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Miscue Analysis: Toward a Parsimonious Approach to Assessment of Oral Reading Errors in the Classroom

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MISCUE ANALYSIS: TOWARD A PARSIMONIOUS APPROACH TO

ASSESSMENT OF ORAL READING ERRORS IN THE CLASSROOM

by

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Abstract

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Several informal, classroom-based methods currently exist for evaluating reading performance, but the daily demands teachers face require that assessment be as efficient and effective as possible. The purpose of this study was to examine two different approaches to analyzing oral reading—assessment of word recognition ability and miscue analysis—in search of a parsimonious approach to children's reading assessment in a sample of second-grade children. Children's word reading was assessed through administration of context-free word lists, and oral reading miscues were gathered from reading of connected text. The results suggested that substitution miscues and self-correction of errors were significantly correlated with reading comprehension. Hierarchical regression analysis revealed that various types of substitution miscues, particularly those that preserved the meaning and grammar of the text, were better predictors of comprehension than were norm-referenced word-reading tasks. Implications for educators and school psychologists are discussed.

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Errors in the Classroom

Skillful reading is a complex process that involves the coordination of a host of

higher mental processes. The reader must successfully orchestrate eye movements,

recognize and translate words, apply appropriate meaning to words, and use inference to

organize and interpret the text as a whole (Vellutino, Fletcher, Snowling, & Scanlon,

2004). Once the text is understood in the context of the reader's existing mental

schemas, the reader must decide what to do with the information. At a most basic level is

the notion that in order to read successfully, the reader must complete two interrelated

tasks: to determine the words that comprise the text and to comprehend the meaning of

the text (Kuhn & Stahl, 2003).

Initially, children read by transforming graphemes into phonemes, then blend

phonemes to decode or "sound out" unfamiliar words. With repeated practice, children

become fast and accurate word readers, recognizing many words by sight (Ehri, 1995).

Identifying the words in the text, or word recognition, is an essential skill within the

larger context of achieving literacy (Chall,1996; Ehri, 1995). Word recognition supplies

the text-based information upon which the reader depends for comprehension (Adams,

1990). Deficits at the word-level can have a profound impact on reading achievement.

Difficulties at the level of word recognition are the most pervasive cause of reading

disability (Perfetti, 1985; Stanovich, 1986; Vellutino et al., 2004). Conversely, fluent

readers are able to translate words quickly and accurately, thereby freeing attentional

resources for use in comprehending the text (LaBerge & Samuels, 1974).

Although facility in identifying words is not sufficient for effective reading comprehension, it is necessary; if text cannot be translated into language, then it cannot be fully understood. Gough and Tunmer (1986) proposed a "simple view" of reading that describes the relation between decoding and linguistic comprehension. In their model, reading comprehension equals the product of decoding and linguistic comprehension, or $RC = D \ x \ LC$, where variables range from 0 (no ability) to 1 (exactness). Reading comprehension takes place only when both D and LC are greater than zero. Thus, decoding and comprehension are intricately woven (Gough & Tunmer, 1986).

It is important to note that, within the framework of the simple view of reading, decoding is described as efficient, context-free word recognition (Gough & Tunmer, 1986). Linguistic comprehension is described as the ability to derive sentence interpretations from word-level information. Reading comprehension is similar to linguistic comprehension, but involves the processing of graphic rather than auditory information (Hoover & Gough, 1990). Intuitively, younger children have relatively well-developed linguistic comprehension but are lacking in word recognition skill. Thus, in accordance with the simple view, word recognition and linguistic comprehension are unrelated in the younger grades. Both skills correlate with reading comprehension, but the relation with word recognition is stronger (Catts, Fey, Zhang, & Tomblin, 1999; Stanovich, Nathan, & Vala-Rossi, 1986). As children advance through schooling word recognition and linguistic comprehension remain correlated to reading comprehension, but the relation with linguistic comprehension increases (Gough, Hoover, & Peterson, 1996). The importance of the relation between word recognition and reading comprehension has been well documented by empirical research (Aouad & Savage, 2009;

Hoover & Gough, 1990; Vellutino, Scanlon, & Tanzman, 1994; Vellutino, Tunmer, Jaccard, & Chen, 2007). Given that word recognition plays a central role in successful reading comprehension, particularly in the early elementary school years, it seems appropriate that assessment of such skills be made a priority in academic instruction.

Informal, classroom-based assessment of student's reading ability is a common practice in the younger elementary grades. Several methods exist for evaluating reading performance. Word recognition and decoding skill are commonly assessed by testing children's reading of words outside of context (i.e., word lists). As previously mentioned, word recognition is a hallmark of skilled reading, as it is closely tied to comprehension (Hoover & Gough, 1990). However, another prominent view in the field of reading research suggests that assessment of oral reading accuracy of connected text can reveal as much or more information about comprehension as measures of word recognition.

Regardless of age or ability, most all readers make mistakes when reading aloud. Mistakes in oral reading were historically perceived as errors that reflect deficiencies in reading ability until some researchers proposed these "miscues" provided valuable insights regarding the learner's strengths and weaknesses (Goodman, 1973). A miscue is defined as a point in reading when an observed response differs from the expected response (Goodman, 1973). Miscues have been described as windows on the reading process, opportunities for educators and researchers to further analyze how the reader is processing text and extracting its meaning (Goodman, 1973). According to some, miscue analysis not only provides information about a reader's proficiency, it can also provide knowledge about the strategies used to understand and construct meaning from text (Goodman, Watson, & Burke, 2005).

An assumption of miscue analysis is that readers use graphic "cues" available to them from the text in order to selectively predict language structures while striving for comprehension (Goodman, 1973). Goodman asserts that three types of cues are utilized in the reading process: semantic, syntactic, and graphophonic. The goal of miscue analysis, then, is to determine if the reader is using all three cues in concert to help identify words (McKenna & Picard, 2006). Though miscues can occur at any point in the text, all miscues do not necessarily interfere with the reader's ability to comprehend. Goodman (1973) advocated that in-depth examination of oral reading miscues can provide insight about the strategies children use while reading and lead to better understanding about how readers derive meaning from text.

It has been argued that miscue analysis can be used in the classroom to explain why and how children produce reading inaccuracies (Goodman et al., 2005). However, it is uncertain how frequently teachers use miscue analysis because such procedures are time-consuming and exacting. Tests of oral reading commonly employed in the classroom and used for educational research, such informal reading inventories (e.g., The Qualitative Reading Inventory, Fourth Edition; Leslie & Caldwell, 2006) and standardized assessments of reading fluency (e.g., *The Gray Oral Reading Test*, Fourth Edition; Wiederholdt & Bryant, 2001), offer derivations of miscue analysis as optional tools for assessing students' strengths and weaknesses in reading. The presence of these procedures in classroom-based assessments stems from the idea that detailed, qualitative samples of children's reading may aid educators in developing individualized reading support programs for struggling readers (Goodman et al., 2005). Typically, oral reading miscues are analyzed by recording and categorizing errors using a coding taxonomy, the

most popular of which was pioneered by Goodman (1973). Goodman's analytic taxonomy considers the graphic, phonological, syntactic, and semantic aspects of miscues. The Reading Miscue Inventory (RMI), developed by Goodman and Burke (1972), is a simplified, more informal version of Goodman's original taxonomy that is designed for miscue analysis in the classroom.

