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# The Prevalence of Reading Fluency and Vocabulary Difficulties Among Adolescents Struggling With Reading Comprehension

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**Abstract**

This study sought to better understand the prevalence of concurrent and specific difficulties in reading fluency and vocabulary among adolescents with low reading comprehension. Latent class analysis (LCA) was used to identify a sample of 180 students in sixth through eighth grades with reading comprehension difficulties. A subsequent LCA identified subgroups of students with common patterns of strengths and weaknesses in reading fluency and vocabulary. Results indicated that more than 96% of the students demonstrated deficits in at least one area, with the largest subgroup exhibiting co-occurring difficulties in fluency and vocabulary. Difficulties in fluency were more common than difficulties in vocabulary. Students with low reading comprehension but adequate scores in reading fluency or vocabulary represented only a very small portion of the sample. Coupled with findings from prior studies, results indicate that large numbers of adolescents with reading comprehension difficulties are likely in need of intervention in foundational skill and knowledge areas, which may not be viewed as instructional priorities among secondary educators.

**Keywords**

reading comprehension, adolescents, reading fluency, vocabulary

By the intermediate grades, curricular and instructional expectations require that students read and apply knowledge acquired from increasingly complex texts. As these expectations increase, so do the consequences of core weaknesses that place limits on students' ability to read for understanding. The ongoing reading comprehension difficulties among U.S. students are well documented (Nation's Report Card, 2015), and research has shown that improving adolescents' reading comprehension skills is difficult, particularly on standardized measures of reading comprehension (Fogarty et al., 2014; Scammacca, Roberts, Vaughn, & Stuebing, 2015; Simmons et al., 2014; Solis, Miciak, Vaughn, & Fletcher, 2014; Wanzek et al., 2013).

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Researchers have pointed to the heterogeneity of skill profiles among struggling adolescent readers (e.g., Brasseur-Hock, Hock, Kieffer, Biancarosa, & Deshler, 2011; Miciak et al., 2014; Solis et al., 2014), which may be a reason why interventions do not consistently confer positive outcomes for struggling adolescent readers. More specifically, interventions may not be optimally effective because they are not sufficiently aligned with the needs of students who lack foundational reading skills and knowledge that facilitate higher order comprehension processes (Perfetti & Stafura, 2014).

## Reading Fluency, Vocabulary, and Reading Comprehension

Research has revealed the multiple skills that, if lacking, may significantly impede reading comprehension. For example, prominent models of reading comprehension such as the Simple View of Reading (SVR; Gough & Tunmer, 1986; Hoover & Gough, 1990), the Direct and Inferential Mediation Model (Cromley & Azevedo, 2007), and Perfetti's (a) Verbal Efficiency hypothesis (Perfetti, 1985), (b) Lexical Quality hypothesis (Perfetti, 2007), and (c) Reading Systems Framework (Perfetti, 1999; Perfetti & Stafura, 2014) all consistently recognize the importance of foundational skills required for reading print, as well as proficiency in receptive and expressive language. In this study, we focused on two foundational components that represent these domains: reading fluency and vocabulary knowledge.

### *Reading Fluency*

Decoding and word identification skills are consistently cited across theoretical and statistical models of reading comprehension. The role of decoding is clear; if a reader struggles to recognize words on the page, comprehension is significantly impaired. According to Perfetti's (1985) Verbal Efficiency hypothesis, automaticity with word recognition facilitates higher order reading comprehension processes by freeing cognitive resources from costly decoding efforts. As an extension of decoding, fluent reading involves effortless and automatic reading of words in text, which has been shown to mediate the relationship between decoding and reading comprehension (Silverman, Speece, Harring, & Ritchey, 2013).

Beyond the rapid reading of words in isolation, fluency reading connected text becomes increasingly more important for adolescent readers. The strength of the decoding-comprehension correlation begins to diminish around age 10 (see García & Cain, 2014), at which point the fluent reading of connected text may be more indicative of difficulties in orchestrating the cognitive processes necessary for constructing and integrating meaning from print. Indeed, fluent text reading appears to be more strongly associated with reading comprehension than fluency of reading words in list form (Denton et al., 2011; Eason, Sabatini, Goldberg, Bruce, & Cutting, 2013; Jenkins, Fuchs, van den Broek, Espin, & Deno, 2003), especially for older students. For example, Eason et al. (2013) found that with students between ages 10 and 14, fluency in reading connected text was more important for comprehension than rate of reading words in list form. In addition, fluency difficulties may be more common among adolescents than decoding problems; Lesaux and Kieffer (2010) observed that among sixth graders with comprehension difficulties, most students demonstrated decoding skills within the average range, but more than 80% of the sample exhibited difficulties with fluent reading of connected text.

