The Effects of Reading Fluency Interventions on the Reading Fluency and Reading Comprehension Performance of Elementary Students With Learning Disabilities: A Synthesis of the Research from 2001 to 2014

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Abstract

Fluent word reading is hypothesized to facilitate reading comprehension by improving automatic word reading, thus releasing a reader's cognitive resources to focus on meaning. Many students with learning disabilities (LD) struggle to develop reading fluency, which affects reading comprehension. This synthesis extends Chard, Vaughn, and Tyler's (2002) review, synthesizing fluency intervention research from 2001 to 2014. The search yielded 19 studies examining reading fluency and comprehension outcomes of reading fluency interventions for students with LD in kindergarten through 5th grade. Results showed repeated reading (RR), multicomponent interventions, and assisted reading with audiobooks produced gains in reading fluency and comprehension. Providing a model of fluent reading and performance feedback, using easier level text, setting a performance criterion, and practicing RR with peers also contributed to improved outcomes. Findings suggest that RR remains the most effective intervention for improving reading fluency for students with LD. Limitations include sample size, only three group design studies, and infrequent use of standardized measures.

Keywords

learning disability, reading fluency, fluency intervention, repeated reading

Fast and accurate word reading is hypothesized to facilitate reading comprehension because it releases a reader's cognitive resources (e.g., working memory) to focus on meaning (LaBerge & Samuels, 1974; Perfetti, 1980, 1985; Wolf & Katzir-Cohen, 2001). When word recognition is slow and labored, cognitive load is occupied at the expense of understanding text. Due to the connection between efficient reading of connected text and comprehension, researchers in the past several decades have highlighted the importance of fluency instruction (Bashir & Hook, 2009; Chard, Vaughn, & Tyler, 2002; Therrien, 2004; Welsch, 2006). In particular, students with learning disabilities (LD) struggle to develop reading fluency (Bashir & Hook, 2009; Chard et al., 2002; Chard, Ketterlin-Geller, Baker, Doabler, & Apichatabutra, 2009). Reading can become a frustrating experience, which leads to an aversion to reading tasks. Consequently, students with LD may spend less time actually reading than proficient readers. When students with LD spend less time with text, this negatively affects vocabulary acquisition and comprehension development and may ultimately further

contribute to the achievement gap for this population (L. S. Fuchs, Fuchs, & Compton, 2010). As such, fluency interventions are integral to effective reading instruction for students with reading difficulties (Bashir & Hook, 2009; Chard et al., 2009; Morgan, Sideridis, & Hua, 2012; Therrien, 2004).

The National Reading Panel ([NRP] 2000) identified fluency as one of the critical factors necessary for reading comprehension, but findings from observation studies examining the components of reading taught indicated fluency instruction is often overlooked for students with LD (e.g., Swanson, 2008). Guided oral repeated reading (RR) with teacher or peer feedback was identified as an effective method for improving reading fluency and comprehension for all readers. Recommendations from NRP were incorporated into the

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No Child Left Behind Act (2002) and the reauthorization of the Individuals With Disabilities Education Act (2004), requiring schools to assess individual progress, use research-based practices, and meet the needs of students with LD via specialized instruction, including in the area of reading fluency.

A systematic review of effective fluency interventions between 1975 and 2000 for elementary-age students with LD was conducted by Chard et al. (2002). Findings indicated that RR interventions improved reading rate, accuracy, and comprehension. Additionally, RR with a model (e.g., teacher, computer, audio recording) was more effective than RR without a model, and modeling of fluent reading improved comprehension. Rereading multiple times, providing error correction feedback, and using progressively more difficult text were also associated with improved reading fluency. Findings related to RR with a peer were unclear. Results showed reading with a peer was an ineffective intervention by itself, yielding negative to small effect sizes on measures of oral reading fluency and comprehension (Deno, Diment, Dongil, Marston, & Rogers, 1995; Mathes & Fuchs, 1993). When combined with other intervention components, such as partner retelling, summarizing, and predicting, peer RR yielded moderate to large effect sizes (D. Fuchs, Fuchs, Mathes, & Simmons, 1997; Simmons, Fuchs, Fuchs, Mathes, & Hodge, 1995).

