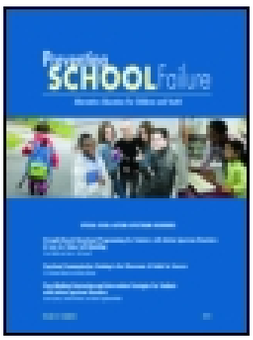

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A synthesis of interventions for improving oral reading fluency of elementary students with learning disabilities

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ABSTRACT

A synthesis of the research literature was conducted from 2004 to 2014 on interventions designed to build oral reading fluency for elementary students with learning disabilities (LD). An extensive search yielded a total of 12 intervention studies. Among the 12 studies, the majority ($n = 9$) implemented repeated reading with or without a model. Findings from this synthesis indicate that there may be no differential effects between repeated reading with or without a model for improving oral reading fluency of elementary students with LD. In addition, findings suggest that elementary students with LD may benefit from video modeling or word/phrase-based practices that provide opportunities to repeat misread words or phrases with words incorrectly read during the initial reading.

KEYWORDS

Elementary level; learning disabilities; oral reading fluency; reading intervention

The ability to read well has received national attention for many years, yet overall, only 35% of fourth-grade students perform at or above proficient on standardized reading tests (National Center for Education Statistics [NCES], 2015). When it comes to students with disabilities, the levels of reading performance of those students raise more concerns: while 30% of fourth graders without disabilities had below-basic reading skills, up to 68% of students with disabilities read below the basic level (NCES, 2015). Although long-term trends in the NCES results for 9-year-olds revealed that average reading performance has improved over the last two decades (Aud et al., 2013), there has been little reduction in the percentage of below-basic readers since 2007, particularly for students with disabilities (NCES, 2015). Moreover, several studies have indicated that more than 40% of fourth-grade students were rated as "nonfluent" readers who displayed an inability to read simple phrases and relate what they read to the main context of the passage (Daane, Campbell, Grigg, Goodman, & Oranje, 2005).

These findings are alarming considering that students with learning disabilities (LD) typically manifest problems in reading. About 80% of students with LD have difficulties learning to read at an early age or in primary school, which in turn impacts their reading to learn across later grades (Adams, 1990; Drummond, 2005). These difficulties are often exhibited in abilities with phonological awareness and word-level reading (e.g., decoding, word-recognition task; Chard, Vaughn, & Tyler, 2002; Kuhn & Schwanenflugel, 2008; Lovett, Steinbach, & Frijters, 2000), leading to limited accuracy and speed of text-level reading (Chard et al., 2002; Meyer & Felton, 1999). In particular, reading words in text effortlessly without errors, and with expression and phrasing, is critical because it strongly predicts reading comprehension in primary grades (Schatschneider, Fletcher, Francis, Carlson, & Foorman, 2004), implying the importance of fluent text reading at this age. The critical contribution of reading fluency to successful reading has also been supported by cumulative research evidence (e.g., National Reading Panel, 2000), and relevant research has established that students need to learn how to read quickly and accurately, which refers to reading fluency, in order to promote their reading comprehension (Allor & Chard, 2011).

Oral reading fluency is defined as reading grade-level text orally "with accuracy, appropriate rate, and expression on successive readings" (Common Core Standards Initiative, 2012). The importance of building oral reading fluency skill is grounded in the theory of automaticity (LaBerge & Samuels, 1974). Automaticity refers to the "ability to read the words in text not only accurately but also automatically or effortlessly" (Morrow, Wixson, & Shanahan, 2013, p. 69). The ability to identify words in print automatically or effortlessly is evident in skilled readers and an essential goal for struggling readers (Adams, 1990). If students with reading learning disabilities (RLD) must attend heavily to decoding, they will have insufficient cognitive attention available to construct meaning from text (Chard, Pikulski, & Templeton, 2000). Therefore, the ability to read fluently is critical as a bridge between decoding and comprehension (Rasinski, 2004), and, thus, has been emphasized as a focus of reading instruction (National Reading Panel [NRP] 2000) and research (Rasinski, Blachowicz, & Lems, 2006). Moreover, building oral reading fluency to promote reading with automaticity and meaningful expression is achieved by sufficient practice and effective reading instruction (Rasinski, Homan, & Biggs, 2009).

To date, two major instructional approaches for oral reading fluency have been suggested: guided repeated oral reading (orally and repeatedly reading passages with systematic and explicit feedback) and independent silent reading (reading

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passages silently on their own with minimal feedback) (NRP, 2000). Relatively more sufficient experimental evidence has been built to support the implementation of guided repeated reading practices than independent silent reading for students with LD.

