FEATURE ARTICLE

# A Phonologically Based Reading Intervention for Undergraduate English Language Learners At-Risk of Reading Difficulties: A Pilot Study

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https://doi.org/10.58997/5.2fa1

## ABSTRACT

Researchers have reported that English language learners (ELLs) may be at risk of reading difficulties in the postsecondary setting. Although some students may only require explicit content-related vocabulary instruction and support with comprehension strategies in order to enhance comprehension, others may benefit from targeted short-term intervention in foundational reading skills. In this study, we examined whether a phonologically based reading intervention for undergraduate ELLs at-risk of reading difficulties would result in significant between-group differences for the proximal variables of decoding and sight word recognition and the distal variable of reading comprehension. This pilot quasi-experimental group design study involved 9 participants (treatment = 6/control = 3) from various L1 backgrounds, including Chinese, Spanish, and Arabic. Effect sizes were calculated for the proximal variables using measures of word attack and letter-word identification, and the distal variable based on a measure of passage comprehension. Although a small and small-medium effect were calculated for the measures of word attack and letter-word identification, respectively, no effect was found for the measure of passage comprehension. Implications related to intervention dosage and additional intervention components are discussed.

**Keywords: phonologically based reading program, reading comprehension, English language learners, undergraduate**

Reading comprehension is a pivotal skill for all students. Students who become competent readers have access to content knowledge (Carnine & Carnine, 2004; Vaughn et al., 2019) and are better positioned to succeed academically (Hammer et al., 2014; Klass et al., 2020). Indeed, studies have demonstrated a direct and significant relation between reading proficiency and post-secondary academic achievement (e.g., Cox et al., 2003; Vaughn et al., 2019). Conversely, students who struggle to become capable readers are not only at-risk academically but face precarious futures beyond the classroom, extending into their ability to function in society at large (Alexander, 2005; Klass et al., 2020).

Underpinning this study is a theoretical framework derived from the evolution of research related to reading comprehension.

### Undergraduate English Language Learners At-Risk of Reading Difficulties

In the United States, English language learners (ELLs) represent the fastest-growing population of students within the K–12 school system (Kanno & Cromley, 2013). Concomitantly, institutions of higher education are also reporting a similar demographic shift (Kanno & Varghese, 2010). At the postsecondary level, ELLs are facing

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barriers to both participation and attainment (Kanno & Cromley, 2013). More specifically, postsecondary ELLs who are still in the process of acquiring English and thus require academic supports are at risk of academic difficulty and the possibility of not successfully completing their program when compared to their English-proficient peers (Kanno & Cromley, 2013). Kanno and Varghese surveyed university students who spoke a language other than English as their primary language and found that the foremost reported linguistic challenges faced by these students were related to reading and writing. In terms of the former, the students identified reading comprehension as the chief barrier (Kanno & Varghese, 2010). This finding is further substantiated by Roessingh and Douglas (2012), who noted that the literacy demands of postsecondary education placed ELLs at academic risk.

Although Kanno and Varghese (2010) focused on content-specific vocabulary as a significant contributory factor to challenges relating to reading comprehension, Haager and Osipova (2017) asserted that for some ELLs, intervention in foundational reading skills is required. Haager and Osipova described the "pathways to academic learning" (p. 12) model for addressing the reading challenges experienced by some ELLs. In this model, the researchers delineated two pathways: (a) intervention in foundational reading skills and language mechanics, and (b) embedded instruction in vocabulary and comprehension strategies in addition to oral and written language opportunities (Haager & Osipova, 2017). Haager and Osipova also noted that ELLs will vary in terms of the type of support needed (i.e., interventions based on a single pathway or both). Thus, some students may only require explicit content-related vocabulary instruction and support with comprehension strategies in order to enhance reading comprehension, while others may benefit from targeted short-term intervention in foundational reading skills (Haager & Osipova, 2017).

The provision of interventions that target foundational reading skills (i.e., Pathway 1) is a process that Haager and Osipova (2017) called *backfilling* and defined as "filling in gaps in students' basic reading and oral language skills in the second language" (Haager & Osipova, 2017, p. 12). These researchers asserted that the need for intensive intervention in foundational reading skills is dependent on student-specific factors such as (a) whether ELLs are students with interrupted formal education (e.g., students who are refugees and have experienced disruptions in their formal education [see Hos, 2020]) and (b) whether ELLs have had restricted exposure to English (Haager & Osipova, 2017). Given that postsecondary institutions are recruiting a greater number of students who are considered to be academically underprepared (Salehi et al., 2020), including immigrant and refugee ELL students (Kanno & Varghese, 2010), backfilling may be required. This call for intervention in foundational skills was also made by Perin (2013), who posited that in terms of reading comprehension, both decoding and linguistic comprehension strategies needed to be explicitly taught to postsecondary students who are academically underprepared such as those with low English language proficiency. Given that Haager and Osipova (2017) determined that "Many ELLs with some proficiency still experience critical gaps in foundational skills that could be addressed with short-term intervention" (p. 12–13), the reading intervention described in this study was selected to provide undergraduate ELLs who self-identify as at-risk of reading difficulty with the backfilling they may require. Next, we describe how the specific components of the reading intervention that formed the basis of this study were selected based on Scarborough's reading rope (Scarborough, 2001).