Despite legislation and recent research that promote best practices in reading fluency instruction, the National Assessment of Educational Progress (NAEP; National Center for Education Statistics, 2013) indicates that only 35% of fourth-grade students and 11% of students with LD are performing at a proficient level in reading. Vaughn and Wanzek (2014) described the concerning trend in the NAEP scores from 2002 to 2011: "While students without disabilities are improving their reading performance, the performance of students with disabilities is declining" (p. 47). This national trend suggests that educators are not meeting the needs of students with LD to close the gap with typically achieving peers in reading. In addition to empirical evidence, observation studies have revealed a discrepancy between best practices and instruction. For example, Vaughn and Wanzek reviewed observational research findings since 2000 to assess the quality of reading instruction for students with LD. Results indicated that students with LD are passively learning in large group settings with little to no specialized, intensive, and explicit instruction. Furthermore, many teachers believe students will naturally acquire fluent reading behaviors through sustained silent reading; however, struggling readers require direct instruction in reading fluency in order to make gains in fluency and comprehension (Rasinski, Homan, & Biggs, 2009).

Researchers have continued to investigate the effects of fluency interventions since Chard et al.'s (2002) synthesis.

For example, Therrien's (2004) meta-analysis evaluated the effects of RR on familiar and unfamiliar (i.e., transfer) passages for students with LD in kindergarten through 12th grade. Therrien suggested that RR improves fluency and comprehension of familiar texts and may improve fluency and comprehension on transfer tasks. Similarly, Morgan and Sideridis (2006) synthesized alternative fluency interventions in single-subject-design studies. Interventions that provided vocabulary definitions and listening passage preview, goal setting and performance feedback, listening preview and repeated practice, and peer tutoring showed promise for increasing students' reading fluency. Strickland, Boon, and Spencer (2013) reviewed RR research on elementary-age students with LD between 2001 and 2011; however, data for students with LD was not disaggregated for all of the studies included.

The most recent synthesis that focuses explicitly on reading fluency in elementary students with LD was Chard et al.'s (2002) synthesis. Since this synthesis was published, the Institute of Education Sciences' (2011) What Works Clearinghouse (WWC) was established to identify high-quality research and provide guidance to educational stakeholders regarding research-based practices. WWC also has as its focus describing standards for high-quality research. This proposed synthesis aims to identify further high-quality knowledge regarding reading fluency interventions. It remains unclear which interventions, including technology-based fluency interventions, produce the best outcomes in fluency and comprehension for elementary students with LD within the framework of WWC standards. Given the declining reading performance of elementary students with LD, the purpose of this systematic review is to synthesize fluency intervention studies for this population published since 2001. The following research question was addressed: Which fluency interventions are associated with positive outcomes in reading fluency and comprehension for students with LD in kindergarten through 5th grade?

Method

Operational Definitions

In this review, *learning disability* refers to an educationally identified or psychologist-diagnosed LD. Some studies specify the criteria used for identifying an LD; however, other studies do not include this information. *Reading fluency* is defined as the ability to read with speed, accuracy, and appropriate expression (NRP, 2000). *Fluency intervention* refers to any intervention that addresses students' speed, accuracy, and prosody when reading text. *Repeated reading* is fluency practice in which a student repeatedly reads a passage aloud to increase oral reading fluency. The number of rereadings, level of text, type of performance feedback, and performance criterion may vary.