The types of miscues that are coded and analyzed are at the discretion of the educator or researcher administering the analysis. According to RMI procedures, text substitutions (incorrect or partial word errors), omissions (omitting a word or part of the text), insertions (reading a word or phrase not included in the text), repetitions (repeating a word or phrase), and corrections (correcting a word or phrase that was initially read incorrectly) are commonly recorded miscues. Though all miscues should be noted, only substitution miscues are coded on the basis of answers to nine specific questions regarding graphic similarity, sound similarity, self-correction, grammatical acceptability, semantic acceptability, and meaning change (Goodman et al., 2005).

Despite the numerous resources describing miscue analysis procedures, its continued inclusion in prominent reading education textbooks (e.g., Lipson & Wixson, 2009; McKenna & Stahl, 2003) and its presence in various reading inventories, little support exists for the validity and utility of miscue analysis as it was originally developed by Goodman. Lipson and Wixson (2009) suggested that administration and scoring of miscue analysis procedures (in their original form) are too complex and time consuming to be used effectively in the classroom. McKenna and Picard (2006) concluded that miscues may serve a useful, but limited, role in oral reading analysis given the lack of empirical support for Goodman's work and the involvement of miscue procedures.

Instead, they offer three alternatives for the effective use of miscue analysis in the classroom. First, it was suggested that miscue analysis could be a tool for compiling reading error totals, which could aid in determining a student's instructional and independent reading levels. Second, teachers should view "meaningful" miscues as evidence for inadequate decoding skill; meaningful miscues are those that detract from comprehension of the text, such as errors that do not focus on the letters and sounds of the word in the original text. Finally, miscue analysis may provide a window into the student's use of graphophonic and contextual cues that teachers can use to monitor students' reliance on decoding skills. However, the authors argue that teachers have better ways of assessing decoding skill (i.e., phonics inventories).

The practicality and usefulness of miscue analysis procedures as originally developed by Goodman in the classroom remains questionable in the literature. Moreover, miscue analysis tends to be a time-consuming and laborious task. Early screening of reading skill as it relates to reading comprehension is a crucial component of reading education in the younger elementary school grades, but the daily classroom demands teachers face require reading assessment to be as efficient and effective as possible. Alternatively, an efficient approach to assessing children's reading lies within the theoretical framework of the simple view of reading. Measurement of decoding and word recognition can be accomplished quickly and easily through the administration of context-free word and pseudoword lists. This study will investigate the relation of miscue analysis to reading comprehension as compared to measurement of decoding skill and word recognition in search of a parsimonious approach to children's reading assessment.

Review of Related Research

Pioneering Studies on Miscues

Researchers and practitioners alike agree that mistakes made while reading are indicators of overall reading performance. Thus, oral reading errors have been the subject of several investigative studies. Goodman's research was mainly descriptive in nature. He emphasized that his work was ecologically valid in that it was based on readers reading actual classroom texts (Goodman, 1996). Goodman's (1965) classic first study of children's reading serves as the pioneering work for miscue research. A sample of 100 children in first, second, and third grades were asked to read word lists from grade level stories. The words the children misread were recorded and used as a controlling variable. The participants were then asked to read aloud from the stories containing the same words they read from the lists, and their reading errors were recorded. The results of the study suggested that the children were able to read many of the same words in the stories that they were not able to read in the lists. Goodman concluded that the mistakes children made in their reading were not incidental, but part of the process of deriving meaning from the text (Goodman, 1996).

Another study by Goodman (1973) examined the reading process of 94 children in grades 2, 4, 6, 8, and 10. Each participant was asked to read a grade-level passage in its entirety, then retell the story in his or her own words. The participants' miscues were recorded and analyzed using the Reading Miscue Inventory (Goodman & Burke, 1972). The total number and types of miscues made for each participant based on grade and ability level were examined. From these observations, it was concluded that low proficiency readers use the same processes in deciphering text as high proficiency

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readers; however, less proficient readers use more syntactic, semantic, and graphophonic information than is necessary for comprehension. As a result, they extract less meaning from the text. The author contended that the best predictor of reading proficiency is the percentage of miscues that are semantically acceptable before correction (those that do not detract from comprehension of the passage; Goodman, 1973). Based on Goodman's findings, one would expect miscues to relate to children's reading comprehension in a meaningful way.

Grade-Level Effects on Children's Miscues

Researchers have also been interested in the developmental trends regarding the types and quality of children's oral reading miscues. Christie (1981) examined the miscues of 120 high and low ability readers in grades 2, 4, and 6 (with 40 participants from each grade). At each grade level, 20 students were high-ability readers, and 20 subjects were low-ability readers (based on placement in basal readers). Children's miscues were recorded from their reading of passages from a basal reader. Low-ability readers were instructed to read passages one grade level below grade placement, whereas high-ability readers read from passages one grade level above grade placement. The miscues were later analyzed using the Qualitative Analysis System (Christie, 1979). Results of the study suggested that the percentage of miscues acceptable within the context of the text increased as a function of grade level and reading ability. However, the relation between miscues and comprehension was not examined.

Miscue Types and Comprehension

Given that oral reading performance is closely tied to comprehension (Fuchs, Fuchs, Hosp, & Jenkins, 2001), researchers have looked at oral reading miscues as a way

to begin to understand why some readers gain more information than others from text. In 2005, the National Center for Education Statistics published a study concerning the oral reading performance of fourth grade students as a component of the National Assessment of Educational Progress (NAEP; National Center for Education Statistics, 2005). The study examined the nature of children's oral reading errors and the relation between oral reading accuracy and comprehension. Participants of the study were a subsample of 1,779 fourth-grade students from the larger sample of children who contributed to the main NAEP reading assessment. The participants were presented with a grade-level reading passage from the NAEP reading assessment and were asked to read it aloud while an examiner recorded any errors. Children's oral reading performance was compared to comprehension scores on the NAEP reading assessment. Results of the study indicated that children with the fewest errors overall demonstrated better comprehension scores (Daane et al., 2005). Additionally, oral reading errors were negatively related to comprehension, regardless of meaning change (i.e., whether the error resulted in alteration of the context of the sentence or passage). Finally, there was a positive relation between the proportion of errors that were self-corrected and average score on the main NAEP reading assessment as a whole. Despite the large sample size of the study, some limitations exist. For instance, children's errors were recorded from the reading of just one passage. It should also be mentioned that the children were previously familiar with the passage, having the chance to read and study it during the main NAEP reading assessment. Moreover, a measure of comprehension tied to the passage used to elicit oral reading errors was not included.

