerned about the reading difficulties of students in upper elementary school and beyond (e.g., Carnegie Council on Advancing Adolescent Literacy, 2010). Many students who

✉ Rebecca D. Silverman
rdsilver@umd.edu

[1] University of Maryland, College Park, MD, USA

[2] Boston College, Chestnut Hill, MA, USA

learn to read words with relative ease begin to experience difficulty in upper elementary school when they are expected to read, understand, and learn from increasingly difficult texts (Catts, Compton, Tomblin, & Bridges, 2012). A large percentage of students who experience reading difficulty in elementary school and beyond are students from low socioeconomic backgrounds and students who are, to varying degrees, *bilingual*, in that they speak English in school and another language in the home (August & Shanahan, 2006; Grosjean, 2010; Kieffer, 2010; Scarborough, 2001; Snow, Burns, & Griffin, 1998).[1] Language skills may be implicated in the reading difficulties of these students. However, there is insufficient research on how specific language skills are related to reading for English monolingual and Spanish–English bilingual students as they transition into upper elementary school. To inform research on interventions to support students with reading difficulties in upper elementary school, more research is needed.

In a previous study, we took an initial step towards adding to the research base by exploring how language components were related to reading comprehension in a cross-sectional study in grades 2–4 (Proctor, Silverman, Harring, & Montecillo, 2012). The sample included 294 students, fifty-six percent of whom were monolingual English speakers. The remaining forty-four percent were Spanish–English bilinguals. Fully two-thirds of the students were eligible for free or reduced price lunch in school. Controlling for grade level and word recognition, we found that vocabulary breadth, vocabulary depth, which we referred to in that study as semantics, and syntactic skill predicted initial status of reading comprehension but not change in reading comprehension across one academic year.

To further add to the research base, in the present study we used a cohort-sequential design to longitudinally investigate the role of initial status in language skills on *growth* and *ending status* in reading comprehension with a sample of English monolingual and Spanish–English bilingual students across grades 2–5. Specifically, we followed the 294 students from the previous study for a second academic year and added an additional 83 children to the study. This study contributes to the field by investigating how language skills and reading comprehension are related longitudinally as students from diverse language backgrounds transition into upper elementary school. Below we review the theoretical framework and research base that laid the foundation for this work.

Theoretical foundation

The Simple View of Reading (SVR) postulates that reading comprehension is the product of decoding and linguistic comprehension (Gough & Tunmer, 1986; Hoover & Gough, 1990). In the original conceptualization of the SVR, decoding was defined as the ability to "read isolated words" (Gough & Tunmer, 1986, p. 7) and linguistic comprehension was defined as "the process by which, given lexical (i.e., word) information, sentences and discourses are interpreted" (Gough & Tunmer, 1990, p. 7). In studies validating the SVR, decoding is usually measured by real or

[1] These students are variously referred to as English language learners (ELLs), English learners (ELs), and Language Minority (LM) students throughout the research base.

nonword reading tasks (e.g., Dreyer & Katz, 1992; Hoover & Gough, 1990), and linguistic comprehension is typically measured via measures of listening comprehension (e.g., Adlof, Catts, & Little, 2006; Hoover & Gough, 1990). However, listening comprehension tasks may be too general to adequately represent the language skills involved in linguistic comprehension. While it is theoretically important to understand how, controlling for decoding, various language skills influence reading comprehension, it is also practically important because teachers need to know which skills might be instructionally malleable in intervention for struggling readers. Potential candidates for specific language skills that may be important for reading comprehension can be identified in the extant research base.

Language skills and reading comprehension

Several language skills involved in linguistic comprehension that could potentially contribute to reading comprehension are vocabulary knowledge, morphological awareness, and syntactic skill. Obviously, vocabulary knowledge is necessary to understand what words mean, and numerous studies have shown positive relationships between receptive and expressive vocabulary and reading comprehension (e.g., Cain & Oakhill, 2011; Ouellette, 2006; Quinn, Wagner, Petscher, & Lopez, 2015). Additionally, studies have revealed that breadth and/or depth of vocabulary knowledge may be important to reading comprehension (e.g., Babayiğit, 2014; Ouellette, 2006). Breadth of vocabulary knowledge refers to a surface level knowledge of a wide range of words and depth of vocabulary knowledge refers to a deep level of knowledge of what words mean, how they are related, and how they are used across contexts. At the sub-word level, research has also shown that morphological awareness (i.e., awareness of how affixes can be added to root words to change meaning) is related to reading comprehension (e.g., Carlisle, 2000). And, beyond the word level, research findings suggest that syntactic skill (i.e., the ability to use various syntactic structures to make meaning) contributes to reading comprehension (Mokhtari & Thompson, 2006). Below we provide an overview of research on the relationship between these language skills and reading comprehension across studies for monolinguals and bilinguals.

Vocabulary breadth and depth

Vocabulary knowledge has been repeatedly shown to be positively and significantly related to reading comprehension (Carroll, 1993; Davis, 1944, 1968; Thorndike, 1973). Most studies of vocabulary knowledge have investigated the role of vocabulary breadth in reading comprehension, and typically measure vocabulary breadth via picture identification or naming tasks. Analyses that have investigated the directionality of the relationship between vocabulary and reading comprehension continue to confirm Anderson and Freebody's (1981) early claim that vocabulary is instrumental to reading comprehension at any given point in time (e.g., Quinn et al., 2015).

The relationship between vocabulary breadth and reading comprehension has been found in studies with monolinguals and bilinguals. Mancilla-Martinez and

Lesaux (2010) studied Spanish-speaking bilingual children in preschool through fifth grade, and found that initial status and growth in expressive vocabulary breadth and was positively and significantly related to latent reading comprehension in fifth grade. In a study comparing nine and ten year old monolingual and bilingual students in England, Babayiğit (2014) found that receptive vocabulary breadth, in addition to morphosyntactic skills, was a substantial predictor of reading comprehension, more so for bilingual rather than monolingual students. Findings such as these suggest that broad vocabulary knowledge may be particularly important for bilingual readers.

Other studies have explored the relationship between vocabulary depth and reading comprehension. These studies typically operationalize vocabulary depth through definition, synonym, and word relation tasks, all of which theoretically tap a deeper level of word knowledge than identification and naming tasks. In investigating vocabulary breadth and depth, Ouellette (2006) found that while vocabulary breadth predicted word recognition, fourth grade students' performance on a word definition task (i.e., vocabulary depth) predicted reading comprehension. Similarly, Nation and Snowling (2004) found that vocabulary depth, measured via word associations and synonym judgment tasks, contributed to reading comprehension among children aged 8.5–13 years in England. In contrast, Ouellette and Beers (2010) found that neither vocabulary breadth nor depth added to the explanation of students' reading comprehension in grade one, while only vocabulary breath added to the explanation of reading comprehension for students in grade six. Thus, the role of vocabulary depth in reading comprehension for monolinguals is not yet settled.

While there has been relatively less research on the role of vocabulary depth in reading comprehension for bilinguals, the research that does exists suggests positive associations. Rydland, Aukrust, and Fulland (2012) studied fifth grade Turkish-Norwegian bilinguals in Norway and found that both a vocabulary identification task (breadth) and a word definitions task (depth) predicted general reading comprehension. However, only vocabulary depth and not breadth predicted content area reading comprehension. Cremer and Schoonen (2013) studied knowledge of words relations (i.e., a facet of vocabulary depth) in a sample of monolingual and bilingual fifth graders in the Netherlands. Controlling for decoding ability, depth predicted reading comprehension comparably for bilinguals and monolinguals. However, this study did not measure vocabulary breadth in addition to word relations, and other researchers (e.g., Vermeer, 2001) have suggested that depth and breadth are too strongly correlated to merit a theoretical or empirical distinction. However, in our previous research Proctor et al. (2012) on the relationship between vocabulary depth and breadth among second through fourth grade bilinguals and monolinguals, we found the correlation between breadth and depth to be 0.625, with both indicators contributing uniquely in predicting reading comprehension.