### *Vocabulary*

The importance of vocabulary knowledge is consistently recognized across models of reading comprehension. Vocabulary knowledge is necessary to understand a language, and because many of the same processes involved in language comprehension are utilized in comprehending text,

vocabulary knowledge is fundamental to reading comprehension (Joshi, 2005; Nation, 2005). Simply, reading comprehension will be significantly impaired (or disrupted entirely) if word meanings in a passage are unknown, even if the student is able to fluently decode the words. Indeed, studies indicate that significant comprehension impairment can occur when as few as 2% to 5% of word meanings in a passage are unknown (Carver, 1994; Hsueh-chao, & Nation, 2000; Schmitt, Jiang, & Grabe, 2011). Vocabulary is also interconnected with background knowledge (see Cromley & Azevedo, 2007), which is important for activating schema and knowledge networks that enhance connections while reading, allow readers to make inferences, and provide a deeper understanding of a text.

## Reading Fluency and Vocabulary Difficulties Among Struggling Adolescent Readers

How common are reading fluency and vocabulary difficulties among adolescents? Biancarosa and Snow (2004) posited that while older readers usually possess adequate basic reading skills, poor achievement is the result of difficulties in higher order comprehension processes. This assumption may underlie the prevailing view of instruction in middle and secondary schools, which is aimed at the acquisition of content knowledge with reading instruction considered the responsibility of elementary educators (Meltzer, Cook Smith, & Clark, 2002; O'Brien, Stewart, & Moje, 1995).

In the early elementary grades, it can be difficult to identify students who struggle with reading comprehension but demonstrate seemingly adequate fluency or vocabulary (Hamilton & Shinn, 2003; Meisinger, Bradley, Schwanenflugel, & Kuhn, 2010; Meisinger, Bradley, Schwanenflugel, Kuhn, & Morris, 2009; Spencer, Quinn, & Wagner, 2014). However, some evidence suggests that the frequency of students with adequate fluency but low comprehension (i.e., "word callers") increases in later grades. For example, Meisinger et al. (2009) found that approximately 10% of fifth graders could be considered word callers compared with less than 3% among second graders.

A limited number of studies have investigated the prevalence of difficulties in reading fluency and vocabulary among adolescent readers. Among existing studies, Hock et al. (2009) identified adolescent readers in urban settings who performed below the 40th percentile on a composite score of reading comprehension. Approximately 88% of students fell below the 40th percentile on a composite variable that included measures of fluency reading words in list form, decoding, and connected text. Approximately 82% of students fell below the 40th percentile on a composite variable that included measures of vocabulary and listening comprehension, and 74% demonstrated low scores in both areas. In a subsequent study using the same data set, Brasseur-Hock et al. (2011) used latent class analysis (LCA) to identify students with low reading comprehension. These authors found that nearly 70% of students demonstrated weaknesses in reading fluency specifically (which included fluency reading words in isolation and connected text), or in addition to difficulties in decoding and language skills (which included measures of vocabulary and listening comprehension). The largest single subgroup consisted of students with moderate global weaknesses across all component skills (36%). Furthermore, Lesaux and Kieffer (2010) used LCA to identify skill profiles among language-minority sixth-grade students who scored below the 35th percentile on a measure of reading comprehension. Their findings showed that all of the skill profiles included low vocabulary skills, and more than 80% of students exhibited skill profiles that also included difficulties in reading fluency. Cirino et al. (2013) utilized factor analysis to investigate the difficulties of students in sixth through eighth grades in decoding, reading fluency (text reading fluency was included on a factor with word list reading measures), and comprehension, finding that decoding and fluency difficulties were prevalent among struggling comprehenders (vocabulary was not measured). Finally, Miciak et al. (2014) examined the skills

of sixth- and seventh-grade students who did not respond to a multicomponent intervention that targeted word study, reading fluency, vocabulary, and comprehension. Results of discriminant function analyses indicated that among students with reading comprehension scores below the 25th percentile, 49% of students also demonstrated scores below the 25th percentile on a measure of word list fluency (fluency reading connected text was not assessed).