## Theoretical Framework: Reading Comprehension

Underpinning this study is a theoretical framework derived from the evolution of research related to reading comprehension. Snow (2002) defined reading comprehension as "the process of simultaneously extracting and constructing meaning through interaction and involvement with written language" (p. 11). Research into the mechanisms that support reading comprehension has led to the development of explanatory conceptual models. Duke and Cartwright (2021) positioned both the Simple View of Reading (SVR: Gough & Tunmer, 1986; Hoover & Gough, 1990) and Scarborough's reading rope (Scarborough, 2001) as two of the foremost models used to illustrate research related to the science of reading. The SVR posits that reading comprehension is achieved by combining effective decoding and listening comprehension (Gough & Tunmer, 1986). Indeed, the pivotal roles of both decoding and vocabulary are reflected in the synthesis of the research by the National Reading Panel (NRP, 2000) as the following five areas of knowledge were determined to be fundamental to reading success: (a) phonological awareness, (b) alphabetical principle, (c) fluency, (d) text comprehension strategies, and (e) vocabulary knowledge. Building on this research is Scarborough's reading rope (Scarborough, 2001). Duke and Cartwright (2021) suggested that this latter model is more precise than SVR because it "unpacks the word recognition and language comprehension constructions" (p. 534). In Scarborough's reading rope, Scarborough proposed two strands that weave together to ultimately create the rope representing reading comprehension. The language

comprehension strand consists of (a) background knowledge, (b) vocabulary, (c) language structures, (d) verbal reasoning, and (e) literacy knowledge. The word recognition strand is composed of (a) phonological awareness, (b) decoding, and (c) sight recognition. Scarborough postulated that as language comprehension becomes more strategic and word recognition becomes automatic, skilled reading is achieved.

Due to Scarborough's reading rope's specificity in terms of identifying the underlying components contained within each strand, it was selected as the theoretical underpinning of this study. Herein, we explain how the components of the reading intervention described in this study map onto the strands of Scarborough's reading rope. The intervention in this study prioritizes foundational skills related to the word recognition strand (i.e., phonological awareness, decoding, and sight recognition). Additionally, reading fluency is also targeted to address the importance of developing automaticity of these skills when reading to support comprehension. Although the word recognition strand is emphasized within this intervention, the vocabulary component of the language comprehension strand is also addressed. However, the vocabulary incorporated in the intervention is more general in nature rather than highly content-specific, as would be the case when *frontloading* in Pathway 2 which involves "explicitly pre-teaching key vocabulary and concepts so that, during whole-class instruction, ELL students will have confidence in understanding words" (Haager & Osipova, 2017, p. 13).

Although the word recognition strand is emphasized within this intervention, the vocabulary component of the language comprehension strand is also addressed.

### Reading Interventions: Language of Instruction

It is important to address the issue of the language of instruction when delivering reading interventions. Although some schools whose ELL populations are homogeneous (e.g., Spanish speaking) have employed bilingual instructional models, schools where the students identify as speaking a vast array of native languages have primarily provided instruction in English (Calderon et al., 2011). Kamps et al. (2007) reviewed the extant research and asserted that instruction of reading skills delivered in English is associated with positive reading outcomes for ELLs, irrespective of their L1. Given that the participants in this study spoke a number of different languages as their primary language, the intervention was delivered in English.

### The Current Study

The pilot, quasi-experimental study described herein is designed to examine the effects of a reading intervention for undergraduate ELLs who self-identify as experiencing difficulties in the area of reading comprehension. Given that research has shown that some ELLs may require intervention in foundational reading skills in order to support their reading comprehension, we implemented a phonologically based reading intervention to address reduced reading comprehension for first-year postsecondary ELLs when reading in their L2. The objective was to determine if a phonologically based reading intervention would result in significant between-group differences for the proximal variables of decoding and sight word recognition and the distal variable of reading comprehension for undergraduate ELLs at-risk of reading difficulties.

## Method

### Design

A quasi-experimental group research design was employed. Participants in the treatment condition received 30-min intervention sessions twice per week for 4 weeks. Pretest occurred before treatment sessions began with all participants, and the posttest occurred following approximately a total of 320 min of intervention per student in the treatment group. All pretests, posttests, and intervention sessions were administered by the lead researcher.