Search Procedures

This systematic review extends the corpus of studies identified by Chard et al. (2002); thus, there are many similarities in the search and inclusion procedures. The differentiating procedures of the present review are described below. In accordance with the procedures used in the Chard et al. (2002) study, an initial computer search was conducted of four electronic databases: Educational Resources Information Clearinghouse, PsycINFO, Education Source, and Academic Search Complete. Education Source was an additional database not utilized in Chard et al. (2002), and Academic Search replaced ArticleFirst, which was no longer available. The search was limited to studies in peer-reviewed journals published between January 2001 and September 2014. The search terms used were *disabilit* OR disorder, read**, and *reading fluency, fluency, reading aloud, reading rate, repeated reading, reading practice, assisted reading, oral reading, paired reading, rereading, reading speed, reading expression, reading prosody, reading accuracy*, and *partner reading.* The search yielded 4,135 articles; the abstracts of these studies were reviewed to identify studies that met the inclusion criteria. An ancestral search was completed using the reference lists from relevant syntheses and meta-analyses conducted since 2002 (Chard et al., 2009; Morgan & Sideridis, 2006; Morgan et al., 2012; Strickland et al., 2013; Therrien, 2004). Hand searches were conducted in the same journals as those searched in the Chard et al. (2002) study, including *Annals of Dyslexia, Education and Treatment of Children; Exceptional Children; Journal of Educational Research; Journal of Experimental Psychology General; Journal of Learning Disabilities; Journal of Literacy Research* (formerly *Journal of Reading Behavior*); *Journal of Experimental Psychology: Learning, Memory, and Cognition; Learning Disabilities Quarterly; Learning Disabilities Research and Practice; Psychology in the Schools; Reading Horizons; Literacy Research and Instruction* (formerly *Reading Research and Instruction*); *Reading Research Quarterly; Remedial Special Education;* and *School Psychology Review.* Finally, reference lists of the studies that met the criteria were reviewed to identify any additional articles for inclusion.

Selection Criteria

Studies were included if they met four inclusion criteria. First, the participants in the study had to include students identified with LD in grades K through 5. Studies with combined samples of students with and without LD were included if the data for students with LD were disaggregated. Studies with participants who were at risk for reading failure or identified as having reading difficulties were excluded. As for grade level, participants had to be in grades K through 5 to be included. Studies with students older than fifth grade were included if 50% or more of the sample fell within the target grade range. Second, the intervention being implemented had to target reading fluency among connected text in English. Studies that included a combined intervention package were included if 50% or more of the intervention was spent on reading fluency. Studies targeting reading fluency in other languages or those that occurred outside of the school programming, such as in home, clinic, or camp settings, were excluded. Third, the studies had to employ an experimental, quasi-experimental, or single-subject design providing a treatment and comparison to determine experimental effect. Studies were excluded if they used single-group (pretest/posttest), AB single-subject, descriptive, case study, or qualitative designs. Last, the dependent variable had to address outcomes in either reading fluency (rate, accuracy, and/or prosody) or comprehension.

Coding Procedures

Studies that met the inclusion criteria were coded using a coding protocol developed for education-related intervention research (Vaughn, Elbaum, Wanzek, Scammacca, & Walker, 2014). The following data were extracted from each study: (a) participant information (e.g., age, grade level, number of participants with LD), (b) research design, (c) treatment fidelity, (d) description of treatment and comparison group(s), (e) clarity of causal inference, (f) measures, and (g) results and effect sizes. Coders participated in a 4.5-hour training session in which the protocol was described and coding procedures were applied to several sample studies of different design types. All studies were double-coded by the first author and an experienced graduate student coder; 99% interrater agreement was achieved, and discrepancies in coding were resolved via discussion.

Results

After sorting the abstracts, 70 articles were further reviewed to determine if they met criteria; 3 studies were excluded based on single-group design (Burns, Dean, & Foley, 2004; Stebbins, Stormont, Lembke, Wilson, & Clippard, 2012; Therrien & Kubina Jr., 2007). Forty-nine studies were excluded based on language, intervention components (i.e., decoding emphasis rather than fluency in connected text), setting, or participant characteristics. Nineteen studies that met inclusion criteria are organized into four tables based on features of the intervention (i.e., RR with or without a model, RR with multiple features, and interventions other than RR).

For group design studies, effect sizes (ESs) were calculated as the difference between the groups' means divided by the pooled standard deviation; ES is interpreted using the following criteria: 0.8 is large, 0.5 is moderate, and 0.2 is small (Cohen, 1988). Hedge's *g* is reported to provide a less

biased estimate of ES with particularly small samples (Hedges, 1985).