Laing (2002) examined how the reading miscues of typically developing children and those with below-average language and reading abilities were related to comprehension. Participants were 22 third-grade children—11 who were typically developing, and 11 who demonstrated below-average reading and below-average general language performance. The participants were administered two types of passages from the Gray Oral Reading Test-3 (GORT-3; Wiederholt & Bryant, 1992)—those at grade level and those above it. Miscues were obtained from participants' oral reading and were analyzed using a coding taxonomy based on the Reading Miscue Inventory. In this study, comprehension performance for both groups was best predicted by omission of content words and by phonologically similar real word errors (i.e., substitutions) that preserved the meaning of the text. However, the small sample size used is a clear limitation in the study.

Bebee (1980) examined the relation between substitution miscues and reading comprehension in a sample of 46 fourth grade boys. In this study, each participant was asked to read the same grade-level passage aloud while the examiners recorded the children's miscues. Following the reading of the passage, the students retold the story to the examiner in their own words. The examiners used questions to encourage recall and interpretation. The Reading Miscue Inventory (Goodman & Burke, 1972) was then used to classify the miscues and to establish a passage retell score. Each substitution miscue was coded into one of three categories: self-corrections, syntactically-semantically acceptable miscues, or syntactically-semantically unacceptable miscues. The Canadian Tests of Basic Skills was used as a secondary measure of reading comprehension. Results suggested that though substitution miscues generally detracted from

comprehension, not all types of substitution miscues were of equal detraction. Self-corrected and acceptable miscues (i.e., those that preserve the meaning of the text) were associated with comprehension of the passage, while unacceptable miscues detracted from comprehension. Further, it was found that the self-corrections and acceptable miscues were predictors of reading comprehension and retelling ability (Bebee, 1980). However, it should be noted that this study examined only one type of miscue in a small sample of students without regard to text difficulty.

D'Angelo and Mahlios (1983) examined the relation of children's insertion, substitution. and omission miscues to reading comprehension. Participants in the study were 57 fifth-grade students who were classified as good and poor readers based on standardized test scores and teacher judgments. The participants were administered the Informal Reading Assessment and reading levels were determined at the instructional and frustration levels (based on comprehension performance). The targeted miscues were recorded, counted, and classified based on the Reading Miscue Inventory. Consistent with Goodman (1976), substitutions were found to be the most common types of miscues, followed by omissions, then insertions. Moreover, it was concluded that insertion and omission miscues made by either good or poor readers at instructional or frustration levels caused little syntactic or semantic distortions. It was suggested that the time spent interpreting insertion and omission miscues is not of great use in the classroom and should be eliminated; attention should be placed on analyzing substitution miscues, which provide useful diagnostic information about reading. It should be noted, however,

that this sample consisted of fifth grade students and data from children in younger grades (when oral reading is most frequently assessed) may yield different results (see Laing, 2002).

Interestingly, the findings of Englert and Semmel's 1981 study suggested that specific types of miscues did not predict reading comprehension performance. Twenty-nine children in grades 3 through 5 who were classified as poor readers participated in the study. Participants were required to read passages from the Houghton-Mifflin Reading Series while examiners recorded miscues. The major classes of miscues included in the study were self-corrections, nonword errors, and real-word substitutions. Real-word substitutions were further categorized in terms of graphic, syntactic, and semantic similarity to the text. Reading comprehension tests were developed by the authors and tied to the contents of each passage. The results of the study indicated that only two categories of miscues were significantly correlated with reading comprehension: nonword substitution miscues and real-word errors that were visually different from the printed text (i.e., miscues that shared less than half of the letters with the text word). From these findings the authors deduced that poor readers' comprehension ability cannot be interpreted by analysis of oral reading miscues alone. They suggest that additional measures of comprehension performance be considered when planning curriculum and instruction for remedial readers.

A review of the literature on children's miscue patterns revealed that many inconsistencies exist in the methodology and findings of relevant studies. Considering the continued presence of miscue analysis in reading research and reading education, current

studies using consistent and reliable methodological instruments are needed to validate the utility of this assessment in the classroom.

Purpose of the Present Study

Though several studies have investigated children's oral reading miscues and miscue analysis procedures, some have criticized the quality of knowledge that has resulted from existing research (Leu, 1980; McKenna & Picard, 2006). In particular, the miscue analysis literature is characterized by a lack of consistency in the error categories that are analyzed across studies and the means by which those errors are classified and evaluated (Leu, 1980). These methodological variations across studies may account for contradicting findings found throughout the literature. Moreover, studies examining children's miscues at different grade levels have resulted in different findings, with no clear patterns defined regarding passage difficulty, developmental trends, or information concerning which miscues are the most important indicators of comprehension in the early grades. This point is key, considering that miscue analysis is most appropriately used in first and second grades. To our knowledge, no studies to date have examined the role between miscues and comprehension in second grade, nor addressed passages of varying difficulty level.

Another major issue in researching oral reading analysis is that Goodman's (1973) assertion that children rely heavily on the context of a passage to predict the identity of each word is yet to be replicated; several researchers have attempted to investigate the validity of this assertion but have failed (Nicholson, Lillas, & Rzoska, 1988; Stanovich, 2000). Though a number of studies have found evidence that readers are better at reading words in context than in lists (Doehring, 1976; Ehri & Roberts,

1979; Jenkins, Fuchs, van den Broek, Espin, & Deno, 2003), the effect is smaller than Goodman suggested and may be more true of struggling readers than proficient readers (Stanovich, 2000). Therefore, it is not clear whether word reading errors that occur within the context of connected text yield information beyond that which is obtained from context-free word reading lists. The present study will seek to fill these important gaps in the literature.

Despite the criticisms of the theoretical framework on which miscue analysis is based and the methodological discrepancies in the literature, the idea that oral reading errors reflect children's construction of meaning is pervasive in reading research. Indeed, miscue procedures have maintained a presence in reading inventories, reading education texts, and the reading literature. Some have contended that modified miscue analysis procedures hold value as reading assessments in the classroom (Lipson & Wixson, 2009; McKenna & Picard, 2006).