In summary, research suggests that significant numbers of students with reading comprehension difficulties also struggle in foundational skill areas, and the prevalence of these difficulties likely exceeds previous estimates (Biancarosa & Snow, 2004). However, several questions remain. Several of the studies reviewed above evaluated text reading fluency in combination with fluency reading words in isolation (i.e., list form). Research has demonstrated the important role that text reading fluency specifically plays in facilitating reading comprehension for adolescents in contrast to reading words in lists (Denton et al., 2011; Eason et al., 2013; Jenkins et al., 2003). Similarly, some studies have included vocabulary assessments with measures of listening comprehension, thereby making it difficult to determine the rates of weaknesses specifically in the area of vocabulary knowledge among struggling adolescent readers. Better knowledge of the rates of co-occurring and specific difficulties in text reading fluency and vocabulary can help educators determine appropriate assessments for evaluating adolescent readers, improve interpretation of assessment data, and aid intervention development for adolescent readers.

### *Study Purpose*

To better inform assessment and evaluation practices of adolescents' reading achievement, this study sought to better understand the prevalence of reading fluency and vocabulary difficulties among adolescents with low reading comprehension. We investigated the following research question:

> What percentage of students with low reading comprehension also demonstrate low reading fluency and/or vocabulary knowledge?

## Method

### *Participants*

The study used data from a sample of students who participated in a randomized controlled trial that investigated the effects of a multicomponent reading intervention. Participants were drawn from a sample of 233 students from sixth through eighth grade in two schools (one rural, one suburban) in the southwest United States. Data used in the present analyses were collected prior to the start of the intervention program. At the time the study began, students were enrolled in reading intervention classes after having failed the state accountability assessment the prior school year. Although schools used this criterion to place students in the intervention classes, a portion of the students demonstrated average (or better) scores on normative-referenced comprehension measures administered as part of the intervention trial. Given the focus of the present study on struggling comprehenders, it was necessary to isolate students with reading comprehension difficulties for the subsequent analyses.

Similar to the methods used by Brasseur-Hock et al. (2011), we used LCA to empirically identify students who were struggling in reading comprehension (analyses are described below). The LCA resulted in the identification of 180 students with below-average and well-below-average reading comprehension skills, and this subsample was used in the analyses of the prevalence of reading fluency and vocabulary difficulties. This group was 51.7% female, 30.6% Black, 28.3% Hispanic, 23.9% White, 2.8% Asian, and 13.9% Other/multiple ethnicities. The sample

included students who were eligible for special education services (7.8%) and students receiving services as an English learner (14.4%) at the time of the study.

## Measures

*Reading comprehension.* Reading comprehension skills were assessed using three measures. A multivariate approach to assessing reading comprehension was considered advantageous given the complex nature of reading comprehension and the possibility that single assessments threaten to underrepresent the construct and introduce mono-operation bias (Fletcher, 2006).

The Comprehension subtest from the Gates-MacGinitie Reading Test, 4th edition (GMRT-4; MacGinitie, MacGinitie, Maria, & Dreyer, 2002) is group-administered and contains 11 narrative and expository passages ranging from three to 15 sentences, followed by three to six multiple-choice questions per passage. Students read and answered the questions silently during a 35-min session. All students received Form S corresponding to students' grade level. Kuder-Richardson formula -20 reliability coefficients range from .88 to .94 for the grades and forms administered in this study (Maria & Hughes, 2008).

The Group Reading Assessment and Diagnostic Evaluation (GRADE; Williams, 2001) was administered. Analyses used students' scores on the Comprehension scale, which is a composite score consisting of scores on two group-administered subtests. On the Sentence Comprehension subtest, students read 19 sentences, each with a missing word, and selected the word that best completes the sentence from five answer choices. Test authors reported coefficient alpha ranging from .83 to .88 for Grades 6 to 8. On the Passage Comprehension subtest, students were provided an unlimited amount of time to read six passages of narrative or expository text and answer five multiple-choice questions per passage. Passages range from eight to 30 sentences in length. Test authors reported coefficient alpha ranging from .85 to .88 for students in sixth through eighth grades (Williams, 2001). Grade-level versions of Form A were administered.

