A Synthesis of Research on Effective Interventions for Building Reading Fluency with Elementary Students with Learning Disabilities

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Abstract

Fluent reading, often defined as speed and accuracy, is an important skill for all readers to develop. Students with learning disabilities (LD) often struggle to read fluently, leading to difficulties in reading comprehension. Despite recent attention to reading fluency and ways to improve fluency, it is not clear which features of interventions that are designed to enhance fluency are beneficial for the most struggling readers. The purpose of this study is to synthesize research on interventions that are designed primarily to build reading fluency for students with LD. The search yielded 24 published and unpublished studies that reported findings on intervention features, including repeated reading with and without a model, sustained reading, number of repetitions, text difficulty, and specific improvement criteria. Our findings suggest that effective interventions for building fluency include an explicit model of fluent reading, multiple opportunities to repeatedly read familiar text independently and with corrective feedback, and established performance criteria for increasing text difficulty.

The development of reading fluency has been linked to successful reading since the early research on the psychology of reading. In his classic review of 19th-century reading research, Huey (1908) likened the development of fluent reading to the development of other psychomotor skills such as playing tennis, remarking that both skills benefited from practice. "Repetition progressively frees the mind from attention to details, and makes facile the total act, shortens the time, and reduces the extent to which consciousness must concern itself with the process" (p. 104). Despite this attention afforded to fluency in the early 1900s, it was not until 1974, when LaBerge and Samuels offered their theory of automatic processing, that reading fluency took a more prominent role in our understanding of reading development.

LaBerge and Samuels (1974) proposed that learning to read involves increasing automaticity in processing word units (e.g., letter–sound correspondences), processing these units into recognizable words, and connecting the words while reading a passage. In effect, improvement in the processing of units, words, and connected text cognitively releases the reader to think about the meaning of the text. This theory of *automatic information processing* resulted in research that focused on improving the speed at which students recognized words (e.g., Ehri & Wilce, 1983) and on repeated reading (Samuels, 1997).

Similarly, Perfetti's (1977, 1985) verbal efficiency model suggested that slow word processing speed interferes with automaticity of reading and, therefore, with comprehension. However, Perfetti extended this explanation to suggest that slow word reading is also debilitating because it consumes working memory and, therefore, prevents the individual from thinking about the text while reading. Slow word reading clogs working memory with the processing of word-level reading so as to prevent understanding at the content level. Thus, both rapid reading of high-frequency words and rapid decoding as a means to enhance text understanding appear critical for typical reading development (L. S. Fuchs, Fuchs, Hosp, & Jenkins, 2001; Kuhn & Stahl, 2000; Meyer & Felton, 1999).

Students with learning or reading disabilities demonstrate difficulties in the area of fluency. A common core problem is the ability to read sight words, decode words, and read phrases and sentences automatically and rapidly. Thus, reading fluency is an essential

skill for all students. However, students with reading or learning disabilities are most at risk for presenting difficulties in fluency (Meyer & Felton, 1999). The U.S. National Research Council's Committee for the Prevention of Reading Failure noted that

> because the ability to obtain meaning from print depends so strongly on the development of word recognition accuracy and reading fluency, both the latter should be regularly assessed in the classroom, permitting timely and effective instructional response when difficulty or delay is apparent. (Snow, Burns, & Griffin, 1998, p. 7)

Contemporary research has demonstrated that some students with learning disabilities (LD) can be characterized as having a specific deficit in naming speed that distinguishes them from students with learning disabilities that stem from phonological processing deficits (Wolf & Katzir-Cohen, 2001). Wolf and Bowers (1999, 2000) have referred to this distinction as a *double deficit* model of reading disability. This model has led to the conjecture that interventions should be specifically tailored to address fluency deficits for those students who are phonologically aware and able to decode accurately but remain dysfluent. These specific intervention practices warrant further investigation and validation (Wolf & Katzir-Cohen, 2001).

Fluency is a critical but often neglected element of reading programs (Allington, 1983; Kameénui & Simmons, 2001). This is likely due in part to the fact that effective interventions for improving fluency are not widely known. For example, whereas there is a consensus that fluency is dependent on adequate word recognition skills, there is also an understanding that word recognition proficiency may not always yield fluent readers (National Reading Panel, 2000). Many of the approaches to improving fluency could be categorized as focusing on repeated reading (Meyer & Felton, 1999), whether through partner reading (e.g., Arreaga-Mayer, Terry, & Greenwood, 1998; D. Fuchs, Fuchs, Mathes, & Simmons, 1997) or through other procedures that support repeated reading (see Topping & Ehly, 1998, for a review).

Due to the perceived importance of fluency development to reading success and because of its apparent neglected status in classroom instruction, the U.S. National Reading Panel (NRP; 2000) has provided a meta-analysis of recent research on fluency building. Sufficient research articles were located for the NRP meta-analysis to inform two areas of fluency building, namely, guided repeated oral reading and formal efforts to increase students' independent or recreational reading. NRP criteria for studies to be included in their meta-analysis were that they (a) examined the impact of repeated reading or some other form of guided oral reading instruction on reading achievement; (b) provided reading instruction in English with students (K–12); and (c) appeared in a refereed journal. The NRP identified 98 articles on guided repeated oral reading that met all of these criteria. The NRP determined that the mean weighted effect size for guided oral repeated reading was .41, indicating that this procedure "has a moderate impact on the reading achievement of the types of students participating in these studies" (p. 3-17).

When distinguishing effect sizes for below-average versus average and above-average readers, the NRP (2000) reported that in general, guided oral repeated reading was more beneficial to average readers than to poor readers. The NRP conjectured that these results were probably less important than the individual findings of some studies that suggested that readers at different levels of proficiency benefited from different aspects of the interventions. For example, poor readers may have benefited more in terms of word reading accuracy, whereas more proficient readers may have benefited in developing prosody. Unfortunately, the NRP was unable to distinguish differences in specific intervention features because of the small sample of studies that addressed each specific intervention feature.

Based on its synthesis of guided repeated oral reading and its association with improved fluency for most students, the NRP (2000) recommended that teachers begin including such activities in their classroom routines to supplement their reading instruction. Despite these promising recommendations for most readers in the classroom, these findings may not generalize to the students with the most significant reading problems. For this reason, we were interested in synthesizing the findings from fluency interventions specifically intended for students with LD. Because most students with LD have reading disabilities, we thought it would be beneficial to specifically describe those fluency intervention studies in which students with learning disabilities were participants.

Furthermore, considering timelines, resources, and purpose, it simply was not possible for the NRP to locate and code the broadest array of research. Thus, dissertations, single group designs, and single-subject/case study designs were not included in the NRP study. The purpose of this study was to examine all intervention studies across a complete array of sources that identified students with LD as the target group for reading fluency intervention.

Method

Operational Definitions

For the purpose of this study, a *learning disability* refers to any researcher- or school-identified learning disability. In many of the included studies, the criteria for identifying a learning disability were explicitly outlined. In some cases, however, the authors did not report the procedures used for identifying the learning disability but stated that participating students met the criteria for state identification. In still other cases, no specific criteria were described, but it was stated that stu-

dents had been identified as having a learning disability.

The term *fluency* refers to the speed and accuracy with which a student reads connected text orally. Measures of fluency included oral reading fluency, in which both rate and accuracy were measured, and measures of oral reading that gauged accuracy, fluency, or prosody separately.

Fluency intervention refers to any instructional intervention designed specifically to increase students' reading fluency in connected text. Fluency interventions could focus at the word level or the connected-text level.

Locating and Selecting Studies

To identify a broad range of studies, computer searches were conducted of the ERIC, PsycINFO, and ArticleFirst databases; the first two of these databases include dissertations in their search returns. Key words and terms used to locate studies included *fluency, reading fluency, reading aloud, reading rate, repeated reading, reading practice, assisted reading, oral reading,* and *paired reading.* Moreover, hand searches were carried out on the most relevant journals, including *Annals of Dyslexia; Education and Treatment of Children; Exceptional Children; Journal of Educational Research; Journal of Experimental Psychology; Journal of Learning Disabilities; Journal of Reading Behavior; Learning, Memory, and Cognition; Learning Disability Quarterly; Learning Disabilities Research & Practice; Psychology in the Schools; Reading Horizons; Reading Research and Instruction; Reading Research Quarterly; Remedial and Special Education;* and *School Psychology Review.* References from studies that met our criteria and from article reviews of fluency research were checked for promising studies that might also fit our criteria. Our broad-based search yielded a pool of 104 studies in a variety of formats, including journal articles, book chapters, reports, and dissertations.

The titles and abstracts of prospective studies were carefully reviewed. Three sets of criteria guided our selection of studies:

1. the students targeted for the intervention were elementary-age students with LD,
2. the purpose of the study specifically targeted reading fluency, and
3. the study was published in the last quarter of the 20th century.

We considered for inclusion only those studies wherein the sample was described as students with LD. In those studies where students with LD were included in general education classrooms, we accepted the study only if the findings for the students with disabilities were reported separately, or in a way that made it possible to disaggregate results, or when the percentage of students with LD was at least 60% of the total sample. In terms of grade level, we restricted our synthesis to those studies wherein at least 50% of the participants were identified as students between the first and fifth grade. Studies were excluded if they included students within our focal grade range as well as outside that range but did not provide sufficient information to determine the number of students in each grade.