### Participants

Participants were selected using non-probability purposive sampling (Etikan et al., 2016). Additionally, homogeneous sampling (Etikan et al., 2016) was employed in order to hone in on students who reported experiencing similar challenges relating to reading comprehension. Participants were chosen following a three-step selection process. First, the University's ELL program director sent a recruitment email with the necessary contact information to all students who were deemed suitable candidates for participation in the study. Additionally, instructors who worked directly with ELLs who were in their first year of university were encouraged to notify suitable study participants of the opportunity. In both cases, the onus was placed on the students to contact the lead researcher via email to communicate their interest in participating in the study. Finally, the lead researcher visited four university-level introductory

composition classes for ELLs and described the project to the students. A participant sign-up sheet was distributed, and interested students provided their contact information. The second step for locating eligible study participants involved the completion of a participant questionnaire (see Appendix A). Two students contacted by the ELL program director expressed interest in participating in the study and completed the participant questionnaire. Of the approximately 60 students enrolled in the classes visited by the lead researcher, 25 initially expressed interest in participating in the study, and five followed through and completed the participant questionnaire. Finally, information obtained using the participant questionnaire was organized into a table to allow for a point-by-point evaluation using inclusion criteria. To be eligible, participants had to (a) speak a language other than English as their L1, (b) reside in the U.S. for 2 years or more and/or have been enrolled in English classes for more than 4 years, and (c) self-report as experiencing difficulty with English reading comprehension. Six of the seven students were identified as meeting the inclusion criteria. The student excluded from the study did not self-report as having difficulty with reading comprehension in English.

The treatment participants for this study were six undergraduate university students. Most of the participants spoke Chinese as their L1 (66.7%). The other participants either spoke Spanish (16.7%) or Arabic as their L1 (16.7%). All the included participants reported experiencing difficulties with reading comprehension in their L2. Time spent in the U.S. ranged from 7 months to 5 years; however, all participants met the inclusionary criteria when exposure to English through school courses was considered. In terms of gender, 66.7% of the participants were male, and 33.3% were female. Their ages during the study ranged between 18 and 22 years old.

Given the small number of participants and time restrictions due to the end of the school year, the control group was comprised of three students who had initially volunteered for participation in the study but did not follow through by completing the participant questionnaire. The three students expressed a willingness to take the pre and posttests without an opportunity to participate in the intervention. Although this represents an unbalanced design with fewer participants in the control group than in the treatment group, Hutchins et al. (2016) demonstrated that studies with a smaller control group can generate valid and accurate findings in terms of effect size. Control participants had similar demographic profiles when compared with the treatment group. However, all control participants spoke Chinese as their L1.

**Setting**

This study was conducted at a university campus in the northeastern part of the United States. The campus is located on the periphery of a mid-sized urban center in a suburban setting. Assessments and intervention sessions for the treatment group took place in a small office on campus. The pre and posttests for the control group were administered in a study room at the university campus library.

**Materials**

***Measures***

Pre and posttest materials consisted of the *Woodcock-Johnson IV Tests of Achievement* (Schrank et al., 2014). Specifically, the pretest involved *Form B Standard*, and the posttest involved *Form A Standard*. In both cases, the same subtests were utilized where the proximal variables were measured using: (a) *Test 7 Word Attack* and (b) *Test 1 Letter-Word Identification*. The distal variable was measured using *Test 4 Passage Comprehension*. These subtests were selected because they are well-known standardized tests extensively used in educational settings (Lovett et al., 2008). *Test 7 Word Attack* was used as a measure of decoding. Participants were asked to read nonwords presented in printed form aloud. A cut-off rule of six consecutive errors was applied. The participants' scores were the number of correct items. *Test 1 Letter-Word Identification* was used to assess sight word recognition. The test required that participants read isolated words aloud. Words were presented in order of difficulty beginning with easier words. The words were presented in printed form. The participants' scores were the number of words read correctly. A cut-off rule of six consecutive mistakes was applied. Finally, *Test 4 Passage Comprehension* was used as a measure of the distal variable of reading comprehension. Participants were asked to read sentences in printed form to themselves and provide the missing words. A cut-off rule of six consecutive errors was applied. The participants' scores were the number of correct items.

***Reading Intervention***

Intervention materials consisted of lessons drawn from the *Corrective Reading: Decoding Strand* (Engelmann et al., 2008a). Each lesson involved the use of a leveled teacher presentation book and a corresponding non-consumable student book. Data collection materials included a pencil, a timer, and accompanying data-tracking sheets such as fluency charts. A small whiteboard, dry-erase marker, and eraser were used for word attack activities.