This work seeks to expand our understanding of the role of miscues in relation to reading comprehension and the utility of miscues analysis as a reading assessment. First, the relation between specific miscues categories and reading comprehension will be examined in second-grade students. Based on the current literature, it is hypothesized that substitution miscues that preserve the meaning of the text will be the greatest predictors of reading comprehension. Second, in search of a more efficient approach to reading assessment in the classroom, the extent to which miscue analysis predicts reading comprehension as compared to a word list based assessment of decoding and word recognition will be explored. The use of miscue analysis procedures requires a considerable amount of time and energy on the part of the evaluator. In contrast, word

recognition and decoding ability have been shown to be strongly correlated with reading comprehension (Hoover & Gough, 1990; Vellutino et al., 2007) and can be assessed using quick and simple measures. Using Gough and Tunmer's (1986) model of the simple view of reading as a conceptual framework, it is hypothesized that children's word reading skills as measured by word recognition and decoding tasks will be a better predictor of reading comprehension than will miscue patterns.

Method

Participants

Participants were 62 second-grade children attending a rural public school in the Mid South region of the United States; 63% were boys. Eighty-seven percent of students at the school were White; 11% were African American; 1% were Hispanic; and 1% were Asian/Pacific Islander. Sixty-four percent of students were eligible for a free or reduced lunch program. All were students in regular education classrooms, and none were excluded because of a reading disability or eligibility for other special education services.

Measures

Word Reading. The Woodcock–Johnson III Tests of Achievement (WJ III ACH; Woodcock, McGrew, & Mather, 2001) is an individually administered, standardized, and norm-referenced test of academic achievement. Two tests from the WJ III ACH were administered in order to assess participants' ability to recognize and decode words accurately. The Letter-Word Identification test was used to measure context-free word recognition. It required participants to read aloud from a graded list of words. The Word Attack test was used to measure phonological decoding. Participants were instructed to read aloud from a list of unfamiliar pseudowords. Each test yields a standard score ($M = 100$, $SD = 15$), based on age norms, that is derived from the number of words or

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pseudowords read correctly. The WJ III ACH reports reliability estimates for 7 to 9 year olds from .94 to .99 for the Letter-Word Identification test and from .89 to .92 for the Word Attack test. Validity estimates with other tests of reading skills range from .66 to .82.

Reading Comprehension. Reading comprehension was measured using the Comprehension test of the Gates-MacGinitie Reading Tests, Fourth Edition (GMRT-4; MacGinitie, MacGinitie, Maria, Dreyer, & Hughes, 2000). The GMRT-4 is a standardized, norm-referenced group administered test of reading comprehension that yields normal curve equivalent and percentile rank scores. Students silently read a series of grade level passages and then answered multiple-choice questions about the text. The participants were given 35 minutes to complete the passages.   Each student's obtained normal curve equivalent was used for analyses. Reliability estimates for the GMRT ranged from .82 to .93 and validity estimates with scores from other tests of reading comprehension ranged from .60 to .62 (MacGinitie et al., 2000).

Reading comprehension was also assessed using the Qualitative Reading Inventory, Fourth Edition (QRI-4; Leslie & Caldwell, 2006). The QRI-4 is a criterion referenced, individually administered test of reading ability. Participants read aloud from a series of passages and then answered eight comprehension questions about what they read. In the current study, participants first read aloud from one passage at grade level (i.e., second grade). Participants' reading level (i.e., independent, instructional, or frustration) was then calculated for the second grade based on total accuracy, as per QRI-4 procedures. If instructional or independent level was achieved on the second-grade passage, participants then read one passage above grade-level (i.e., third-grade) in order

to elicit enough oral reading errors for analysis. Conversely, if frustration level was achieved on the second-grade passage, participants read a first grade level passage. All participants read the same second-grade passage, and all passages were narrative in content. Participants were informed that after they finished reading they would be asked to answer a series of questions assessing the contents of the passage. They were also told that the examiner could not assist them with any of the words as they read. Oral reading was only interrupted to encourage participants to continue reading if they stopped, lost their place, or lingered on a particular word. Comprehension questions consisted of both literal and inferential questions. The number of questions answered correctly was used in the analysis. During administration examiners used a stopwatch to record the amount of time it took for the participants to read each passage. The first grade passage ("The Bear and the Rabbit") contained 181 words, the second-grade passage ("What Can I Get for My New Toy") contained 175 words, and the third-grade passage ("The Trip to the Zoo") contained 312 words.

Reliability estimates for the QRI-4 in a sample of second-grade children ranged from .80 to .99, and validity estimates with other test scores ranged from .44 to .72 (Leslie & Caldwell, 2006). One reason the QRI-4 was selected as a measure of reading comprehension for the present study was because research suggests that it is less reliant on the participant's decoding skills to comprehend the passage text than similar reading comprehension measures (Keenan, Betjemann, & Olson, 2008). Additionally, the comprehension questions associated with other reading comprehension measures have been shown to be more dependent on prior knowledge than actual comprehension of the text (Kennan & Betjemann, 2006).

Miscue Analysis. Miscues were obtained from the QRI-4 passages. Participants' reading was tape-recorded to allow for review following data collection. During administration, examiners transcribed miscues orthographically using a copy of the text as the students read the passages out loud. When a child made a substitution error (using a real or nonsense word), the researchers recorded the error phonetically on the text copy. Omissions (omitting a word or part of the text), insertions (reading a word or phrase not included in the text), repetitions (repeating a word or phrase), and self-corrections (correcting a word or phrase that was initially read incorrectly) were also recorded using transcription techniques described in the Reading Miscue Inventory (RMI; Goodman et al., 2005). Substitution miscues were further coded after data collection in terms of graphic, phonemic, syntactic, and semantic similarity to the text.

Substitutions miscues were analyzed at the sentence level. Errors that preserved grammatical structure of the sentence in which they were embedded were categorized as syntactically acceptable miscues. Miscues that did not make grammatical sense at the sentence level were considered syntactically unacceptable miscues. Similarly, miscues that preserved the author's intended meaning of the text were coded as semantically acceptable miscues, while those that altered the meaning of the text were coded as semantically unacceptable miscues.

Additionally, substitutions were analyzed at the word level based on their graphic similarity to the printed text. As outlined in the RMI, words were divided into three parts for the purposes of comparing the errors to the text: beginning, middle, and end. Miscues were coded as having high graphic similarity if they resembled the printed word in two or more word parts. Miscues that shared one word part with the text were labeled as having

some graphic similarity. Conversely, miscues were coded as graphically dissimilar if they did not resemble the printed word in any parts at all. In the same way, miscues were also coded as having high phonemic similarity, some phonemic similarity, or no phonemic similarity if they resembled two or more, one, or no word parts of the text word, respectively.

