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How Initial Word Reading and Language Skills Affect Reading Comprehension Outcomes for Students With Reading Difficulties

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Abstract

This study examined how differences in listening comprehension and word reading at the beginning of the school year influence changes in reading comprehension for English learners (ELs) with significant reading difficulties compared to non-ELs with significant reading difficulties. The study investigated heterogeneity in response to instruction among 400 struggling readers in fourth grade ($n = 183$ for non-EL; $n = 217$ for EL) who received an intensive reading intervention. At pretest, word reading, listening comprehension, and reading comprehension were measured, and at posttest, reading comprehension was measured again. Results from moderated multiple regression analyses showed a significant three-way interaction such that reading comprehension at posttest was higher for ELs than non-ELs with similar levels of low word reading but relatively higher levels of listening comprehension. However, non-ELs outperformed ELs with similar levels of relatively high word reading and average to high listening comprehension. The findings suggest that pre-intervention skill profiles may need to be interpreted differently for ELs and non-ELs with significant reading difficulties in relation to language and literacy outcomes.

Although early reading interventions have demonstrated robust impacts (e.g., O'Connor, Bocian, Beebe-Frankenberger, & Linklater, 2010; Wanzek, Swanson, Vaughn, Roberts, & Fall, 2016), remedial programs targeting students in third grade and above have been associated with much smaller effects (Scammacca, Roberts, Cho, Williams, Roberts, Vaughn, & Carroll, 2016). One possible explanation for the stronger findings with primary students is the emphasis of early reading interventions on word reading, which exerts a relatively large influence on comprehension at these grades because the text demands are relatively simple and the linguistic-related skills such as vocabulary, syntax, and background knowledge are less influential than in later grades, when text demands are more complex (e.g., Catts, Adlof, & Weismer, 2006).

Reading difficulties for students in the upper-elementary and middle school grades are multifaceted (Deshler & Hock, 2007). The vast majority of middle school students with reading problems (81%) demonstrate problems in comprehension, fluency, *and* decoding—not just reading comprehension (Cirino, Romain, Barth, Tolar, Fletcher, & Vaughn, 2013). Most studies investigating the efficacy of interventions for improving literacy outcomes for students with reading difficulties in Grades 4 to 9 yield findings with no or small impact for standardized measures of reading comprehension (e.g., Cheung, Slavin, Lake, & Kim, 2016; James-Burdumy et al., 2012; Kemple, Corrin, Nelson, & Salinger, 2008). For example, results from randomized trials investigating yearlong reading interventions provided to middle school students with reading difficulties have yielded effect sizes ranging from 0.09 to 0.16 (Corrin, Somers, Kemple, Nelson, & Sepanik, 2008; Kemple et al., 2008) regardless of whether the intervention focused primarily on text reading and comprehension (Vaughn, Klingner, Swanson, Boardman, Roberts, Mohammed, & Stillman-Spisak, 2011), aligned with the reading skills of the target students (Vaughn, Wexler, et al., 2011), or included technology components (Lang, Torgesen, Vogel, Chanter, Lefsky, & Petscher, 2009).

There are several possible explanations for relatively smaller effects of reading interventions for upper-elementary and secondary students, including that (a) the foundational skills of phonemic awareness and phonics are more readily acquired from intervention, (b) many students identified as at risk in the early grades may be false positives and thus their response to instruction can be partially attributed to inadequate instructional opportunities (e.g., Johnson, Jenkins, Petscher, & Catts, 2009), and (c) the reading problems of students in the later grades are likely the most intractable and thus remediation is more challenging. These students likely have the most intensive reading needs; thus, we may benefit from determining whether student attributes (e.g., pre-intervention word reading or language ability, English learner [EL] status) contribute to our understanding of how they will respond to reading interventions.

Considering the relatively low impacts of studies targeting students with significant reading difficulties in the upper-elementary and middle school grades, it is essential to investigate student-level factors associated with differential response to instruction and thus further our understanding of how to tailor and improve these interventions. In their call for this special issue, D. Fuchs and L. Fuchs suggested that one mechanism for improving understanding of intensive interventions is to determine for whom interventions are effective and under what conditions—questions addressed in their recent work exploring whether initial academic performance affected response to a fractions intervention (Fuchs, Sterba, Fuchs, & Malone, 2016). For middle grade students with significant reading disabilities, we propose that initial status on listening comprehension (as a marker for vocabulary and background knowledge) and word reading might be important variables to consider when predicting individual response to reading instruction. We also investigate whether the relationships between these predictors and subsequent reading outcomes are different for ELs and non-ELs.

The Simple View of Reading for ELs and non-ELs

The simple view of reading (SVR) provides an organizing framework for understanding how the component skills of reading contribute to reading comprehension (Gough & Tunmer,

1986). SVR proposes that two interrelated but separable components, decoding and linguistic comprehension, contribute in a multiplicative manner to reading comprehension. Decoding is the ability to quickly and accurately access a mental representation of text relying on phonetic decoding and automatic word recognition. Linguistic comprehension is the lexical information that represents meaning and syntax, such as vocabulary knowledge and phrase- and sentence-level syntax, and it may also be assessed as listening comprehension (Lonigan & Milburn, 2017).