The second set of criteria addressed aspects of the studies' purpose. First, we included only studies that reported on the implementation of an intervention that expressly targeted the improvement of reading fluency in connected text. Studies in which interventions focused on improved word analysis and where improved fluency might be a by-product were excluded from our analysis. Second, although fluency development has been studied in many languages, we restricted our selection to those studies that focused on reading in English. Finally, we limited our corpus of studies to those published between January 1975 and December 2000 inclusive. In cases where it was difficult to determine from the title and abstract whether a particular study would be appropriate for inclusion, the work was reviewed to clarify ambiguous or incomplete information. In cases of remaining uncertainty, we discussed the work, and a decision was reached. Following these criteria, we established a final pool of 24 studies.

Coding Studies

Studies that met all criteria were distributed among the authors and a trained research assistant, who coded them using a comprehensive coding protocol designed to facilitate the recording of, and ease of access to, key aspects of the included studies. The coding protocol focused on the following major categories: (a) study information, (b) comparison and treatment group information, (c) treatment and comparison descriptions, (d) measure information, and (e) specific findings.

Coders participated in a 3-hour training session in which the specific categories and codes were described and discussed and coding was practiced on sample studies. As in the search process, confusing aspects of studies discovered during coding were discussed at meetings between the authors, and decisions were reached by consensus. During the study, 20% of all studies were coded twice and interrater agreement was calculated. Overall interrater agreement ranged between .85 and .97, with a mean of .92.

Instruction for comparison groups was coded similar to the treatment groups unless no intervention was specified. Five studies meeting our criteria included a no-treatment comparison. In all five studies, this no-treatment comparison was described as either traditional reading instruction or using a commercial or basal reading program. A summary of all treatment and comparison groups is included in Tables 1 through 3.

Results

Tables 1 through 5 provide an overview of the studies included in this synthesis according to the focus of the intervention. For example, Table 1 de-

scribes studies that examined repeated reading without a model. All tables use the following descriptions of quasi-experimental and experimental research designs (Campbell & Stanley, 1966): single group, single group pretest–posttest design, treatment–control, multiple group comparison, nonequivalent control group design. Furthermore, tables include studies that employed single-subject or case study methodology. In some instances, information about a particular study may be reported on more than one table because samples within the study received treatments that included multiple features.

In each table, Column 1 includes author names, publication date, participant age range, and design category for each study. Column 2 describes the treatments administered to participants and reports the sample sizes. Furthermore, the duration of the treatment in minutes is listed if this information was provided in the study. Column 3 describes the dependent measures for each study. Although the focus of this synthesis is on reading fluency, all dependent measures related to reading are included. Column 4 summarizes the results reported in each study. The summary of results reflects the significant differences reported between samples. For example, in Table 3, PALs > No PALs indicates that there was a statistically significant difference between the PALs (peer-assisted learning strategies) sample and the No PALs sample, favoring PALs. Those studies that reported no significant differences and did not provide means and standard deviations were coded as such.

Column 4 also reports effect sizes (ES) for comparisons between treatment samples or between treatments and comparison samples on all dependent measures. Cohen's *d* was the index of effect size (Hedges & Olkin, 1985). Where mean scores and standard deviations were reported, *d* was calculated as the difference between treatment and comparison posttest mean scores (or adjusted posttest means if that information was provided) divided by the pooled standard deviations of the posttest. In some cases, when neither mean scores nor standard deviations were reported, effect sizes were estimated from *F* values. In some cases, effect sizes were not reported because neither means, standard deviations, nor *F* values were reported.

When a study included only two independent samples, the effect sizes in Column 4 reflect the magnitude of the effect between two treatments or between the treatment and the comparison condition. When more than two independent samples were included in the study, the effect sizes in Column 4 are preceded by the relevant comparison, usually with the treatment demonstrating superior performance listed first. For example, in Table 3, "PALs vs. No PALs: $d = .63$" indicates that the PALs sample outperformed the No PALs sample with an effect size of .63. For the purpose of interpretation, J. Cohen's (1988) distinctions on the magnitude of effect were used, with $d = .20$ reflecting a small effect size, $d = .60$ a moderate effect size, and $d = .80$ a large effect size. This corpus of studies revealed that variations on two intervention types were used to enhance fluency for students with LD: *repeated reading* interventions and *word practice* interventions.

Repeated Reading

Repeated Reading Without a Model. Twenty-one studies ($N = 128$) addressed the question of whether repeatedly reading text is an effective way to improve the reading fluency of students with LD. In all samples, the students independently read connected text repeatedly a minimum of two times and a maximum of seven times. The effect sizes on measures of fluency (including rate and accuracy) ranged from $d = .02$ to $d = 3.02$, with an average of $d = .68$. These studies are summarized in Table 1.

A. L. Cohen (1988) compared the four-times-repeated reading of text to a no-treatment condition and found no main effects on measures of oral reading fluency, accuracy, or passage comprehension. However, the mean effect size for repeated readings on fluency and accuracy was $d = 1.98$ for students with LD. Furthermore, in another study, the repeated reading of text compared with reading text just once yielded significantly better scores for fluency and comprehension (O'Shea, Sindelar, & O'Shea, 1987) and for accuracy and fluency when compared with an audiotaped model of word reading in yet another study (Daly & Martens, 1994).

Monda (1989) compared both silent and oral repeated reading without a model to reading that followed a read-aloud text by the teacher. The mean effect size for the repeated reading interventions compared to the listening intervention yielded no differences ($d = -.05$). However, although Monda found no significant differences between groups on any measure of fluency, she found moderate effect sizes ($d = .57$ and $d = .46$) on measures of reading accuracy, favoring oral repeated reading over modeled reading as treatments.

Rashotte and Torgesen (1985) compared the reading fluency of students with LD under two different repeated reading conditions (one with overlapping words and one without) with a sustained reading condition. The mean effect size for the repeated reading conditions relative to the sustained reading condition was $d = .34$. Students in both repeated reading conditions performed significantly better than those in the sustained reading condition on a measure of reading rate. When the repeated reading condition with no overlapping words was compared to the sustained reading condition, the effect size was moderate ($d = .65$). When the repeated reading condition with a high percentage of overlapping words was compared to sustained reading, the effect size was somewhat smaller ($d = .35$).

In an alternating treatment design across six students, Rose (1984) com-

TABLE 1
Studies Examining Repeated Reading Without a Model

Author/participant age/design	Treatment description/sample size/treatment duration	Dependent measures	Results/effect sizes (*d*)
Cohen, 1988 8 years 7 months–13 years 2 months Multiple group comparison	• Processing power (PP; $n = 16$): Repeated reading (4 times) with text presented 3–5 words at a time. • Repetitive reading (RR; $n = 16$): Repeated reading (4 times) with student control of text amount. • No-treatment comparison (C; $n = 15$). Duration: 195–202 minutes	Paragraph reading speed (practiced) Paragraph reading accuracy (practiced) Paragraph reading speed (unpracticed) Paragraph reading accuracy (unpracticed) Reading fluency, final text Reading accuracy, final text Word reading speed (single syllable, practiced) Word reading speed (multisyllable, practiced) Word reading speed (unpracticed) Passage comprehension	RR vs. PP: $d = .19$ PP vs. RR: $d = .56$ PP vs. RR: $d = .26$ PP vs. RR: $d = .19$ PP vs. RR: $d = .30$; PP vs. C: $d = 1.58$; RR vs. C: $d = 1.25$ PP vs. RR: $d = .89$; PP vs. C: $d = 3.02$; RR vs. C: $d = 2.09$ PP > C PP > C no significant difference between groups no significant difference between groups
Daly & Martens, 1994 8 years 10 months–11 years 11 months Multi-element design	$N = 4$ • All conditions followed a model, drill, and train to criterion lesson structure. • Subject Passage Preview (SP): Read passage silently and reread for assessment. • Listening Passage Preview (LP): Listened to audiotaped (130 wpm) passage, read list of unknown words, and reread passage for assessment. • Taped Words (TW): Read aloud along with audiotaped word list (80 wpm). Reread list and read passage for assessment. Length and duration: Session length not specified. Treatments lasted 21 days.	Passage reading accuracy Passage reading fluency Word reading accuracy Word reading fluency	• LP > SP > TW on accuracy and fluency of passage reading. • TW condition outperformed SP and LP on measures of word reading accuracy and fluency.
Marston, Deno, Dongil, Diment, & Rogers, 1995 Age not reported Treatment–Comparison[a]	• Peer tutoring (PT; $n = 27$): Repeated reading of text with peer partners taking turns reading. • Comparison (C; $n = 23$): not described Duration: 2,250 minutes	Oral reading fluency	PT vs. C: $d = -.14$
Monda, 1989 9.0–13.5 years Multiple group comparison	• Oral Repeated Rereading (OR; $n = 20$): Read, reread with timing and no feedback. • Silent Repeated Reading (SR; $n = 20$): Read, reread silently with timing. • Listening Repeated Reading (LR; $n = 20$): Read, reread aloud to student by teacher. Duration: All students reread the passage a third time before responding to comprehension questions. Procedure administered once to each condition.	Words read per minute (exp). Words read per minute (transfer)[b] Errors per minute (exp.)[b] Errors per minute (transfer)[b,c]	SR vs. OR: $d = .13$; OR vs. LR: $d = .02$; SR vs. LR: $d = .15$ SR vs. OR: $d = .27$; OR vs. LR: $d = -.06$; SR vs. LR: $d = .20$ OR vs. SR: $d = .70$; OR vs. LR: $d = .57$; SR vs. LR: $d = -.17$ OR vs. SR: $d = .76$; OR vs. LR: $d = .46$; SR vs. LR: $d = -.46$