The Gray Oral Reading Test, 5th edition (GORT-5; Wiederholt & Bryant, 2012) was individually administered. Students were asked to read a set of narrative and expository passages orally (passages applicable to Grades 6-8 range from six to 12 sentences in length) while the examiner recorded reading errors and the amount of time needed to read the passage. The passage was then removed from view, and the examiner asked a series of open-ended questions. Responses were scored as correct or incorrect based on acceptable answers developed by the test authors. Passages were administered until a fluency ceiling was reached. The Comprehension scaled score was used in our analyses, which was based on the total number of correct responses to comprehension questions. Coefficient alpha for the Comprehension score ranges from .93 to .95 for students of ages 11 to 14 years (Wiederholt & Bryant, 2012). Previous versions of the GORT had been criticized for including "passage-independent" questions that students could answer correctly without having to read the text (Keenan & Betjemann, 2006); however, the GORT-5 was revised to ensure that all items are passage-dependent (Wiederholt & Bryant, 2012).

*Vocabulary.* The Vocabulary subtest from the GRADE (Williams, 2001) is a group-administered, untimed multiple-choice test. Students read a series of two- to four-word phrases that contain a target word and select the closest synonym from five choices. Students were administered Form A that corresponded to their grade level. Test authors reported coefficient alpha ranging from .86 to .88 for students in sixth through eighth grades (Williams, 2001).

*Text reading fluency.* Fluency in reading connected text was measured using a Passage Reading Fluency probe from the easyCBM system (University of Oregon, 2008). Students were asked to read orally from the passage while the examiner recorded the number of words read correctly in 1 min. A Grade 7 passage was administered to student in Grades 6, 7, and 8.[1] The passage

**Table 1.** Latent Class Analysis of Reading Comprehension Achievement ($N$ = 233).

| | 2-class solution | 3-class solution | 4-class solution | 5-class solution |
|---|---|---|---|---|
| AIC | 3,825.77 | 3,801.08 | 3,788.40 | 3,791.42 |
| BIC | 3,860.28 | 3,849.39 | 3,850.52 | 3,867.34 |
| SABIC | 3,828.58 | 3,805.02 | 3,793.46 | 3,797.61 |
| BLRT | 85.92*** | 32.69*** | 20.68*** | 4.98 |

*Note.* AIC = Akaike information criterion; BIC = Bayesian information criterion; SABIC = sample-size adjusted Bayesian information criterion; BLRT = bootstrap likelihood ratio test (statistical significance indicates that the class solution is better fitting than the solution with one fewer class).
***$p < .001$.

demonstrates alternate-form reliability coefficients ranging from .75 to .96 with an average of .91. Students' scores were compared with easyCBM normative data for their respective grades to obtain norm-referenced percentile levels of reading fluency.

## Procedures

Measures were administered during a 3-week span in September. Data collectors were trained research staff experienced in data collection. Training for assessment staff consisted of two sessions (7 total hr) led by the project coordinator focusing on explanation and modeling of assessment procedures, with time allocated for individual practice. Initial reliability was established in mock assessment sessions, which were repeated until each data collector demonstrated 100% reliability for procedural fidelity and scoring agreement. In-field reliability was established whereby data collectors were required to demonstrate 100% fidelity of assessment procedures and 95% interscorer agreement before being permitted to administer assessments independently.

## Data Analyses

*Identification of comprehension subgroups.* As noted previously, LCA was used to identify a subset of the students with low reading comprehension achievement. LCA was advantageous in this case because it permitted us to (a) use information from multiple measures (as opposed to a single measure) of reading comprehension and (b) empirically identify subgroups rather than relying on arbitrary cut scores. LCA is conducted by examining a series of models with an increasing number of classes (i.e., subgroups) to find a solution with a parsimonious number of interpretable classes that demonstrates statistically better fit than a solution with one fewer class. Using three reading comprehension measures, we systematically tested solutions with increasing numbers of classes beginning with a two-class solution. At each step, we balanced statistical fit criteria with evaluation of the extracted classes to determine whether they represented interpretable subgroups of students according to their comprehension achievement (Geiser, 2013). Statistical fit was evaluated using the Akaike information criterion (AIC), Bayesian information criterion (BIC), and sample-size adjusted Bayesian information criterion (SABIC), where smaller values represent better fitting models. We also used the bootstrap likelihood ratio test (BLRT), in which a smaller and statistically significant value indicates a better fitting class solution than a solution with one fewer class. We relied more heavily on the BLRT, which has demonstrated evidence as the most consistent indicator of class solution across sample sizes and models of various numbers of classes compared with other indices (Nylund, Asparouhov, & Muthén, 2007).

Table 1 reports the results of the class solutions for the reading comprehension subgroups. Although the BIC for the four-class solution was nearly the same as the three-class solution (a difference of 1.13), other indices were improved, including a statistically significant BLRT.