Procedure

Written parent consent and child assent was required for participation in the study. The policies and procedures dictated by the Institutional Review Board were adhered to throughout the data collection process. The purpose of the study was explained to each participant, and all individually administered assessments were administered in a quiet location in the school. The GMRT-4 (MacGinitie et al., 2000) was conducted in a group setting during a nonacademic period. The individual tests of reading ability were counterbalanced such that an equal number of participants were administered either the word reading or miscue measure first. All measures were administered by school psychology graduate students trained in the procedure. A doctoral school psychology student with experience in administering each of the proposed measures trained all examiners. A training session was held prior to data collection where assessment procedures and miscue coding were reviewed. Examiners practiced coding miscues using taped recordings of children's readings until they achieved at least 95% agreement. Tape recordings were also periodically reviewed throughout data collection to uphold procedural adherence. Furthermore, the trainer reviewed a sampling of the recorded assessments given by examiners to ensure miscues are coded accurately. Following data collection, substitution miscues were further coded and classified based

on their semantic and syntactic acceptability and their graphic and phonemic similarity to the text word. Coding of all protocols was completed by two advanced graduate-level psychology students, and 97% agreement across all substitution miscue categories was achieved.

Data Screening and Analysis

All data was screened for missing data points, outliers, and normalcy. No missing or out of range data points were found. Data points from three participants were identified as outliers on most of the reading measures (i.e., $z > 3.29$; Tabachnick & Fidell, 2007) and were thus removed from the final data set. A few participants were excluded from analysis due to technical failure by the audio recording device. The miscue variables were found to be moderately positively skewed, and were subsequently altered for data analysis using a square root transformation (Tabachnick & Fidell, 2007). Data from the first-grade passage of the QRI were not included in the analyses because so few participants ($n = 2$) were required to reverse below grade-level during administration of the reading measure. Data screening suggested a ceiling effect for the comprehension questions associated with the QRI passages (i.e., most participants were able to answer most or all questions correctly). It was determined that data gathered from the QRI comprehension scores may not be a valid measure of reading comprehension for the purposes of this study. Therefore, only scores from the GMRT, the independent measure of reading comprehension, were used throughout the analyses. An a priori alpha level of .05 was used for all analyses.

Results

Descriptive statistics for the miscue variables are included in Table 1. On average, the participants demonstrated age-appropriate skills on the WJ III ACH Letter-Word Identification test (standard score $M = 106.24$, $SD = 8.01$), the W III ACH Word Attack test (standard score $M = 103.69$, $SD = 8.85$), and the GRMT-4 Comprehension test (normal curve equivalent $M = 47.05$, $SD = 17.65$). As would be expected, a paired samples t-test suggested that participants read the second-grade level QRI-4 passage faster, $t = -14.75$, $p < .001$, and more accurately, $t = 6.97$, $p < .001$, than the third-grade passage.

Relation Among Miscue Types And Comprehension

In order to examine the relation between different types of miscues and reading comprehension, a series of Pearson product-moment correlation coefficients were computed (see Table 1). For both the second- and third-grade passages, substitution miscues were found to be closely tied to reading comprehension, $r = -.50$, $p < .05$ and $r = -.51$, $p < .05$, respectively. The more students substituted text words, the less likely they were to clearly comprehend the passage as a whole. Moreover, focusing on self-correcting reading miscues may have interfered with students' comprehension across both passages, $r = -.28$, $p < .01$ and $r = -.29$, $p < .01$. The magnitude of the correlations between substitution miscues and comprehension and between self-corrections and comprehension were remarkably similar across the second- and third-grade passages, suggesting that the relations held true whether the passage read was at grade-level or more advanced. No additional miscue categories were significantly correlated with reading comprehension.

Further analyses suggested that some miscue types were correlated with one another (see Table 1).   A weak relation was found between substitution miscues and self-corrections in the second-grade passage, $r = .25; p < .05$, whereas a strong relation was found in the more difficult third-grade passage, $r = .51; p < .01$. A moderate relation was found between participants' repetitions and self-corrections across both the second-, $r = .42; p < .01$, and third-grade passages, $r = .39; p < .01$. Finally, substitution miscues and repetitions were moderately related in the third-grade passage only, $r = .30; p < .05$. Based on these findings, it appears that students who were likely to provide substitutions or self-corrections while engaging in oral reading were more likely to repeat words or whole phrases while doing so.

Substitution miscues were also analyzed at the sentence level and divided into two categories: errors that preserved grammaticality (syntactic acceptability) and errors that preserved meaning (semantic acceptability) of the sentences in which they were embedded (see Table 2). A moderate positive relation was found between syntactic acceptability and reading comprehension across the second- and third-grade passages, $r = .45, p < .01; r = .45, p < .01$. Comparable relations were found between semantic acceptability and comprehension across the two passages, $r = .49, p < .01; r = .53, p < .01$. Lastly, semantically and syntactically acceptable miscues were closely related in both passages, $r = .79, p > .01$. These findings suggest that even when substitution miscues are made, those errors that preserve the sentence meaning and grammaticality are related to better performance in reading comprehension.

Table 1

Correlations Among Miscue Types and Reading Comprehension and Descriptive Statistics

Miscue Types	1	2	3	4	5	6	*M*	*SD*
1. Substitutions	---	.10	.15	.10	.25*	-.50**	2.02	2.43
2. Omissions	.09	---	.21	-.11	-.03	.20	.73	.81
3. Insertions	.09	.16	---	-.10	.08	-.05	.58	.86
4. Repetitions	.30*	-.03	.19	---	.42**	-.17	2.32	2.25
5. Self-Corrections	.51**	-.06	.15	.39**	---	-.28*	1.89	1.98
6. Comprehension	-.51**	.01	.11	-.12	-.29*	---	---	---
M	9.22	1.73	.88	3.83	3.00	---	---	---
SD	6.35	2.47	1.25	3.15	2.14	---	---	---

Note. Correlations for the second-grade passage are presented above the diagonal, and correlations for the third-grade passage are presented below the diagonal.

*p < .05. **p < .01.

A word-level analysis was also conducted using substitution miscues. Each substitution was categorized based on its graphic and phonemic similarity to the text word. Substitutions were initially coded as having high, some, or no graphic similarity to the printed word; the same process was completed regarding phonemic similarity. However, the correlations among the "high" and "some" graphic and phonemic similarity categories were compared, and no significant differences were found among the categories across both the second- and third-grade passages, $z = .26$, $p = .40$ and $z = .40$, $p = .34$, respectively. Therefore, these categories were collapsed to form one variable for graphic similarity and one variable for phonemic similarity.

Correlation coefficients for the word level analysis (see Table 2) indicated that there was a moderate negative relation between substitutions that were graphically similar to the text word and comprehension scores across both passages, $r = -.46$, $p < .01$; $r = -.53$, $p < .01$; similar results were found for phonetically similar substitutions, $r = -.49$, $p < .01$; $r = -.54$, $p < .01$. Furthermore, graphically and phonetically similar substitutions were closely related in both passages, $r = .85$, $p < .01$. Taken together, these findings suggest that substitution errors that look and sound similar to the text detract from comprehension performance, whereas substitution errors that preserve the meaning or grammar of the sentence support comprehension.