For single-subject-design studies, data are reported as gains in words correct per minute (WCPM; i.e., the baseline phase or preintervention mean subtracted from the treatment phase mean) and decreases in errors per minute (EPM; i.e., the treatment phase mean subtracted from the baseline or preintervention mean) for each student. However, if mean performance data were unavailable across phases, the percentage of nonoverlapping data points (PND) was calculated using the graphs provided. For WCPM, PND was calculated by counting the total number of data points during the intervention phase that exceeded the highest baseline data point, divided by the total number of treatment data points and multiplying by 100 (Scruggs, Mastropieri, & Casto, 1987). For EPM, PND was calculated by counting the number of data points during the intervention phase that did not exceed the lowest baseline data point, divided by the total number of treatment data points and multiplying by 100. PND results are interpreted as follows: 90% or greater is highly effective, 70% to 90% is moderately effective, 50% to 70% is minimally effective, and 50% or less is ineffective (Scruggs & Mastropieri, 1998).

RR Without a Model

Table 1 summarizes five studies that examined the effects of repeatedly reading text, ranging two to four times, without modeling by a more proficient reader. O'Connor, White, and Swanson (2007) compared the effects of three RRs to 15 min of continuous reading and a no-treatment comparison. Results showed medium to large effects in favor of RR compared to the no-treatment comparison on standardized measures of reading fluency (*Gray Oral Reading Test–4 g* = 0.65; *Woodcock Reading Mastery Test–NU g* = 0.94) and passage comprehension (*g* = 0.72; *g* = 2.09); RR outperformed continuous reading with small to medium effects in reading fluency (*g* = 0.50; *g* = 0.29) and comprehension (*g* = 0.59; *g* = 0.28).

Three alternating treatment designs yielded positive results for improving rate, accuracy, and comprehension. Chafouleas, Martens, Dobson, Weinstein, and Gardner (2004) found three RR conditions (i.e., RR alone, RR with WCPM performance feedback (PF) and RR/PF with a reward option) to be highly effective for improving reading rate but minimally to moderately effective for improving accuracy. Kubina, Amato, Schwilk, and Therrien (2008) found RR to a high-performance criterion required more practice sessions but yielded greater gains in reading rate than RR to a low-performance criterion. However, maintenance testing showed decrement in WCPM regardless of a high or low performance standard. Finally, Welsch (2007) compared RR to a listening passage preview (LPP) condition of instructional and easier level texts; RR of instructional (*n* = 1) and easier (*n* = 3) text

was identified as the best treatment condition (i.e., produced the best oral reading fluency rates during brief and extended analysis of alternating conditions). PND results showed RR to be highly effective for improving reading rate, accuracy, and comprehension.

Nelson, Alber, and Gordy (2004) compared systematic error correction (EC) alone to EC with RR on unfamiliar and previously read basal passages. The EC with RR conditions outperformed the EC-only condition; however, EC with RR of previously read material yielded better reading rate and accuracy than EC with RR of new text.

Generalization to novel passages. Only two studies examined generalization of skill to unfamiliar passages, and the results are inconclusive. In Chafouleas et al. (2004), PND of student performance on new passages with high content overlap suggests generalization of rate and accuracy skills; however, further inspection of the graphs shows limited generalization of skills. For three of four students (Welsch, 2007), RR yielded results that were moderately to highly effective in generalization (i.e., rates and comprehension to unfamiliar text at the same readability level). However, RR was ineffective for decreasing error rates in generalization passages for two students and moderately effective for the other two students.

RR With a Model

Nine studies examining RR with a model are grouped in Table 2 based on the type of modeling provided.

Modeling by an adult. Four single-subject-design studies incorporated adult modeling of fluent reading (Ardoin, Williams, Klubnik, & McCall, 2009; Daly, Bonfiglio, Mattson, Persampieri, & Foreman-Yates, 2005; Hapstak & Tracey, 2007; Welsch, 2007). Welsch's (2007) alternating treatment design, listed in Table 1 (i.e., two of the four alternating treatments included RR without a teacher model), determined LPP without RR was not a best treatment condition compared to RR alone. However, three studies found that adult modeling combined with RR improved reading rates (Ardoin et al., 2009; Daly et al., 2005; Hapstak & Tracey, 2007). Modeling and RR of instructional level text six versus three times yielded higher reading rates (Ardoin et al., 2009). Engaging in echo or choral reading with a fluent adult model and practicing phrase drill EC improved reading rates on familiar passages (Hapstak & Tracey, 2007).