Repeated reading, or guided repeated reading, involves "re-reading a short and meaningful passage until a satisfactory level of fluency is reached" (Samuels, 1979, p. 404). Repeated reading also refers to reading connected text more than once each session to improve oral reading fluency; thus, students should have multiple opportunities to read connected text or participate in repeated reading activities (Chard, Ketterlin-Geller, Baker, Doabler, & Apichatabutra, 2009). There are many different approaches for repeated reading such as timed repeated reading, repeated reading with a model, repeated reading without a model, assisted reading, choral reading, paired reading, reading with audiotapes, or reading with computer programs (Hudson, Lane, & Pullen, 2005). Of the interventions designed to improve oral reading fluency for students with RLD, repeated reading has been researched most often (Chard et al., 2002) and has been shown to improve oral reading fluency across the grade levels (Chard et al., 2002; Chard et al., 2009; Rasinski et al., 2006; Therrien, 2004).

Focuses and findings of previous synthesis studies

In recent years, six syntheses (Chard et al., 2002; Edmonds et al., 2009; NRP, 2000; Swanson, 2008; Wanzek, Wexler, Vaughn, & Ciullo, 2010; Wexler, Vaughn, Edmonds, & Reutebuch, 2008) have examined reading interventions for struggling readers. Only two of them focused on oral reading fluency (Chard et al., 2002; Wexler et al., 2008) and only one (Chard et al., 2002) analyzed oral reading fluency interventions for elementary students with LD. Syntheses of the findings on the effects of interventions on oral reading fluency are presented and include both elementary and secondary levels to provide a broad array of information across the grade levels. In addition, reading comprehension findings are noted if it was also a dependent variable with oral reading fluency so that this review of previous research is robust. In the following section, four synthesis studies (i.e., Chard et al., 2002; Therrien, 2004; Wanzek et al., 2010; Wexler et al., 2008) of intervention research on oral reading fluency are presented. Whereas Therrien reviewed studies for school-age participants (ages 5–18 years), Chard et al., Wanzek et al., and Wexler et al. only focused on elementary students with LD, struggling readers in the upper elementary grades, and secondary struggling readers, respectively. In addition, Wanzek et al. reviewed reading intervention studies that cover vocabulary, comprehension, fluency, and word recognition. The other three syntheses examined the intervention studies on reading fluency. However, in these cases of syntheses on fluency studies, other reading skills such as reading comprehension were also reported as reading outcomes. The summary of four syntheses is as follows.

For elementary students with LD, in particular, Chard et al. (2002) synthesized previously conducted research (24 studies) on fluency interventions and found that repeated reading with a model was considered the most effective method for building oral reading fluency. In addition, Chard et al. suggested that repeated reading interventions improved reading rate, accuracy, and comprehension and that effective interventions were associated with multiple opportunities to read text or engage in repeated oral reading. However, it has been more than a decade since they have reviewed fluency interventions specifically targeted to elementary students with LD. In addition, over the decade, technology has been continuously developed and has come to play "an integral and important role in education" (OECD, 2010, p. 3).

Therrien (2004) conducted a meta-analysis of 18 studies to examine the effect of repeated reading on reading fluency and comprehension and to identify critical instructional components of repeated reading. The analysis of the studies indicated that repeated reading improves the reading fluency and comprehension of students without disabilities and students with LD. However, critical instructional components of repeated reading varied. For example, if the purpose of repeated reading was to help students with reading fluency and comprehension for a particular passage, providing a cue and repeating the passage (three to four times) were needed. If the purpose was to improve overall reading fluency and comprehension, however, corrective feedback was provided and passages were read until the performance criterion was achieved.

Wexler et al. (2008), who reviewed 19 interventions between 1980 and 2005, found that positive effects were associated with repeated reading with a previewing condition that included listening to passages (e.g., listening to an audiotape or an adult model) before reading them. Also, the impact of repeated reading interventions may not widely differ from that of nonrepetitive reading interventions (i.e., reading an equal amount of text nonrepetitively) on improvements in reading rate. Thus, they recommended having struggling readers at the secondary level use different passages to practice, instead of repeating the same text.

In another synthesis of reading instruction for secondary struggling readers, Wanzek et al. (2010) addressed two fluency studies (i.e., Mathes & Fuchs, 1993; O'Connor, White, & Swanson, 2007) in which repeated reading (with peers and adults) was compared to continuous reading. Although the two studies yielded varying results for students with RLD and reading difficulties, improved fluency outcomes were associated with using a model such as an adult or fluent peer. Therefore, they suggested that teachers embed both repeated reading and continuous reading into their instruction and use a model reader for repeated reading.