Morphological awareness

Derivational morphological awareness (e.g., farm + er = farmer) has, for the most part, been linked to reading comprehension in studies with both monolingual and

bilingual students, with some conflicting findings. Among monolinguals, Carlisle (2000) found that three morphology tasks, including a task assessing awareness of derivational morphology, contributed to the explanation of reading comprehension among 8 and 11 year olds. More recently, Kruk and Bergman (2013) and Deacon, Kieffer, and Laroche (2014) found that inflectional and derivational morphology predicted middle and upper elementary students' reading comprehension. Relatedly, Tong, Deacon, Kirby, Cain, and Parilla (2011), found that, in grade 5 (though not in grade 3), poor comprehenders showed weakness in morphological derivation skill as compared with average comprehenders.

Some conflicting findings have also been noted when other language skills are controlled. When McCutchen, Green, and Abbott (2008) controlled for oral vocabulary knowledge, derivational morphology was not a unique contributor to the explanation of reading comprehension for students in grades 4 and 6. Similarly, Apel, Wilson-Fowler, Brimo, and Perrin (2012) found that while 11 % of the variance in reading comprehension was accounted for by receptive vocabulary breadth and derivational morphology, neither was a significant predictor of reading comprehension among second and third grade children. Thus, the role of morphological awareness in reading comprehension, particularly when controlling for other language related skills, is not yet decided.

Similar findings accrue to bilingual populations. Kieffer and Lesaux (2012) found that derivational morphology significantly predicted reading comprehension above and beyond reading vocabulary for sixth graders from four different language groups. Kieffer (2014) found that substantial proportions of sixth grade students with reading difficulties showed weakness in awareness of derivational morphology, and further that bilingual students with reading difficulties showed particular weakness in this area as compared their native English speaking peers. In contrast, however, Goodwin, Huggins, Carlo, August, and Calderon (2013) found that fourth grade morphological awareness did not predict fifth grade reading comprehension, when controls for phonological decoding, word reading, and reading vocabulary were included in their models. Goodwin et al. (2013), however, did find that morphology indirectly predicted reading comprehension through its effect on reading vocabulary.

Syntactic skill

Another, less studied, language component that is potentially important to reading comprehension is syntax. Like morphology, findings from research on syntactical skill have been somewhat contradictory. Mokhtari and Thompson (2006) found a significant relationship between syntactic skill, as measured via a composite of scores on sentence combining, word ordering, and grammatical competence tasks, and reading comprehension for English-speaking students in Grade 5. Foorman, Koon, Petscher, Mitchell, and Truckenmiller (2015) found that syntax, measured via recalling sentences and grammaticality judgment tasks, was a specific factor uniquely predicting reading comprehension in fourth grade. However, these authors found that, for the most part, across grades 4–10, arrays of language skills more parsimoniously loaded on a single second order oral language factor that did not contribute uniquely to

reading comprehension. This is reminiscent of Cain's (2007) study of 8–10 year old English-speaking children in England in which she found that the influence of syntax on reading comprehension was mediated by other language and literacy skills. Findings such as these suggest that syntax may not play a direct role in predicting reading comprehension for monolinguals in upper elementary school.

Findings related to syntax with bilinguals suggest a positive relationship with reading comprehension, but are inconsistent on whether the relationship is the same for monolinguals and bilinguals alike. Studying third grade Spanish–English bilingual students, Lee Swanson, Rosston, Gerber, and Solari (2008) found that syntactic skill, as measured by a cloze task that measured metalinguistic knowledge at a syntactic level, uniquely predicted English reading comprehension. In a study of fifth grade native English speakers and bilinguals from a variety of home language backgrounds, Geva and Farnia (2012) found that syntactic skill, as measured via a sentence formulation task, contributed to the explanation of reading comprehension for bilingual learners but not for native English speakers. However, Low and Siegel (2005) found that syntactic skill, as measured via an oral cloze task, contributed to a model of reading comprehension that was applicable to both monolingual and bilingual sixth grade students. Similarly, Simard, Foucambert, and Labelle (2014), found that syntactic skill, measured via an ungrammatical sentence repetition task and an error replication task, contributed to reading comprehension for both native and non-native French speakers in Quebec.

Directions for research on language skills and reading comprehension

Inconsistent findings about the role of various language skills in reading comprehension for monolinguals and bilinguals suggest the need for additional research. Specifically, to inform future intervention development, research is needed that simultaneously investigates multiple language skills in relation to reading comprehension for students from different backgrounds. A few studies lay the groundwork for this research. For example, Tong, Deacon, and Cain (2014) found that poor comprehenders in grade 4 had difficulty on a word analogy task tapping awareness of derivational morphology and a sentence correction task tapping syntactic skill. Both language skills contributed significantly to reading comprehension. Similarly, Geva and Farnia (2012) evaluated the roles of both receptive vocabulary breadth and syntactical skill for ELLs and native English speakers in fifth grade and found that, while vocabulary breadth was an important predictor of reading comprehension for both groups of students, syntactical skill was only an important predictor for ELLs. However, we could find no studies that simultaneously investigated vocabulary breadth, vocabulary depth, morphological awareness, and syntactic skills and how they are related to reading comprehension for monolingual and bilingual students in upper elementary school. Additionally, few studies investigate the role of language skills on growth in reading comprehension. Since children with poor language and comprehension skills, bilingual and monolingual alike, ultimately need to catch up to their peers to succeed in school, interventions that focus on language skills that are associated with growth in reading comprehension may be particularly promising.

The present study

The present study investigated the role of initial level of vocabulary breadth, vocabulary depth, morphological awareness, and syntactic skill in growth and ending level of reading comprehension across grades two through five. Using a cohort-sequential design (Nesselroade & Baltes, 1979), we followed three cohorts of students from Fall 2009 through Spring 2011. Cohort One (C1) began the study in grade 2, Cohort Two (C2) began the study in grade 3, and Cohort Three (C3) began the study in grade 4. Each cohort was assessed on language and literacy skills at four time points (i.e., fall and spring in each of two sequential academic years). Data from each of the cohorts were connected for longitudinal analysis across grades 2 through 5. The following research question guided the present study: What are the relationships between the initial level of (a) vocabulary breadth, (b) vocabulary depth, (c) morphological awareness, and (c) syntactic skill and the ending status and growth in reading comprehension?[2]

Methods

Setting

Student participants were drawn from six public schools. Three schools were located in the Northeast region of the United States, and three schools were in the mid-Atlantic region of the United States. The three schools in the Northeast were from one district, which operated under a legal framework that required rapid mainstreaming of limited English proficient (LEP) bilingual students. As a result, most bilingual students received instruction in regular classroom contexts and were provided with few if any additional support services. For those students who were recently-arrived immigrants, the district provided a substantially-separate Sheltered English Immersion (SEI) classroom setting. In the SEI classroom context, students were exposed to the same curriculum as in regular classroom contexts, but the teacher of record was a certified English as a Second Language Teacher who was trained to provide additional supports such as verbal reinforcement and pictures and gestures to aid comprehension. Across regular and SEI classrooms, English language arts (ELA) instruction was guided by a published reading program, which teachers supplemented using a readers' and writers' workshop model and additional resources.

[2] The cohort sequential design we employed allowed us to connect data across cohorts and use that data to estimate, through growth modeling, initial status in language skills and ending status and growth in reading comprehension for each student based on the data available for that student. To estimate initial status in language skills for students who we did not assess in second grade (C2 and C3), we first developed growth trajectories for each variable of interest using all of the data we had available, and then we used data on each student to estimate what that students' second grade score would have been. To estimate ending status in comprehension for students who we did not assess in fifth grade (C1 and C2), we developed a growth trajectory for reading comprehension using all of the data we had available and used data on each student to estimate what that students' fifth grade score would have been. Growth analysis on the reading comprehension outcome yielded growth estimates for each student based on the data available for that student.