Generalization to novel passages. Modeling and RR six versus three times did not provide greater generalization in reading rate to new, high-content overlap passages (Ardoin et al., 2009). Adult modeling, RR, and phrase drill EC increased reading rates and decreased error rates on easy and difficult generalization passages with high content overlap (Daly et al., 2005).

Table 1. Studies Examining Repeated Reading Without a Model.

Author/research design	Participant age or grade/sample size	Treatment conditions	Session length/treatment duration	Dependent measures	Results/effect sizes
Chafouleas, Martens, Dobson, Weinstein, and Gardner (2004) Alternating treatment	Age: 8–9 Grades: 1–3 $N = 3$ $n = 1$ LD	* RR: Student read passage (three times) to a fluency criterion for three consecutive sessions. * RR + Performance Feedback (RR_{PF}): Same as RR but student was told WCPM after each reading. * RR_{PF} + Reward ($RR_{PF/RE}$): Same as RR_{PF} except reward was given if student improved WCPM from the last reading.	For all conditions: NR/6 sessions	(a) WCPM (b) EPM	(a) PND RR, RR_{PF}, $RR_{PF/RE}$ S1: 100, 100, 100 (b) PND RR, RR_{PF}, $RR_{PF/RE}$ S1: 83, 67, 67 Gen. to HCO passages (a) PND RR, RR_{PF}, $RR_{PF/RE}$ S1: 67, 100, 100 (b) PND RR, RR_{PF}, $RR_{PF/RE}$ S1: 100, 67, 100
Kubina, Amato, Schwilk, and Therrien (2008) Alternating treatment	Age: 9 Grade: 3 $N = 3$ $n = 2$ LD	* RR Low Criterion (RR_{Low}): Student read passage (two to three times) to criterion (123 WCPM) for 2 consecutive days. Praise and corrective feedback given. * RR High Criterion (RR_{High}): Same as RR_{Low} but criterion was 200 WCPM.	For both conditions: NR/NR	(a) WCPM	(a) Gain RR_{Low}, RR_{High} S1: 69, 110 S2: 90, 161 Maintenance (14 weeks) (a) Gain RR_{Low}, RR_{High} S1: 60, 86 S2: 40, 77
Nelson, Alber, and Gordy (2004) Multiple baseline	Age: 8–9 Grade: 2 $N = 4$ $n = 3$ LD	* Baseline: Student read passage for 5 min. Teacher provided word-supply feedback. Student was assessed on second reading. * Systematic Error Correction (EC): Student read for 5 min. Teacher provided word supply feedback; student repeated the word and reread the sentence. Missed words were reviewed after reading. * RR + EC (RR_{EC}): Same as EC, except EC was provided during first 3 min of reading. Student was timed on three RRs. * RR + EC on previously read material (RR_{ECP}): Same as RR_{EC} except students read baseline passages.	6 min; treatment duration for EC, RR_{EC}, RR_{ECP} as follows for students 1–3: 11/11/7 8/8/5 6/5/4	(a) WCPM (b) EPM	(a) M_{gain} EC, RR_{EC}, RR_{ECP} S1: −1.6, 11.0, 12.3 S2: −2.3, 12.2, 17.1 S3: 11.7, 25.2, 28.8 (b) $M_{decrease}$ EC, RR_{EC}, RR_{ECP} S1: 2.6, 3.4, 3.5 S2: 3.1, 2.0, 3.9 S3: 0.7, 0.5, 2.8

(continued)

Table 1. (continued)