Purpose and research questions

Given (a) the limited previous syntheses primarily focusing on oral reading fluency of elementary students with LD and (b) the long period of time since the synthesis on oral reading fluency of elementary students with LD (Chard et al., 2002), the purpose of the current study was to gain new insights by extending findings on the effects of oral reading fluency interventions on the oral reading abilities of elementary students with LD. For this reason, we were interested in examining relatively recent fluency-building interventions (after 2002) for elementary students with LD. In addition, considering the impact that new learning tools or developments of technology may have on education, we thought it would be beneficial to specifically identify instructional components as part of the

intervention to improve oral reading performance of elementary students with LD. We addressed the following research questions:

1. What types of intervention studies have taken place to improve oral reading fluency of elementary students with LD?
2. How effective are interventions in increasing oral reading fluency for elementary students with LD?

Method

Operational definitions

Learning disability

The Individuals with Disabilities Education Improvement Act (IDEA, 2004) defined "specific learning disability" as a disorder in one or more of the basic psychological processes involved in understanding or in using language, spoken or written, which may manifest itself in an imperfect ability to listen, think, speak, read, write, spell, or do mathematical calculations. The present synthesis uses LD as a general term based on what the author(s) reported about how students in their studies were identified as having LD.

Oral reading fluency

The NRP report (2000) identified five areas that are critical for effective reading instruction: phonological awareness, phonics, fluency, vocabulary, and comprehension. As one of five essential components of reading, oral reading fluency is defined as reading grade-level text orally "with accuracy, appropriate rate, and expression on successive readings" (Common Core Standards Initiative, 2012).

Selection procedures, selection criteria, coding

Selection procedures

To find a broad range of studies, the following three steps were conducted. First, electronic searches were conducted through ERIC, EBSCO, and PsycINFO. Keywords and terms included *oral reading fluency, learning disabilities, reading intervention, elementary*, and their combinations. Second, a manual search of journals included *Exceptional Children, Learning Disability Quarterly, Learning Disabilities Research & Practice*, and *Journal of Special Education*. Third, the references cited in each article were identified and searched for relevant papers.

Selection criteria

The initial search resulted in 192 studies. As the second step, the titles, keywords, and abstracts of these 192 studies were reviewed, and 82 studies that addressed interventions for improving oral reading fluency for elementary students with LD were selected for further review. Of those 82 studies, the studies that met the following inclusion criteria were selected for in-depth analysis:

1. Articles had participants who were specifically described as having LD. Articles with learning difficulties or struggling readers without being labeled "LD" were excluded.
2. Articles provided segregated data for students with LD if students with LD were part of the participants.
3. Participants were elementary-age students when the fluency intervention was implemented (i.e., Grades 1–5).
4. Articles with experimental or quasi-experimental research design had to report disaggregated scores for students with LD to calculate effect sizes. A synthesis or meta-analysis on oral reading fluency was excluded.
5. Articles used treatment-comparison, single-group, or single-case designs.
6. Articles were written in English and were published in peer-reviewed educational journals between 2002 and 2014. The year 2002 was selected as a starting date because (a) Chard et al.'s synthesis of research on building reading fluency with elementary students with LD was published in 2002, and (b) the NRP report (2000) significantly influenced the federal literacy policy and encouraged the initiation of the Reading First program (Shanahan, 2006). It is therefore meaningful to examine research on improving oral reading fluency conducted after the report.
7. Articles focused on the implementation of an intervention that targeted the improvement of oral reading fluency. Measures assessed the oral reading fluency of students with LD and revealed the oral reading fluency outcomes as results.

Twelve of the 82 studies met the criteria for inclusion in this synthesis; 70 studies were excluded because they (a) did not measure oral reading fluency, (b) included students with learning difficulties but not specifically students with LD, (c) did not disaggregate data for target students with LD, (d) included kindergarteners or secondary students as participants, or (e) did not focus on a reading intervention to improve reading fluency.

Coding procedures

A comprehensive coding protocol was developed to organize key aspects and essential information for each study. The coding document included the following categories: (a) study information (e.g., authors, research design), (b) participant information (e.g., age, grade, gender, ethnicity), (c) treatment descriptions, (d) measure information, and (e) findings. The two coders for the articles were trained before coding; both were doctoral students in special education who had experience conducting research syntheses as part of their doctoral studies. To calculate inter-rater reliability, each coder coded the articles independently for each category. An inter-rater agreement of 97% was achieved. In the few instances where disagreements occurred, the two coders discussed the categories with discrepant responses until they reached an agreement.

Data analysis

Effect size of group design studies (i.e., comparing treatment and comparison group means) was calculated by using means and standard deviations. For continuous outcomes, the *What Works Clearinghouse Procedures and Standards Handbook* (2014) suggested the effect size (ES) from the standardized mean difference, which is known as Hedges's *g*. This ES is defined as the difference between the mean outcomes of the intervention group and the comparison group divided by the pooled within-group standard deviation. The following

formulas were used to calculate the effect size:

$$g = \frac{x_i - x_t}{S}$$

$$S = \sqrt{\frac{(n_i - 1)s_i^2 + (n_t - 1)s_t^2}{n_i + n_t - 2}}$$

S is a pooled within-group standard deviation (SD), and the x_i and x_c are the mean of the intervention group and comparison group, respectively. The n_i and n_c are the sample sizes, and s_i and s_c are the SDs for intervention and comparison groups.