(Table continues)

(Table 1 continued)

Author/participant age/design	Treatment description/sample size/treatment duration	Dependent measures	Results/effect sizes (*d*)
O'Shea, Sindelar, & O'Shea, 1987 11.3–13.6 years 2 (Focus) × 3 (No. of reading) factorial design	*N* = 29 • Repeated Reading 7 (R7): Read text 7 times. • Repeated Reading 3 (R3): Read text 3 times. • Reading (R): Read text once. Duration: Each treatment administered once.	Oral reading fluency Story retell	R7 > R3 > R R7, R3 > R
Rashotte & Torgesen, 1985 (based on dissertation by Rashotte, 1983) 8.6–12 years Multiple treatment design	*N* = 12 • Repeated reading, no overlapping words (NO): Read stories 4 times with about 20 words in common across stories. • Repeated reading with high overlap (HO): Same as NO but with about 60 words in common. • Sustained Reading (SR): Read 4 different stories each day. Duration: 7 days	Reading rate (slope of progress) Reading accuracy (slope of progress)[b] Passage comprehension (slope of progress)	Both interventions with repeated reading performed significantly better than sustained reading on reading rate. NO vs. HO: *d* = .18 NO vs. SR: *d* = .65 HO vs. SR: *d* = .35 HO slope, SR slope > 0 NO vs. HO: *d* = –.26 NO vs. SR: *d* = –.52 HO vs. SR: *d* = –.24 HO slope, SR slope > 0 no significant differences between groups. NO vs. HO: *d* = .10 NO vs. SR: *d* = .08 HO vs. SR: *d* = .17
Rose, 1984 9.5–13.1 years Alternating treatment design	*N* = 6 • Baseline: Oral reading only, no previewing. • Silent previewing: Student read passage silently before reading it aloud to the teacher. • Listening previewing: Teacher read passage aloud while student followed along. Then student read passage aloud to teacher. Length and duration: Approximately 25 days of intervention. Length of daily intervention not specified.	Words read correctly per minute	• Listening previewing led to faster reading rates. • Both silent and listening previewing appeared to be more beneficial than baseline.
Stout, 1997 8 years–9 years 3 months Multiple baseline across participants with an additional prebaseline phase	*N* = 4 • Baseline: Student read a passage with feedback provided after reading. Then students were allowed to study the passage. Comprehension questions were asked. (at least 3 sessions). • Treatment: Students read randomly selected passages 3 times, using the same procedures used in baseline. After 3 readings, students answered written multiple choice comprehension questions. (At least 3 sessions). Length and duration: Not specified.	Words read correctly per minute Errors per minute % comprehension questions answered correctly	• Statistically significant increases in fluency across all four students. • Students did not demonstrate statistically significant improvements in errors per minute. • Statistically significant difference in comprehension only for one student.

(Table continues)

(Table 1 continued)

Author/participant age/design	Treatment description/sample size/treatment duration	Dependent measures	Results/effect sizes (*d*)
Swain & Allinder, 1996 7 years 8 months–8 years 1 month Multiple baseline across individuals	*N* = 3 Baseline: No additional instructional activities. Repeated Reading (RR): Read passage four times over 4 days to the teacher, instructional assistant, parent, and younger student. Length and duration: Session length not specified; treatment lasted 24, 12, and 6 days for Students 1–3, respectively.	Oral reading fluency Curriculum-based maze measure	• Intervention improved oral reading fluency for 2 of 3 students. • Maze performance decreased for 2 of 3 students during intervention phase.

[a]Several other interventions were conducted in this study, but they were not focused on fluency development. [b]Negative *d* reflects positive outcome favoring treatment listed first. [c]Additional measures were reported in this study that were not directly related to reading fluency.

pared silent repeated reading without a model to a no-treatment baseline and to a teacher-modeled repeated reading condition. Whereas the modeled condition led to higher reading rates than repeated reading alone, both repeated reading conditions again led to higher reading rates than the baseline condition.

In a multiple baseline study across four participants, Stout (1997) reported significant increases in reading fluency from baseline to treatment for all four students with LD. However, the differences in reading accuracy and written comprehension were not significant.

Swain and Allinder (1996) studied the effectiveness of a repeated reading intervention that provided students the opportunity to read and reread text to multiple people, including the teacher, an instructional assistant, a parent, and a younger student. The intervention was relatively brief—24, 12, and 6 days, respectively, for three students. Still, two of the three students demonstrated improved oral reading fluency. However, only one student demonstrated improvement on a reading maze measure. In general, the findings for repeated reading of text without a model revealed that repeated reading was associated with improved outcomes in accuracy and fluency.

Repeated Reading With a Model. Several types of studies can be distinguished based on the method used for modeling. All studies using repeated reading with a model are listed in Table 2.

Modeling by an adult. Fourteen samples (one group [*N* = 10] and 13 single cases) were studied to address the issue of repeated reading with an adult model. Monda (1989) compared student repeated reading of text to a listening preview condition in which the teacher read the passage to the student twice before the student reread the passage alone. Although there were no statistically significant differences between groups, the effect sizes for reading accuracy (errors per minute) were moderate (d = .46 to d = .57), favoring oral repeated reading without a model. In contrast, the effect size for accuracy on a transfer measure compared to silent repeated reading was moderate, favoring the listening preview or adult model (d = .46). On a measure of comprehension, students in the listening preview condition outperformed students in the oral repeated reading condition, although effect sizes were small (d = .25 on cued recall, and d = .34 on free recall).

In a multiple baseline design, Smith (1979) presented students with a passage of text read by the teacher at 100 words per minute. At the end of the reading by the teacher, the student continued reading from where the teacher stopped. For the two students with LD included in the sample, reading fluency increased during and after the modeling phase from approximately 6 to 14 correct words per minute. This increase in fluency over the baseline was maintained during a follow-up phase. Smith (1979) replicated this study with a student with much lower reading fluency at baseline than the students in her first study and found similar results.

Rose and Beattie (1986) compared three interventions for improving fluency—a teacher-modeled condition, a baseline condition that included oral reading and skill instruction, and a taped previewing condition. For three of the four participating students in this alternating treatment design, the teacher model resulted in higher oral reading fluency than either the baseline or the taped previewing condition. However, reading accuracy was not affected by the various previewing procedures. In a similar study, Rose (1984) found that a listening preview (teacher model) promoted faster reading rates than either a no-preview baseline condition or a repeated reading alone condition.

Modeling by a more proficient peer. The findings from three samples (*N* = 89) addressed using a more proficient peer for modeling fluent reading. Mathes and Fuchs (1993) compared the use of repeated reading with a partner, sustained reading of text with a partner, and a comparison condition. The sample in the sustained reading condition performed significantly better on flu-

TABLE 2
Studies Examining Repeated Reading with a Model

Author/participant age/design	Treatment description/sample size/treatment duration	Dependent measures	Results/effect sizes (*d*)
Daly & Martens, 1994 *8 years 10 months–* 11 years 11 months Multi-element design	*N* = 4 • *All conditions followed a model, drill,* and train to criterion lesson structure. • Subject Passage Preview (SP): Read passage silently and reread for assessment. • Listening Passage Preview (LP): Listened to audiotaped (130 wpm) passage, read list of unknown words and reread passage for assessment. • Taped Words (TW): Read aloud along with audiotaped word list (80 wpm). Reread list and read passage for assessment. *Length and duration: Session length not* specified. Treatments lasted 21 days.	Passage reading accuracy Passage reading fluency Word reading accuracy Word reading fluency	• LP > SP > TW on accuracy and fluency of passage reading. • TW condition outperformed SP and LP on measures of word reading accuracy and fluency.
Gilbert, Williams, & McLaughlin, 1986 7 years 1 month–7 years 4 months Multiple baseline design across participants	*N* = 3 • Baseline (45-minute session; duration: 1 day): Teacher introduction to vocabulary and phonics; students practiced passage silently before reading aloud for 4 min. No feedback provided. • Intervention (session length not provided; duration: 4 days): Students listened once and read along 3 times with a tape-recorded reading before reading for 4 minutes.	Oral reading fluency Oral reading accuracy	• Intervention led to increased fluency and increased accuracy for all 3 students.
Mathes & Fuchs, 1993 *4th–6th grade, no age* information reported Multiple group comparison	All three conditions were divided randomly *into groups reading instructional* and independent texts. • Sustained Reading (SR; *n* = 23): Partner reading from same text for 9 min. • Repeated Reading (RR; *n* = 22): Partner reading of same text 3 times (repeated once by partner) • Control (C; *n* = 22): Traditional reading instruction. Duration: 1,350 minutes	Average number of words read *orally in 3 min.* Average number of correct responses to 10 comprehension questions Number of maze items correct[a]	SR > C; SR vs. C: *d* = .17; *RR vs. C:* *d* = .10; SR vs. RR: *d* = .07 SR vs. C: *d* = .04; RR vs. C: *d* = .01; SR vs. RR: *d* = .04 SR vs. C: *d* = .15; RR vs. C: *d* = –.24; SR vs. RR: *d* = .38
Moseley, 1993 11 years *Individual case study*	*N* = 1 Intervention (one 30-min. session weekly; *Duration: 300 minutes):* 1. Passage (one year above instructional level) read to student by a speech synthesizer. 2. Passage presented to student visually in phrases and in speech. 3. Passage read by student either in phrases or learner-paced sentence by sentence. 4. Student read and reread passages until criterion of 120 wpm with 2 or fewer errors was met.	*Schonell Word Recognition Test* Reading accuracy *Reading rate*	• Student improved in word recognition, reading accuracy from pretest to follow-up. • *Student's reading* rate decreased from pretest to posttest but increased considerably at follow-up.