SVR has been substantiated as a robust model for predicting reading comprehension for both ELs and non-ELs in studies with large samples with diverse reading skills that use multiple outcome measures (Hoover & Gough, 1990; Kieffer & Vukovic, 2012; Lesaux, Crosson, Kieffer, & Pierce, 2010; Lesaux, Rupp, & Siegel, 2007; Mancilla-Martinez, Kieffer, Biancarosa, Christodoulou, & Snow, 2011; Proctor, Carlo, August, & Snow, 2005). Findings for both ELs and non-ELs indicate that decoding and linguistic comprehension skills explain substantial variance in reading comprehension development. Additionally, and consistent with research with monolingual English speakers, these studies suggest that for ELs without reading difficulties, decoding skills become less predictive of reading comprehension than linguistic comprehension in later grades. However, there is some evidence that the relative contribution of decoding and linguistic comprehension to subsequent reading comprehension may differ among late-elementary ELs with low reading comprehension (Mancilla-Martinez & Lesaux, 2010), although this finding is not consistent in longitudinal studies with ELs and non-ELs (Kieffer & Vukovic, 2012; Lesaux et al., 2010).

Taken together, these studies indicate that the SVR variables of decoding and linguistic comprehension are robust longitudinal predictors of reading comprehension for both ELs and non-ELs and therefore important intervention targets. However, these studies do not leverage what is known about students' initial skills in decoding and language (both ELs and non-ELs) to predict potential differences in individuals' response to interventions. In a recent meta-analysis, Stuebing, Barth, Trahan, Reddy, Miciak, & Fletcher (2015) summarized 28 studies investigating cognitive and linguistic factors that may predict individual response to reading interventions. Although limited overlap among the included studies precluded an analysis of the relative strength of specific cognitive and linguistic predictors, initial status in both language and word reading skills were identified as significant predictors of intervention response. The results indicate that student characteristics prior to intervention are associated with small but statistically significant differences in posttest outcomes for students in intensive interventions and may provide guidance for future attempts to tailor interventions to individual student profiles.

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None of the 28 studies investigating initial status predictors of intervention response reviewed by Stuebing et al. (2015) reported results specific to ELs. None of the studies that included ELs (Foorman, Francis, Fletcher, Schatschneider, & Mehta, 1998; Vadasy, Sanders, & Abbott, 2008) disaggregated results for ELs or investigated EL status as a potential moderating variable. As a result, it is unknown whether well-established predictors of intervention response (e.g., word reading and linguistic comprehension) function similarly for ELs and non-ELs with significant reading difficulties. In the present study, we directly investigate this question.

Purpose of the Study

The purpose of this study is to better understand how the factors associated with reading comprehension from SVR (listening comprehension and decoding; Gough & Tunmer, 1986) may affect receptivity to particular treatments. We also investigate whether the relationship between the SVR factors and individual differences in response to interventions differs for ELs and non-ELs. These questions have implications for interventionists working with ELs, non-ELs struggling to read, and ELs struggling to read. Understanding the components of SVR and their influence on reading comprehension can inform instructional planning for both ELs and non-ELs struggling to learn. Understanding how word reading and listening comprehension affect reading comprehension differently across the two language groups can support teachers tasked with fine-tuning instruction to meet the unique needs of ELs who read with low comprehension. Our focus is on the mechanics of SVR in the context of low reading achievement and how the model's components may interact differently across the two primary language groups for the purpose of informing the instructional decision making of interventionists working in related areas.

The sample for this study participated in a study examining the efficacy of a researcher-provided small group reading intervention with fourth-graders with significant reading difficulties who were randomly assigned to a researcher- or school-implemented condition (Vaughn, Solís, Miciak, Taylor, & Fletcher, 2016). School personnel chose to provide interventions in the business-as-usual condition. Thus, students in the researcher- and school-implemented conditions received intensive word reading and reading comprehension interventions. Findings revealed no statistically significant differences between students in the researcher- and school-implemented reading interventions after a year of instruction (Vaughn et al., 2016). There were no significant differences, on average, between students in the treated and untreated conditions on any of the study's outcomes (Woodcock-Johnson [WJ-III] Letter Word Identification: $F(1, 393) = 3.56, p = .06$; WJ-III Spelling: $F(1, 101) = 1.45, p = .23$; WJ-III Passage Comprehension: $F(1, 393) = 0.10, p = .75$; Gates-Mac-Ginitie Comprehension: $F(1, 405) = 0.69, p = .41$; Test of Word Reading Efficiency [TOWRE]: $F(1, 399) = 0.05, p = .83$; Test of Silent Reading Efficiency and Comprehension: $F(1, 405) = 0.05, p = .83$). However, students in both conditions made significant gains in reading outcomes, as shown by increases of 3 standard score points on decoding, 5 on fluency, and 2 to 7 on a range of reading comprehension measures from pre-test to posttest. The present study does not evaluate between-group differences by treatment assignment but instead investigates heterogeneity in their response to instruction. Across both treatment groups,

individual students demonstrated relatively larger or smaller growth in reading comprehension over the course of the study; we evaluate whether individual differences at baseline (pretest) can explain observed differences in growth.

A single research question guides the study: Do differences in listening comprehension and/or word reading at the beginning of the school year predict changes in reading comprehension differently for ELs than for non-ELs with significant reading difficulties?