Single-subject design studies' results were calculated with percentage of nonoverlapping data (PND) by identifying the data points in the intervention that are higher than the highest data points in the baseline, dividing that by the total number of data points of the intervention and then multiplying this number by 100 (Scruggs & Mastropieri, 1998). The interpretation of PND scores is as follows: (a) greater than 90% of PND = very effective, (b) between 70% and 90% of PND = effective, (c) between 50% and 70% of PND = questionably effective, and (d) less than 50% of PND = ineffective (Scruggs & Mastropieri, 1998).

Results

The findings for the 12 studies that met the inclusion criteria are organized according to the type of interventions. These include (a) repeated reading with a model, (b) repeated reading without a model, (c) video modeling only (without instruction), and (d) word/phrase-based practice.

Participant characteristics and durations

Sixty-six participants were included in the studies; 44 were male and 22 were female students. Ages across 30 participants ranged from 6.9 through 12.1 years (mean = 9.0 years). Grade was reported for 66 participants, ranging from Grades 1 through 5 (mean = 3.4). Ethnicity was reported for 37 participants; 21 were Caucasian, 8 African American, 4 biracial, 2 Hispanic, 1 Arab American, and 1 Asian. Type of LD was reported for 40 participants: 38 with RLD, 1 with RLD and LD in written expression, and 1 with LD in written expression.

For 7 of 12 studies (i.e., Begeny, Daly, & Valleley, 2006; Burns, Dean, & Foley, 2004; Decker & Buggey, 2014; Gortmaker, Daly, McCurdy, Persampieri, & Hergenrader, 2007; Persampieri, Gortmaker, Daly, Sheridan, & McCurdy, 2006; Watson, Fore, & Boon, 2009; Welsch, 2007), information was reported on areas of LD. Although only studies with participants identified as having LD were included, few studies provided specific information about methods used to identify the LD. For example, three studies (Gortmaker et al., 2007; Tam et al., 2006; Welsch, 2007) did not provide specific information about the identification procedures but simply reported that the identification was done by the state eligibility criteria (Gortmaker et al., 2007), the school district policy following the federal IDEA guidelines (Tam et al., 2006), or according to the students' IEPs (Welsch, 2007). On the other hand, the other three studies (Burns et al., 2004; Decker & Buggey, 2014; Hitchcock et al., 2004) reported that the students were identified based on the discrepancy model; Burns et al. also raised questions about the acceptability of the discrepancy model.

Five of 12 studies identified the durations of the interventions. Interventions lasted for four to six weeks in three studies (i.e., Decker & Buggey, 2014; Gortmaker et al., 2007; Nelson et al., 2004) and for over six weeks in two studies (i.e., 6–12 weeks in Musti-Rao et al., 2009; 16–18 weeks in Hitchcock et al., 2004). For studies that only provided the number of sessions, they were varied from nine sessions (Persampieri et al., 2006) to 27–49 sessions (Begeny et al, 2006; Tam et al., 2006; Welsch, 2007).

Research designs

The studies included various research designs (i.e., treatment-comparison design, single-group design, alternating-treatment design, multiple-baseline design, multiple-probe design, and single-subject parallel treatments design). One experimental study (O'Connor et al., 2007) and one quasi-experimental study (Burns et al., 2004) employed group designs, either a treatment-comparison design (O'Connor et al., 2007) or a single-group design (Burns et al., 2004), and reported an effect size. Ten studies used single-case designs, including multiple-baseline designs (Decker & Buggey, 2014; Hitchcock et al., 2004; Musti-Rao et al., 2009; Nelson et al., 2004; Tam et al., 2006; Welsch, 2007), multiple-probe designs (Gortmaker et al., 2007; Persampieri et al., 2006), and an alternating-treatment design (Begeny et al., 2006; Watson et al., 2009).

Effects of types of interventions

The corpus of studies reviewed showed that variations on four intervention types were implemented to improve reading fluency for students with LD: (a) repeated reading with a model, (b) repeated reading without a model, (c) video modeling only (without instruction), and (d) word/phrase-based practice.

Repeated reading

In the present synthesis, repeated reading involved two types of approaches. These were (a) repeated reading without a model, and (b) repeated reading with a model.