**Table 2.** Estimated Means and 95% Confidence Intervals From Four-Class Solution Identifying Reading Comprehension Achievement Subgroups.

| Class | *n* | GMRT | GRADE | GORT |
|---|---|---|---|---|
| Above average | 2 | 123.48 [123.01, 123.94] | 118.80 [105.58, 132.02] | 12.17 [9.60, 14.74] |
| Average | 50 | 93.19 [90.04, 96.35] | 100.19 [96.78, 103.60] | 8.33 [7.64, 9.03] |
| Below average | 139 | 85.05 [81.11, 88.98] | 89.52 [85.47, 93.56] | 6.66 [6.37, 6.95] |
| Well below average | 42 | 75.03 [69.41, 80.65] | 79.47 [76.01, 82.92] | 5.75 [4.75, 6.74] |

*Note.* Standard scores are reported for GMRT and GRADE (100 = 50th percentile); scaled scores reported for GORT which range from 1 to 20, and a score of 10 = 50th percentile. GMRT = Gates-MacGinitie Reading Test; GRADE = Group Reading Assessment and Diagnostic Evaluation; GORT = Gray Oral Reading Test.

**Table 3.** Latent Class Analysis of Reading Fluency and Vocabulary Achievement Among Low Comprehenders ($n$ = 180).

| | 2-class solution | 3-class solution | 4-class solution | 5-class solution | 6-class solution |
|---|---|---|---|---|---|
| AIC | 2,991.17 | 2,983.80 | 2,973.63 | 2,966.64 | 2,968.94 |
| BIC | 3,013.52 | 3,015.73 | 3,015.14 | 3,017.72 | 3,029.60 |
| SABIC | 2,991.35 | 2,984.06 | 2,973.97 | 2,967.05 | 2,969.43 |
| BLRT | 36.09*** | 13.37** | 16.17*** | 12.99 | 3.70 |

*Note.* AIC = Akaike information criterion; BIC = Bayesian information criterion; SABIC = sample-size adjusted Bayesian information criterion; BLRT = bootstrap likelihood ratio test (statistical significance indicates that the class solution is better fitting than the solution with one fewer class).
*$p$ < .05. **$p$ < .01. ***$p$ < .001.

Adding a fifth class, on the contrary, resulted in worsening fit across the indices. In addition, the four-class solution could be easily interpreted in terms of the achievement patterns in the classes (see below). Therefore, we selected the four-class solution.

The estimated mean scores for the four classes on the comprehension measures are reported in Table 2. As illustrated, two classes were distinguished by mean comprehension test scores within or above the average range, which we named "average" and "above-average" classes, respectively. Although the above-average class was made up of only two students, the result was considered meaningful because estimated mean scores were exceptionally high for both students. The remaining two classes included 181 students who demonstrated estimated reading comprehension means that were considered "below average" (i.e., below the 25th percentile; $n$ = 139) and "well below average" (i.e., below the 10th percentile; $n$ = 42). One student was missing data on the reading fluency and vocabulary assessments and, therefore, could not be included in the subsequent analyses. We therefore focused the main analyses on the 180 students with low reading comprehension performance (i.e., students from the below-average and well-below-average classes).

*Main analyses: Identification of reading fluency and vocabulary subgroups.* The main analysis consisted of a second LCA with the 180 struggling comprehenders to empirically identify the proportion of those demonstrated difficulties in reading fluency, vocabulary, or both areas. We used the procedures described earlier for evaluating class solutions statistically while balancing the evaluation of the extracted classes to determine whether they represented interpretable subgroups of students according to their skill profiles.

## Results

Results of the LCA on reading fluency and vocabulary skills are reported in Table 3. The BLRT indicated that the two-class solution was favorable to a one-class solution ($p$ < .001), three classes

**Table 4.** Estimated Means and 95% Confidence Intervals of Fluency and Vocabulary Achievement Subgroups ($n$ = 180).

| Class | $n$ (%) | Reading fluency | Vocabulary |
|---|---|---|---|
| Below-average fluency and vocabulary | 103 (57) | 18.32 [14.64, 22.01] | 17.52 [13.84, 21.21] |
| Below-average fluency, average vocabulary | 41 (23) | 22.83 [17.99, 27.67] | 48.81 [41.05, 56.57] |
| Average fluency, below-average vocabulary | 28 (16) | 55.41 [47.06, 63.76] | 19.56 [14.07, 25.05] |
| Average fluency and vocabulary | 8 (4) | 69.98 [61.63, 78.33] | 48.44 [39.23, 57.65] |

*Note.* Mean percentile levels of achievement for both variables based on normative data for the respective measures.