Author/research design	Participant age or grade/sample size	Treatment conditions	Session length/treatment duration	Dependent measures	Results/effect sizes
O'Connor, White, and Swanson (2007) Treatment-comparison	Age: NR Grades: 2 and 4 $N = 37$ $n = 16$ LD	* RR: RR (three times) to an adult listener. $n = 5$ * Continuous Reading (CR): Students read continuously for 15 min. $n = 6$ * No-treatment comparison (C). $n = 5$	RR: 15 min/42 sessions CR: 15 min/42 sessions C: NR/NR	(a) GORT-4 fluency (b) GORT-4 comprehension (c) WRMT-NU passage comprehension (d) WRMT-NU fluency	(a) RR vs. C $g = 0.65$, $SE = .65$ CR vs. C $g = 0.21$, $SE = .61$ RR vs. CR $g = 0.50$, $SE = .61$ (b) RR vs. C $g = 0.72$, $SE = .65$ CR vs. C $g = 0.22$, $SE = .61$ RR vs. CR $g = 0.59$, $SE = .62$ (c) RR vs. C $g = 2.09$, $SE = .79$ CR vs. C $g = 1.45$, $SE = .68$ RR vs. CR $g = 0.28$, $SE = .61$ (d) RR vs. C $g = 0.94$, $SE = .67$ CR vs. C $g = 0.69$, $SE = .62$ RR vs. CR $g = 0.29$, $SE = .61$
Welsch (2007) Alternating treatment	Age: 9–11 Grades: 3–4 $N = 4$ LD	* Baseline Instructional: Instructional passage read for 1 min. * Baseline Easier Material: Easier passage read for 1 min. * RR with PF Instructional ($RRPF_{Instructional}$): Four RRs of instructional passage, provided WCPM and EPM after each reading. * Listening Passage Preview Instructional: Adult read instructional passage, student read same passage. * RR with PF Easier ($RRPF_{Easier}$): Four RRs of easier passage, provided WCPM and EPM after each reading. * Listening Passage Preview Easier: Adult read easier passage, student read same passage. * Generalization assessed during best treatment phase with grade-level passages.	For all conditions: 5–10 min/total sessions per condition vary by participant	(a) WCPM (b) EPM (c) Recall of key words or phrases per minute	PND Best treatment/gen. S1: $RRPF_{Instructional}$ (a) 100/88.9 (b) 100/88.9 (c) 94/88.9 S2: $RRPF_{Easier}$ (a) 100/53.8 (b) 96.2/46.2 (c) 100/96.2 S3: $RRPF_{Easier}$ (a) 100/95.8 (b) 100/37.5 (c) 100/100 S4: $RRPF_{Easier}$ (a) 100/81.8 (b) 100/81.8 (c) 100/81.8

Note. LD = learning disability; NR = not reported; RR = repeated reading; WCPM = words correct per minute; EPM = errors per minute; GORT-4 = *Gray Oral Reading Test-4*; WRMT-NU = *Woodcock Reading Mastery Test–NU*; PND = percentage of nonoverlapping data points; Gen. = generalization; HCO = high content overlap; M_{gain} = the baseline phase or pre-intervention mean subtracted from the treatment phase mean; $M_{decrease}$ = the treatment phase mean subtracted from the baseline or pre-intervention phase mean; S1 = Student 1; S2 = Student 2; S3 = Student 3; S4 = Student 4; SE = standard error.

Table 2. Studies Examining Repeated Reading With a Model.