Repeated reading without a model

Six studies (i.e., Begeny et al., 2006; Musti-Rao et al., 2009; Nelson et al., 2004; O'Connor et al., 2007; Tam et al., 2006; Welsch, 2007) involved interventions that had students reread passages more than once without listening to a model (see Table 1). Four studies (i.e., Musti-Rao et al., 2009; Nelson et al., 2004; O'Connor et al., 2007; Tam et al., 2006) examined the effect of repeated reading without a model that included error correction, and two studies (i.e., Begeny et al., 2006; Welsch, 2007) examined the effect of repeated reading without a model that did not include the error correction. First, Tam et al. (2006) examined the effects of repeated reading with error correction combined with instructional features (e.g., vocabulary instruction, self-charting) for two students. Students showed more positive reading outcomes during two interventions (i.e.,

Table 1. Studies examining repeated reading without a model.

Author and design	Treatment description	Types of reading text	Dependent measures	Results
Begeny et al. (2006) $N = 1$; 8 years Alternating-treatment design	BL RR (two times) PD RE	Different passage each session in order of sequentially increasing difficulty (from instructional level to frustration level)	WCPM, EPM	WCPM: PD > RR > RE> BL EPM: PD< RE< RR< BL
Musti-Rao et al. (2009) $N = 3$; 10.2–11.4 years Multiple-baseline design	BL RR (three times) + EC	Grade-level reading text	WCPM	S1: PND (%) = 10/11 = 91 S2: PND (%) = 4/10 = 40 S3: PND (%) = 0/6 = 0
Nelson et al. (2004) $N = 3$; 8.2–9.6 years Multiple-baseline design	BL EC EC + RR (three times) EC + RR wPRM (three times)	One-grade-level-below text (based on fluency assessment)	WCPM, EPM	WCPM—**S1, S2**: EC + RR wPRM > EC + RR > BL > EC; **S3**: EC + RR wPRM > EC + RR > EC > BL; EPM–**S1**: EC + RR wPRM < EC + RR < EC < BL; **S2, S3**: EC + RR wPRM < EC < EC + RR < BL
O'Connor et al. (2007) $N = 16$, 14 4th graders & 2 2nd graders Treatment-comparison design	RR (three times) + EC Continuous reading Control (no intervention)	Instructional reading level (88%–94% accuracy) for intervention and one-grade-below text for assessment	WCPM, standardized measures on word identification and reading comprehension	WCPM: RR> Continuous reading> Control
Tam et al. (2006) $N = 2$; 9.4–9.6 years Multiple-baseline across subjects design	BL Storytelling New passage each session (three times) + EC Same passage to criterion (three times) + EC	A two-grade-level-below text for S1 and a grade-level text for S2 (based on text readability)	WCPM, EPM, RC	PND (%) for S1: WCPM = New passage > same passage > BL > storytelling, EPM = same passage < new passage < BL > storytelling; PND (%) for S2: WCPM = same passage > new passage > storytelling > BL, EPM = New passage < same passage < BL < storytelling
Welsch (2007) $N = 4$; 9.4–11.1 years Multiple-baseline design	BL (a) RR (S3; four times); (b) RR with easier material (S1, 2, & 4; four times)	An instructional-reading-level text (based on text readability) for S3 and one-grade-below the student's instructional Level text for S 1, 2, & 4	WCPM, EPM, RPM	PND (%) for S1: WCPM = 100, EPM = 96, RPM = 100; PND (%) for S2: WCPM = 100, EPM = 100, RPM = 100; PND (%) for S3: WCPM = 100, EPM = 50, RPM = 100; PND (%) for S4: WCPM = 100, EPM = 100, RPM = 100

Note. BL = baseline; RR = repeated readings; PD = phrase-drill with error correction; RE = reward; WCPM = words correct per minute; EPM: errors per minute, EC = systematic error correction; WPRM = with previously read materials; RPM = recalls per minute; PND = percentage of nonoverlapping data.

repeated reading with a new passage and with the same passage) than during baseline.

Nelson et al. (2004) used a multiple-baseline design to study the effects of (a) systematic error correction, (b) systematic error correction with repeated readings, and (c) systematic error correction with repeated readings with previously read passages. Three students increased their level of WCPM during the repeated reading combined with error correction condition relative to the baseline condition and the systematic error correction-only condition; their performance showed more improvement with repeated reading of previously read passages compared to repeated reading with new passages.

Similarly, in the O'Connor et al. (2007) study, low-performing readers were randomly assigned to one of two fluency interventions (i.e., repeated reading or continuous reading) with error correction or to a control group. Results revealed that students in the two treatments yielded higher performance levels than students in the control group; however, students in the repeated reading condition showed greater growth on WCPM than students in the continuous reading condition (i.e., nonrepeated reading condition). Musti-Rao et al. (2009) also examined repeated reading with error-correction procedures for three students; however, findings showed less favorable results (i.e., PND of 91%, 40%, and 0%) than the first two studies.