Method

We used data from a multisite randomized control trial (RCT) for students with severe reading difficulties in fourth grade. Participants were drawn from 17 schools in the Southwestern United States. Nine schools were in an urban school district, and eight schools were in two near-urban school districts. Schools were selected to reflect the demographic diversity of the broader region. The mean enrollment for the schools was 697 students, and each school included a significant proportion of students who qualified for free lunch ($M = 81.6\%$; range, 46.1%–98.4%).

Student Participants

The research teams at each site screened fourth-grade students at the participating schools using the Gates-MacGinitie Reading Comprehension subtest (MacGinitie, MacGinitie, Maria, Dreyer, & Hughes, 2000). All fourth-grade students ($n = 1,695$) were screened unless students were enrolled in an alternative curriculum (i.e., life skills class) or identified as having a significant sensory disability that interfered with participating in the study. Students whose performance was at or below a standard score of 85 met the screening criteria.

A total of 485 students met the screening criteria and were randomly assigned within school to a researcher-provided treatment ($n = 323$) or school-delivered reading intervention ($n = 161$) using a 2:1 ratio. Because there were no significant differences in the reading outcomes at posttest for students in the researcher-implemented and school-implemented reading interventions, the present study includes students in both conditions. Fifty students attrited over the course of the study, and 35 students were missing limited English proficiency (LEP) status information or posttest data. Thus, a total of 400 struggling readers ($n = 183$ for non-EL; $n = 217$ for EL) were included in this secondary analysis. Similar to other EL studies (e.g., Snow, Lawrence, & White, 2009; Wanzek et al., 2016), we included as ELs students who were currently classified as LEP and students reclassified from LEP to non-LEP in the previous two years. We considered both students currently classified as and recently reclassified from LEP as ELs, because these students frequently require academic language support.

Table 1 illustrates the student demographic data by EL status. Due to difficulties accessing demographic information from schools, a considerable proportion of the special education data (45%) were missing. Based on the demographic data available, non-ELs and ELs differed on the following demographic variables: gender, $\chi^2(1, N = 400) = 11.02, p < .001$, and special education status, $\chi^2(1, N = 224) = 19.02, p < .001$. Chisquare tests showed that a greater proportion of non-ELs were identified with a disability and as male.

Reading Interventions

All students in the treatment and comparison conditions demonstrated significant reading comprehension problems. Students randomized to the treatment condition received small group reading instruction in groups of four to five students for 35 minutes daily for approximately 16 weeks (November to April). School personnel elected to provide a reading intervention to the students randomized to the comparison condition. The school-provided reading intervention was delivered in group sizes ranging from 1 to 15 students for two to five days per week for, on average, 35 minutes per session. Although there was considerable variation in the school-implemented reading interventions, there was overlap in the components of reading (e.g., fluency, reading comprehension) addressed in the researcher- and school-delivered interventions.

Researcher-implemented reading intervention.—The standardized researcher-delivered reading intervention was organized into two-week thematic units consisting of 10 lessons aligned with what was taught in the students' social studies classes. The research team designed lessons using social studies content because it gave students ample opportunities to build background knowledge and vocabulary and read narrative and informational texts. Each lesson consisted of three components: vocabulary development (3–10 minutes), reading of a social studies passage (15–20 minutes), and instruction in decoding (10–15 minutes). In each 10-lesson unit, six vocabulary words essential to understanding the key concepts of the unit's social studies text were explicitly taught. Text reading instruction focused on developing reading fluency and comprehension through two text types: stretch texts (i.e., longer texts on grade level) and fluency texts (i.e., texts at students' reading level). In each unit, students read stretch texts and fluency passages to develop their reading fluency and comprehension. Decoding instruction addressed sight word and phonics skills, particularly vowel and multisyllabic word patterns, and students practiced these skills at the word, phrase, and sentence levels. Student progress was monitored through reading fluency progress monitoring each month. After each progress monitoring assessment, student scores were categorized into on target, at some risk, or at risk. For students identified as at risk, the research staff developed a plan for adjusting instruction.

School-implemented reading intervention.—All classroom teachers and other instructional staff members (e.g., special education personnel, reading interventionists) who provided reading instruction to the comparison condition were interviewed to ascertain the amount and type of reading instruction provided. The surveys revealed that the comparison condition included a variety of reading interventions, including those focused on phonics and word reading, fluency, reading comprehension, and reading test preparation. Teachers reported using several commercially available reading programs. For example, for phonics and word reading interventions, teachers reported using the Basic Language Skills program (Vickery, Reynolds, & Cochran, 1987), Science Research Associates Corrective Reading (Engelmann, 1988), Science Research Associates Reading Mastery (Engelmann & Bruner, 1995), and the computer-based programs Read 180 (Scholastic, 2013) and Istation (2011).

Measures

All assessments were administered by trained assessment administrators who were blind to student condition. The training for assessment administration included assessment delivery, reliability, and a demonstration of proficiency for each measure. All participating students were initially screened using the Gates-MacGinitie Reading Comprehension subtest (fourth edition) and assessed at the beginning and end of fourth grade on the WJ-III Passage Comprehension subtest, WJ-III Listening Comprehension subtest, and TOWRE Sight Word Efficiency subtest.

Reading comprehension.—In the Gates-MacGinitie Reading Comprehension subtest, students read narrative and expository passages (3–15 sentences long) and answer multiple-choice questions. Alternate form reliability is reported as .80 to .87, and the internal consistency coefficient ranges from .91 to .93. The WJ-III Passage Comprehension subtest (Woodcock, McGrew, & Mather, 2001) measures understanding of written text by providing sentences (and eventually paragraphs) that are missing a word and requiring students to add the missing word.