Author/research design/modeling	Participant age or grade/sample size	Treatment conditions	Session length/ treatment duration	Dependent measures	Results/effect sizes
Ardoin, Williams, Klubnik, and McCall (2009) Alternating treatment Adult	Age: 11 Grade: 4 $N = 4$ $n = 1$ LD	* Three Repeated Readings (3RR): Passage read to student prior to three repeated readings. WCPM, EPM, and error correction (phrase drill or syllable segmentation and blending) provided after each reading. * Six Repeated Readings (6RR): Same as 3RR but the student reads the text six times. * Generalization (G): HCO passage used.	For all conditions: NR/5 sessions	(a) WCPM	(a) M_{gain} 3RR, 6RR S1: 43.6, 60.0 G same day (a) M_{gain} 3RR, 6RR S1: 15.4, 19.6 G 1 week (a) M_{gain} 3RR, 6RR S1: 34.8, 39.2
Daly, Bonfiglio, Mattson, Persampieri, and Foreman-Yates (2005) Alternating treatment Adult	Age: 9–11 Grades: 3–4 $N = 3$ LD	HCO passage assessment administered after each condition; reward offered during the assessment if student improved WCPM and decreased EPM. * Easy no instruction (E/NI): Passage read once, and then word supply, WCPM, and EPM feedback were given. * Easy with instruction (E/I): Passage read to student, student read passage and practiced phrase drill error correction, passage read again, and repeated errors were practiced with syllable segmentation and blending. * Hard no instruction (H/NI): Same as E/NI but with a harder passage. * Hard with instruction (H/I): Same as E/I but with a harder passage.	For all conditions: 10–25 min/4 sessions each per condition	(a) WCPM HCO passage (b) Errors per minute HCO passage	(a) M_{gain} E/NI, E/I, H/NI, H/I S1: 14.3, 21.5, 27.3, 25.0 S2: 6.3, 32.5, 26.5, 31.0 S3: 14.3, 14.5, 22.5, 34.5 (b) $M_{decrease}$ E/NI, E/I, H/NI, H/I S1: 2.8, 5.0, 2.5, 4.8 S2: 2.8, 4.8, 5.0, 7.5 S3: 2.3, 4.8, 6.0, 5.0
Hapstak and Tracey (2007) Multiple baseline Adult	Age: 7 Grade: 1 $N = 3$ $n = 1$ LD	* Baseline: Student read across 5 days; scores averaged for baseline WCPM. * Assisted Repeated Reading (ARR): One reading of instructional-level passage, WCPM reported and graphed. Teacher read passage, followed by one echo and two choral readings with student. Student read again and teacher recorded WCPM.	10–15 min/16 sessions	(a) WCPM	(a) PND $ARR_{First\,Read},$ $ARR_{Final\,Read}$ S1: 94, 100
Decker and Buggey (2014) Multiple baseline Proficient peer	Age: 8–12 Grades: 3–5 $N = 9$ LD	* Video Self-Modeling (VSM): Student watched his or her own video of fluent reading once per day. $n = 3$ * Video Peer-Modeling (VPM): Student watched a peer's video of fluent reading once per day. $n = 3$ * Comparison (C) Group: Business as usual. $n = 3$	For all conditions: NR/10 sessions	(a) WCPM (b) Retelling (c) Comprehension quiz ($n = 4$)	(a) M_{gain} (range) VSM = 58.0 (25.0–85.3) VPM = 24.2 (20.7–26.5) C = 11.7 (3.0–18.5) (b) NR (c) NR Maintenance (a) M_{gain} VSM = 68.4 (33.0–96.6) VPM = 30.5 (20.0–45.4) C = 25.9 (21.6–30.5)
Oddo, Barnett, Hawkins, and Musti-Rao (2010) Multiple baseline Proficient peer	Age: 9 Grade: 4 $N = 4$ $n = 1$ LD	* Baseline: Sustained silent reading of grade-level novels. * Group Peer-Mediated Repeated Reading: Three to five mixed-ability groups (high, average, low fluency scores) repeatedly read a passage, alternating paragraphs. Students followed a scripted error-correction procedure, including word supply and rereading miscues.	10 min/24 sessions	(a) WCPM (b) EPM (c) AIMSweb maze probes (multiple choice cloze task)	PND (a) 87.5 (b) 12.5 (c) 75.0
Sáenz, Fuchs, and Fuchs (2005)[WWC] Treatment-comparison Proficient peer	Mean age: 10.9 Mean grade: 4.3 $N = 132$ $n = 20$ LD, ELL	* Peer Assisted Learning Strategies (PALS): Partner reading (one repeated reading) with retell and error correction, summarizing, and making predictions. Text appropriate for the weaker reader. $n = 10$ * C: Traditional reading instruction. $n = 10$	PALS: 35 min/45 sessions C: 35 min/45 sessions	(a) CRAB words correct (b) CRAB questions correct (c) CRAB maze	(a) PALS vs. C: $g = 0.42,$ SE = .45 (b) PALS vs. C: $g = 0.91,$ SE = .47 (c) PALS vs. C: $g = 0.46,$ SE = .45

Table 2. (continued)