(Table continues)

(Table 2 continued)

Author/participant age/design	Treatment description/sample size/treatment duration	Dependent measures	Results/effect sizes (*d*)
Rose, 1984 9.5–13.1 years Alternating treatment design	*N* = 6 • Baseline: Oral reading only, no previewing. • Silent previewing: Student read passage silently before reading it aloud to the teacher. • Listening previewing: Teacher read passage aloud while student followed along. Then student read passage aloud to teacher. Length and duration: Approximately 25 days of intervention. Length of daily intervention not specified.	Words read correctly per minute	• Listening previewing led to faster reading rates. • Both silent and listening previewing appeared to be more beneficial than baseline.
Rose & Beattie, 1986 8.7–11.6 years Alternating treatment design	*N* = 4 • Baseline: Daily individual oral reading, introduction to new words, practice of new words via flash cards, sentence construction using new words, and worksheet practice. • Listening previewing: Teacher reads assigned passage orally at relatively slow conversational rate (approximately 130–160 wpm) as students follow along. All other instructional procedures same as baseline. • Taped previewing: Identical to listening, except teacher had prerecorded the taped passage and students followed along with the tape. Length and duration: 3–4-min. sessions daily. Approximately 30 days of intervention alternating between 3 conditions.	Oral reading fluency Reading accuracy	• Listening and taped previewing resulted in increased oral reading rates relative to baseline. • Listening previewing procedure was more beneficial than taped previewing for 3 of 4 participants. • Error rates were not effected by the previewing procedures.
Smith, 1979 (Study 1); 8 years Multiple baseline, multi-element design	*N* = 2 • Baseline: Children read a passage at instructional level without support. • Modeling: Teacher read child's passage for 1 minute at 100 wpm. Child continued reading from where teacher stopped. • Follow-up: Students read passage additional time. Length and duration: Not specified, all conditions administered once.	Words read correctly per minute Errors per minute	• Intervention resulted in increased speed and accuracy for both students.
Smith, 1979 (Study 2) 12 years Multi-element single-subject design	*N* = 1 • Baseline: Child read a passage at instructional level without support. • Modeling: Teacher read passage for 1 minute at 100 wpm. Child continued reading from where teacher stopped. • Modeling with correction: Same as modeling, plus corrections provided during student reading.	Words read correctly per minute Errors per minute	• Speed and accuracy increased with each additional intervention component. • Maximum speed and accuracy achieved under the modeling with correction and previewing condition.

(Table continues)

(Table 2 continued)

Author/participant age/design	Treatment description/sample size/treatment duration	Dependent measures	Results/effect sizes (*d*)
Smith *(continued)*	• Modeling with correction and previewing: After modeling, student reread the modeled portion and continued to read for 5 minutes. • Follow-up: Student read passage additional time. Length and duration: Not specified, all conditions administered once.		
Vaughn et al., 2000 8.5–8.8 years Quasi-experimental pretest–posttest comparison design	Partner Reading (PR; $n = 7$): Partners took turns reading (3 minutes each) with the more proficient reader reading first. 1-minute, timed reading followed. Collaborative Strategic Reading (CSR; $n = 9$): Partners used four-strategy approach to reading text Length and duration: 2–3 sessions weekly for 12 weeks; approximately 25 miuntes per session for PR and 45 minutes per session for CSR.	*Gray Oral Reading Test*, rate[b] *Gray Oral Reading Test*, accuracy[b] *Gray Oral Reading Test*, comprehension[b] *Test of Reading Fluency*, words correct per minute[b]	PR vs. CSR: $d = .69$ PR vs. CSR: $d = .65$ PR vs. CSR: $d = .30$ PR vs. CSR: $d = .16$

[a]Negative *d* reflects positive outcome favoring treatment listed first. [b]Statistical comparisons were not possible because of the small sample size in each group.

ency than the control sample ($d = .17$), but there were no significant differences between the repeated reading condition and the control condition on measures of fluency ($d = .10$) or comprehension ($d = .01$). Moreover, on a maze task, effect sizes were small but significant when the repeated reading with partners condition was compared with the control condition ($d = .24$) and slightly higher, though still moderate, when the sustained reading condition was compared with the control condition ($d = .38$).

Modeling by audiotape or computer. Results from four samples ($N = 12$) addressed the question of whether an audiotaped or computer model or preview of the text to be read by the students in the sample improved the reading fluency of students with LD. Of the four samples, one used a case study design (Moseley, 1993) and three used a single-subject design (Daly & Martens, 1994; Gilbert, Williams, & McLaughlin, 1986; Rose & Beattie, 1986). In the case study sample, the model was provided through a speech synthesizer, with the pace controlled by the student. In this case, the student's reading fluency decreased from 76 words correct per minute at pretest to 63 words correct per minute during the intervention. However, at the follow-up test of fluency, the student read at 112 words correct per minute, suggesting that the overall impact of the intervention may have been positive. In one of the single-subject designs, Rose and Beattie (1986) compared listening previewing, in which the teacher modeled reading of the text, with a taped preview, in which the student controlled the tape and followed along reading with the tape. For three of the four students, the teacher-modeled reading of the text was more effective than the taped model.

Daly and Martens (1994) compared a taped model of passage reading with repeated reading without a model and with audiotaped reading of a related word list. On measures of passage reading accuracy and fluency, the taped reading model resulted in consistently better performance than repeated reading without a model and taped words. The taped words condition resulted in better performance on a measure of word reading accuracy for three of the four participants in the study.

Gilbert et al. (1986) compared a taped model of fluent reading followed by three repeated readings to a baseline condition in which the teacher introduced vocabulary and important phonics elements and the student silently read the passage once. Fluency and accuracy improved for all three students in both conditions.

Repeated Reading Interventions with Multiple Features. Three group samples and four single-case samples ($N = 52$) involved interventions that included repeated reading as one of several instructional features. The mean effect size across interventions on measures of fluency was $d = .71$ and ranged from $d = .20$ to $d = 1.17$. These studies are listed in Table 3.

Simmons, Fuchs, Fuchs, Mathes, and Hodge (1995) compared an intervention that combined an effective teaching component and peer-mediated repeated reading to traditional reading instruction. On a measure of oral reading fluency, the students who received the combination of effective teaching

TABLE 3
Studies Examining Repeated Reading with Multiple Features

Author/participant age/design	Treatment description/sample size/treatment duration	Dependent measures	Results/effect sizes (*d*)
Simmons, Fuchs, Fuchs, Mathes, & Hodge, 1995 9.47–9.91 years Treatment–Comparison	• Effective teaching plus peer tutoring (ET+PT; $n = 11$): Effective instructional principles and peer tutoring using repeated reading (3 readings/passage for first 4 weeks, 2 readings/passage for second 4 weeks), story retells, and paragraph summarization. • Comparison (C; $n = 29$): Traditional reading instruction. Duration: 800 minutes	No. of words read in 3 min. No. of words read in 3 min. (delayed) No. comprehension questions correct No. comprehension questions correct (delayed) No. maze items correct in 2 min. Matched words in recall summaries Total words in recall summaries SAT Comprehension	ET + PT > C; ET + PT vs. C: $d = .73$ No significant differences between groups; ET + PT vs. C: $d = .53$ ET + PT > C; ET + PT vs. C: $d = .82$ No significant differences between groups; ET + PT vs. C: $d = .36$ ET + PT > C; ET + PT vs. C: $d = 1.00$ No significant differences between groups; ET + PT vs. C: $d = 1.05$ No significant differences between groups; ET + PT vs. C: $d = .78$ No significant differences between groups; ET + PT vs. C: $d = .56$; Mean effect size (ET + PT vs. C): $d = .73$
D. Fuchs, Fuchs, Mathes, & Simmons, 1996 Mean age = 9.87 years (PALs group); 10.09 years (No PALs group) Treatment–Comparison	• Peer Assisted Learning (PALs; $n = 20$): Partner reading with retell (one repeated reading), paragraph summary, and prediction relay. • No PALs ($n = 20$): Traditional reading instruction. Duration: 1,350 minutes	Average number of words read orally in 3 min. Average number of correct responses to 10 comprehension questions Number of maze items correct	PALs vs. No PALs: $d = .20$ PALs vs. No PALs: $d = .63$ PALs vs. No PALs: $d = .49$ Mean effect size (PALs v. No PALs): $d = .44$
Sutton, 1991 Ages not provided Pre–Posttest design	$N = 17$ Four-element condition: 1. Teacher modeled reading of story. 2. Target students read to tutor partners. 3. Partner reading. 4. Target student read story to teacher.	*Brigance Test of Oral Reading* (words per minute) *Brigance Test of Oral Reading* (errors per minute)[a]	Posttest vs. Pretest: $d = 1.17$ Posttest vs. Pretest: $d = .91$; Mean effect size (Posttest vs. Pretest): $d = 1.04$
Weinstein & Cooke, 1992 8 years 1 month–10 years 2 months Multi-treatment, single-subject design (ABACA)	$N = 4$ Baseline: Each student read first set of 3 passages for first baseline phase and the intervention conditions. Same procedure was used for the second set of passages. Third set of 3 passages was used for final baseline. Intervention (10 min./day): 1. Students listened to taped model at 100 wpm. 2. Students asked to read passage quickly and accurately.	Oral reading fluency	• All students made progress over baseline; mean gains ranging from 16.1 to 39.4 words correct per minute. • Mean gain for the fixed-rate phase = 62% • Mean gain for the improvement phase = 58%

(Table continues)

(Table 3 continued)

Author/participant age/design	Treatment description/sample size/treatment duration	Dependent measures	Results/effect sizes (*d*)
Weinstein *(continued)*	3. For fixed criterion phase, each student reread the passage twice daily until he or she met the specified criterion of 90 wcpm. 4. For improvement phase, students reread a passage until they achieved 3 successive improvements. 5. Results were plotted and shared with student immediately.		• Generalization improved after improvement phase from 5% to 89% but was mixed for fixed-rate phase, ranging from –25% to 56%.