The three schools in the Mid-Atlantic were also from one district, which included all LEP bilingual students in regular classroom contexts and provided additional support for these students through English for Speakers of Other Languages (ESOL) services. Based on students' proficiency level, students received a certain amount of additional "push in" or "pull out" support from an ESOL teacher. ESOL support included preview, review, and reinforcement of material from the regular classroom context. ELA instruction in the regular classroom context was guided by a published reading program, which, like in the Northeastern site, teachers supplemented using a readers' and writers' workshop model and additional resources. Thus, in both sites, monolingual and bilingual students were instructed using the regular language arts curriculum. Observations we conducted in classrooms confirmed the language instruction models described above. We did not determine the amount of time students spent in ELA instruction and whether this differed by language background for the present study, but future research should explore the role of time and type of instruction in mediating relationships between language skills and reading comprehension.

Participants

A total of 386 English monolingual (55 %) and Spanish–English bilingual (45 %) students participated in the study. (Non-Spanish speaking bilinguals were excluded from the sample so that our bilingual sample would be somewhat homogenous.) Across the sample, 70 % of students received free or reduced price lunch, an indicator of socio-economic status. The racial/ethnic composition of the sample was 46 % Latino, 32 % Black, 19 % White, and 2 % from other racial/ethnic backgrounds. See Table 1 for further information on the demographic composition of the sample.

In an effort to understand the linguistic backgrounds of the bilingual students, a limited set of Spanish language and literacy data were collected at a single time point for all bilingual students. Performance on Spanish language measures suggested that the bilingual sample was, on average, rather limited in Spanish language and literacy. Standard scores (mean = 100, SD = 15) for the Woodcock-Muñoz (Woodcock, Muñoz-Sandoval, Reuf, & Alvarado, 2005) Letter Word Identification, Picture Vocabulary, and Passage Comprehension subtests were 71 (SD = 24), 88 (SD = 23), and 82 (SD = 16), respectively, with distributions skewed strongly toward higher values. These results indicated that, absent native language instruction, the bilingual sample was relatively English-dominant. Additionally there were no significant differences in performance between bilingual students across sites.

Measures

Students were assessed on five English language measures in the fall and spring of each year of the study. Fall assessments occurred between October and November and spring assessments occurred between mid-April and mid-June. Measures were delivered over two days in the same order to all participating students. All measures were individually-administered unless otherwise specified.

Table 1 N (percentage of sample) of students by demographic variables

	Mid-Atlantic	Northeast	Total
Cohort			
1	94 (24.3)	50 (13.0)	144 (37.3)
2	85 (22.0)	44 (11.4)	129 (33.4)
3	76 (19.7)	37 (9.6)	113 (29.3)
Language background			
Monolingual	140 (36.3)	73 (18.9)	213 (55.2)
Bilingual	115 (29.8)	58 (15.0)	173 (44.8)
Socioeconomic status			
Free and reduced meals (FARMS)	202 (52.3)	68 (17.6)	270 (69.9)
Race			
White	19 (4.9)	55 (14.5)	74 (19.2)
Black	116 (30.0)	8 (2.1)	124 (32.1)
Hispanic	119 (30.8)	60 (15.5)	179 (46.3)
Gender			
Male	123 (31.9)	59 (15.3)	182 (47.2)
Female	132 (34.2)	72 (18.7)	204 (52.9)

Cohort 1 was followed from grade 2–3. Cohort 2 was followed from grade 3–4. Cohort 3 was followed from grade 4–5

Word recognition

The Woodcock-Muñoz Language Survey-Revised (WMLS-R; Woodcock et al., 2005) Letter-Word Identification subtest was used to evaluate students' word recognition ability. On this measure, students were presented with a series of increasingly difficult words to read aloud fluently. The internal reliability of this subtest is between 0.96 and 0.98 for 7 to 12 year-old children (Woodcock et al., 2005).

Vocabulary breadth

Similar to the measure used in the study by Mancilla-Martinez and Lesaux (2010), the WMLS-R Picture Vocabulary subtest (Woodcock et al., 2005) was used to assess vocabulary breadth. In this expressive task, students were prompted to verbally identify the names of pictured objects. The internal reliability for children between 7 and 12 years old on the picture vocabulary test is 0.88 through 0.92 (Woodcock et al., 2005).

Vocabulary depth

Similar to the word relations measure used by Cremer and Schoonen (2013), the Clinical Evaluation of Language Fundamentals, Fourth Edition (CELF; Semel,

Wiig, & Secord, 2003) Word Classes 2 subtest was used to measure vocabulary depth. In this task, examiners read aloud a set of four words, two of which were semantically related (e.g., *fence,* ***window***, ***glass****, rug*). Students were asked to identify the two semantically related words from each set of four. Stability and internal consistency range from 0.72 to 0.84 and 0.72 to 0.82, respectively, for 7 to 12 years old children (Semel et al., 2003).

Morphological awareness

As used in Goodwin et al. (2013), the Extract the Base test (August, Kenyon, Malabonga, Louguit, & Caglarcan, 2001) was used to evaluate awareness of derivational morphology. This group-administered test required a student to segment the base of a derived word (e.g., *elect* from *election*) in order to logically complete a given sentence (e.g., *How many women did they* ____*?*). The examiner read the target word and corresponding sentence aloud, while students followed along and independently wrote their response in the blank space. Each answer was evaluated on a 0/1 coding scheme, where 0 indicated an incorrect response and, to control somewhat for the role of spelling in this task, 1 indicated a phonologically plausible response whether it was spelled correctly or not (e.g., *empti* instead of *empty*). Rasch-based reliability is reported at 0.98 (August et al., 2001).

Syntactical skill

As used in Geva and Farnia (2012), the CELF Formulated Sentences subtest (Semel et al., 2003) was used to measure syntactic skill. On this test, students were prompted to generate a sentence to describe a given picture while using a target word. Each response was scored on a scale of 0 to 2. A score of 1 was given for complete sentences with only one or two errors. A score of 2 was given for correct and complete sentences. Stability coefficients as reported for this measure are 0.74 to 0.62 for children ages 7.0 through 12.11 and internal consistency is 0.82 to 0.76 for these same ages (Semel et al., 2003).

Reading comprehension

Reading comprehension was assessed through three measures, which informed a latent construct of reading comprehension used for analyses. The three measures included the WMLS-R Passage Comprehension (PC; Woodcock et al., 2005) subtest, the Gates-MacGinitie Reading Test, Fourth Edition (GMRT; MacGinitie, MacGinitie, Maria, & Dreyer, 2002), and the Test of Sentence Reading Efficiency and Comprehension (TOSREC; Wagner, Torgeson, Rashotte, & Pearson, 2010). On the PC subtest, students read increasingly difficult cloze passages and orally provided the missing word for each passage. The student responses were scored as correct or incorrect. The internal reliability of the PC assessment for children between 7 and 12 years old is 0.80 to 0.94 (Woodcock et al., 2005). On the group-administered GMRT, students were given thirty-five minutes to read a series of passages matched to their grade level and answer corresponding multiple-choice

questions. Test–retest reliability coefficients of the GMRT are 0.89 to 0.93 for second through fifth grade (MacGinitie et al., 2002). On the group-administered TOSREC, students were given three minutes to read and respond *true* or *false* to a series of single sentence items (e.g., *A doughnut is made of very hard steel*). The TOSREC manual reports high alternate-form reliability for grades 2 through 5 ($r = 0.93$–0.89).

Procedures

Alternate forms of the PC, GMRT, and TOSREC were administered across time points, but, since alternate forms of the other measures do not exist, the same forms were used at each time point. At each time point, data were collected in one individual administration session and one group administration session. Assessment administrators were trained each year. All administrators were required to achieve 90 % or above on a checklist for fidelity of assessment administration for each measure before they began testing in schools. Fidelity of administration was monitored throughout the project. All administration sessions were audio-recorded, and 20 % of the assessment sessions were coded for fidelity of assessment administration. Fidelity was above 90 % across all coded assessment sessions. Raw scores were used in analyses for all measures except the PC. For this measure only, W scores were used to scale the latent reading comprehension variable.[3]

Results

Preliminary analyses

First, we created a latent variable for reading comprehension using the PC, TOSREC, and GMRT variables. Table 2 shows descriptive statistics for these variables. Initially, we conducted a series of confirmatory factor analyses (CFAs) to establish whether a single latent factor of reading comprehension existed. All three observed variables were mean-centered. The CFA model at each time point, which included three unique variable variances, two factor loadings (the loading for the PC variable was constrained to unity to set the scale for the factor), and a factor variance was just-identified, which resulted in perfect fit. The CFA model for this same structure across time with the stipulation of allowing the factors to correlate and the error variances of the same indicator to covary across time provided good model-data fit [χ^2 (188, $N = 389$) = 242.2, $p = 0.005$, CFI = 0.99, RMSEA = 0.045], suggesting that a viable reading comprehension factor was indicated by the three observed variables across the eight time points (i.e., the beginning and end of grades 2, 3, 4, and 5).