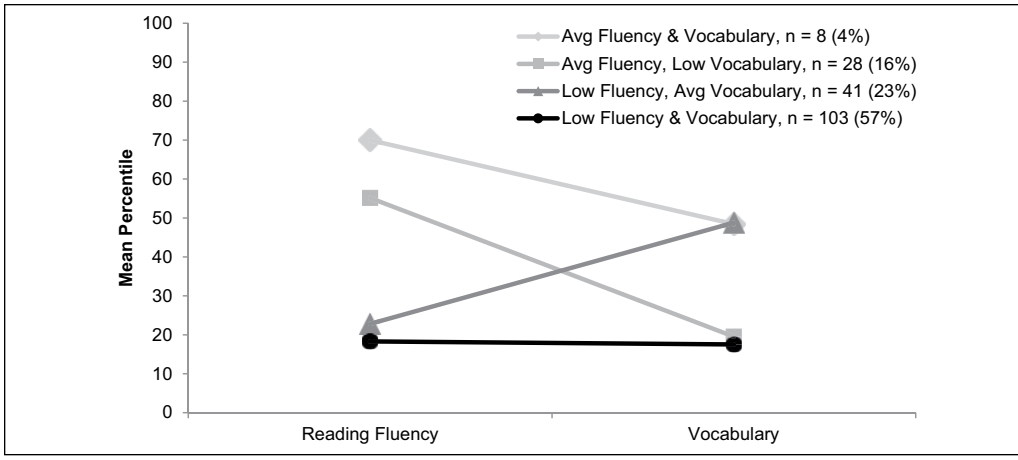


**Figure 1.** Estimated mean percentile scores and group sizes of the reading fluency and vocabulary achievement classes ($n$ = 180).

were favorable to two ($p$ = .01), and a four-class solution was favorable to a three-class solution ($p$ < .001). AIC and SABIC also indicated that the four-class solution was favorable to two- and three-class solutions. Although the AIC and SABIC indicated some improvement for the five- and six-class solutions, the more robust BLRT indicated that solutions of five and six classes did not improve upon the four-class solution on a statistically significant basis. As we report below, the more parsimonious four-class solution also offered a clearer interpretation of the resulting classes in terms of their patterns of reading fluency and vocabulary strengths and weaknesses. Therefore, the balance of statistical fit and interpretability favored the four-class solution.

The estimated mean scores for the extracted classes from the four-class solution of reading fluency and vocabulary skills are reported in Table 4 and displayed in Figure 1. The data revealed four distinct score profiles. The largest class in terms of group membership demonstrated below-average scores in both fluency and vocabulary ($n$ = 103), which represented approximately half of the struggling comprehender subgroup (57%), with estimated mean standard scores falling approximately 1 *SD* below the mean for both measures. Students with below-average fluency but average vocabulary represented the next largest subgroup ($n$ = 41, 23%), followed by students with average fluency but below-average vocabulary ($n$ = 28, 16%). By far, the smallest class was made up of students with average or above-average scores in both fluency and vocabulary ($n$ = 8, 4%). Together, 96% of students demonstrated difficulties in one or both areas. Specifically with regard to fluency, the number of students with below-average skills in reading fluency (either alone or in addition to below-average vocabulary) represented 80% of students struggling with reading comprehension.

## Discussion

One reason why so many adolescents struggle in reading comprehension may be due to persistent difficulties in foundational literacy and language that are critical to supporting the processes necessary for constructing meaning from text. To better inform the design and focus of interventions for struggling adolescent readers, this study built on prior work to determine the prevalence of concurrent and specific reading fluency and vocabulary difficulties among struggling comprehenders.

Results indicated a high level of similarity in the number of students with low scores in one or both areas. Specifically, 96% achieved scores below average in reading fluency, vocabulary, or both. Students with concurrent difficulties in fluency and vocabulary represented the largest skill profile (57%). Fluency difficulties (either with or without vocabulary difficulties) represented 80% of the sample.

Our findings support prior research that has observed a high prevalence of basic skill difficulties among adolescent readers (Brasseur-Hock et al., 2011; Cirino et al., 2013; Hock et al., 2009; Lesaux & Kieffer, 2010; Miciak et al., 2014) but extend that work by examining text reading fluency and vocabulary difficulties more specifically. Results suggest that for most struggling adolescent readers, problems in understanding text may be rooted in insufficient knowledge and skills that are needed to read text efficiently and free the cognitive resources to permit higher order processing, connect ideas, infer meaning, and draw conclusions.