[a]These effect sizes were changed to positive numbers to reflect a growth in student accuracy rather than a decrease in errors.

and repeated reading performed significantly better than the comparison sample. Similar significant differences were found for a measure of comprehension and for a maze measure. Although no other significant differences were noted, the mean effect size for the combination intervention versus the control sample was moderate to large at d = 73. D. Fuchs et al. (1997) compared a partner reading intervention that included repeated readings of text and comprehension activities (paragraph summarization and prediction activities) to a traditional reading program, yielding a low to moderate mean effect size of d = .44.

A four-element intervention implemented by Sutton (1991), which included a combination of teacher-modeled reading, target students' rereading to a tutor, peer-paired reading, and target students' rereading to the teacher, resulted in a considerable increase in reading rate and a decrease in reading errors, with a large mean effect size of d = 1.04. Weinstein and Cooke (1992) used a similar intervention in a single-subject design in which students listened to a taped model before rereading the passage to a particular criterion and then examining their progress as it was plotted on a graph. The four participating students all experienced increased fluency as a result of this intervention.

Other Elements That Influence Fluency Performance in Repeated Reading Interventions. Various other elements of interventions may affect reading fluency. Studies that addressed these elements are listed in Table 4.

Amount of text. A. L. Cohen (1988) compared the amount of text presented to students as they repeatedly read passages from a computer screen. One sample (N = 16) was presented a passage at a rate of three to five words at a time, whereas a second sample (N = 16) had control over the amount of text that was presented. Both samples were compared to a control sample. No significant differences were noted between the repeated reading samples. The sample that received only three to five words per screen scored significantly higher on measures of single- and multisyllabic word reading accuracy. Both repeated reading samples demonstrated improved fluency over the control condition, with a large mean effect size of d = 1.98. Effect size comparisons of the two repeated reading groups were small, with the exception of reading accuracy (ranging from d = .56 to d = .89), favoring the controlled presentation of three to five words per screen.

Text difficulty. Three samples (N = 37) were studied to better understand the influence of text difficulty in repeated reading interventions. Sindelar, Monda, and O'Shea (1990) compared repeated reading of instructional-level texts (defined as text that could be read at 50–100 words per minute with two or fewer errors) to repeated reading of mastery-level texts (defined as text that could be read at more than 100 words per minute). Statistically significant differences on a measure of oral reading fluency favored the mastery-level text sample (d = 1.57). However, the instructional-level sample significantly outperformed the mastery-level sample on accuracy (d = .61). No significant differences were identified on the measure of comprehension.

In a related study, Rashotte and Torgesen (1985) compared repeated reading of text that included a high proportion of overlapping words with repeated reading of text in which there was a low degree of overlap. There were no significant differences between groups. However, the condition in which there were few overlapping words performed better than the condition with a high degree of overlap on all measures.

Number of repetitions. To determine the number of times that students should repeatedly read text for the most fluency benefit, the findings from two samples (N = 54) are relevant. O'Shea et al. (1987) used a factorial design to study the relative influence of the number of repetitions on fluency. They used three intervention levels: a single reading, three repeated readings, and seven repeated readings. On a measure of oral reading fluency, main effects were identified with significant differences between all groups. Seven readings resulted in higher performance than three readings, which was significantly better than a single reading. On a measure of story retelling, there were no differences between

TABLE 4
Studies That Examined Other Elements of Repeated Reading Interventions

Author/participant age/design	Treatment description/sample size/treatment duration	Dependent measures	Results/effect sizes (*d*)
A. L. Cohen, 1988 8 years 7 months–13 years 2 months Multiple-group comparison	• Processing Power (PP; $n = 16$): Repeated reading (4 times) with text presented 3–5 words at a time. • Repetitive Reading (RR; $n = 16$): Repeated reading (4 times) with student control of text amount. • No-treatment comparison (C; $n = 15$). Duration: 195–202 minutes	Paragraph reading speed (practiced)	RR vs. PP: $d = .19$
		Paragraph reading accuracy (practiced)	PP vs. RR: $d = .56$
		Paragraph reading speed (unpracticed)	PP vs. RR: $d = .26$
		Paragraph reading accuracy (unpracticed)	PP vs. RR: $d = .19$
		Reading fluency, final text	PP vs. RR: $d = .30$; PP vs. C: $d = 1.58$; RR vs. C: $d = 1.25$
		Reading accuracy, final text	PP vs. RR: $d = .89$; PP vs. C: $d = 3.02$; RR vs. C: $d = 2.09$
		Word reading speed (single syllable, practiced)	PP > C; insufficient information for d
		Word reading speed (multisyllable, practiced)	PP > C; insufficient information for d
		Word reading speed (unpracticed)	No significant differences between groups; insufficient information for d
		Passage comprehension	No significant differences between groups; insufficient information for d; Mean effect size for repeated reading interventions: $d = 1.98$
Lovitt, T. W., & Hansen, C. L., 1976 8–12 years One-group pretest–posttest	• Baseline (B) ($N = 7$): Students read aloud to the teacher. Teacher supplies missed or mispronounced words. Teacher records responses and students respond to written comprehension questions after reading. • Treatment (T): Students reread or skip levelled passages contingent on their correct word rate and comprehension scores. Drill was provided on portions of reading that were problematic. Duration: 800 minutes	Correct word rate (cwpm)	All students improved in correct rate. Mean gain of 9.3 cwpm. Increases ranged from 2.4 cwpm to 15.3 cwpm.
		Orral error rate (epm)	Four of the seven participants decreased their error rates. The mean error rate improved from 31 epm to 2.9 epm. Decreases ranged from .5 to −.9 epm.
		Percentage of comprehension questions correct	All students improved in their comprehension responses, with a mean increase of 11.9% and a range of 5.7% to 16.1%.
Sindelar, Monda, & O'Shea, 1990 Age not reported Treatment–Comparison	• Repeated reading–Instructional level (I; $n = 17$): Reread text 3 times at 50–100 wpm. • Repeated reading–Mastery level (M; $n = 8$): Reread text 3 times at 100 wpm or faster.	Oral reading fluency	M > I; M vs. I (1 reading): $d = 2.31$; M vs. I (3 readings): $d = 1.57$

(Table continues)

(Table 4 continued)

Author/participant age/design	Treatment description/sample size/treatment duration	Dependent measures	Results/effect sizes (*d*)
Sindelar *(continued)*	Duration: Each condition administered *once.*	Errors per minute[a]	I > M; M vs. I (1 reading): *d* = .88; M vs. I (3 readings): *d* = .61
		Number of propositions retold	No significant differences between groups; M vs. I (1 reading): *d* = .78; M vs. I (3 readings): *d* = .34
Rashotte & Torgesen, 1985 (based on dissertation by Rashotte, 1984) 8.6–12 years Multiple treatment design	*N* = 12 • Repeated reading, no overlapping words (NO): Read stories 4 times with about 20 words in common across *stories.* • Repeated reading with high overlap (HO): Same as NO but with about 60 words in common. • Sustained Reading (SR): Read 4 different stories each day. Duration: 7 days	Reading rate (slope of progress)	Both interventions with repeated reading performed significantly better than *sustained reading on* reading rate. NO vs. HO: *d* = .18; NO vs. SR: *d* = .65; HO vs. SR: *d* = .35; HO slope, SR slope > 0
		Reading accuracy (slope of progress)[a]	*NO vs. HO: d = .26;* NO vs. SR: *d* = .52; HO vs. SR: *d* = .24; HO slope, SR slope > 0
		Passage comprehension (slope of progress)	No significant differences between *groups; NO vs. HO:* *d* = .10; NO vs. SR: *d* = .08; HO vs. SR: *d* = .17; Mean effect size, repeated reading vs. sustained reading: *d* = .34
O'Shea, Sindelar, & O'Shea, 1987 11.3–13.6 years 2 (Focus) × 3 (No. of readings) factorial design	*N* = 29 • Repeated Reading 7 (R7): Read text 7 times. • Repeated Reading 3 (R3): Read text 3 times. • *Reading (R): Read text once.* Duration: Each treatment administered once.	Oral reading fluency	R7 > R3 > R Insufficient information to calculate *ES.*
		Story retell	R7, R3 > R Insufficient information to calculate *ES.*
Sindelar, Monda, & O'Shea, 1990 Age not reported 2 *(Reading level)* × 2 *(No.* of readings) factorial design	*N* = 25 • Reading text once (R1). • Repeated reading (R3): Reread text 3 *times.* Duration: Each condition administered once.	Oral reading fluency	R3 > R1, R3 vs. R1: *d* = 2.70
		Oral reading accuracy	R1 > R3, R3 vs. R1: *d* = −.62
		Number of propositions retold	R3 > R1, R3 vs. R1: *d* = 1.67; Mean effect size (R3 vs. R1): *d* = 1.25
Smith, 1979 (Study 2) 12 years	*N* = 1 • *Baseline: Child read a passage at in*structional level without support.	Words read correctly per minute *Errors per minute*	• Fluency and accuracy increased with