[3] The decision to equate factor scores for the latent reading comprehension variable to the W-scale allowed for an interpretable growth metric for the major outcome of the study. The W score is a transformation of the Rasch scale with equal intervals. The W scale is centered on a value of 500 for the average performance at grade 5.0. On the PC measure, the following W scores are equivalent to grade 2.1, 3.3, 4.4, and 5.2, respectively: 472, 490, 499, 504.

Table 2 Means and standard deviations for the reading comprehension measures disaggregated by time point and language status

Measures	Time 1 Gr. 2 Fall	Time 2 Gr. 2 Spring	Time 3 Gr. 3 Fall	Time 4 Gr. 3 Spring	Time 5 Gr. 4 Fall	Time 6 Gr. 4 Spring	Time 7 Gr. 5 Fall	Time 8 Gr. 5 Spring
Reading comprehension 1 (PC)								
Total sample	475.14 (17.39)	479.98 (15.12)	484.41 (15.84)	489.30 (14.19)	487.87 (21.36)	491.06 (15.07)	488.71 (15.83)	491.95 (14.53)
Monolingual	479.75 (16.02)	482.92 (14.79)	489.86 (13.77)	493.37 (13.60)	493.07 (15.22)	493.03 (14.28)	491.82 (10.10)	493.52 (12.00)
Bilingual	467.78 (17.13)	475.38 (14.65)	477.96 (15.76)	484.70 (13.47)	482.24 (25.35)	489.03 (15.66)	484.83 (20.36)	490.05 (17.06)
Reading comprehension 2 (GMRT)								
Total sample	22.82 (8.10)	26.50 (7.62)	23.85 (9.48)	28.02 (10.36)	22.67 (9.42)	24.75 (9.98)	19.49 (7.88)	21.71 (8.14)
Monolingual	24.28 (8.53)	27.71 (7.40)	26.47 (9.90)	31.01 (10.06)	24.46 (9.88)	25.89 (10.39)	20.79 (7.31)	23.27 (7.94)
Bilingual	20.82 (7.08)	24.87 (7.68)	20.84 (8.01)	24.69 (9.68)	20.76 (8.53)	23.55 (9.43)	17.95 (8.33)	19.98 (8.10)
Reading comprehension 3 (TOSREC)								
Total sample	16.74 (9.56)	23.79 (10.13)	20.37 (9.26)	22.11 (8.38)	19.97 (9.43)	26.48 (10.87)	18.50 (9.56)	22.84 (9.88)
Monolingual	19.03 (9.95)	26.00 (10.47)	22.77 (9.20)	24.16 (8.30)	21.51 (8.75)	28.19 (10.22)	19.59 (7.78)	25.10 (8.69)
Bilingual	13.57 (8.06)	20.79 (8.90)	17.61 (8.57)	19.79 (7.90)	18.36 (9.88)	24.74 (11.28)	17.16 (11.32)	20.30 (10.58)

W scores are presented for PC, and raw scores are presented for GMRT and TOSREC

Table 3 Descriptive statistics for the estimated intercepts (averages) for the word recognition and language variables used in the study

Variable	Total sample	Monolingual	Bilingual
Word recognition	41.55 (7.90)	43.25 (7.29)	39.47 (8.14)
Vocabulary breadth	28.95 (8.34)	30.57 (8.26)	26.97 (8.03)
Vocabulary depth	5.81 (1.68)	6.27 (1.77)	5.25 (1.37)
Morphological awareness	16.43 (3.91)	16.67 (3.90)	16.13 (3.93)
Syntactical skill	31.39 (9.41)	34.65 (8.22)	27.43 (9.26)

Next, we tested whether the trajectories of latent reading comprehension for the cohorts in our cohort sequential design converged using a likelihood ratio test (LRT) in which two models, a *full* model (i.e., with dummy variables included allowing for trajectories to differ by cohort) and a *reduced* model (i.e., without dummy variables that assumes a common trajectory across all three cohorts), were compared (Miyazaki & Raudenbush, 2000). The LRT results for latent reading comprehension implied that the linear trajectories of reading comprehension converged [χ^2 (4, $N = 389$) = 7.6, $p = 0.106$]. (A non-significant finding indicates that the cohort trajectories converged while a significant finding indicates non-convergence.) Thus, we did not control for cohort on the outcome variable of reading comprehension in our latent growth modeling.

We then tested the convergence of the cohort trajectories of the word recognition and language variables under investigation, with the goal of establishing second grade initial status for all participants for use in answering our research question. All variables except Vocabulary Depth converged: Word Recognition [χ^2 (4, $N = 389$) = 8.5, $p = 0.074$], Vocabulary Breadth [χ^2 (4, $N = 389$) = 9.2, $p = 0.056$]; Vocabulary Depth [χ^2 (4, $N = 389$) = 24.8, $p < 0.001$]; Syntactical Skill [χ^2 (4, $N = 389$) = 7.8, $p = 0.100$]; Morphological Awareness [χ^2 (4, $N = 389$) = 12.4, $p = 0.054$]. Thus, we included a variable to control for cohort when estimating the initial level of Vocabulary Depth for further analysis. Table 3 presents descriptive statistics for the estimated word recognition and language skills intercepts used in analyses, and Table 4 presents correlations among these variables.[4]

Primary analyses

Once these preliminary steps were taken, we fit second order latent growth models to answer our research question (Blozis, 2004; Hancock, Kuo, & Lawrence, 2001). Figure 1 represents the model used in the present study. Using the common structural equation convention, squares in Fig. 1 denote observed variables and circles denote latent variables. In the figure, RC stands for reading comprehension.

[4] We modeled a latent variable for language skills, and the model did not converge. We also investigated growth in word recognition and language skills and how growth in these skills was related to reading comprehension. There were large standard errors for each of the growth estimates, suggesting that our model may have been underpowered to detect relationships between growth in these variables and reading comprehension.

Table 4 Correlations among estimated intercepts (average) for the word recognition and language variables used in the study

	Word recognition	Vocabulary breadth	Vocabulary depth	Syntactical skill	Morphological awareness
Word recognition	–				
Vocabulary breadth	0.77*	–			
Vocabulary depth	0.62*	0.65*	–		
Syntactical skill	0.64*	0.64*	0.75*	–	
Morphological awareness	0.59*	0.79*	0.45*	0.48*	–