Listening comprehension.—The WJ-III Listening Comprehension subtest (Woodcock et al., 2001) measures students' ability to understand brief passages presented orally. The Oral Comprehension subtest is a cloze task in which students complete sentences by supplying the missing word. The Oral Comprehension subtest has a median reliability of .80 (students aged 5–19).

Word reading.—The TOWRE Sight Word Efficiency subtest (Torgesen, Wagner, & Rashotte, 1999) assesses fluency with real words and pseudowords. Students are asked to read a list of words of increasing difficulty for 45 seconds. Alternate-form reliability exceeds .90.

Data Analysis

The research design of the original study is partially nested and cross-classified (Vaughn et al., 2016). We fit unconditional models (i.e., empty means, random intercept) to estimate variance related to partial nesting and cross-classification at different levels of the model, starting with the partial nesting of students in tutors under the assumption that trivial amounts of tutor-level partial nesting would preclude any consequential cross-classification of students from the same classrooms to different tutors. We tested the hypothesis that intraclass correlations within the treatment condition do not differ statistically from 0 (within-group deviations were normally distributed) by calculating F statistics as $\bar{n}(S^2_{\text{between}})/(S^2_{\text{within}})$ where $\bar{n}$ is the average cluster size, S^2_{between} is the observed between-group variance, and S^2_{within} is the observed within-group variance (Snijders & Bosker, 1999)—with $n - 1$ and $m - n$ degrees of freedom, n being the number of Level 2 units and m the number of Level 1 units. Tutor-level clustering within the treatment condition did not differ statistically from 0 at pretest or post-test for the WJ-III Passage Comprehension subtest (p values of .65 at pretest and .18 at posttest). Thus, we ignored the design's partial nesting. We also ignored the cross-classification of teacher and tutor for the reasons out-lined previously. Further, because our research question involves student-level constructs and the sample-wide

nesting (independent of tutor) of students in classroom teachers is trivial ($p = .86$), we fit single-level models to estimate the simple main and the conditional effects of word reading and listening comprehension at Time 1 (beginning of fourth grade) on later reading comprehension outcomes (end of fourth grade) and to evaluate differences in these effects for ELs and non-ELs.

In earlier studies (Vaughn et al., 2016), main treatment effects between the researcher- and school-delivered treatments did not differ from 0. Further, the effect of the researcher-delivered treatment did not differ at the statistical mean of selected continuous moderators (listening comprehension and word reading). We did *not* consider differences in effects at values other than the mean average of listening comprehension or word reading in the earlier work. Accordingly, as a prelude to this study, we fit a series of preliminary models to determine whether the treatment's effect differed at points other than the mean of the selected moderators. The effect of treatment was not moderated at any values of listening comprehension or word reading, so we did not include assignment to condition in the models described in the following.

Descriptive features of the sample data are provided in Table 2. Data are organized by primary language group. Errors are normally distributed, homoscedastic, and independent across sampling units. The full model is expressed as

$$\begin{aligned}
 y_{\text{pretest}i} = & \beta_0 + \beta_1 \text{RC}_{\text{pretest}i} + \beta_2 \text{EL}_i + \beta_3 \text{LC}_{\text{pretest}i} \\
 & + \beta_4 \text{WR}_{\text{pretest}i} + \beta_5 (\text{EL} * \text{LC}_{\text{pretest}})_i \\
 & + \beta_6 (\text{EL} * \text{WR}_{\text{pretest}})_i \\
 & + \beta_6 (\text{LC}_{\text{pretest}} * \text{WR}_{\text{pretest}})_i \\
 & + \beta_7 (\text{EL} * \text{LC}_{\text{pretest}} * \text{WR}_{\text{pretest}})_i + \varepsilon_i,
 \end{aligned} \tag{1}$$

where EL is binary with 1, indicating students whose first language is not English (i.e., EL). Students who speak English as their first language (non-ELs) are scored as 0. We treat EL status as the independent variable or focal predictor and use non-ELs as the reference group. The other Time 1 moderators in Equation 1—listening comprehension ($\text{LC}_{\text{pretest}}$) and word reading ($\text{WR}_{\text{pretest}}$)—are continuous, as described in an earlier section of this paper. We grand-mean-center these moderators for purposes of analysis. We include the pretest score for reading comprehension as a covariate but do not model its moderating effect given our interest in the conditional effects of word reading and listening comprehension, per SVR. Thus Equation 1 includes the two-way interactions that involve EL status, listening comprehension, and word reading as well as the related three-way term. Reorganizing terms in Equation 1 yields the function (Muthén, Muthén, & Asparouhov, 2016) for EL as the focal moderator,

$$\left(\beta_1 + \beta_4 LC_{pretesti} + \beta_5 WR_{pretesti} + \beta_7 [LC_{pretesti} * WR_{pretesti}] \right)_{EL}, \quad (2)$$

which represents the simple slope (Aiken & West, 1991) at selected values of the moderators. Because we conceptualize listening comprehension as “superordinate” to word reading and reading comprehension (Gough & Tunmer, 1986), $LC_{pretest}$ serves as the “sub-focal” moderator, though subordinate to EL status. Given Equation 2, it follows that

$$\left(\beta_0 + \beta_3 LC_{pretesti} + \beta_4 WR_{pretesti} + \beta_6 [LC_{pretest} * WR_{pretest}]_i \right), \quad (3)$$

which represents the simple intercept for Equation 1. We plot the effect of Time 1 word reading on Time 2 reading comprehension at different values of listening comprehension for ELs and non-ELs, per the functions in Equations 2 and 3. Also, using methods described by Bauer and Curran (2005) and others, we identify regions along the word reading scale (apart from the mean) where EL status and listening comprehension interact to affect posttest reading comprehension. We also present confidence intervals for statistically significant interaction effects.