(Table continues)

(Table 4 continued)

Author/participant age/design	Treatment description/sample size/treatment duration	Dependent measures	Results/effect sizes (*d*)
Smith *(continued)* Multi-element single-subject design.	• Modeling: Teacher read passage for 1 minute at 100 wpm. Child continued reading from where teacher stopped. • Modeling with correction: Same as modeling, plus corrections provided during student reading. • Modeling with correction and previewing: After modeling, student reread the modeled portion and continued to read for 5 minutes. • Follow-up: Student read passage additional time. Length and duration: Not specified, all conditions administered once.		each additional intervention component. • Maximum fluency and accuracy achieved under the modeling with correction and previewing condition.
Weinstein & Cooke, 1992 8 years 1 month–10 years 2 months Multi-treatment, single-subject design (ABACA)	*N* = 4 Baseline: Each student read first set of 3 passages for first baseline phase. The same passages were used in the intervention conditions. Same procedure was used for the second set of passages. Third set of 3 passages were used for final baseline. Intervention (10 min./day): 1. Students listened to taped model at 100 wpm. 2. Students asked to read passage quickly and accurately. 3. For fixed criterion phase, each student reread the passage twice daily until he or she met the specified criterion of 90 wcpm. 4. For improvement phase, students reread a passage until they achieved 3 successive improvements. 5. Results were plotted and shared with student immediately.	Oral reading fluency	• All students made progress over baseline; mean gains ranging from 16.1 to 39.4 words correct per minute. • Mean gain for the fixed-rate phase = 62% • Mean gain for the improvement phase = 58% • Generalization improved after improvement phase from 5% to 89% but was mixed for fixed-rate phase, ranging from –25% to 56%.

[a]Negative *d* reflects positive outcome favoring treatment listed first.

the repeated reading conditions, but both repeated reading conditions resulted in significantly higher scores than the single reading condition.

Similarly, Sindelar et al. (1990) found that rereading text three times resulted in significantly better performance on a measure of oral reading fluency than reading the text once. Similar differences were noted on a comprehension measure.

Types of feedback. Findings from one single-subject sample relate to the influence of feedback during repeated reading. Smith (1979) found that following teacher modeling of fluent reading, providing the correct words when the student read words incorrectly during oral reading resulted in an increase of more than 20 words correct per minute over baseline, and errors decreased from 13.6 to 9.4 errors per minute.

Criteria for repeated reading. Eleven single-subject samples studied the influence of establishing particular criteria for repeated-reading interventions. Using an alternative treatment design, Weinstein and Cooke (1992) compared repeated reading using a criterion of 90 words per minute (fixed rate) with a criterion based on individual improvement as a basis for increasing the difficulty of the text. They found the fixed-rate criterion more effective than the individual improvement criterion, although the individual improvement seemed to facilitate generalization to unpracticed text.

Similar to the fixed criterion condition studied by Weinstein and Cooke (1992), Lovitt and Hansen (1976) designed an intervention that required students to meet a particular set of criteria (> 75 words read correctly per minute, < 4.5 errors per minute, and 87% comprehension questions correct) in order to skip a difficulty level of text.

If the three criteria were not met in 7 days, the reader received drill and practice on the difficult words and phrases in the text. The researchers reported that all participating students improved in reading fluency during the performance-based advancement condition by 10 words correct per minute and answered almost 12% more comprehension questions accurately. These results were maintained at follow-up.

Word Practice Interventions

Nine single-subject samples were studied to examine the effectiveness of decoding interventions on improving reading fluency (see Table 5). O'Shea, Munson, and O'Shea (1984) applied an alternating treatment design to compare the relative effectiveness of a word drill procedure and a phrase drill procedure. Each procedure was based on words missed during an initial oral reading baseline phase. Words missed after oral reading were placed on flash cards, and students were given the opportunity to practice on half of the words in isolation (word drill). Alternatively, in the phrase drill condition, the error words were practiced in contextual phrases. There were negligible differences between alternating treatment conditions for isolated word reading and reading fluency. Significant differences between conditions were demonstrated only on a measure of passage reading accuracy, favoring the phrase drill condition.

Employing a multi-element design, Daly and Martens (1994) compared taped previewing of words read in a list to participating students to repeated reading conditions. Students demonstrated greater word reading accuracy in this taped words condition than in the baseline or repeated reading conditions. However, on measures of passage reading fluency and accuracy, the repeated reading condition was consistently more effective.

Discussion

Fluency has been identified as an essential link between word analysis and comprehension of text and is considered a necessary tool for learning from

TABLE 5
Studies Examining Fluency Practice at the Word Level

Author/participant age/design	Number of students/ treatment description/ length and duration	Dependent measures	Results
Daly & Martens, 1994 8 years 10 months–11 years 11 months Multi-element design	*N* = 4 * All conditions followed a model, drill, and train to criterion lesson structure. * Subject Passage Preview (SP): Read passage silently and reread for assessment. * Listening Passage Preview (LP): Listened to audiotaped (130 wpm) passage, read list of unknown words, and reread passage for assessment. * Taped Words (TW): Read aloud along with audiotaped word list (80 wpm). Reread list and read passage for assessment. Length and duration: Session length not specified. Treatments lasted 21 days.	Passage reading accuracy Passage reading fluency Word reading accuracy Word reading fluency	* LP > SP > TW on accuracy and fluency of passage reading. * TW condition outperformed SP and LP on measures of word reading accuracy and fluency.
O'Shea, Munson, & O'Shea, 1984 7–11 years Alternating treatment design	*N* = 5 * Baseline (Word supply): When an error was made during oral reading, the teacher supplied the word. * Word drill: Words were supplied by teacher during oral reading. After reading, students were drilled on half of error words using 5" × 8" flash cards. * Phrase drill: Same procedure as control. After reading, words were drilled using phrases in which they occurred in text. Length and duration: 30 min. sessions/ day for 10 days; 300 min.	Error words read correctly in isolation Error words read correctly in passage context Words read correctly per minute in daily reading passage	No significant differences between drill conditions and control. Significant effects favoring phrase drill. Negligible differences between conditions.

reading (Chall, 1983). The relationship of fluent oral reading and overall reading ability is supported by both empirical and clinical evidence (Meyer & Felton, 1999; Rasinski, Padak, Linek, & Sturtevant, 1994; Reutzel & Hollingsworth, 1993). Despite the importance of fluency, its essential role in building overall reading ability has only recently been highlighted (NRP, 2000).

Fluency appears to be particularly important for students with significant reading problems, because they often have labored reading with many pauses, which results in slow and disconnected oral reading. This effortful reading is problematic because it focuses reading at the decoding and word level, which makes comprehension virtually impossible. Chall (1979) described these readers as "glued to print" (p. 41) and unable to delight in the reading of text. The students with LD who were the target group for this synthesis represent a large subgroup of dysfluent readers.

The National Reading Panel (2000) summarized findings about guided repeated oral reading as a means to improve fluency and indicated that the overall weighted effect size produced a moderate effect for repeated oral reading. The NRP presented the case that instruction in guided oral reading is an important part of a reading program and is associated with gains in fluency and comprehension. Oral reading interventions were found to be superior to instruction encouraging students to read silently. Furthermore, the NRP reported that good and poor readers both benefited from the repeated guided reading, although they may benefit differentially from different aspects of the treatment (Faulkner & Levy, 1999). However, the NRP reading fluency synthesis did not address the extent to which individuals with LD might benefit from fluency interventions or the extent to which other types of fluency interventions (other than oral repeated reading) might be associated with improvements in fluency and other aspects of reading.

The purpose of this study was to provide a synthesis of the research on fluency interventions conducted with students with LD. Our goal was to locate all intervention studies published and all dissertations conducted within the past 25 years that evaluated the effects of fluency training on elementary students with LD. The comprehensive search yielded 24 studies: 8 multiple group, 5 single group, and 11 case studies or single-subject design studies. Two of the single-group studies were part of factorial designs that also included other samples.

Before interpreting the findings of the present synthesis, it is important to note that effect sizes can be considered only within the context of the comparisons with which treatment groups were contrasted. Because effect sizes are largely dependent on the nature of the comparison groups, it is critical that a synthesis include detailed information regarding the comparisons. For this reason, Tables 1 through 5 include details of both treatment and comparison conditions. However, comparison groups differ considerably across samples, complicating the interpretation of the findings. The interpretations that follow were developed with this limitation in mind.

In general, the findings from this synthesis suggested that repeated reading interventions for students with LD are associated with improvements in reading rate, accuracy, and comprehension. This would provide support for the theory of automaticity proposed by LaBerge and Samuels (1974) and extended as a verbal efficiency model by Perfetti (1977, 1985). These studies, and the theory supporting them, provide evidence that the focus on developing students' rapid processing of print by reading target passages more than once is often effective as a means to improve accuracy and speed, and ultimately leads to better understanding of text.

One procedure for enhancing fluency is for teachers to model reading of text by reading aloud to students (Dowhower, 1987; Hoffman, 1987; Smith, 1979). Repeated reading with a model seems to be more effective than repeated reading with no model, particularly for students with low fluency (e.g., Rose & Beattie, 1986; Smith, 1979). Tape- or computer-modeled reading seems more effective than having no model but may not be as effective as teacher modeling (Daly & Martens, 1994; Rose & Beattie, 1986). Furthermore, having text read initially by a model promoted comprehension, perhaps because it allowed students to focus initially on the content of the passage before they read it themselves (Monda, 1989; Rose & Beattie, 1986).