Predictors of Reading Comprehension

Next, we tested the hypothesis that word recognition and decoding tasks would be stronger predictors of reading comprehension than would children's miscue patterns. That is, whether reading assessment using context-free word lists (word recognition) better predicts reading comprehension skills than qualitative analysis of connected text

Table 2

Correlations Among Substitution Miscue Types and Reading Comprehension

Category	1	2	3	4	5	6	7
1. Syntactic Acceptability	---	.90**	-.53**	-.11	-.61**	.04	.45**
2. Semantic Acceptability	.79**	---	-.64	-.23	-.73**	-.06	.53**
3. Graphic Similarity	-.71**	-.85**	---	-.25	.85**	.28	-.46**
4. No Graphic Similarity	-.33*	-.30*	.30*	---	-.04	.50**	.10
5. Phonemic Similarity	-.70**	-.83**	.98**	.32	---	-.18	-.53**
6. No Phonemic Similarity	-.35**	-.40**	.44**	.41**	.28*	---	.21
7. Comprehension	.45**	.49**	-.53**	-.14	-.54**	-.18	---

Note. Correlations for the second-grade passage are presented above the diagonal, and correlations for the third-grade passage are presented below the diagonal.

*p < .05. **p < .01.

(miscue analysis). Separate hierarchical regression analyses were conducted for the second- and third-grade passages. The miscue types found to be significantly correlated with comprehension (i.e., substitutions and self-corrections, semantic acceptability, syntactic acceptability, graphic similarity, and phonetic similarity) and word reading tasks (word recognition and word decoding) were used as predictor variables, whereas reading comprehension served as the outcome variable. After running the first regression analysis, the order of the predictor variables was reversed so that the unique variance of each predictor could be determined after controlling for the other predictors. Tables 4-7 show the shared and unique variance for each predictor of comprehension.

The first set of regression analyses examined the relative contributions of substitution and self-correction miscues to comprehension as compared to word reading variables (see Table 3). When reading grade level text, both substitution miscues and word recognition were significant predictors of reading comprehension. When entered after the word reading variables, substitutions explained 13% unique variance in reading comprehension. However, after accounting for the miscues variables, word recognition explained only an additional 6% of the variance. Thus, substitution miscues were the strongest predictor of comprehension. An identical set of regression analyses for the more challenging third-grade passage offered somewhat different results. Substitution miscues continued to be the strongest predictor of comprehension, explaining 14% of the variance in comprehension after taking into account the word reading variables.   However, word decoding (not word recognition) added unique variance (5%) when entered after the miscues variables. The results suggest that although sight word reading skills facilitate

Table 3

Hierarchical Regressions Predicting Reading Comprehension: Substitution and Self-correction Miscues

Regression and steps	Second-grade passage					Third-grade passage				
	B	$SE\ B$	β	R^2	ΔR^2	B	$SE\ B$	β	R^2	ΔR^2
Step 1										
Substitution miscues	-9.99	2.23	-.50**	.25	.25	-7.57	1.68	-.51**	.26	.26
Step 2										
Self-corrections	-3.41	2.44	-.16	.28	.02	-1.27	3.55	-.05	.26	.00
Step 3										
Word recognition	.60	.27	.27*	.33	.06	.37	.28	.18	.28	.02
Step 4										
Word decoding	-.51	.34	.26	.36	.03	-.63	.32	-.35*	.33	.05
Step 1										
Word recognition	1.01	.25	.46**	.21	.21	.84	.24	.42**	.18	.18
Step 2										
Word decoding	-.16	.34	-.08	.21	.00	-.29	.32	-.16	.19	.01
Step 3										
Substitution miscues	-8.13	2.41	-.41**	.34	.13	-7.15	2.11	-.48**	.33	.14
Step 4										
Self-corrections	-3.10	2.52	-.14	.36	.02	-2.20	3.50	-.08	.33	.01

Note. *$p < .05$. **$p < .01$.

comprehension, the ability to decipher unknown words becomes essential when children encounter more challenging text.

As is common in the literature, substitution miscues were further examined based on whether the meaning and grammar of the text was preserved at the sentence level. These two variables are not mutually exclusive categories, such that a single substitution could be coded as both semantically and syntactically acceptable. Therefore, the hierarchical regressions were replicated examining semantically and syntactically acceptable miscues separately (see Table 4 and Table 5). Results mirrored those of the previous analyses. In the second-grade passage, word recognition added unique variance when entered after semantic acceptability (5%), whereas word decoding was a significant predictor of comprehension in the third-grade passage, adding 6% variance. Importantly, across both passages, semantic acceptability explained a greater amount of unique variance to comprehension when entered after the word recognition variables (18% and 14%, respectively); syntactic acceptability followed the same pattern (15% and 14%, respectively). In contrast to previous analyses, word recognition added unique variance in both the second- and third-grade passages when entered after syntactic acceptability (10% and 7%, respectively).

Consistent with the literature, a final set of hierarchical regressions examined substitution miscues at the word level. Graphic and phonemic similarity to the text word were examined separately (see Table 6 and Table 7). When entered after graphically similar substitutions, word recognition explained 11% unique variance in the second-grade passage. Word decoding was again shown to be a significant predictor of

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Table 4

Hierarchical Regressions Predicting Reading Comprehension: Semantic Acceptability

Regression and steps	Second-grade passage					Third-grade passage				
	B	$SE\ B$	β	R^2	ΔR^2	B	$SE\ B$	β	R^2	ΔR^2
Step 1										
Semantic acceptability	63.43	12.08	.56**	.32	.32	21.96	5.21	.49**	.24	.24
Step 2										
Word recognition	.54	.25	.26*	.37	.05	.39	.29	.20	.26	.02
Step 3										
Word decoding	-.39	.31	-.20	.39	.02	-.71	.32	-.38*	.32	.06
Step 1										
Word recognition	1.01	.25	.47*	.21	.21	.84	.24	.41**	.17	.17
Step 2										
Word decoding	-.16	.34	-.08	.21	.00	-.29	.32	-.16	.18	.01
Step 3										
Semantic acceptability	53.61	13.17	-.47**	.39	.18	22.35	6.67	.50**	.32	.14

Note. *p < .05. **p < .01.

Table 5

Hierarchical Regressions Predicting Reading Comprehension: Syntactic Acceptability

	Second-grade passage					Third-grade passage				
Regression and steps	B	$SE\ B$	β	R^2	ΔR^2	B	$SE\ B$	β	R^2	ΔR^2
Step 1										
Syntactic acceptability	81.69	18.26	.50**	.25	.25	49.00	12.79	.45**	.21	.21
Step 2										
Word recognition	.72	.25	.33**	.35	.10	.58	.25	.29*	.28	.07
Step 3										
Word decoding	-.37	.33	-.19	.36	.01	-.61	.31	-.31	.32	.04
Step 1										
Word recognition	1.01	.25	.46**	.21	.21	.84	.24	.41**	.17	.17
Step 2										
Word decoding	-.16	.34	-.08	.21	.00	-.29	.32	-.16	.18	.01
Step 3										
Syntactic acceptability	67.94	18.49	.42**	.36	.15	45.51	13.47	.42**	.32	.14

Note. *p < .05. **p < .01.