**Effect Size Calculations**

Due to the small sample size ($n \leq 20$), we used

Hedges' *g* to calculate an estimate of effect size as it "corrects for the upward bias that arises in Cohen's *d* when estimated in small samples" (Turner & Bernard, 2006, p. 45). To calculate effect size for each subtest, we replicated the procedures employed by Hwang and Riccomini (2016). Hedges' *g* was calculated for this study to estimate the effect size related to specific measures of reading skill: word attack, letter-word identification, and passage comprehension. Given that this study included a control group, effect size was calculated as $d = ((X_{post.trt} - X_{pre.trt}) - (X_{post.ctr} - X_{pre.ctr})) \sqrt{\frac{(n_{trt}-1)s^2_{trt} + (n_{ctr}-1)s^2_{ctr}}{ntrt + nctr - 2}}$. For the respective treatment and control groups, $X_{post.trt}$ and $X_{post.ctr}$ were unadjusted posttest means, $X_{pre.trt}$ and $X_{pre.ctr}$ were unadjusted pretest means, $n_{trt}$ and $n_{ctr}$ were sample sizes, and $S_{trt}$ and $S_{ctr}$ were unadjusted posttest standard deviations. Following the recommendations of Hedges and Olkin (1985), an unbiased estimator was obtained by multiplying all of the effect sizes by $(1 \frac{3}{4(ntrt + nctr) - 9})$, which represents a "correction factor for small samples" (Turner & Bernard, 2006, p. 45). Standard errors, and confidence intervals were calculated and reported with the corresponding effect sizes.

## Procedures

### *Pretest*

Students in both the treatment and the control groups completed the pretest. The lead researcher met individually with each participant with all materials ready, including the *Woodcock-Johnson IV Tests of Achievement Form B Standard* (Schrank et al., 2014) and the corresponding scoring sheets. The testing book was positioned upright on the table directly between the participant and the lead researcher, with the pages to be read by the participant facing the participant and the pages to be read by the lead researcher facing the lead researcher. The scoring sheets were arranged behind the testing book so that they were not visible to the participant. The lead researcher followed the script provided in the standard test book to guide all verbal prompts/feedback. The participants completed the activities while the lead researcher scored each response according to the guidelines indicated by the *Woodcock-Johnson IV Tests of Achievement Form B Standard* (Schrank et al., 2014).

### *Pre-Intervention*

As required by the *Corrective Reading: Decoding Strand* (Engelmann et al., 2008a), a decoding placement test was used to determine the appropriate leveled placement for each participant in the treatment condition to start the program. The decoding placement test required that participants read four passages orally. A single two-sided sheet with the four passages was provided to the participants. The lead researcher retained an identical copy of the single two-sided sheet with the four passages and noted errors directly on this form. The form was positioned so that the participant could not see what the lead researcher was writing. The lead researcher followed the verbal prompts as directed in the guidelines for administering the test. The following participant responses were noted as errors: (a) adding a word that did not appear in the story; (b) words that were misidentified; (c) any word that was not identified within 3 seconds; (d) a mistake that was subsequently self-corrected by the student; or (e) a word that was sounded out at a rate that was not equivalent to a normal speaking rate that could not be correctly identified by the participant following the lead researcher's prompt (Engelmann et al., 2008a, p. 246).

Each lesson involved the use of a leveled teacher presentation book and a corresponding non-consumable student book.

### *Intervention*

Intervention sessions took place two times per week for four weeks. Participants began the intervention using the appropriate decoding strand level as indicated by the decoding placement test. For each intervention session, the participant and the lead researcher met under the same conditions as described during the pretest. The lead researcher followed the scripted lessons in the leveled teacher presentation book (Engelmann et al., 2008b). Each lesson, regardless of level, followed a similar structure. The lessons began with exercises targeting word-attack skills using a whiteboard. For example, the lead researcher printed words on the board such as 'laid, aim, and snail' and asked the participant, "What word?" while pointing at each word individually. Then the lead researcher replaced the letters 'ai' with the letters 'ar' and asked the student, "What word now?" (Engelmann et al., 2008b, p. 2). The following procedure to correct word identification errors was employed: (a) The word is _____; (b) What word? (signal) _____; (c) Spell _____; and (d) Go back to the first word in the row/column (Engelmann et al., 2008b, p. 3).

The next exercise involved the introduction of various sound combinations. For example, participants were told that the letters S-H go together and

make the sound "shsh." The participants were then presented with a word containing the sound that was underlined. Participants were asked to say the sound for the underlined part and then read the word. This process was repeated for other sound combinations. Next, participants read additional words containing the various sound combinations by first saying the sound and then reading the word (Engelmann et al., 2008b, p. 3–4).

Exercises involving the presentation of vocabulary and corresponding definitions were then presented. Participants were both presented with the meaning of words as well as asked to use the vocabulary word in a sentence. Following the introduction of vocabulary, participants were provided with a list of words that were to be practiced by reading the words orally. Error correction procedures were the same as those described above.

Finally, participants engaged in a story reading. First, they were asked to read the title and infer the plot presented in the passage. Next, participants read the passage. The lead researcher would stop the participants and ask comprehension questions throughout the reading of the text as indicated in the teacher presentation book. To correct word reading errors, the following procedures were used: (a) The word is _____; (b) Touch under that word; (c) What word?; and (d) Go back to the beginning of the sentence and read that sentence again (Engelmann et al., 2008b, p. 6).