Results

We did not consider the effects between the treatment and control conditions. Table 2 presents descriptive statistics by primary language status for all measures (recall that treatment effects are not modeled). Table 3 presents estimates for the parameters in Equation 1. We report unstandardized coefficients. Values for the simple main effects represent average deviations from the sample mean. Because we mean centered continuous moderators (Jaccard & Turrissi, 2003), a main effect for a given covariate (i.e., the simple main effect) holds at values of the sample mean for other covariates (Hoffman, 2014) in the model. For example, the value for EL status ($\beta = -.690, p = .438$) represents the difference on the WJ-III Passage Comprehension subtest in age-based *w*-score units for ELs relative to non-ELs when comparing students who score at the mean at pretest on listening comprehension ($LC_{pretest}$) and word reading ($WR_{pretest}$) and controlling for pretest differences in reading comprehension. That is, when controlling for other influences, including the interactions among variables, struggling fourth-grade ELs make slightly smaller gains over time in reading comprehension, though the differences in gains between ELs and non-ELs do not differ statistically from 0. The simple main effect of pretest performance on the WJ-III Listening Comprehension sub-test ($\beta = .080$) does not differ from 0 ($p = .098$), whereas the simple main effect for word reading (TOWRE) at pretest ($\beta = .160$) is statistically significant ($p = .003$).

Coefficients for the two two-way interactions involving EL status do not differ statistically from 0, which means that ELs and non-ELs do not differ in the effect of word reading at

pretest on later reading comprehension ($p = .062$); word reading at pretest is generally predictive of later reading comprehension, per the statistically significant simple main effect, but its effect does not differ across the two language groups, as demonstrated by the similar slopes for ELs and non-ELs. The absence of simple main effects for listening comprehension holds across the two primary language groups ($p = .751$). Finally, the two-way interaction involving listening comprehension and word reading is statistically significant ($\beta = .008, p = .009$). The positive coefficient indicates that a given value for Time 1 word reading has a greater impact on Time 2 reading comprehension at higher scores on Time 1 listening comprehension compared to lower scores of listening comprehension independent of EL status.

The interaction of EL status ($\beta = -.010, p = .012$) with listening comprehension and word reading at pretest is of primary interest. The shaded areas in Figures 1 and 2 represent regions along the word reading scale for which the three-way interaction term is significant for ELs (Figure 1) and non-ELs (Figure 2). For ELs with TOWRE scores of 66 and below (Table 2), listening comprehension moderates the relationship of pretest word reading and posttest reading comprehension, where higher scores on the pretest WJ-III Listening Comprehension subtest (scores within the shaded area) predict better posttest performance on the WJ-III Passage Comprehension subtest compared to non-ELs with the same level of listening comprehension. For example, a TOWRE pretest score of 65 for an EL with relatively high listening comprehension (i.e., high relative to others in the sample; the sample is generally low on listening comprehension and word reading when compared with the larger population of fourth-graders) aligns with a posttest score of 480 on the WJ-III Passage Comprehension subtest (the axes in Figures 1 and 2 align, which allows comparisons across the figures), whereas non-ELs with a 65 on the pretest TOWRE score only 475 on the posttest reading comprehension measure, on average. This difference is statistically significant (Hedges $g = .387$; 95% CI [.188, .585]; Hedges, 1981), as are similar contrasts at lesser values of word reading. Note that very low word reading is not uncommon in either sample; about 12% of students in both groups scored at or below a standard score of 66. Also, about 8% of ELs and about 4% of non-ELs who score in the low range on the TOWRE (below 66) also score one standard deviation above the sample mean on the WJ-III Listening Comprehension subtest. The simple bivariate correlations for the TOWRE and the WJ-III Listening Comprehension subtest are .26 for ELs and .10 for non-ELs, a surprisingly low association between constructs that are more strongly related in the larger population of fourth graders, due probably to the narrowly defined sample and the restricted range of observed scores for word reading and listening comprehension. A similar pattern of language group differences is not evident for average and below average levels of listening comprehension, at least not along the lower range of word reading ability (Hedges g s of .139 and $-.109$, respectively).

The shaded area in Figure 2 represents values on the TOWRE (standard scores of 99 or greater) at which non-EL status moderates the relationship of word reading and reading comprehension given similar levels of listening comprehension. In this case, non-ELs with average and above average listening comprehension at pretest outperform ELs (about 20% of non-ELs and about 10% of ELs are in the higher listening comprehension group, defined as one standard deviation above the sample grand mean). At the lower end of the shaded

range (standard score of 99), ELs with higher listening comprehension differ from non-ELs by almost one-half of a standard deviation on the posttest WJ-III Passage Comprehension subtest (Hedges $g = -.449$; 95% CI $[-.648, -.250]$). Non-ELs with average listening comprehension outperform ELs by one-fifth of a standard deviation (Hedges $g = -.206$; 95% CI $[-.404, -.009]$). These differences within high and average listening comprehension groups increase as values of word reading extend beyond 99. There are no group (EL or non-EL) differences among participants with low listening comprehension at any values of word reading in the shaded area (Hedges g ranges from .027 to .069 for values of TOWRE of 99 through 110).