Table 6

Hierarchical Regressions Predicting Reading Comprehension: Graphic Similarity

Regression and steps	Second-grade passage					Third-grade passage				
	B	$SE\ B$	β	R^2	ΔR^2	B	$SE\ B$	β	R^2	ΔR^2
Step 1										
Graphic Similarity	-11.05	3.28	-.46**	.21	.21	-8.30	1.74	-.53**	.29	.29
Step 2										
No Graphic Similarity	-.55	5.26	-.02	.21	.00	.58	3.74	.02	.29	.00
Step 3										
Word recognition	.848	.33	.38*	.32	.11	.33	.29	.16	.30	.01
Step 4										
Word decoding	-.50	.37	-.25	.35	.03	-.67	.31	-.37*	.36	.06
Step 1										
Word recognition	1.15	.29	.52**	.27	.27	.84	.24	.41**	.17	.17
Step 2										
Word decoding	-.45	.38	-.22	.29	.02	-.29	.32	-.16	.18	.01
Step 3										
Graphic Similarity	-6.81	3.52	-.28*	.35	.06	-8.46	2.21	-.55**	.36	.17
Step 4										
No Graphic Similarity	-.72	4.92	-.02	.35	.00	1.73	3.71	-.06	.36	.00

Note. *p < .05. **p < .01.

Table 7

Hierarchical Regressions Predicting Reading Comprehension: Phonemic Similarity

Regression and steps	Second-grade passage					Third-grade passage				
	B	$SE\ B$	β	R^2	ΔR^2	B	$SE\ B$	β	R^2	ΔR^2
Step 1										
Phonemic Similarity	-11.07	3.04	-.49**	.24	.24	-8.49	1.75	-.54**	.29	.29
Step 2										
No Phonemic Similarity	3.00	4.10	.10	.25	.01	-.58	2.50	-.03	.29	.00
Step 3										
Word recognition	.77	.35	.35*	.33	.08	.27	.29	.13	.30	.01
Step 4										
Word decoding	-.61	.37	-.30	.38	.05	-.68	.31	-.37*	.36	.06
Step 1										
Word recognition	1.15	.29	.52**	.27	.27	.84	.24	.41**	.17	.17
Step 2										
Word decoding	-.45	.38	-.22	.29	.02	-.29	.32	-.16	.18	.01
Step 3										
Phonemic Similarity	-7.76	3.48	-.34*	.37	.08	-8.65	2.26	-.55**	.36	.17
Step 4										
No Phonemic Similarity	2.01	3.85	.07	.38	.01	-1.40	2.46	-.07	.36	.00

*Note. *p* < .05. **p* < .01.*

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comprehension in the third-grade passage, explaining 6% unique variance in comprehension. When entered after the word reading variables, graphic similarity explained unique variance across the second- and third-grade passages (6% and 17%, respectively). Lastly, the analysis examining phonemically similar substitutions revealed congruent results. After taking phonetic similarity into account, word recognition added 8% unique variance in the second-grade passage, whereas word decoding added 6% unique variance in the third-grade passage. When entered after the word reading variables, phonemic similarity explained additional unique variance in both passages (8% and 17%, respectively). In sum, children's miscues were generally stronger predictors of comprehension than their performance on word reading lists.

Discussion

The aim of this study was twofold: first, to identify which types of oral reading miscues related to reading comprehension in second-grade children and, second, to examine whether miscue analysis better predicted comprehension as compared to context-free word identification and decoding tasks. To this end, oral reading passages, word identification and decoding lists, and comprehension measures were administered to a sample of second-grade children. It was hypothesized that, of all miscues types, substitutions would be most correlated with reading comprehension, and that word list tasks would be better predictors of comprehension than miscues. However, the results of the study suggest that substitution miscues were the best predictors of comprehension of the variables analyzed in the present study.

Relation Between Miscues and Comprehension

Previous research linking various miscue types to reading comprehension is inconsistent and mostly antiquated. This study sought to examine correlations between different error types and comprehension in second-grade children, a population that has been overlooked in former studies. Based on the literature (e.g., Bebe, 1980; D'Angelo & Mahlios, 1983; and Laing, 2002), it was hypothesized that of all miscue types, substitution miscues would be the most highly correlated with reading comprehension. This prediction was verified by the results across the second- and third-grade level passages. Interestingly, findings from the present study also suggested that self-corrections were negatively related to comprehension scores, results that contradict the recent findings of the 2005 NAEP Special Study on Oral Reading (Daane et al., 2005). The NAEP study reported that, in a sample of fourth-grade students, self-corrected errors were positively related to reading comprehension. One possible explanation for this discrepancy could be developmental differences among the samples of these two studies. Children in early elementary school are still in the process of developing fluent reading skills (Chall, 1996). Monitoring and correcting reading errors may exceed the capacity of their working memories, thereby interfering with the construction of meaning as they read. However, once fluent reading skills are established, attentional resources are freed to devote to reading comprehension and critical thinking skills (La Berge & Samuels, 1974). Fourth grade readers may engage in more effective self-monitoring while reading, thereby supporting comprehension. However, in the present study, self-correcting errors appeared to disrupt rather than facilitate children's ability to comprehend the text.

Relations among certain miscue types were discovered, and patterns remained fairly constant in both passages. Our results suggest that children often self-correct their substitution errors. After correcting errors, children are likely to go back and repeat the phrase or sentence in order to improve reading fluidity. This finding is reflective of classroom instructional practices; teachers often encourage students to return to the beginning and reread a sentence when it contains errors. Furthermore, a relation between substitutions and repetitions was found only in the third-grade passage, potentially indicating that children who struggle with substitution errors were more likely to use rereading as a strategy to work through the text.

Predictors of Comprehension

Teachers, school psychologists, and other school personnel commonly employ context-free word lists to assess children's reading skill. Miscue analysis, a qualitative approach to assessment of errors in the context of passage reading, is another approach to evaluating students' reading. A second goal of this study was to compare these two approaches in order to determine which type of assessment best predicted reading comprehension.

Results from our hierarchical regression analyses indicated that, for the both the second- and third-grade passages, substitution miscues were better predictors of comprehension scores than was word recognition or decoding ability. Further analysis of various types of substitution miscues at the word and sentence level yielded largely similar findings. Substitution miscues that were semantically or syntactically acceptable at the sentence level (i.e., they preserved the author's intended meaning or grammaticality of text) explained more unique variance in reading comprehension across

grade level and passage difficulty than the word reading measures. At the word level, substitution errors that resembled the text word either graphically or phonemically were shown be negatively related to comprehension. For example, several children substituted *chipmunk* for *chimp* during oral reading of the third-grade passage. Although *chipmunk* is both graphically and phonemically similar to *chimp*, the concept is vastly different. Thus, children's comprehension of the passage was negatively affected by their misunderstanding of the animal the author was referencing. In sum, focusing on the graphic or phonemic features at the word level appears to interfere with comprehending the text.