On the other hand, two studies examined repeated reading without error correction. First, Begeny et al. (2006) examined the relative effects of four conditions: baseline, repeated reading without error correction, phrase-drill with error correction (in which students practiced phrases with words incorrectly read during the initial reading and then reread the whole passage), and rewards given to an 8-year-old student if he read a passage faster than his previous reading score. The three treatments improved oral reading fluency relative to the baseline. However, the phrase-drill with error correction condition resulted in the highest WCPM and lowest errors per minute. Second, in Welsch (2007), repeated reading of a grade-level passage was administered to three students, and repeated reading of easier material (one grade below) was assigned to one student based on brief and extended analyses. Compared to baseline, all participants showed positive fluency outcomes during repeated reading without a model and without error correction.

Repeated reading with a model

Three studies addressed research questions regarding interventions that used repeated reading with a model. Gortmaker et al. (2007), Hitchcock et al. (2004), and Persampieri et al. (2006)

Table 2. Studies examining repeated reading with a model.

Author and design	Treatment description	Types of reading text	Dependent measures	Results
Gortmaker et al. (2007) $N = 3$; 9.3–9.8 years Multiple-probe design across tasks	BL Instruction (S2 & 3; including RR three times) + EC Reward plus instruction (S1) + EC	An instructional-reading-level text (based on text readability)	WCPM, EPM	PND (%) for S1: WCPM = 100, EPM = 0; PND (%) for S2: WCPM = 100, EPM = 67, PND (%) for S3: WCPM = 100, EPM = 75
Hitchcock et al. (2004) $N = 2$; 7–3, 6–11 years Multiple-baseline design	BL TRF (including RR three times) TRF + VSM (including RR three times) TRC TRC + VSM	A different passage each session at instructional reading level	WCPM, RC	PND (%) for S1s WCPM: TRF = 0, TRF + VSM = 29, TRC = 100, TRC + VSM = 100; PND (%) for S2s WCPM: TRF = 14, TRF + VSM = 71, TRC = 100, TRC + VSM = 100
Persampieri et al. (2006) $N = 2$; 8.4–9.8 years Multiple-probe design	RR (at least three times) with EC and modeling	A different passage each session at instructional reading level	WCPM, EPM	PND (%) for S1: WCPM = 89, EPM = 100; PND (%) for S2: WCPM = 89, EPM = 78

Note. BL = baseline; RR = repeated readings; WCPM = words correct per minute; EPM: errors per minute; TRF = tutoring for reading fluency; VSM = video self-monitoring; TRC = tutoring for comprehension; RC = reading comprehension; EPM: errors per minute; PND = percentage of nonoverlapping data.

examined modeling by an adult, and Hitchcock et al. also examined modeling by a video. Although two studies (i.e., Gortmaker et al., 2007; Persampieri et al., 2006) included error correction and modeling, only one study (i.e., Hitchcock et al., 2004) included modeling without error correction (see Table 2).

Gortmaker et al. (2007) investigated the effects of parent-tutored instruction. Through brief experimental analysis, two students received instruction that included listening passage previewing and repeated reading, and one student received instruction combined with the reward condition. Three students displayed a higher level of WCPM with PND of 100%. Similarly, in Persampieri et al. (2006), two students received parent tutoring that included repeated reading with error correction. Parent tutors provided error correction and modeled fluent reading with accurate pronunciation of any words incorrectly read. Following intervention, both students' PNDs on WCPM and errors per minute were in the effective range.

A different type of modeling paired with repeated reading was used in Hitchcock et al. (2004). These researchers examined the effects of repeated reading with video self-modeling for two students. Higher fluency outcomes were found in repeated reading with a self-modeling video than that without a self-modeling video as evidenced by PND scores. For reading comprehension, two tutoring conditions, which included a graphic organizer and direct instruction of story structures with and without the self-modeling video, were compared to a baseline. Two comprehension instructions had positive effects on both fluency and comprehension skills (PND = 100%).

Video modeling-only intervention

Decker and Buggey (2014) confirmed the effect of video modeling by asking participants to watch a modeling video without reading instruction (e.g., repeated reading). Based on a multiple baseline across participants design, the authors compared the effects of self-modeling and peer-modeling videos to a control condition. Nine students watched either a self-modeling video of echo reading (teacher-read and student-echoed) or a peer-modeling video of a comparable classmate (i.e., student with LD), depending on the group condition. Both video conditions increased the level of WCPM (as evidenced by PNDs of 100% for five out of six students); whereas, the control group showed a small WCPM increase.

Word/phrase practice interventions

Three studies (i.e., Begeny et al., 2006; Burns et al., 2004; Watson et al., 2009) examined the effects of a word- or phrase-based reading intervention for improving reading skills, including oral reading fluency (see Table 3). First, Begeny et al. found the phrase-drill with error correction (i.e., reading a passage and practicing phrases that included words previously read incorrectly) condition to be more effective than repeated reading without error correction. Burns et al. compared preteaching keywords in a control condition to the word-based practice condition. They found that the word-based practice condition showed a larger effect size for comprehension ($d = 1.78$) than for fluency ($d = .38$) for 20 third- and fourth-grade students.