* correlation is significant at $p \leq .05$

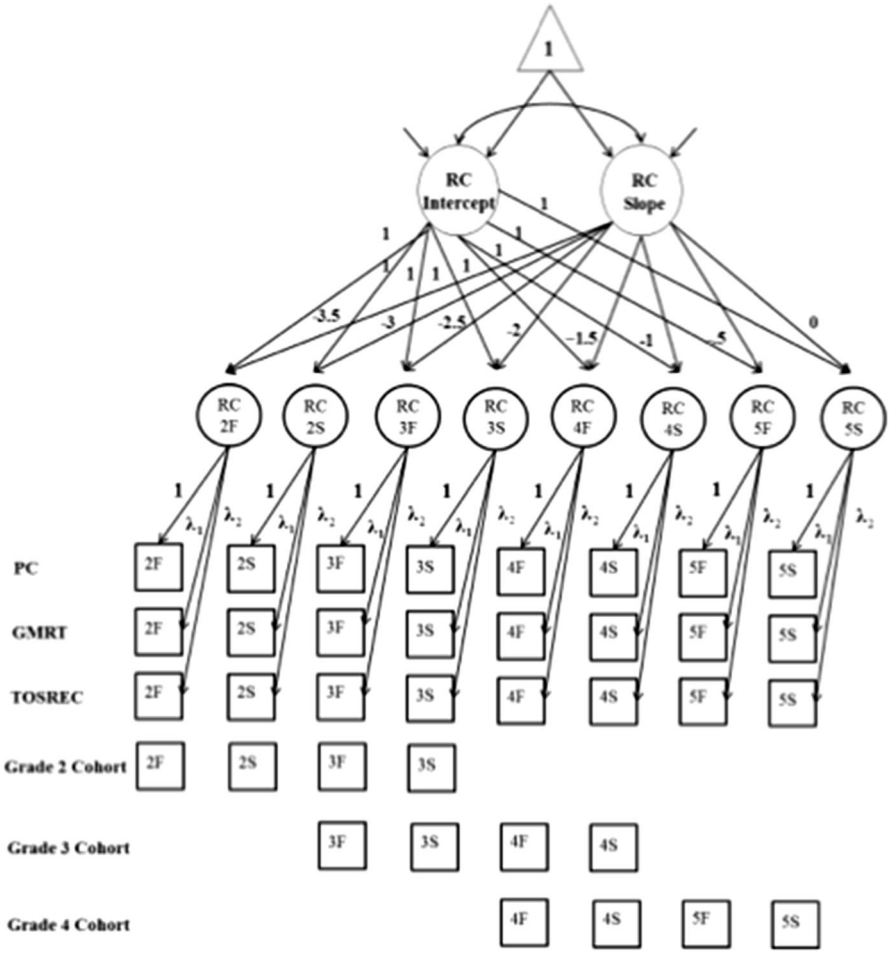

Fig. 1 Representation of the second-order linear latent growth model. *Note* RC = Reading Comprehension; 2 = Grade 2, 3 = Grade 3, 4 = Grade 4, 5 = Grade 5; F = Fall, S = Spring. Within the cohort-sequential design, cohort one contributed data from second through third grade, cohort two contributed data from third through fourth grade, and cohort three contributed data from fourth through fifth grade

The first second-order factor is labeled "RC Intercept" and is a constant for any individual across time. Given the transformation of time implied by the factor loadings in Fig. 1, the mean intercept across individuals, denoted, μ_α, is the performance in latent reading comprehension at the spring of fifth grade. The other second-order factor, labeled "RC Slope," represents the linear slope of an individual's trajectory determined by the repeated measures. The mean slope, denoted, μ_β, is the average linear rate of change in the outcome per unit of time. The second-order growth factors, intercept and slope, were allowed to vary among individuals and covary with one another. These are denoted as two-headed curved arrows in the figure and have labels, $\varphi_{\alpha\alpha}$, $\varphi_{\beta\beta}$, and $\varphi_{\alpha\beta}$, respectively. The factor loadings of the intercept are fixed at 1. The factor loadings of the slope are fixed values −3.5 to 0, representing a linear growth trend in latent reading comprehension from grades 2 through 5 in half-year increments.

In fitting a second-order LGM, error terms for each variable over time were allowed to covary. A second-order LGM necessitates a condition of factor pattern invariance where common factor pattern elements must be equal over time. In Fig. 1, the observed variable PC (W-score) was used as the scaling referent for the first-order common factors (RC at grades 2, 3, etc.), and the loadings for GMRT and TOSREC were constrained to be equal across time, as represented by the factor loadings λ_1 and λ_2, respectively. These first-order factors were then used as time-varying indicators for the second-order reading comprehension linear LGM. Corresponding intercepts of the same variable across time were constrained to be equal across time. Along with the equality constraints for the factor loadings, this level of longitudinal measurement invariance is what is often referred to as strong metric invariance (Meredith, 1993).

Unconditional model

An unconditional model (e.g., a model with no covariates) was fitted to the data first to further examine the appropriateness of the linear specification for the within-subject trajectory as well as to ascertain the viability of the cohort-sequential second-order LGM. Model fit for a linear model with permitting only random intercepts was [χ^2 (176, $N = 389$) = 323.7, $p < 0.001$, CFI = 0.952 and RMSEA = 0.075]. A model comparison was performed between a full model (with random intercepts and slopes) and a reduced model (random intercept only). Based on the Bayesian information criterion (BIC), with lower values indicating relatively better fit, it was clear the reduced model, with random intercept only, was the better fitting model ($BIC_F = 26469.8$ for the full model while $BIC_R = 26462.7$ for the reduced model). The W-scaled PC variable was used as the scaling referent for the first-order common reading comprehension factor and thus was set to "1." The loadings for the other two variables on the first order reading comprehension factor were $\lambda_1 = 0.61$, $t = 21.16$ for TOSREC, and $\lambda_2 = 0.50$, $t = 18.49$ for GMRT. The common intercepts for these same two variables were $\tau_1 = 270.1$, $t = -20.72$ for TOSREC and $\tau_2 = 25.3$, $t = -10.21$ for GMRT, respectively. Variance accounted for in the observed variables by the latent reading comprehension factor ranged from 58 to 76 %.

Table 5 Estimates and standardized effects for second-order linear growth model for reading comprehension with covariates

Parameters	Model 1		Model 2		Model 3	
	Estimates	Standardized estimates	Estimates	Standardized estimates	Estimates	Standardized estimates
Fixed effects						
Intercept	495.70***		501.50***		493.17***	
Language status			−4.04*	−0.31	3.56**	0.26
FARMS			−5.68**	−0.44	−0.55	−0.02
Word recognition (intercept)					0.82***	0.46
Vocabulary breadth (intercept)					0.09	0.06
Vocabulary depth (intercept)					2.35***	0.29
Morphological awareness (intercept)					0.02	0.01
Syntactical skill (intercept)					0.46***	0.31
Slope	5.38***		4.94***		4.33***	
Language status			1.14*	2.06	1.53**	1.85
FARMS			−0.07	−0.12	−0.48	−0.27
Word recognition (intercept)					0.06	0.55
Vocabulary breadth (intercept)					−0.14**	−1.54
Vocabulary depth (intercept)					0.13	0.27
Morphological awareness (intercept)					0.11	0.69
Syntactical skill (intercept)					0.04	0.45
Variance components						
RC intercept	174.11***		154.23***		15.31***	
Residuals	2.70		2.69		2.74	

Models for latent reading comprehension were fitted with a linear function where only the intercept randomly varied between individuals. Metric invariance was used for the measurement model with covariances between temporally-adjacent observed variables freely estimated. * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$. Model 1: RMSEA = 0.074, CFI = 0.965; Model 2: RMSEA = 0.076, CFI = 0.950; Model 3: RMSEA = 0.078, CFI = 0.950

There were significant mean levels for reading comprehension intercept [$\mu_\alpha = 495.7$ ($p < 0.001$) and slope $\mu_\beta = 5.4$ ($p < 0.001$)]. See Table 5 Model 1. Individual differences in the higher-order intercept factor were significant, with variance of the intercepts: $\varphi_{\alpha\alpha} = 174.1$ ($p < 0.001$). These findings indicated that, on average, fifth grade students in the spring semester scored approximately 496 W-scale points, roughly equivalent to grade 3.7, and incrementally (fall to spring and spring to fall) from second through fifth grade their scaled score increased nearly 5.4 points. There was significant variation among students in reading comprehension performance in spring of fifth grade.

Conditional models

Two conditional second-order LGMs were then fitted to the data. See Models 2 and 3 in Table 5. In Model 2, time-invariant covariates monolingual-bilingual (MB) language status and free and reduced meal status (FARMS) were entered into the model (RMSEA = 0.076, CFI = 0.950). Coefficients on the intercept show that bilingual students and students receiving FARMs had lower initial levels of reading comprehension. Coefficients on the slope suggest that FARMs had no effect on growth in reading comprehension, but bilingual students grew faster in reading comprehension over time.