Across analyses, word recognition generally contributed unique variance to comprehension in the second-grade passage, whereas word decoding explained unique variance in the third-grade passage. However, word reading contributed uniquely to comprehension across both grade level passages when syntactic similarity was examined. This trend is rather logical. Although word recognition is crucial, decoding skill is of primary importance when attempting to tackle more challenging passages containing unknown words. Our analyses suggested that although some categories of substitution miscues predicted enhanced comprehension (e.g., semantically and syntactically acceptable substitutions), others, particularly analysis of word level features, predicted variance that actually detracted from comprehension scores. Overall, substitution miscues that were semantically acceptable predicted the greatest amount of variance in reading comprehension.

Consistent with the literature (e.g., Bebe, 1980; Laing, 2002), the findings of this study suggest that substitution miscues, primarily those that preserve the meaning and grammaticality of the text, are better predictors of reading comprehension in second-grade children than is performance on context-free word reading measures. These results further implicate that examination of particular types of oral reading errors may provide valuable information in assessment of children's reading skill. Of course, the aforementioned components of reading account for only a portion of the variance contributing to comprehension, leaving much to variables not examined in the current study. Consideration of additional cognitive processes, such as language comprehension, world knowledge, the ability to draw inferences, to name a few, is necessary to construct a complete picture of reading comprehension (Sweet & Snow, 2003).

Implications for School Psychologists

The traditional role of school psychologists has been heavily focused on assessment and evaluation. As legislation regarding student services and processes by which students are identified for special education has evolved (i.e., the Response to Intervention model), so have the duties of school psychologists. Recent years have seen a shift from assessment-based practice to a problem-solving approach. As such, school psychologists are in the position to assist teachers with the administration and selection of classroom-based reading measures, as well as to help implement interventions. To this end, it is important that school psychologists are familiar with assessment measures that can efficiently and accurately address the needs of students.

Curriculum-based evaluation (CBE) is a methodical, problem-solving approach to evaluating students' academic weaknesses in effort to provide them with individual

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interventions to improve their performance in the classroom (Hosp, Hosp, & Howell, 2007; Howell & Nolet, 2000). CBE employs the process of inquiry to direct assessment and measurement that is aligned with students' learning outcomes and current skill level. A common way to begin assessment of children's reading skill within the CBE framework is to examine reading accuracy by conducting an error analysis based on oral reading of connected text (Howell & Nolet, 2000). This practice is essentially identical to the procedures of miscue analysis; the goal is to detect patterns of errors in struggling readers to learn how students are interacting with the text. The next step would be to engage in consultative decision making with teachers to determine appropriate interventions for students so that reading skill may be improved.

Given that the examination of children's miscue patterns may be used to guide the selection of interventions, as is done in CBE, it is vital that we understand what types of errors are prevalent amongst beginning readers and how such errors relate to reading curriculum goals, such as fluency and comprehension. Results from the present study suggested that substitution errors appear to be most predictive of reading comprehension in particular. However, other errors (i.e., repetitions and omissions) did not appear to be indicative of comprehension performance. If future studies continue to suggest that some reading errors coded and tracked through CBE inquiry, running records, or traditional miscue analysis are not empirically related to important curricular goals, it may not be constructive to devote time and resources to creating interventions to address these problems.

Research examining miscue analysis also has the potential to inform practices related to curriculum-based measurement of reading (CBM-R; Deno, 1985), a common

progress monitoring tool used in the schools. These oral reading fluency probes are used as screeners for general reading skill due to their close relation with reading comprehension (Fuchs, et al., 2001). Children read aloud from a grade level passage for one minute, during which their oral reading errors (i.e., miscues) are recorded. These errors are then used to calculate the number of words read correctly per minute (WCPM). By providing guidance regarding which miscues are important for comprehension, the relation between the WCPM metric and comprehension could be maximized. For example, our results suggest that for second-grade children substitution and self-corrections, but not omissions or repetitions, should be counted as reading errors. Although outside the scope of this paper, the application of miscue analysis research to the criteria used to calculate the WCPM metric warrants further investigation.

Limitations and Future Directions

Some limitations of this study warrant discussion. First, because of ceiling effects encountered with the comprehension questions associated with the Qualitative Reading Inventory-4, the comprehension variable used our analyses was not tied to the connected text used for the elicitation of miscues. The use of a comprehension measure linked with oral reading passages would provide a direct connection between reading errors and comprehension of a particular passage. Furthermore, miscue analysis or running records may be a more suitable assessment technique for struggling readers who frequently exhibit patterns of reading errors. Results from the present study are based on data derived from a sample of regular education students. Although understanding the relation between miscues and reading comprehension in a normative sample is an important first step, future studies should address whether the reading errors of children

with reading problems differ from those of average readers and how these errors are related to the development of core reading skills.

The current gaps in the miscue literature leave much room for exploration regarding how this procedure is used and the types of interventions that may be linked to such assessment. Although some authors have suggested ways in which miscue analysis procedures can be more easily adapted for classroom use (Lipson & Wixson, 2009), little is known about how teachers currently utilize this form of reading analysis. Further studies may investigate teachers' knowledge, use, and perception of miscue analysis or running records to gather information about how these procedures are commonly executed in the classroom. Such information could lead to valuable improvements in assessment techniques, particularly in looking at teachers' perceptions about which reading errors are crucial to understanding children's reading ability. Finally, studies linking instructional interventions based on miscue analysis to outcome data will expand our knowledge about how reading errors impact students' ability to read successfully. For example, miscue analysis is a component of many reading programs (e.g., Reading Recovery; Clay, 1994), but few studies have examined the role of miscues in the remediation of reading difficulties.

Conclusions

Overall, it appears that not all types of reading errors may be equally predictive of children's reading comprehension ability. Results of the present study indicated that substitution miscues are negatively related to comprehension; self-corrections were also shown to have a negative relation and may actually detract from the ability of beginning readers to comprehend a passage text. More specifically, substitution miscues that

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preserve the author's intended meaning of the text appear to be most predictive of comprehension scores. In contrast, our results imply that too much focus on word-level text features (e.g., graphic or phonemic properties) may potentially distract the reader from fully grasping the author's intended meaning. Together, these findings suggest that not all types of reading errors currently coded through miscue analysis procedures may provide information that is valuable for classroom curriculum and intervention planning. As such, researchers should continue to work toward analyzing which error types provide information that can lead to the implementation of appropriate strategies to effectively improve reading performance.

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