Last, Watson et al. (2009) compared a word-supply lesson to a phonics-based lesson. The word-supply lesson focused on error correction with students practicing incorrectly read words by repeating the word and the passage. The phonics-based lessons consisted of the students' sounding out incorrectly read words and provided phonetic modeling from the teacher. Both treatments included error correction procedures. For the participants of the study, the word-supply condition resulted in a higher level of WCPM than the phonics-based condition and baseline.

Discussion

The purpose of this synthesis was to determine the effects of oral reading fluency interventions on the oral reading performance of elementary students with LD. Elementary school students with LD were the focus of this synthesis because students who lack fluent reading skills may experience continued poor school outcomes and more serious disadvantages in later life (Torgesen, 2000), such as in postsecondary education and the workplace. Several findings of this synthesis regarding the effect

Table 3. Word/phrase practice interventions.

Author and design	Treatment description	Types of reading text	Dependent measures	Results
Begeny et al. (2006) $N = 1$; 8 years Alternating-treatment design	BL RR PD + EC RE	A different passage each session from instructional level to frustration level	WCPM, EPM	WCPM: PD > RR > RE > BL EPM: PD < RE < RR < BL
Burns et al. (2004) 3rd grade ($N = 11$), 4th grade ($N = 9$) Single-group design	Control condition Preteaching keywords	A grade-level reading text	WCPM, RC	Fluency: EX vs. C: $d = .38$ Comprehension: EX vs. C: $d = 1.78$
Watson et al. (2009) $N = 1$; 11.3 years Alternating-treatment design	BL Word-supply + EC Phonics-based + EC	An instructional-reading-level text (passage with 94%–96% accuracy)	WCPM	Mean of WCPM: Word-supply > Phonics-based

Note. BL = baseline; RR = repeated readings; PD = phrase-drill with error correction; RE = reward; WCPM = words correct per minute; EC = systematic error correction; RC = reading comprehension; EX = experimental group; C = control group.

of types of interventions and related instructional components are noteworthy.

Repeated reading with and without a model

In this synthesis, repeated reading approaches to build oral reading fluency represented the majority of the interventions found across studies; that is, 75% of the studies in this synthesis involved repeated reading. Repeated reading has been consistently implemented, with most studies yielding positive oral reading fluency outcomes (Chard et al., 2002).

Earlier, Chard et al. (2002) found that repeated reading with a model was more effective than repeated reading without a model. However, findings from this synthesis indicate that there were no significant differences between repeated reading with or without a model when comparing participants' performance on oral reading fluency measures between baseline and intervention conditions. Despite the perceived importance of an oral reading model for fluency development, only three studies in this synthesis examined repeated reading with a model, whereas, six studies examined repeated reading without a model. Specifically, 75% of studies that conducted repeated reading without a model, which included error correction procedures, showed positive results. In Begeny et al. (2006), phrase-drill with error correction outperformed repeated reading without error correction.

Word-phrase reading

Word/phrase-based instruction, which NRP (2000) did not include, appeared to be promising, with a positive impact on oral reading fluency performance. Findings suggest that elementary students with LD may benefit from (a) fluency practices that provide opportunities to preview keywords with preteaching, (b) error correction, and (c) opportunities to practice words by repeating the word and then rereading the passage.

Effective instructional components

Several instructional components for improving oral reading fluency were identified. First, as suggested by Therrien and Kubina (2006), error correction should be considered as an important component of repeated reading, as evidenced in six studies in which an adult listener pointed out students' errors and then had the students correctly repeat the misread word(s).

Second, repeated reading of previously read passages appeared to be more effective than repeated reading of new passages (Nelson et al., 2004). In Tam et al. (2006), repeated reading with previously read passages led to improved oral reading fluency and comprehension. These findings provide support for the influence of reading familiar texts on improving students' oral reading fluency. It appears to be beneficial to employ reading passages that students with RLD have already read; this finding is in line with the Chard et al. (2002) synthesis.

In this synthesis, most studies (83%) selected reading passages based on students' current reading levels; few studies (e.g., O'Connor et al., 2007; Watson et al., 2009) specified that reading passages were chosen according to instructional reading levels. More research focusing on the relationship between the level of reading passages, oral reading fluency performance, and reading comprehension abilities is warranted.