In Model 3, the final model, the predicted intercepts for the word recognition and language skill variables were added to the model (RMSEA = 0.078, CFI = 0.943). This model accounted for approximately 91 % of the variance in intercepts (Raudenbush & Bryk, 2002, p. 128). The coefficient for MB on the intercept $\hat{\beta} = 3.56$, $p < 0.01$ implies that on average, bilingual students ended in spring of fifth grade with approximately 3.5 W-score points more on latent reading comprehension than their monolingual counterparts, controlling for FARMS and initial status in language skills. This indicates that when socioeconomic status and language abilities are equal, bilingual students significantly outperform their monolingual counterparts in fifth grade reading comprehension.

Word Recognition had a significant positive effect on reading comprehension status in fifth grade ($\hat{\beta} = 0.82$, $\hat{\beta}^* = 0.46$, $p < 0.01$). Of the language skill variables, Syntactical Skill ($\hat{\beta} = 0.46$, $\hat{\beta}^* = 0.31$, $p < 0.01$) and Vocabulary Depth ($\hat{\beta} = 2.35$, $\hat{\beta}^* = 0.29$, $p < 0.01$) had significant positive effects on reading comprehension status in fifth grade. The standardized coefficients show medium effects of Syntactical Skill and Vocabulary Depth on reading comprehension status in fifth grade. Initial status on Vocabulary Breadth ($\hat{\beta} = -0.14$, $\hat{\beta}^* = -1.54$, $p < 0.01$), was the only language variable that had a significant effect on growth in reading comprehension, controlling for other variables in the model. The effect of initial level of Vocabulary Breadth on growth in reading comprehension was negative, suggesting that lower initial expressive vocabulary breadth was associated with faster growth in reading comprehension across grades 2–5. This effect was large. Further, the coefficient for language status for the slope ($\hat{\beta} = 1.53$, $p < 0.01$)

implies that on average, bilingual students grew in reading comprehension at a rate of approximately 1.5 more W-scaled points per half-year than did monolinguals.[5]

Discussion

Answering our research question about how second grade language skills are related to growth rates and fifth-grade end points of reading comprehension yielded some interesting and unexpected findings. Initial status of Word Reading, Syntactical Skill, and Vocabulary Depth were significant, positive predictors of fifth grade reading comprehension, providing continued evidence for the importance of these variables, and calling into question the role of morphological awareness when other language variables are modeled simultaneously. Additionally, initial status of Vocabulary Breadth was a strong negative predictor of reading comprehension slope such that students with lower levels of vocabulary breadth in second grade grew at a significantly faster rate than their initially higher performing peers. One notable finding was that, net all predictors in the model, bilingual students significantly outperformed their monolingual counterparts. This is paradoxical because the descriptive reality of the sample showed the bilingual students performing well below their monolingual peers across all language and literacy measures. We discuss these findings below.

Vocabulary breadth and depth

Vocabulary breadth and depth were both found to be important indicators of reading comprehension in this study. As in research by Ouellette (2006) with fourth graders and Nation and Snowling (2004) with children ages 8.5 to 13, vocabulary depth was an important contributor to reading comprehension. While Ouellette (2006) explored the role of vocabulary depth and reading comprehension concurrently, Nation and Snowling (2004) examined the role of vocabulary depth at age 8.5 (roughly 3rd grade in the U.S.) on reading comprehension at age 13 (roughly 7th grade in the U.S.). And, while Ouellette (2006) used a definitions task to measure vocabulary depth, Nation and Snowling (2004) used word associations and synonyms tasks to measure vocabulary depth. Thus, the present study aligns most with the Nation and Snowling (2004) study in both design and measurement, but it also adds to the research base by investigating vocabulary breadth and depth concurrently with syntactical skill and morphological awareness.

Our finding on the role of vocabulary depth in reading comprehension runs contrary to the results from Oullette and Beers (2006) that suggested that neither breadth nor depth contributed to reading comprehension in grade 1 and only vocabulary breadth predicted reading comprehension in grade 6. Different measures and different grade levels may account for differences between our findings and those of Oullette and Beers (2006). In the present study, the role of vocabulary depth in reading comprehension applied to monolinguals and bilinguals. This finding

[5] We also simultaneously tested for interactions between language skill variables and monolingual-bilingual status. None of the interactions were statistically significantly.

aligns with research by Cremer and Schoonen (2013) that this particular language skill is important for students from both language groups, and it extends this work by investigating vocabulary depth alongside other language skills, namely, vocabulary breadth, syntactical skill, and morphological awareness.

Research on the role of vocabulary breadth in reading comprehension traditionally shows a positive and significant relationship for monolinguals and bilinguals alike (e.g., Babayiğit, 2014; Mancilla-Martinez & Lesaux, 2010; Quinn et al., 2015). Thus, the finding in the present study that vocabulary breadth had a significant and negative relationship with growth in reading comprehension is somewhat puzzling. It may be that at lower levels of vocabulary breadth, all else being equal and given exposure to a wide range of vocabulary at home and in school, students are catching up in vocabulary and reading comprehension so they are growing at a faster rate than students with higher levels of vocabulary. This explanation would be reminiscent of findings from some intervention studies that show that students with lower vocabulary knowledge gain more from vocabulary intervention than students with higher vocabulary knowledge (e.g., Coyne, Simmons, Kame'enui, & Stoolmiller, 2004; Silverman, 2007).

Syntactic skill

Just as vocabulary depth was an important and positive predictor of reading comprehension in our study, so too was syntactic skill. While there is not as much research on the role of syntax in reading comprehension as there is for other language skills, research by Low and Siegel (2005), Moktari and Thompson (2006) and Simard et al. (2014) has suggested that syntactical skill may play an important role in reading comprehension. Each of these studies explored the role of syntax in reading comprehension in one grade in upper elementary school and did not include measures of vocabulary, morphology, and syntax together. Thus, our study contributes to the research base by investigating the role of early syntax on later reading comprehension, controlling for the other language skills of interest in this study.

As in the studies by Low and Siegel (2005) and Simard et al. (2014), we found that the role of syntax in reading comprehension does not differ for monolinguals and bilinguals. This finding contradicted research by Geva and Farnia (2014) that showed that syntactical skill contributed to reading comprehension for ELLs but not for native English speakers. Interestingly, the measure we used in our study aligned most closely to the measure used in the study by Geva and Farnia (2014). However, our study differed from the study by Geva and Farnia (2014) in two ways. First, the bilinguals in our sample were all from Spanish speaking backgrounds rather than multiple language backgrounds. Second, we investigated the role of syntax in second grade on reading comprehension in fifth grade rather than the role of syntax in fifth grade on reading comprehension in fifth grade. These differences may account for divergent findings, but further research clarifying the role of syntax in reading comprehension for monolinguals and bilinguals is needed.

Morphological awareness

The fact that there was no relationship between morphological awareness and reading comprehension in this study was also surprising, given the research by Carlisle (2000), Kruk and Bergman (2013) and Deacon et al. (2014) showing the importance of this language skill to reading comprehension. However, the finding from this study is aligned with research by McCutchen et al. (2008), Apel et al. (2012) and Goodwin et al. (2013), as well as our own previous work with these data (Proctor et al., 2012), that suggests that morphological awareness does not have a significant and positive direct effect on reading comprehension. Differences in findings across studies may be attributable to measures used and samples studied (e.g., different grades and language backgrounds), but the recent work by Goodwin et al. (2013) suggests that morphological awareness may have a role in reading comprehension through its effect on reading vocabulary. We did not explore indirect effects of morphological awareness on reading comprehension in our analyses, but researchers should aim to investigate not only direct but also indirect effects of the various language skills on reading comprehension with larger samples. Indeed, in addition to the research by Goodwin et al. (2013), recent work by Deacon, Kieffer, and Laroche (2014) with monolinguals in grades 3 and 4 and Kieffer, Biancarosa, and Mancilla-Martinez (2013) with bilinguals in 6th through 8th grades suggests that morphological awareness may play a role in reading comprehension through its influence on word reading, fluency, and/or vocabulary. Much more work along these lines that includes measures of vocabulary breadth and depth and syntax and well as morphology are needed to further understand how morphological awareness effects reading comprehension in upper elementary school.