Lastly, a fluency assessment was conducted using the same passage. Participants were provided 2 min and were asked to "read like they talk." Errors were scored by the lead researcher, and the same scoring procedures as those described for the decoding placement test were employed. At the end of the 2-min fluency assessment, the participants used an individual reading progress chart to graph the number of words read during the 2 min and the number of errors.

### *Posttest*

Participants in both the treatment and the control groups completed the posttest. The posttest consisted of three subtests from the *Woodcock-Johnson IV Tests of Achievement Form A Standard* (Schrank et al., 2014): (a) *Test 1 Letter-Word Identification*, (b) *Test 7 Word Attack*, and (c) *Test 4 Passage Comprehension*. Procedures mirrored those described for the pretest.

### Dependent Variable

The distal dependent variable for this study was reading comprehension. Reading comprehension was operationally defined as the ability to extract meaning from English text. Reading comprehension was measured using the *Woodcock-Johnson IV Tests of Achievement Form B Standard* (Schrank et al., 2014) Test 4 Passage Comprehension. Additionally, the two proximal dependent variables of decoding and sight word recognition were also included, given that efficient word-attack and word identification skills are hypothesized to reduce demands on working memory and subsequently support reading comprehension (Cain et al., 2004). Furthermore, these two proximal variables map directly onto Scarborough's reading rope in terms of contributing to reading comprehension.

## Treatment Integrity

A treatment integrity checklist was developed by the lead researcher (see Appendix B). Treatment integrity data was obtained for 20% of intervention sessions. Treatment integrity was measured using a point-by-point format where an independent observer scored treatment integrity on 14 items. Items could be scored as either 'not observed' or receive a score of one (inappropriate), two (somewhat appropriate), and three (appropriate). The total number of possible points per session was 42. To obtain a treatment integrity score, the independent observer divided the total number of points by the total number of items. An independent observer (an undergraduate student) was trained in data collection prior to the commencement of the intervention. Practice data collection sessions were scheduled to allow the observer the opportunity to request clarifications. The average treatment integrity was 98.81% for all observed sessions.

## Results

Table 1 contains a comparison of the means, standard deviations, sample sizes, effect sizes, and standard errors for the treatment and control groups.

**Table 1**
*Descriptive and Inferential Statistics*

| Subtest | Comparison | Treatment | | | Control | | | Effect size estimate | |
|---|---|---|---|---|---|---|---|---|---|
| | | $\bar{X}$ | $\sqrt{S^2}$ | *n* | $\bar{X}$ | $\sqrt{S^2}$ | *n* | $g_{Hedges}$ | $SE_g$ |
| Word identification | Treatment vs. Control | 66.5 | 13.91 | 6 | 64 | 3.742 | 3 | 0.372 | 0.635 |
| Passage comprehension | Treatment vs. Control | 38.8 | 9.739 | 6 | 39.3 | 2.161 | 3 | 0.043 | 0.629 |
| Word attack | Treatment vs. Control | 26 | 6.928 | 5 | 25.3 | 1.634 | 3 | 0.288 | 0.639 |

**Decoding**

The Word Attack mean at pretest of 21.8 for the treatment group corresponds roughly to a grade equivalent (GE) of 4–9. The Word Attack mean at posttest of 26 for the treatment group corresponds roughly to a GE of 9–2, indicating a change in GE of 4–3. All treatment participants scored below their current grade equivalent level at pretest, with three participants scoring at or below a GE of 3–6 at pretest indicating initial difficulties in decoding. The Word Attack mean at pretest of 23 for the control group corresponds roughly to a grade equivalent (GE) of 5–7. The Word Attack mean at of 25.3 for the control group corresponds roughly to a GE of 7–6, indicating a change in GE of 1–9. All control participants scored at or below a GE of 6.7 at pretest, indicating initial difficulties in decoding.

**Table 2**

*Word Attack: Descriptive Statistics*

| Group | Pretest mean | Posttest mean |
|---|---|---|
| Treatment | 21.8 | 26.0 |
| Control | 23.0 | 25.3 |

**Sight Word Recognition**

The Letter-Word Identification mean at pretest of 66.3 for the treatment group corresponds roughly to a GE of 7–7. The Letter-Word Identification mean at posttest of 66.5 for the treatment group corresponds roughly to a GE of 9–6, indicating a change in GE of 1–9. All treatment participants scored below their current grade equivalent level at pretest indicating initial difficulties in word reading. The Letter-Word Identification mean at pretest of 66.3 for the control group corresponds roughly to a GE of 8–9. The Letter-Word Identification mean at posttest of 64 for the control group corresponds roughly to a GE of 7–6, indicating a change in GE of negative 1–3. All control participants scored below their current grade equivalent level at pretest indicating initial difficulties in word reading.