Asking peers, who are often better readers, to serve as the model for students with LD was investigated in several studies reported here and reviewed in separate syntheses (Elbaum, Vaughn, Hughes, & Moody, 1999; Mathes & Fuchs, 1994). Repeated reading with a partner as a means to improving fluency has yielded somewhat equivocal results (e.g., Marston, Deno, Dongil, Diment, & Rogers, 1995), although there are few studies documenting its effectiveness alone (Marston et al., 1995; Mathes & Fuchs, 1994). In a separate analysis of the effects of peer tutoring on broad reading outcomes, cross-age tutoring was associated with higher mean weighted effect sizes (.50) than cooperative partners (.00), and with peer tutoring, the role of the student within the pair had a significant effect on outcomes, with reciprocal tutor–tutee roles demonstrating low mean weighted effect sizes (.09; Elbaum, Vaughn, Hughes, & Moody, 2000).

Speed and accuracy have traditionally been considered the hallmarks or most essential features of fluency (LaBerge & Samuels, 1974; Samuels, 1997). Most researchers agree that accuracy in itself is insufficient and that students need to read rapidly if they are going to understand the connections that need to be made between ideas in print (Nathan & Stanovich, 1991). Variables associated with effects

for fluency include controlling the difficulty of text and providing feedback for words missed. Advancing students through progressively more difficult text based on their performance seems to enhance their overall fluency (Lovitt & Hansen, 1976; Weinstein & Cooke, 1992), as does correction and feedback for words read incorrectly (Smith, 1979). Rereading text many times and to many different people and providing progressively more difficult text with feedback and correction for missed words may be the components essential to improving fluency.

Another approach to fluency building is to provide struggling readers with text chunked in words or phrases as a means of improving fluency and comprehension (Young & Bowers, 1995). The research in this review reveals that varying the amounts of text presented in repeated reading does not seem to change the outcome. However, controlling the amount of text presented may be beneficial for students who are experiencing difficulty with reading accuracy, as it may force them to focus on the words for a longer period of time (A. L. Cohen, 1988).

Several researchers have argued that fluency is enhanced when reading addresses the meaning of the text (Anderson, Wilkinson, & Mason, 1991). At least for struggling readers and students with dyslexia in the third grade, a fluency intervention (repeated reading) and a comprehension intervention (collaborative strategic reading) were both associated with gains in fluency and comprehension (Vaughn et al., 2000). In this synthesis we found that although comprehension was not typically the focus of the intervention, in many cases fluency growth was associated with growth in comprehension (e.g., Simmons et al., 1995; Sindelar et al., 1990). In the lone study where comprehension instruction was combined with repeated reading (D. Fuchs et al., 1997), the effect sizes for growth in comprehension were moderate and exceeded the effect sizes for fluency. Additional research focusing on the relationship between fluency and comprehension for students with LD is warranted.

Rereading text or repeated oral reading is perhaps the best documented approach to improving fluency (NPR, 2000; Rashotte & Torgesen, 1985) and has been associated with improved outcomes for young students (e.g., O'Shea et al., 1987) and for college students (Carver & Hoffman, 1981). Generally, intervention research on fluency development for students with LD has been dominated by research on repeated reading. This likely reflects the application of the theory that fluent reading is promoted by frequent opportunities to practice with familiar text and to increase exposure to words. It may also be influenced by the finding that repeated readings do improve fluency for students with LD. Furthermore, rereading the same text more times is better than fewer.

Future Research

Like most research syntheses, this study both answers questions and raises new ones. Questions that would be valuable to address in future research include,

1. What aspects of guided oral reading are associated with positive outcomes in fluency? To what extent do these aspects differ based on the reading level of the student? What about the decoding ability of the student?
2. When students are reading, at what level is repeated reading associated with the greatest gains in fluency? What about comprehension?
3. Most research questions have asked about the extent to which fluency intervention, particularly repeated reading, influences comprehension. What about the extent to which comprehension instruction influences outcomes in fluency? This question is prompted by the strong correlation between fluent reading and comprehension (Dowhower, 1987; Shinn, Good, Knutson, Tilly, & Collins, 1992).
4. How much text needs to be included in the repeated reading intervention to most effectively influence fluency? Does this vary by age and reading level of students? Should reading material be chunked and repeated at the phrase level, sentence level, or multiple sentence level? Some research has suggested that word-level reading (repeated), such as with flash cards, is associated with improved outcomes in comprehension (Tan & Nicholson, 1997).
5. Is there a small number of students for whom automaticity is not possible (e.g., due to neurological difficulties), in which case fluency building may be exceedingly difficult? What is the best way to build comprehension for these students?
6. Are the effects of fluency-building activities sustainable? Only one study in the present corpus (Simmons et al., 1995) included a follow-up measure of fluency. Although Simmons et al. (1995) reported no significant differences on this measure, further research should focus on this issue.

Implications for Practice

For many struggling readers, particularly students with LD, becoming a fluent reader is a challenge that must be overcome in order to progress from decoding to understanding what is read. Despite the integral role of fluency in reading development, fluency has not played a prominent role in reading instruction (Allington, 1983). Because of this apparent lack of attention to fluency development, recent syntheses of research on reading have highlighted the importance of including fluency building as part of daily instruction (Chard, Simmons, & Kameénui, 1998; NRP, 2000; Snow, Burns, & Griffin, 1998). The importance of becoming a fluent reader warrants careful atten-

tion to the evidence documenting which interventions are most effective at promoting reading fluency. To date, research on fluency interventions for students with LD has focused almost exclusively on repeated reading interventions. The results of the present synthesis have provided a more detailed look at which features of interventions make them more effective or less effective.

Generally, the findings of this synthesis suggest that students with LD who are experiencing difficulties with fluent reading would benefit from interventions that have multiple components focusing attention on increasing the rate and accuracy of reading. The findings of the present synthesis support earlier findings suggesting that opportunities to practice reading and rereading familiar text is one way for students with LD to enhance their reading fluency. Although silent reading has become a popular feature of reading instruction nationwide, there is little evidence to suggest that it is an effective way to build students' fluency. Equal attention should be paid to repeated reading of text for students who continue to struggle with reading fluency.

Another salient finding that has implications for classroom instruction is that students benefit from having a model of fluent reading. As repeated reading is implemented, it will be important for teachers to consider the best way to model fluency before students engage in repeated reading. Seemingly, the most effective way to do this is by having an adult provide that model. Realistically, however, resources are not always available for an adult to model fluent reading. In these cases, an audiotaped or computer-generated model is an effective substitute. Moreover, the findings of this synthesis support earlier findings (Elbaum et al., 1999) suggesting that using grouping practices that allow more proficient readers to guide less able readers is also an effective way to build fluency.

Several other intervention features should be considered as teachers develop instructional activities for fluency development. In instances where corrective feedback was combined with repeated reading, students were more successful at boosting their fluency, primarily by decreasing their reading errors. Moreover, fluency appears to develop more quickly if deliberate attention is given to setting criteria and adjusting the difficulty level of text as students progress.

Although more research is needed to better understand how reading fluency and comprehension are related, the results of this synthesis support the combination of instructional components that focus students' attention both on increasing their fluency and on improving their understanding of what they read. It is important to note that modeling of fluent reading also seems to boost students' comprehension, as they not only hear how a skilled reader reads but are able to understand the text rather than focusing all their attention on decoding. Moreover, repeated reading interventions that were combined with comprehension activities enhanced both fluency and comprehension. Thus, it would seem to confirm the importance of including both these elements in daily instruction.

The findings of the present review provide strong support for the implementation of fluency-building activities for students with learning disabilities. Given the narrowly defined population of students considered in this review, further research is needed to understand the extent to which repeated reading and other fluency-building activities can enhance academic outcomes for all readers.

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REFERENCES

Note. *Asterisks denote articles that were included in the synthesis.*

Allington, R. E. (1983). The reading instruction provided readers of differing ability. *Elementary School Journal, 83,* 548–559.

Anderson, R. C., Wilkinson, I. A. G., & Mason, J. A. (1991). A microanalysis of small-group, guided reading lessons: Effects of an emphasis on global story meaning. *Reading Research Quarterly, 26,* 417–441.

Arreaga-Mayer, C., Terry, B. J., & Greenwood, C. R. (1998). Classwide peer tutoring. In K. Topping & S. Ehly (Eds.), *Peer-assisted learning* (pp. 105–120). Mahwah, NJ: Erlbaum.

Campbell, D. T., & Stanley, J. C. (1966). *Experimental and quasi-experimental designs for research.* Chicago: Rand McNally.

Carver, R. P., & Hoffman, J. V. (1981). The effect of practice through repeated reading on gain in reading ability using a computer-based instructional system. *Reading Research Quarterly, 16,* 374–390.

Chall, J. S. (1979). The great debate: Ten years later, with a modest proposal for reading stages. In L. B. Resnick & P. A. Weaver (Eds.), *Theory and practice of early reading* (Vol. 1, pp. 29–55). Hillsdale, NJ: Erlbaum.

Chall, J. S. (1983). *Stages of reading development.* New York: McGraw-Hill.

Chard, D. J., Simmons, D. C., & Kameénui, E. J. (1998). Word recognition: Instructional and curricular basics and implications. In D. C. Simmons & E. J. Kameénui (Eds.), *What reading research tells us about children with diverse learning needs: The bases and the basics* (pp. 169–182). Hillsdale, NJ: Erlbaum.