The paradox of language status

Finally, previous research has shown that, when comparing bilingual and monolingual populations on reading outcomes, predictive models that include multiple language and literacy indicators tend to erase unconditional language status differences (e.g. Proctor, Dalton, Uccelli, Biancarosa, Mo, Snow, & Neugebauer, 2011). This makes good sense given that if we linguistically equate two groups who differ primarily on aspects of language, then those differences ought to disappear. Note also that Model 2 in Table 5 shows that there is a significant difference in reading comprehension in favor of the monolingual students even when free and reduced lunch status is controlled.

This study is the first to detect an effect whereby bilingual students are predicted to outperform their monolingual counterparts when language skills are controlled. However, the results here only simulate such a scenario through statistical manipulation. The reality was that the bilingual students performed less well then the monolinguals on all of our indicators. Yet this finding still leads us back to what is it that distinguishes bilingual from monolingual students. One such distinguishing trait is the presence of a heritage language. An intriguing hypothesis, worthy of future research, is that when bilingual learners actually attain comparable word

reading and linguistic proficiency as their monolingual peers, are reading outcomes measurably better?

Implications

If the findings from the present study hold up in future research on the language constructs under investigation, there are implications for developing instructional interventions to support reading comprehension for monolinguals and bilinguals in upper elementary school. Given the importance of vocabulary depth to reading comprehension, focusing on instructional strategies such as word association tasks, synonym/antonym tasks, and semantic feature analysis tasks as used in Carlo et al. (2004) may be important. And, given the importance of syntactical skill to reading comprehension, including instructional strategies such as sentence combining (Wilkinson & Patty, 1993), explicit teaching of sentence complexity (Hirschman, 2000 as cited in Scott, 2009), and providing exposure to and supporting production of syntactical targets (Phillips, 2014) may be worth considering for inclusion in future interventions for reading comprehension.

Strengths and limitations of the present study

The present study contributes to the literature by simultaneously investigating multiple language skills and reading comprehension and by investigating the role of these language skills on growth and fifth grade end points in reading comprehension. This research provides an important foundation for future research investigating multiple language skills and growth in reading comprehension in upper elementary school. The present study also contributes to the literature by investigating these language skills in a heterogeneous sample of monolinguals and bilinguals. Much more research is needed to understand how language skills are related to reading comprehension for students from these language groups. Finally, the present study used a latent variable for reading comprehension, ensuring we had a robust indicator of this construct. Future studies should use latent variables when possible to reduce the error associated with specific observed measures of the construct under investigation. However, despite these strengths, there were several limitations of the study that should be considered in interpreting results and in designing future research along these lines.

First, due to the limited sample size and the methodological complexity of the current study, we did not have enough power to investigate research questions pertaining to how growth in language skills are related to growth in reading comprehension (as in Quinn et al., 2015) and how these relationships are similar or different for monolinguals and bilinguals. Future studies with much larger samples are needed to answer these questions. Second, in order to protect students in our sample from the effects of over-testing, we did not collect multiple measures of language skills in this study. Given that different measures of language skills may have different relations to reading (Apel, Diehm, & Apel, 2013), future studies should include multiple measures of each language skill and create latent variables for the language skills, if possible. Third, our study included a relatively

homogenous sample of bilingual students in that they were all Spanish-speaking, which limits the generalizability of our findings about how monolinguals and bilinguals compare. Future studies should include bilingual students from multiple language groups (e.g., Geva & Farnia, 2012) and disentangle how language skills may be related to reading comprehension for students from a variety of different language backgrounds.

Conclusions

It is generally well-accepted that language skills are important to reading comprehension. However, there is less consensus on the relative importance of various language skills to reading comprehension for students from different language backgrounds. To appropriately address the needs of both monolingual and bilingual students struggling in reading comprehension in the upper elementary grades, research on which language skills might be appropriate targets for intervention is needed. Results from this study suggest that vocabulary depth and syntax may be important targets for intervention, but much more research is needed to confirm these results.

References

Adlof, S. M., Catts, H. W., & Little, T. D. (2006). Should the simple view of reading include a fluency component? *Reading and Writing: An Interdisciplinary Journal, 19*, 933–958.

Anderson, R. C., & Freebody, P. (1981). Vocabulary knowledge. In J. Guthrie (Ed.), *Comprehension and teaching: Research reviews* (pp. 77–117). Newark, DE: International Reading Association.

Apel, K., Diehm, E., & Apel, L. (2013). Using multiple measures of morphological awareness to assess its relation to reading. *Topics in Language Disorders, 33*, 42–56.

Apel, K., Wilson-Fowler, E. B., Brimo, D., & Perrin, N. A. (2012). Metalinguistic contributions to reading and spelling in second and third grade students. *Reading and Writing: An Interdisciplinary Journal, 25*, 1283–1305.

August, D., Kenyon, D., Malabonga, V., Louguit, M., & Caglarcan, S. (2001). *Extract the base*. Washington, DC: Center for Applied Linguistics.

August, D., & Shanahan, T. (2006). *Developing literacy in second language learners*. Mahwah, NJ: Lawrence Erlbaum Associates.

Babayiğit, 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*, 22–47.

Blozis, S. A. (2004). Structured latent curve models for the study of change in multivariate repeated measures. *Psychological Methods, 9*, 334–353.

Cain, K. (2007). Syntactic awareness and reading ability: Is there evidence for a special relationship? *Applied Psycholinguistics, 28*, 679–694.

Cain, K., & Oakhill, J. (2011). Matthew effects in young readers: Reading comprehension and reading experience aid vocabulary development. *Journal of Learning Disabilities, 44*, 431–443.

Carlisle, J. F. (2000). Awareness of the structure of meaning of morphologically complex words: Impact on reading. *Reading and Writing: An Interdisciplinary Journal, 12*, 169–190.

Carlo, M., August, D., McLaughlin, B., Snow, C., Dressler, C., Lippman, D., & White, C. (2004). Closing the gap: Addressing the vocabulary needs of English language learners in bilingual and mainstream classrooms. *Reading Research Quarterly, 39*, 188–206.

Carnegie Council on Advancing Adolescent Literacy. (2010). *Time to act: An agenda for advancing adolescent literacy for college and career success*. New York, NY: Carnegie Corporation of New York.

Carroll, J. B. (1993). *Human cognitive abilities: A survey of factor analytic studies*. Cambridge, MA: Cambridge University Press.

Catts, H. W., Compton, D., Tomblin, J. B., & Bridges, M. S. (2012). Prevalence and nature of late-emerging poor readers. *Journal of Educational Psychology, 104*, 166–181.

Coyne, M., Simmons, D., Kame'enui, E., & Stoolmiller, M. (2004). Teaching vocabulary during shared storybook readings: An examination of differential effects. *Exceptionality, 12*, 145–162.

Cremer, M., & Schoonen, R. (2013). The role of accessibility of semantic word knowledge in monolingual and bilingual fifth-grade reading. *Applied Psycholinguistics, 34*, 1195–1217.

Davis, F. B. (1944). Fundamental factors in reading. *Psychometrika, 9*, 185–197.

Davis, F. B. (1968). Research in comprehension in reading. *Reading Research Quarterly, 3*, 499–545.

Deacon, S. H., Kieffer, M. J., & Laroche, A. (2014). The relation between morphological awareness and reading comprehension: Evidence from mediation and longitudinal models. *Scientific Studies of Reading, 18*, 432–451.

Dreyer, L. G., & Katz, L. (1992). An examination of "The simple view of reading". In C. K. Kinzer & D. J. Leu (Eds.), *Literacy research, theory, and practice: Views from many perspectives* (pp. 169–175). Washington, DC: The National Reading Conference.

Foorman, B. R., Koon, S., Petscher, Y., Mitchell, A., & Truckenmiller, A. (2015). Examining general and specific factors in the dimensionality of oral language and reading in 4th–10th grades. *Journal of Educational Psychology*. doi:10.1037/edu0000026.