**Table 3**

*Letter-Word Identification: Descriptive Statistics*

| Group | Pretest mean | Posttest mean |
|---|---|---|
| Treatment | 66.3 | 66.5 |
| Control | 66.3 | 64.0 |

**Reading Comprehension**

The Passage Comprehension mean at pretest of 33.8 for the treatment group corresponds roughly to a GE of 4–5. The Passage Comprehension mean at of 38.8 for the treatment group corresponds roughly to a GE of 7–7, indicating a change in GE of 3–2. No participant in the treatment group scored above a GE of 6–3 at pretest, indicating initial difficulties in reading comprehension. The Passage Comprehension mean at pretest of 34.7 for the control group corresponds roughly to a GE of 4–5. The Passage Comprehension mean at posttest of 39.3 for the control group corresponds roughly to a GE of 7–7, indicating a change in GE of 3–2. No participant in the treatment group scored above a GE of 5–7 at pretest, indicating initial difficulties in reading comprehension.

**Table 4**

*Passage Comprehension: Descriptive Statistics*

| Group | Pretest mean | Posttest mean |
|---|---|---|
| Treatment | 33.8 | 38.8 |
| Control | 34.7 | 39.3 |

**Effect size**

The result for the Word Attack subtest indicates that the sample estimate of the effect of the reading intervention on study participants is 0.288 SD, but the effect of the reading intervention on study participants in the population (from which the sample was drawn) has a range (95% CI = -0.921, 1.583). The result for the Word Identification subtest indicates that the sample estimate for the effect of the reading intervention on study participants is 0.372 SD, but the effect of the reading intervention on study participants in the population (from which the sample was drawn) has a range (95% CI = -0.826, 1.664). Finally, the result for the Passage Comprehension subtest indicates that the sample estimate for the effect of the reading intervention on study participants is 0.043 SD, but the effect of the reading intervention on study participants in the population (from which the sample was drawn) has a range (95% CI = –1.185, 1.281).

**Social Validity**

The participants were asked to complete a short Social Validity Questionnaire following the final intervention session (see Appendix C). The participants rated statements between one (strongly disagree) and five (strongly agree). All the participants reported that they enjoyed participating in the reading study ($\mu$= 5) and that the reading activities were interesting ($\mu$ = 4.8). In terms of their perceptions of the impact of the reading intervention, participants reported: (a) that they felt that their reading fluency had improved over the course of the program ($\mu$ = 4.5), (b) that their reading comprehension had improved ($\mu$ = 4.5), and that overall, they felt more confident about their reading skills in English ($\mu$= 4.7). Two students did state that they would like to see more opportunities to practice vocabulary. The results support the social validity of the phonologically based reading intervention within the university context.

## Discussion

The objective of the current study was to determine whether a phonologically based reading intervention would result in significant between-group differences for decoding, sight word recognition, and reading comprehension for undergraduate ELLs at-risk of reading difficulties. Although the results did not demonstrate a significant between-group difference for the distal variable of reading comprehension, effects were found for the proximal variables of decoding and sight word recognition.

We will begin with a discussion related to the distal variable of reading comprehension. Although no significant effect was found for the measure of passage comprehension, there are a number of factors that should be considered. First, the small sample size may have factored into the results, as it should be noted that in the case of studies where the participant sample is small, a larger effect size is required in order to produce findings that are statistically significant (Slavin & Smith, 2009).

Second, it could be posited that the lack of improvement seen in reading comprehension performance may be due to the truncated treatment time of four weeks. To observe a statistical change in passage comprehension, more time in treatment may be necessary. For example, Lovett et al. (2008) employed three phonologically based reading intervention programs (including *Corrective Reading: Decoding Strand* [Engelmann et al., 2008]) with ELLs in grades 2 through 8 who had been identified as experiencing reading difficulty. Although these researchers reported significant improvements in reading achievement for the participants, it is important to note that the participants received approximately 105 intervention hours.

Finally, reading comprehension is a complex skill that involves the coordination of many subskills (Scarborough, 2001). Although this intervention addressed the backfilling of foundational skills related to the word recognition strand of Scarborough's reading rope, only the vocabulary component of the language comprehension strand was included. Therefore, it could be speculated that other components of the language comprehension strand needed to be addressed for these participants (i.e., background knowledge, language structures, verbal reasoning, and literacy knowledge). Additionally, it is worth noting that Duke and Cartwright (2021) suggested that Scarborough's reading rope should be recalibrated to include an "active self-regulation category" (p. 534). These researchers proposed that in addition to language comprehension and word recognition, readers need to "regulate themselves, actively coordinate the various processes and text elements necessary for successful reading, deploy strategies to ensure reading processes go smoothly, maintain motivation, and actively engage with text" (Duke & Cartwright, 2021, p. 530). Thus, perhaps our findings point to a need to include intervention components that target either one or both of the following: (a) a broader inclusion of the language comprehension strand of Scarborough's reading rope and/or (b) instruction in active self-regulation reading behaviors as described by Duke and Cartwright (2021).