Our findings are consistent with prior work showing that students with more significant reading difficulties tend to demonstrate weaknesses across multiple skill areas (Fletcher, Lyon, Fuchs, & Barnes, 2007; Morris et al., 1998). The findings are also consistent with theories on the interdependence of word identification efficiency, vocabulary knowledge, and comprehension processes (Perfetti, 2010). The interconnected nature of these skills suggests that deficits in one area are highly likely to be related to deficits in another.

The presence of subgroups of struggling comprehenders with specific weaknesses is worthy of additional discussion, particularly with regard to students with reading fluency within the average range. In this study, students with reading fluency scores within the average range represented approximately 20% of the sample. Studies have indicated that the prevalence of students who demonstrate at least adequate reading fluency but difficulties with reading comprehension (i.e., "word callers") is more rare in early elementary school (e.g., 0%-3%; Hamilton & Shinn, 2003; Meisinger et al., 2009) but, consistent with our findings, may increase in later grades. Limited vocabulary knowledge may partially explain the comprehension difficulties of adolescents with seemingly adequate fluency. Perfetti (2010) noted the mediating role that vocabulary plays between word identification and comprehension; that is, fluent word recognition removes a significant barrier to reading comprehension, but true understanding depends on knowledge of word meanings. As observed in this study, 20% of the students demonstrated reading fluency skills within the average range, but only 4% demonstrated adequate fluency *and* vocabulary. Similarly, Lesaux and Kieffer (2010) noted that among their sample of language-minority adolescents with low reading comprehension, all skill profiles demonstrated weaknesses in vocabulary. Future studies should investigate the degree to which vocabulary deficits explain the comprehension difficulties of students who are described as "word callers."

### *Implications for Intervention*

The results of this study, in the context of prior research, have several implications for intervention design and delivery. Our findings are particularly relevant for practitioners who work with adolescents or participate in instructional planning teams.

First and foremost is the finding that students in middle and secondary grades with reading comprehension difficulties likely experience low reading fluency, low vocabulary knowledge,

and, most likely, weaknesses in both areas. Interventions that primarily target reading strategies such as summarization, main idea generation, and comprehension monitoring, or the use of tools such as graphic organizers or text structure maps may address only part of students' comprehension difficulties. As struggling adolescent readers are asked to achieve standards that emphasize reading more complex and authentic texts, it is important to recognize the scope of intervention necessary to attain this standard. Many students will still require intervention to address skills in reading text efficiently and understanding word meanings before more higher order comprehension processes can be expected. From an instructional and intervention standpoint, however, students with multiple areas of skill deficit would likely require more intensive levels of intervention, in contrast to students with isolated skill deficits in one area (e.g., low fluency) in which a more targeted intervention may be effective.

The present results underscore the importance of considering vocabulary knowledge, and building knowledge in general (Compton, Miller, Elleman, & Steacy, 2014), as a central aspect of interventions aimed at improving reading comprehension skills. This is no small feat, considering the cumulative effect of vocabulary knowledge on reading achievement (Joshi, 2005) and the reciprocal effect of word reading and vocabulary knowledge (Ouellette, 2006). Instruction in the content areas (i.e., science, social studies, history) becomes increasingly more prominent in later grades, and a critical aspect of content-area learning is an understanding of relevant vocabulary. Therefore, vocabulary interventions must be particularly powerful and teach high-priority words, encourage wide reading, and foster generative vocabulary strategies (e.g., contextual and morphological awareness) across grade levels and subjects.

The present results also speak to the importance of effective instruction and intervention in early grades. Interventions initiated in preschool or early elementary school provide opportunities to address both foundational reading skills (Cavanaugh, Kim, Wanzek, & Vaughn, 2004) and language development (e.g., Neuman, Newman, & Dwyer, 2011). Before achievement gaps widen, early reading instruction must provide significant practice opportunities to develop fluent reading and provide children with exposure to new vocabulary through rich language, storybook reading, and direct instruction.

### *Implications for Assessment*

The results of this study also have implications for the assessment of reading achievement with adolescents. Practitioners working with students in secondary grades may overlook basic reading skills; however, as this study demonstrated, the assessment of adolescents' reading skills must be sufficiently comprehensive to identify weaknesses in foundational skills that may be implicated in their reading comprehension difficulties. If assessment is limited to solely to tests of reading comprehension that do not allow for fine-grained analysis of component reading and language skills, it may be difficult to determine whether comprehension difficulties are constrained primarily by foundational skill deficits as opposed to difficulties in higher order text processing.