Discussion

We investigate the effects of the interrelationships of listening comprehension and word reading on reading comprehension for ELs and non-ELs provided intensive reading interventions in fourth grade. Given the lack of a significant difference between students randomized to the researcher-delivered and school-delivered reading intervention conditions, we examined the effects of initial word reading and listening comprehension and interactions between these variables on posttest reading comprehension for ELs and non-ELs with significant reading difficulties. There are main effects for word reading. Of primary interest, however, is the interaction of word reading and listening comprehension measured in the fall of the school year on end-of-year performance in reading comprehension for ELs and non-ELs. The statistically significant coefficient for this three-way interaction suggests that ELs with very low word reading but relatively high levels of listening comprehension (relative to the sample mean) make greater reading comprehension gains than non-ELs with the same levels of low word reading and average or high listening comprehension. However, at high levels of word reading, non-ELs outperform ELs on the year-end measure of reading comprehension when both groups have relatively high levels of listening comprehension.

This study shows that initial word reading performance is a greater predictor of reading comprehension than listening comprehension performance for students with significant reading comprehension problems in fourth grade provided intensive reading intervention. Past studies have shown that word reading plays a larger role for beginning readers; however, listening comprehension becomes increasingly important as students become more proficient readers (e.g., Chen & Vellutino, 1997; Juel, 1988; Tunmer & Hoover, 1993). Similar to the results of Mancilla-Martinez and Lesaux (2010) and Nakamoto, Lindsey, & Manis (2007), this study shows that expected developmental shifts in the influences of word reading and linguistic comprehension over time are delayed for ELs and non-ELs with below grade-level reading comprehension achievement. In a recent longitudinal study with low-performing ELs, Mancilla-Martinez and Lesaux (2018) found that word reading measured in kindergarten to second grade was more predictive of reading comprehension in fifth grade; yet by eighth grade, language-based skills were a greater predictor of reading comprehension. The effect of initial word reading performance and listening comprehension on reading comprehension did not vary based on EL status. The present findings also suggest that word reading continues to play an important role for both ELs and non-ELs with reading problems in the upper-elementary grades.

This study shows that initial word reading performance is a greater predictor of reading comprehension than listening comprehension performance for students with significant reading comprehension problems in fourth grade provided intensive reading intervention.

SVR (Gough & Tunmer, 1986) provides some guidance for explaining the effect of improved word reading on reading comprehension for students with significant reading difficulties. SVR argues for a multiplicative effect of word reading and listening comprehension leading to the product of reading comprehension. Thus, increasing word reading would improve the “size” of the product of reading comprehension. However, why would the magnitude of this effect not be the same for ELs? One possible explanation is that the effect for word reading occurs when students can both read the word and know the meaning of the word and the effect is reduced when students can read the word but have reduced knowledge about its meaning. The significant interaction between listening comprehension and word reading on posttest reading comprehension supports SVR. Assuming that SVR applies comparably across the two language groups, we would expect that the comprehension product of word reading and listening comprehension at pretest would yield the same outcome for reading comprehension for both groups. However, findings suggest that we may need to consider initial levels of word reading and listening comprehension in light of students’ primary language status. ELs with extremely low word reading and relatively high listening comprehension made greater gains in reading comprehension than non-ELs with the same levels of initial word reading and listening comprehension. And non-ELs with near average pretest word reading and relatively high listening comprehension for this sample made greater gains in reading comprehension than ELs with similar pretest scores. ELs and non-ELs who have average or above average listening comprehension and high word reading do not perform comparably at the end of the year.

Farnia and Geva (2013) examined SVR for ELs and non-ELs longitudinally (first grade through sixth grade), reporting that reading comprehension is nonlinear for non-ELs and linear for ELs. Word reading, vocabulary, syntax, and listening comprehension were significant predictors of reading comprehension for both ELs and non-ELs. Their sample included ELs and non-ELs representing a range of performance on reading measures, whereas our sample represented a group of ELs and non-ELs more restricted on reading performance (all below a standard score of 85 on reading comprehension at onset).

Furthermore, findings from this study indicate that listening comprehension modifies the two-way interaction between word reading and EL status. As listening comprehension scores increase, the effect of word reading on reading comprehension becomes significantly

smaller for ELs but not for non-ELs. Considering listening comprehension as a marker for vocabulary or word meaning, this finding aligns with our previous reliance on SVR to interpret these findings. However, some research suggests that different pre-intervention components may need to be evaluated for ELs and non-ELs with reading difficulties to predict responsiveness to instruction (e.g., Proctor et al., 2005). As ELs acquire greater proficiency in vocabulary knowledge, as reflected in their listening comprehension scores, the effect of word reading on reading comprehension appears to become significantly smaller (though we do not specifically model this contrast), resembling that of non-ELs who have similar vocabulary and language knowledge in English. The interactions between EL status and word reading as they relate to listening comprehension are negative in the two-way and three-way interactions. This nonsignificant interaction is significantly more negative for every point of increase in listening comprehension. This larger effect of word reading for non-ELs than ELs is magnified significantly as scores on listening comprehension increase. For non-ELs, this finding aligns with our previous application of SVR in that non-ELs demonstrate a larger effect of word reading on reading comprehension as their scores in listening comprehension increase—again, considering listening comprehension as a marker for word meaning or vocabulary knowledge.