A small and small-medium effect were calculated for the proximal measures of word attack and word identification, respectively. Given that we employed a phonologically based reading intervention, the treatment sessions placed a significant emphasis on decoding skills, which translated directly into the findings. The pivotal roles of decoding and sight word recognition in terms of developing reading comprehension are supported by Scarborough's reading rope. Furthermore, Burt et al. (2003) noted that adult ELLs should be taught to decode. Therefore, considering that the participants in the treatment condition demonstrated improvement in their decoding skills, amelioration in reading comprehension performance might have been expected. One explanatory factor that might account for the lack of improvement in reading comprehension despite the observed growth in decoding and sight word reading skills is automaticity. According to Cain et al. (2004), comprehension is affected by word reading that is either slow or inaccurate. Cain et al. (2004) posited that text comprehension is curtailed due to the demands placed on the working memory that limit the functioning of other necessary processes, such as integration and inference. This finding is echoed by Nouwens et al. (2017), who concluded that working memory is a reliable predictor of differences in reading comprehension for adults as well as children. As depicted by Scarborough's reading rope, automaticity of these skills (decoding and sight word recognition) is required in order to enhance reading comprehension. Thus, perhaps with further practice and development of fluency, the observed improvement in decoding and sight word recognition may translate into improved reading comprehension for participants.

One caveat to this hypothesis is that Cain et al. (2004) warned that for L1 struggling readers, as they aged and saw improvements in word reading performance, performance in reading comprehension was not necessarily concomitant. One important variable identified by these authors was vocabulary knowledge. Similarly, Burt et al. (2003) explained that ELLs who are able to decode efficiently may still experience reduced performance in reading comprehension if they experience difficulty identifying the meaning of the vocabulary contained within the text. As such, a greater

emphasis on vocabulary development may be warranted in addition to the phonologically based reading intervention. Thus, the suggestion regarding the need to develop automaticity of decoding and sight word recognition skills does not negate the discussion above related to the important role of the language comprehension strand and the need to consider the addition of components within this strand to enhance reading comprehension for these participants.

We also would like to address the unbalanced design utilized in this study, in which there were more participants in the treatment group ($n$ = 6) than in the control group ($n$ = 3). We propose that this represents a student-centered approach as we did not want to withhold supports from students who may benefit from the reading intervention. Thus, we opted to include all students who volunteered as participants in the treatment group and assigned to the control group students who had originally volunteered to participate but subsequently did not follow through with the participant questionnaire. As a pilot study, our aim was to provide supports to as many students as possible who self-identified as requiring reading supports.

**Limitations**

The recruitment of participants for the current study relied on student self-reports of reading difficulty. Such methodology may elicit concerns related to the subjectivity of the assessment of the initial reading skill level of participants. However, Parrila et al. (2007) investigated the accuracy of using student self-reports to identify university students with a history of reading difficulty and determined that employing student self-reports is a viable method for accurately locating individuals with a history of reading problems.

We also recognize that a disadvantage related to the use of a group design for this study is associated with the reduced number of participants. As such, the present study may not have been adequately powered to detect significant between-group differences. We consider this pilot study as a proof of concept that warrants further research and the inclusion of a greater number of participants.

Additionally, it is important to recognize that grade norms should be interpreted with caution as the growth rate is not consistent across grades in the areas of cognitive, psychomotor, and affective development (Aiken, 2003). Reynolds (1981) warned that the use of GE can overemphasize concerns about reading assessments in the upper grades. Furthermore, given the inconsistency across grades described by Aiken (2003), changes in performance between the pretest and posttest that involve calculating the difference in GE should be understood in light of the limitations of such calculations.

An uncontrollable threat to the internal validity of the study was that the participants were concurrently participating in a variety of English university courses. As such, we cannot eliminate learning from other classes as a confounding variable.

As such, a greater emphasis on vocabulary development may be warranted in addition to the phonologically based reading intervention.

**Conclusion, Future Research, and Application to Practice**

This study represents an initial investigation to examine whether a phonologically based reading intervention will result in significant between-group differences for decoding, sight word recognition, and reading comprehension for undergraduate ELLs with self-reported reading difficulty. Although a small and small-medium effect were calculated for the measures of word attack and word identification, respectively, no effect was found for the measure of passage comprehension. Thus, initial findings support the use of a phonologically based reading program to improve students' decoding and sight word skills that are key components of the word recognition strand of the Scarborough's reading rope and thus contribute to the development of reading comprehension. However, more research over an extended period of time is needed to examine whether the development of automaticity in decoding and sight word recognition will translate into improved reading comprehension or whether the inclusion of components from the language recognition strand of Scarborough's reading rope or other active self-regulation reading strategies are required in order to see the needle move in terms of reading comprehension.

**Disclosure Statement**

No potential conflict of interest was reported by the authors.