Our findings have implications for universal screening efforts at various grade levels. The increased use of vocabulary screening in early childhood may assist in early identification of children who may be at risk for reading comprehension difficulties due to vocabulary and oral language delays. These efforts may assist in identifying students with "late-emerging" reading disabilities who, despite seemingly adequate basic reading skills in early grades, experience reading difficulties by middle elementary school that may be due to a history of difficulties in vocabulary, grammar, or other linguistic abilities that were not detected earlier (Catts, Compton, Tomblin, & Bridges, 2012; Compton, Fuchs, Fuchs, Elleman, & Gilbert, 2008). With older students, prior performance on state accountability assessments may be the strongest indicator of future state test performance (Denton et al., 2011); however, test results may not indicate the degree to which

low test scores are due to poor text reading or vocabulary skills. Denton et al. (2011) suggested using a fluency assessment following a comprehension test to better align instruction and intervention for students at risk for failure. Group-administered reading fluency tests (e.g., Wagner, Torgesen, Rashotte, & Pearson, 2010) or vocabulary assessments (Wray, Alonzo, & Tindal, 2014) can be efficient screening methods for identifying foundational skill difficulties. In addition to helping align intervention to meet the needs of adolescent populations, these data can also be used to identify systemic instructional issues associated with the prevalence of fluency and vocabulary difficulties within a school or a district.

### *Limitations*

Group-administered measures of vocabulary such as that used in this study require students to read words independently; therefore, results on such assessments may be confounded to a degree by decoding skills. This limitation is mitigated somewhat by (a) the inclusion of text reading fluency, which helped to control for decoding skill deficits and (b) the findings of prior research, which has demonstrated that measures of reading vocabulary load more strongly on a vocabulary factor than on a decoding factor with struggling readers (Hock et al., 2009). Nevertheless, an assessment of vocabulary that was not potentially confounded by decoding skills would have been ideal.

Although we limited our analyses to two foundational skills, we acknowledge that reading comprehension involves several other components and processes. Working memory (Cain, Oakhill, & Bryant, 2004) and higher order processes such as comprehension monitoring, story structure knowledge, and inference-making (Cain & Oakhill, 1999; Cain et al., 2004) have been implicated in reading comprehension and may be additional sources of difficulty.

Our assessment of reading fluency was only limited to reading rate. Skilled reading of text also includes prosody (i.e., reading aloud with expression and inflection). The assessment of reading prosody is receiving increasing attention (e.g., Kuhn, Schwanenflugel, & Meisinger, 2010), and studies have indicated that prosody can explain unique variance in reading comprehension skills over and above the effects of reading rate (e.g., Valencia et al., 2010). It is likely that many of our students demonstrated low reading prosody, which may serve as an additional index of reading comprehension difficulties. Prosody variables require additional attention with regard to adolescents with reading difficulties.

## Conclusion

Our findings add to a growing body of work showing that among adolescents struggling with reading comprehension, the majority experience poor reading fluency, vocabulary knowledge, or difficulties in both areas. Although comprehension strategy instruction may be the default recommendation for adolescents struggling with reading comprehension, the high prevalence of students with deficits in reading fluency and vocabulary highlights the need to reconsider how instruction and assessment can better address the needs of struggling adolescent readers. The results underscore the importance of comprehensive assessments of component reading and language skills to better understand the sources of adolescents' reading difficulties. From a larger perspective, the findings also reinforce the need for prevention efforts that support the acquisition of proficient reading and language skills in young children.

### Authors' Note

The opinions expressed are those of the authors and do not represent views of the Institute of Education Sciences or the U.S. Department of Education.

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## Note

1. A common passage was administered as part of the intervention trial to more clearly ascertain intervention effects. The Grade 7 passage had a Lexile score (an index of text difficulty and complexity) of 960, which fell within the Lexile range observed on the easyCBM passages across Grades 6 to 8 (600-1,180). An ANOVA indicated that the mean reading fluency percentile scores did not statistically differ, $F(2, 159) = 2.02$, $p = .137$, between students in Grades 6 ($M = 25.61$, $SD = 14.22$), 7 ($M = 29.81$, $SD = 22.72$), or 8 ($M = 31.77$, $SD = 24.61$).

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