Questions to Consider

Considering these findings, how do we answer the question: Do differences in listening comprehension or word reading at the beginning of the school year influence changes in reading comprehension differently for ELs compared to non-ELs with significant reading difficulties? The findings provide a rather complex and nuanced answer. Because listening comprehension and reading comprehension are highly correlated for both ELs and non-ELs in this age group (Carlisle, Beeman, Davis, & Spharim, 1999; Garcia-Vázquez, Vázquez, Lopez, & Ward, 1997) and these relationships increase as students move through the grades (Garcia-Vázquez et al., 1997), we expected that students with more severe listening comprehension difficulties at pretest would demonstrate a lower response to interventions. The two-way interaction results support this general view, demonstrating that overall, having a greater level of listening comprehension at pretest resulted in higher reading comprehension at posttest with similar levels of pretest word reading. However, listening comprehension at pretest has a differential influence on posttest reading comprehension outcomes for ELs and non-ELs. The differential impact lies in the three-way interaction of EL status, listening comprehension, and word reading. For ELs, low listening comprehension *and* low word reading at pretest is associated with lower benefit from intensive reading intervention based on the target outcome of reading comprehension. However, this phenomenon occurs at only higher levels of word reading for non-ELs.

How do we explain the different findings for ELs and non-ELs? Our goal was to examine how treatment affects the range of students with significant reading difficulties and better identify those who need more time in intervention or more customized instruction. These results suggest that listening comprehension plays an important role in predicting intervention impact but that listening comprehension may influence ELs and non-ELs differentially. We interpret that ELs with lower listening comprehension *and* lower word reading at pretest would likely have a less positive response to intensive reading instruction.

One might consider these students as having the most impaired knowledge and skill set for improving reading comprehension, particularly according to SVR's proposal that linguistic comprehension multiplied by word reading equals reading comprehension (Gough & Tunmer, 1986). This model has largely been supported for ELs and non-ELs (Hoover & Gough, 1990; Kieffer & Vukovic, 2012; Lesaux et al., 2010; Proctor et al., 2005). ELs with lower listening comprehension may indeed have lower language proficiency in English, which would likely have an impact on reading comprehension. These students are likely to need long-term and highly specialized interventions that address both oral and written language skills as mechanisms for improving their reading comprehension.

All students in the sample—EL or not—had demonstrated significant challenges in reading comprehension. We discuss students who have relatively high and low scores on measures, and it is critical to consider that these relative “highs” and “lows” are within a purposively constrained sample of students with significant reading difficulties.

We find it somewhat puzzling, however, that the non-ELs who demonstrated a less positive response on reading comprehension had low listening comprehension and high word reading at pretest. We might expect that low listening comprehension at pretest would affect these students regardless of pretest word reading ability, but in fact, it is only in the higher range of pretest word reading that we see differential effects on reading comprehension for initial listening comprehension. As few studies have examined this phenomenon with EL and non-EL samples, we are cautious to overemphasize this finding and suggest that the differential impact of pretest listening comprehension for ELs and non-ELs warrants further investigation.

Why are these findings important? A better understanding of how the needs of students with listening comprehension difficulties differ for ELs and non-ELs might serve as a trigger point for designing more effective interventions that consider the significant role of listening comprehension and language development (e.g., in reading comprehension). These findings may also improve understanding of why some students' response to instruction is less than expected and thus enable these students to be targeted early for more customized approaches that consider more deliberate mechanisms for improving language (e.g., vocabulary and construct knowledge).

Considerations for Interpreting Findings and Implications for Instruction

At least two considerations are relevant to interpretation of the findings. First, all students in the sample—EL or not—had demonstrated significant challenges in reading comprehension. We discuss students who have relatively high and low scores on measures, and it is critical to consider that these relative “highs” and “lows” are within a purposively constrained sample of students with significant reading difficulties.

Second, students are identified as EL or non-EL. The non-EL group includes monolingual English speakers and students previously identified as EL but reclassified based on their English language proficiency and thus considered by the schools as proficient in English.

Also, the topic of this special issue of *Exceptional Children* is statistical moderation. We model the interaction of three variables and their respective and joint effects on reading comprehension. The variables were selected based on theory (SVR) and prior research. Other variables might have been included; however, adding main effect variables to the model would have introduced additional interaction terms and made an already complex model even more difficult to interpret. Thus, we limit the model to theory-based and research-supported malleable factors given our ongoing interest in refining the originally implemented intervention.

These findings, as well as those in previous research (Gersten & Baker, 2000), suggest that teachers’ instruction may need to be adjusted to reflect the language needs of ELs. Baker et al.’s (2014) synthesis provided a guide for effective reading and content area instruction of ELs in kindergarten through eighth grade. They recommend (1) teaching academic vocabulary words over several days using a range of instructional practices; (2) integrating oral and written English language instruction through text reading, including content area reading instruction; (3) providing regular, structured opportunities to develop written language skills; and (4) providing intervention for students with low language and literacy skills.