*Cohen, A. L. (1988). *An evaluation of the effectiveness of two methods for providing computer-assisted repeated reading training to reading disabled students.* Unpublished doctoral dissertation, Florida State University, Tallahassee.

Cohen, J. (1988). *Statistical power analysis for the behavioral sciences* (2nd ed.). Hillsdale, NJ: Erlbaum.

*Daly, E. J., & Martens, B. K. (1994). A comparison of three interventions for increasing oral reading performance: Application of the instructional hierarchy. *Journal of Applied Behavior Analysis, 27,* 459–469.

Dowhower, S. L. (1987). Effects of repeated readings on selected second grade transitional readers' fluency and comprehension. *Reading Research Quarterly, 22,* 389–406.

Ehri, L. C., & Wilce, L. S. (1983). Development of word identification speed in skilled and less skilled beginning readers. *Journal of Educational Psychology, 75,* 3–18.

Elbaum, B., Vaughn, S., Hughes, M., & Moody, S. W. (1999). Grouping practices and reading outcomes for students with disabilities. *Exceptional Children, 65,* 399–415.

Elbaum, B. E., Vaughn, S., Hughes, M. T., & Moody, S. W. (2000). How effective are one-to-one tutoring programs in reading for elementary students at risk for reading failure? *Journal of Educational Psychology, 92,* 605–619.

Faulkner, H. J., & Levy, B. A. (1999). Fluent and nonfluent forms of transfer in reading: Words and their message. *Psychonomic Bulletin and Review, 6,* 111–116.

*Fuchs, D., Fuchs, L. S., Mathes, P. G., & Simmons, D. C. (1997). Peer-assisted learning strategies: Making classrooms more responsive to diversity. *American Educational Research Journal, 34,* 174–206.

Fuchs, L. S., Fuchs, D., Hosp, M. K., & Jenkins, J. R. (2001). Oral reading fluency as an indicator of reading competence: A theoretical, empirical, and historical analysis. *Scientific Studies of Reading, 5,* 239–256.

*Gilbert, L. M., Williams, R. L., & McLaughlin, T. F. (1986). Use of assisted reading to increase correct reading rates and decrease error rates of students with learning disabilities. *Journal of Applied Behavior Analysis, 29,* 255–257.

Hedges, L. V., & Olkin, I. (1985). *Statistical methods for meta-analysis.* Orlando, FL: Academic Press.

Hoffman, J. V. (1987). Rethinking the role of oral reading in basal instruction. *Elementary School Journal, 87,* 367–374.

Huey, E. B. (1908). *The psychology and pedagogy of reading.* Cambridge, MA: MIT Press.

Kameénui, E. J., & Simmons, D. C. (2001). Introduction to this special issue: The DNA of reading fluency. *Scientific Studies of Reading, 5,* 203–210.

Kuhn, M. R., & Stahl, S. A. (2000). *Fluency: A review of developmental and remedial practices* (Technical Report No. 2-008). Ann Arbor: University of Michigan, Center for the Improvement of Early Reading Achievement.

LaBerge, D., & Samuels, S. J. (1974). Toward a theory of automatic information processing in reading. *Cognitive Psychology, 6,* 293–323.

*Lovitt, T. W., & Hansen, C. L. (1976). The use of contingent skipping and drilling to improve oral reading and comprehension. *Journal of Learning Disabilities, 9,* 20–26.

*Marston, D., Deno, S. L., Dongil, K., Diment, K., & Rogers, D. (1995). Comparison of reading intervention approaches for students with mild disabilities. *Exceptional Children, 62,* 20–37.

*Mathes, P. G., & Fuchs, L. S. (1993). Peer-mediated reading instruction in special education resource rooms. *Learning Disabilities Research & Practice, 8,* 233–243.

Mathes, P. G., & Fuchs, L. S. (1994). The efficacy of peer tutoring in reading for students with mild disabilities: A best-evidence synthesis. *School Psychology Review, 23,* 59–80.

Meyer, M. S., & Felton, R. H. (1999). Repeated reading to enhance fluency: Old approaches and new direction. *Annals of Dyslexia, 49,* 283–306.

*Monda, L. E. (1989). *The effects of oral, silent, and listening repetitive reading on the fluency and comprehension of learning disabled students.* Unpublished doctoral dissertation, Florida State University, Tallahassee.

*Moseley, D. (1993). Visual and linguistic determinants of reading fluency in dyslexics: A classroom study with talking computers. In S. F. Wright & R. Groner (Eds.), *Facets of dyslexia and its remediation* (pp. 567–584). London: Elsevier.

Nathan, R. G., & Stanovich, K. E. (1991). The causes and consequences of differences in reading fluency. *Theory Into Practice, 30*(3), 176–184.

National Reading Panel. (2000). *Teaching children to read.* Washington, DC: National Institutes of Health.

*O'Shea, L. J., Munson, S. M., & O'Shea, D. J. (1984). Error correction in oral reading: Evaluating the effectiveness of three procedures. *Education and Treatment of Children, 7,* 203–214.

*O'Shea, L. J., Sindelar, P. T., & O'Shea, D. J. (1987). The effects of repeated readings and attentional cues on the reading fluency and comprehension of learning disabled readers. *Learning Disabilities Research, 2,* 103–109.

Perfetti, C. A. (1977). Language comprehension and fast decoding: Some psycholinguistic prerequisites for skilled reading comprehension. In J. T. Guthrie (Ed.), *Cognition, curriculum, and comprehension* (pp. 20–41). Newark, DE: International Reading Association.

Perfetti, C. A. (1985). *Reading ability.* New York: Oxford University Press.

Rashotte, C. A. (1984). *Reported reading and reading fluency in learning disabled children.* Unpublished doctoral dissertation, Florida State University.

*Rashotte, C. A., & Torgesen, J. K. (1985). Repeated reading and reading fluency in learning disabled children. *Reading Research Quarterly, 20,* 180–188.

Rasinski, T. V., Padak, N., Linek, W., & Sturtevant, E. (1994). Effects of fluency development on urban second-grade readers. *Journal of Educational Research, 87,* 158–165.

Reutzel, D. R., & Hollingsworth, P. M. (1993). Effects of fluency training on second graders' reading comprehension. *Journal of Educational Research, 86,* 325–331.

*Rose, T. L. (1984). The effects of two prepractice procedures on oral reading. *Journal of Learning Disabilities, 17,* 544–548.

*Rose, T. L., & Beattie, J. R. (1986). Relative effects of teacher-directed and taped previewing on oral reading. *Learning Disability Quarterly, 9,* 193–199.

Samuels, S. J. (1997). The method of repeated readings. *The Reading Teacher, 50,* 376–381.

Shinn, M. R., Good, R. H., Knutson, N., Tilly, W. D., & Collins, V. (1992). Curriculum-based measurement of oral reading fluency: A confirmatory analysis of its relation to reading. *School Psychology Review, 21,* 459–479.

*Simmons, D. C., Fuchs, L. S., Fuchs, D., Mathes, P., & Hodge, J. P. (1995). Effects of explicit teaching and peer tutoring on the reading achievement of learning-disabled and low-performing students in the classroom. *The Elementary School Journal, 95,* 387–408.

*Sindelar, P. T., Monda, L. E., & O'Shea, L. J. (1990). Effects of repeated readings on instructional- and mastery-level readers. *Journal of Educational Research, 83,* 220–226.

*Smith, D. D. (1979). The improvement of children's oral reading through the use of teacher modeling. *Journal of Learning Disabilities, 12,* 172–175.

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

*Stout, T. W. (1997). *An investigation of the effects of a repeated reading intervention on the fluency and comprehension of students with language-learning disabilities.* Unpublished doctoral dissertation, Georgia State University, Atlanta.

*Sutton, P. A. (1991). *Strategies to increase oral reading fluency of primary resource students.* Unpublished manuscript, Nova University.

*Swain, K. D., & Allinder, R. M. (1996). The effects of repeated reading on two types of CBM: Computer maze and oral reading with second-grade students with learning disabilities. *Diagnostique, 21,* 51–66.

Tan, A., & Nicholson, T. (1997). Flashcards revisited: Training poor readers to read words faster improves their comprehension of text. *Journal of Educational Psychology, 59,* 276–288.

Topping, K., & Ehly, S. (1998). *Peer-assisted learning.* Mahwah, NJ: Erlbaum.

*Vaughn, S., Chard, D. J., Bryant, D. P., Coleman, M., Tyler, B. J., Thompson, S., et al. (2000). Fluency and comprehension interventions for third-grade students. *Remedial and Special Education, 21,* 325–335.

*Weinstein, G., & Cooke, N. L. (1992). The effects of two repeated reading interventions on generalization of fluency. *Learning Disability Quarterly, 15,* 21–28.

Wolf, M., & Bowers, P. (1999). The "double-deficit hypothesis" for the developmental dyslexias. *Journal of Educational Psychology, 91*(3), 1–24.

Wolf, M., & Bowers, P. (2000). The question of naming-speed deficits in developmental reading disabilities: An introduction to the double-deficit hypothesis. *Journal of Learning Disabilities, 33,* 322–324.

Wolf, M., & Katzir-Cohen, T. (2001). Reading fluency and its intervention. *Scientific Studies of Reading, 5,* 211–238.

Young, A., & Bowers, P. G. (1995). Individual differences and text difficulty determinants of reading fluency and expressiveness. *Journal of Experimental Child Psychology, 60,* 428–454.