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## Appendix A

### Participant Checklist

Title of Project: Multicomponent Reading Intervention: Effects on the Reading Comprehension of Undergraduate English Learners At-Risk of Reading Difficulties

*Your participation in this questionnaire and willingness to provide the requested information is strictly voluntary. Refusal to complete this form will involve no penalty or loss of benefits you would receive otherwise.*

**Please circle the appropriate response.**

1. Are you currently enrolled as an undergraduate student at a university?

   Yes No

2. Are you currently 18 years of age or older?

   Yes No

   a. If you circled "yes" for question 2, please indicate your age: _____

3. Was the primary language spoken at home with your parent(s) when you were first learning to speak a language other than English?

   Yes No

   a. If you circled "yes" for question 3, please indicate what primary language you spoke at home with your parent(s) when you were first learning to speak: _____

4. Have you lived in the United States for at least 2 years?

   Yes No

   a. If you circled "yes" for question 4, please indicate the number of years you have lived in the United States: _____

5. Do you experience difficulty reading in English?

   Yes No

   a. If you circled "yes" for question 5, please provide more specific information (E.g., When I read text in English, I have difficulty understanding the meaning of what I have read" or "I read slowly in English and this can cause me difficulty making sense of what I have read").

   _____
   _____
   _____
   _____

6. Are you able to understand what is being asked in order for you to participate in this study?

   Yes No

## Appendix B

### Treatment Fidelity Observation Form: Corrective Reading

Interventionist:_____
Observer: _____
Date: _____ Time: _____ Fidelity Rating: _____

***Please circle the number which best describes your observation of the use of each instructional skill. The observation should last the entire reading lesson.***

**Scale:**
*NO: Not observed*
1. *Inappropriate*
2. *Somewhat Appropriate*
3. *Appropriate*

| | | | | |
|---|---|---|---|---|
| **Learning Environment** | | | | |
| 1. Materials were organized and readily available. | No | 1 | 2 | 3 |
| 2. Teachers could see all students; students could see the teacher. | No | 1 | 2 | 3 |
| **Management** | | | | |
| 3. Lesson began within 2 or 3 minutes of designated time. | No | 1 | 2 | 3 |
| 4. Student(s) is on-task and/or off-task behavior is addressed. | No | 1 | 2 | 3 |

| **Presentation** | | | |
|---|---|---|---|
| 5. Teacher delivered clear instructions. | | | |
| No | 1 | 2 | 3 |
| 6. Teacher provided clear signals to elicit student response. | | | |
| No | 1 | 2 | 3 |
| 7. 100% student response on signal. | | | |
| No | 1 | 2 | 3 |
| 8. Teacher provided firm-up repetitions after student errors. (Mispronunciations due to accent are exempt). | | | |
| No | 1 | 2 | 3 |
| 9. Teacher delivers instruction at a brisk pace. | | | |
| No | 1 | 2 | 3 |
| 10. Student(s) tracks in workbook when necessary. | | | |
| No | 1 | 2 | 3 |
| **Intervention Components** | | | |
| 11. Work Attack | | | |
| No | 1 | 2 | 3 |
| 12. Vocabulary | | | |
| No | 1 | 2 | 3 |
| 13. Reading Comprehension | | | |
| No | 1 | 2 | 3 |
| 14. Fluency Assessment | | | |
| No | 1 | 2 | 3 |

Total number of points: _____
Total number of possible points: 42
Fidelity Score (divide total points by total number of items [14]): _____

Adapted from the "Corrective Reading Fidelity Observation Form" (2007) available at the RTI Action Network (http://www.rtinetwork.org/checklists/633-available-treatment-integrity-protocols).

## Appendix C

### Participant Feedback Questionnaire

*Thank you for participating in this reading study. To fully ascertain the value of this reading project, I would like to understand your personal impressions of the reading activities. Your feedback will remain anonymous and will be used to inform how future reading interventions like this one should be conceived and carried out. Your completion of this questionnaire is completely voluntary.*

**Please read the following statements and circle the appropriate number.**

1. **Strongly Disagree**
2. **Disagree**
3. **Neither Agree nor Disagree**
4. **Agree**
5. **Strongly Agree**

a) I enjoyed participating in this reading project.
1 2 3 4 5

b) Overall, the reading activities were interesting.
1 2 3 4 5

c) The individual reading sessions lasted an appropriate amount of time.
1 2 3 4 5

d) I feel that my reading fluency (the ability to read words quickly and accurately) improved over the course of the sessions.
1 2 3 4 5

e) I feel that my ability to understand what I read in English improved over the course of the sessions.
1 2 3 4 5

f) Overall, I feel more confident about my reading skills in English.
1 2 3 4 5

g) Given the opportunity, I would like to continue with more sessions of this reading program.
1 2 3 4 5

h) I would recommend this reading program to others.
1 2 3 4 5

Is there any other feedback that you would like to provide regarding the reading program?

_____
_____
_____
_____
_____
_____
_____