Considering the significant role of SVR in guiding our understanding of the reading process, we view these findings as necessary first steps in better understanding the important roles of both listening comprehension and word reading as moderators of the treatment effects on reading comprehension for ELs and non-ELs. Our understanding of ELs’ language development is derived primarily from first-language English speakers; thus, our knowledge of language development for ELs and its role in reading development is limited (Saunders & O’Brien, 2006). Very few studies examine mechanisms for integrating language development practices within reading instruction to improve reading comprehension outcomes, which suggests that this might be a fruitful consideration for future research (Barth, Vaughn, Capin, Cho, Stillman-Spisak, Martinez, & Kincaid, 2016; Connor, Alberto, Compton, & O’Connor, 2014).

Do these interventions close the gap for students with significant reading difficulties? Participants were part of a multiyear intervention investigating the efficacy of a reading comprehension intervention over time (Vaughn et al., 2016). Using standard scores as an indicator of “closing the gap,” students made gains in word reading averaging about 3 to 5

standard score points, about 5 to 10 standard score points on fluency outcomes, and 2 to 7 standard score points on reading comprehension. Considering that these students demonstrated reading comprehension scores at pretest that were in the 6th to 12th percentiles (extremely low), these gains might be interpreted as promising. However, students were, on average, more than one standard deviation below the standard score means at posttest on comprehension, suggesting considerable distance between their current performance and grade-level expected performance. Improving outcomes for students with significant reading disabilities will likely require intensive and long-term adjustments in their instruction that go well beyond what is currently provided.

Conclusions

We examined how differences in listening comprehension and word reading affected changes in reading comprehension for fourth-grade ELs compared with non-ELs with significant reading difficulties participating in an RCT with researcher-provided intervention. Findings from moderated multiple regression analyses revealed a significant three-way interaction. Reading comprehension at posttest was higher for ELs than non-ELs with similar levels of low word reading but relatively higher levels of listening comprehension. However, non-ELs outperformed ELs with similar levels of relatively high word reading and average to high listening comprehension. We interpret these findings as suggesting educational stakeholders may interpret pre-intervention skill profiles differently for ELs and non-ELs with significant reading difficulties in relation to language and literacy outcomes. In light of the restricted research on language development in ELs, we view these findings as necessary first steps in better understanding the important roles of both listening comprehension and word reading as moderators of the treatment effects on reading comprehension for ELs and non-ELs. We think it is also valuable to note that while students made standard score gains from 3 to 10 points on word reading, fluency, and reading comprehension, the participating students demonstrated very low reading comprehension at the beginning of the study and remained significantly below average at the end of the study—suggesting a need for even more extensive and intensive intervention support.

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Figure 1.
The effect of word reading at Time 1 on reading comprehension at Time 2 for English learners with low, average, and high listening comprehension.

Figure 2.

The effect of word reading at Time 1 on reading comprehension at Time 2 for non-English learners with low, average, and high listening comprehension.

Table 1.

Demographic Information.

	Non-ELs (<i>n</i> = 183)		ELs (<i>n</i> = 217)		χ^2
	<i>N</i>	%	<i>n</i>	%	
Gender					11.02 **
Female	65	36	113	52	
Male	118	64	104	48	
Special education					19.02 **
No	68	65	106	89	
Yes	37	35	13	11	
Missing	78		98		
Race					170.14 **
Latino/Hispanic	68	37	211	97	
Caucasian/White	26	14	5	2	
African American	87	48	0	0	
Others	2	1	1	1	

Note. Percentage is calculated based on the available data.

EL = English learner.

**
p .01.

Table 2.
Descriptive Statistics for Primary Outcome and Covariates by Primary Language Status.

Measure	EL (<i>n</i> = 214)		Non-EL (<i>n</i> = 228)	
	Mean	SD	Mean	SD
WJ-III Reading Comprehension pretest	469.64	11.97	475.59	12.77
WJ-III Oral Comprehension pretest	471.20	19.14	484.59	14.26
Test of Word Reading Efficiency pretest	81.33	11.46	79.77	12.53
WJ-III Reading Comprehension posttest	481.99	11.69	488.10	12.60

Note. Standard scores for the Test of Word Reading Efficiency are presented. The score represents the expected average score in the normative sample for same-age students. The reference scores are not disaggregated by EL/non-EL status. EL = English learner; WJ-III = Woodcock-Johnson III Tests of Achievement.

Table 3.

Parameter Estimates for Equation 1.

Parameter	Estimate	SE	Estimate/SE	p Value
RC _{posttest} ON				
RC _{pretest}	.613	.042	-9.313	<.0001
EL	-.690	.889	-.776	.438
LC _{pretest}	.080	.048	1.653	.098
WR _{pretest}	.160	.054	2.975	.003
EL × LC _{pretest}	-.017	.054	-.317	.751
EL × WR _{pretest}	-.130	.070	-1.863	.062
WR _{pretest} × LC _{pretest}	.008	.003	2.595	.009
EL × LC _{pretest} × WR _{pretest}	-.010	.004	-2.498	.012
Intercepts				
RC _{posttest}	479.456	.684	700.72	<.0001
Residual variances				
RC _{posttest}	61.495	4.348	14.142	<.0001

Note. EL = English learner; LC = listening comprehension; WR = word reading; RC = reading comprehension.