Reading comprehension

In several of the studies in this synthesis, growth in oral reading fluency was associated with reading comprehension outcomes. Students with LD may improve reading comprehension and oral reading fluency with fluency-based instruction; that is, increases in fluency have the potential to improve reading comprehension (Pressley, Gaskins, & Fingeret, 2006). According to the Common Core State Standards (Common Core Standards Initiative, 2012), oral reading fluency is considered a tool for supporting comprehension because of the focus on reading with sufficient accuracy and fluency. In addition, Wanzek et al. (Common Core Standards Initiative, 2012) suggested that elementary students with reading difficulties might continue to struggle with word recognition and would benefit from treatments that focus on word recognition; fluency interventions that address word recognition may yield more extensive effects for students with RLD.

Video modeling

Advanced technology has allowed students to access a new concept of modeling that includes models presented in a video format. Video modeling was implemented in two studies and resulted in increased oral reading fluency (Decker & Buggey,

2014; Hitchcock et al., 2004). These findings are similar to those of previous studies, which suggested that video self-modeling produces significant gains in students' oral reading fluency (Bray & Kehle, 1996, 1998; Dowrick, Kim-Rupnow, & Power, 2006). Although video-embedded interventions demonstrate promise for oral reading fluency outcomes, specific instructional features leading to improvement have not been fully studied.

Given the positive outcomes of video modeling, tablet-assisted video modeling may be promising for improving students' oral reading fluency outcomes. Recently, tablets have gained considerable attention from educators as a means for supporting learning. For example, Bryant et al. (2015) found that tablet-assisted instruction improved oral reading fluency of elementary students with LD. Given the portability (Ozok, Benson, Chakraborty, & Norcio, 2008) and accessibility (Pyper, 2011) of tablets, it would be interesting to determine the role of tablets as a tool for video modeling for improving the oral reading fluency performance of students with LD.

Limitations and future research

The findings from this synthesis should be interpreted within the context of their limitations. Even though the criteria of this synthesis limited participants to elementary students identified as having RLD, some of the studies reviewed did not provide specific information regarding the diagnosis of LD. In addition, a larger sample of struggling readers would bring broader perspectives on instructional components in fluency interventions. Furthermore, prosody was not analyzed in the synthesis and was not reported in any of the 12 studies synthesized.

Also, Begeny et al. (2006) presented reading passages sequenced in increasing difficulty (i.e., from instructional level to frustration level) and specifically reported difficulty level. Most of the studies reviewed used reading passages at students' instructional reading level; however, reading passages at students' grade level were used in Musti-Rao et al. (2009) and Burns et al. (2004). It is interesting that each study had different definitions of instructional level; for example, O'Connor et al. (2007) defined the instructional level as "88%–94% accuracy," and Watson et al. (2009) defined it as "94%–96% accuracy." In addition, without specific information on the level of the passages (i.e., independent, instructional, or frustration levels) for each student, results have to be interpreted cautiously, because findings can vary according to the level of the text chosen for the research studies.

Implications for educational practice

There are several implications for teachers who want to improve oral reading fluency of their students with LD. First, one of the salient findings is that teachers should provide students with sufficient opportunities to read a text repeatedly and should implement evidence-based instructional features that have been found in recent studies to improve the oral reading fluency of students with LD.

Second, assistive technology can be used to provide a model in oral reading fluency instruction for students with RLD. Tablet computers offer potential as a means for teaching oral reading fluency due to its portability, multimedia features (e.g., audio, video, and pictures), and ease of use (e.g., touch screen). In addition, video self-modeling can allow students the opportunity to self-correct their errors and self-evaluate their performances.

The video can be relatively easily made or edited by recording a student reading aloud with a model as part of echo reading. Notably, motivation at the upper elementary level is a necessary consideration; educators may need to consider how to embed video modeling into oral reading fluency instructions (Decker & Buggey, 2014; Hitchcock et al., 2004) to help students with RLD to visually imitate fluent reading and observe themselves reading successfully.

Third, given the positive results from word/phrase-based reading instruction, teachers should spend more time to preview and preteach key vocabulary of each passage and help students practice the key vocabulary before they read the text (Burns et al., 2004). Also, before each lesson, teachers should understand language demands and identify unknown words in addition to key vocabulary so that students can focus on fluent reading.

Fourth, teachers should use error-correction procedures for repeated reading. The most effective way to provide corrective feedback is to ask students to correctly repeat any misread word and then reread the sentence or passage. In addition to repeated reading of passages, students may improve their oral reading fluency by correctly practicing incorrect words or phrases previously read incorrectly.

Finally, teachers can consider using familiar texts (i.e., previously read passages) for oral fluency practices of students with LD. To help students stay focused and motivated, teachers should carefully select reading passages based on interests and reading levels of students with LD. Although most of the studies reviewed selected reading passages based on the current reading levels, teacher should be careful to identify students' instructional reading levels (i.e., 90%–95% accuracy) and monitor their progress for data-based instructional decision-making purposes.

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