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: An Interdisciplinary Journal, 25*, 1819–1845.

Goodwin, A. P., Huggins, A. C., Carlo, M. S., August, D., & Calderon, M. (2013). Minding morphology: How morphological awareness relates to reading for English language learners. *Reading and Writing: An International Journal, 26*, 1387–1415.

Gough, P. B., & Tunmer, W. (1986). Decoding, reading, and reading disability. *Remedial and Special Education, 7*, 6–10.

Grosjean, J. (2010). *Bilingual: Life and reality*. Cambridge, MA: Harvard University Press.

Hancock, G. R., Kuo, W.-L., & Lawrence, F. R. (2001). An illustration of second-order latent growth models. *Structural Equation Modeling: A Multidisciplinary Journal, 8*, 470–483.

Hirschman, M. (2000). Language repair via metalinguistic means. *International Journal of Language and Communication Disorders, 35*, 251–268.

Hoover, W. A., & Gough, P. B. (1990). The simple view of reading. *Reading and Writing: An Interdisciplinary Journal, 2*, 127–160.

Kieffer, M. J. (2010). Socioeconomic status, English proficiency, and late-emerging reading difficulties. *Educational Researcher, 39*, 484–486.

Kieffer, M. J. (2014). Morphological awareness and reading difficulties in adolescent Spanish-speaking language minority learners and their classmates. *Journal of Learning Disabilities, 47*, 44–53.

Kieffer, M. J., Biancarosa, G., & Mancilla-Martinez, J. (2013). Roles of morphological awareness in English reading comprehension for Spanish-speaking language minority learners: Exploring partial mediation by vocabulary and reading fluency. *Applied Psycholinguistics, 34*, 697–725.

Kieffer, M. J., & Lesaux, N. K. (2012). Direct and indirect roles of morphological awareness in English reading comprehension of native English, Spanish, Filipino, and Vietnamese speakers. *Language Learning, 62*, 1170–1204.

Kruk, R. S., & Bergman, K. (2013). The reciprocal relations between morphological processes and reading. *Journal of Experimental Child Psychology, 114*, 10–34.

Lee Swanson, H., Rosston, K. K., Gerber, M., & Solari, E. (2008). Influence of oral language and phonological awareness on children's bilingual reading. *Journal of School Psychology, 46*, 413–429.

Low, P., & Siegel, L. S. (2005). A comparison of the cognitive processes underlying reading comprehension in native English and ESL speakers. *Written Language and Literacy, 8*, 207–231.

MacGinitie, W., MacGinitie, R., Maria, K., & Dreyer, L. (2002). *Gates-MacGinitie reading tests* (4th ed.). Itasca, IL: Riverside.

Mancilla-Martinez, J., & Lesaux, N. K. (2010). Predictors of reading comprehension for struggling readers: The case of Spanish speaking Language Minority Learners. *Journal of Educational Psychology, 102*, 701–711.

McCutchen, D., Green, L., & Abbot, R. D. (2008). Children's morphological knowledge: Links to literacy. *Reading Psychology, 29*, 289–314.

Meredith, W. (1993). Measurement invariance, factor analysis, and factorial invariance. *Psychometrika, 58*, 525–542.

Miyazaki, Y., & Raudenbush, S. W. (2000). A test for linkage of multiple cohorts from an accelerated longitudinal design. *Psychological Methods, 5*, 44–63.

Mokhtari, K., & Thompson, H. B. (2006). How problems of reading fluency and comprehension are related to difficulties in syntactic awareness among fifth graders. *Reading Research and Instruction, 46*, 73–94.

Nation, K., & Snowling, M. (2004). Beyond phonological skills: Broader language skills contribute to the development of reading. *Journal of Research in Reading, 27*, 342–356.

Nesselroade, J. R., & Baltes, P. B. (Eds.). (1979). *Longitudinal research in the study of behavior and development*. New York, NY: Academic Press.

Ouellette, G. P. (2006). What's meaning got to do with it: The role of vocabulary in word reading and reading comprehension. *Journal of Educational Psychology, 98*, 554–566.

Ouellette, G. P., & Beers, A. (2010). A not-so-simple view of reading: How oral vocabulary and visual-word recognition complicate the story. *Reading and Writing: An Interdisciplinary Journal, 23*, 189–208.

Phillips, B. M. (2014). Promotion of syntactical development and oral comprehension: Development and initial evaluation of a small-group intervention. *Child Language Teaching and Therapy, 30*, 63–77.

Proctor, C. P., Dalton, D., Uccelli, P., Biancarosa, G., Mo, E., Snow, C. E., & Neugebauer, S. (2011). Improving Comprehension Online (ICON): Effects of deep vocabulary instruction with bilingual and monolingual fifth graders. *Reading and Writing: An interdisciplinary journal, 24*, 517–544.

Proctor, P., Silverman, R., Harring, J. R., & Montecillo, C. (2012). The role of vocabulary depth in predicting reading comprehension among English monolingual and Spanish-English bilingual children in elementary school. *Reading and Writing: An Interdisciplinary Journal, 25*, 1635–1664.

Quinn, J. M., Wagner, R. K., Petscher, Y., & Lopez, D. (2015). Developmental relations between vocabulary knowledge and reading comprehension: A latent change score modeling study. *Child Development, 86*, 159–175.

Raudenbush, S. W., & Bryk, A. S. (2002). *Hierarchical linear models* (2nd ed.). Thousand Oaks, CA: Sage.

Rydland, V., Aukrust, V. G., & Fulland, H. (2012). How word decoding, vocabulary and prior topic knowledge predict reading comprehension. A study of language-minority students in Norwegian fifth grade classrooms. *Reading and Writing: An Interdisciplinary Journal, 25*, 465–482.

Scarborough, H. S. (2001). Connecting early language and literacy to later reading (dis)abilities: Evidence, theory, and practice. In S. Neuman & D. Dickinson (Eds.), *Handbook for research in early literacy* (pp. 97–110). New York, NY: Guilford.

Scott, C. M. (2009). A case for the sentence in reading comprehension. *Language, Speech, and Hearing Services in Schools, 40*, 184–191.

Semel, E. M., Wiig, E. H., & Secord, W. (2003). *Clinical evaluation of language fundamentals*. San Antonio, TX: The Psychological Corporation.

Silverman, R. (2007). Vocabulary development of English-language and English-only learners in kindergarten. *Elementary School Journal, 107*, 365–383.

Simard, D., Foucambert, D., & Labelle, M. (2014). Examining the contribution of metasyntactic ability to reading comprehension among native and non-native speakers of French. *International Journal of Bilingualism, 18*, 586–604.

Snow, C. E., Burns, M. S., & Griffin, P. (1998). *Preventing reading difficulties in young children*. Washington, DC: National Academy Press.

Thorndike, R. L. (1973). *Reading comprehension, education in 15 countries: An empirical study*. Stockholm: Almqvist & Wiksell.

Tong, X., Deacon, S. H., & Cain, K. (2014). Morphological and syntactic awareness in poor comprehenders: Another piece of the puzzle. *Journal of Learning Disabilities, 47*, 22–33.

Tong, X., Deacon, S., Kirby, J. R., Cain, K., & Parrila, R. (2011). Morphological awareness: A key to understanding poor reading comprehension in English. *Journal of Educational Psychology, 103*, 523–534.

Vermeer, A. (2001). Breadth and depth of vocabulary in relation to L1/L2 acquisition and frequency of input. *Applied Psycholinguistics, 22*, 217–234.

Wagner, R. K., Torgesen, J. K., Rashotte, C. A., & Pearson, N. (2010). *Test of silent reading efficiency and comprehension*. Austin, TX: PRO-Ed.

Wilkinson, P., & Patty, D. (1993). The effects of sentence combining on the reading comprehension of fourth grade students. *Research in the Teaching of English, 27*, 104–125.

Woodcock, R., Munoz-Sandoval, A., Reuf, M., & Alvarado, C. (2005). *Woodcock-Muñoz language survey-revised*. Itasca, IL: Riverside.