Author/research design/modeling	Participant age or grade/sample size	Treatment conditions	Session length/ treatment duration	Dependent measures	Results/effect sizes
Musti-Rao, Hawkins, Barkley (2009) Multiple baseline Matched peer	Age: 10–11 Grade: 4 N = 12 n = 3 LD	* Baseline: 30 min sustained silent reading of a student-selected book. * Paired Repeated Reading (PRR): Student dyads took turns reading a passage to a fluency criterion (118 words per minute) for 10 min, providing error correction. Students given a reward for meeting the criterion by the third day of repeated reading.	30 min; treatment duration 36, 36, and 18 sessions for students 1–3, respectively	(a) DORF WCPM	(a) M_{gain} PRR S1: 21.9 S2: 10.7 S3: 5.4
Staubitz, Cartledge, Yurick, and Lo (2005) Multiple baseline Matched peer	Age: 11 Grade: 5 N = 6 n = 1 LD	* Baseline: 10 min sustained silent reading, then 1-min assessment (covert timing). * Peer-Mediated Repeated Reading: Matched-reading-ability pairs took turns repeatedly reading a passage and providing error correction feedback. Students had three opportunities (overtly timed) to read to a criterion of 180 words per minute (fifth grade) with no more than 10 errors. Best performance charted. * G assessed under three conditions: covert timing (CT), overt timing (OT), and OT with charting performance (OTC).	10–15 min/16 sessions	(a) Words per minute (b) Percentage words read correctly (c) Percentage correct comprehension cloze passage (n = 5)	(a) M_{gain} 3rd, 4th text S1: 95, 95 (b) M_{gain} (%) 3rd, 4th text S1: 5.1, 8.0 (c) M_{gain} (%) 3rd, 4th text S1: 45.6, 45.6 G CT, OT, OTC: (a) M_{gain} S1: 9, 30, 25 (b) M_{gain} S1: 3, –1.3, 1.8 (c) M_{gain} (%) S1: 14.2, –7.8, 12.2
Yurick, Robinson, Cartledge, Lo, and Evans (2006$_{Exp.\ 1}$) Multiple baseline Matched peer	Age: 10–11 Grade: 5 N = 8 n = 2 LD	* Baseline: 10 min sustained silent reading with text 1 year below grade level. * PRR: Student dyads took turns reading a passage to fluency criteria (180 words per minute, 10 errors or less, all five comprehension questions answered correctly) for 10 min. Listener provided error correction (sound it out, read the group of words before and after the miscue, say the group of words three times fast). Reward given for reaching criteria.	10 min; treatment duration 18/12 and 25/18 in SSR/PRR for students 1 and 2, respectively	(a) Words per minute (b) Percentage WCPM (c) Percentage correct cloze comprehension passage (n = 5)	(a) M_{gain} PRR 4th, 5th, 6th text S1: 63.0, 67.8, 66.8 S2: 90.9, 69.6, 55.9 (b) M_{gain} (%) PRR 4th, 5th, 6th text S1: 3.4, 3.2, 3.6 S2: 4.0, 1.2, 1.9 (c) M_{gain} (%) PRR 4th, 5th, 6th text S1: 52.0, 42.0, 52.0 S2: 32.0, 32.0, 32.0
Yurick et al. (2006$_{Exp.\ 3}$) Multiple baseline Matched peer	Age: 9 Grade: 4 N = 6 n = 1 LD	* Baseline: 10 min sustained silent reading with third-grade text. * PRR: Same as Experiment 1, except students were trained to follow a more explicit, scripted error correction procedure. * G assessed under three conditions: CT, OT, and OTC.	10 min/39 sessions	(a) Words per minute (b) Percentage WCPM (c) Percentage correct cloze comprehension passage (n = 5)	(a) PND 3rd, 4th, 5th, 6th text S1: 90, 100, 100, 91 G CT, OT, OTC: (a) M_{gain} S1: 7, 9, 15 (b) M_{gain} (%) S1: –3.2, –0.4, –4.6 (c) M_{gain} (%) S1: 10, 10, 10

Note. WWC = meets What Works Clearinghouse group design standards without reservations; Exp. = experiment; ELL = English language learner; LD = learning disability; WCPM = words correct per minute; EPM = errors per minute; NR = not reported; CRAB = *Comprehensive Reading Assessment Battery;* HCO = high content overlap; PND = percentage of nonoverlapping data points; DORF = *Dynamic Indicators of Early Literacy Skills Oral Reading Fluency;* 1 = Experiment 1; 3 = Experiment 3; S1 = Student 1; S2 = Student 2; S3 = Student 3; SE = standard error.

Modeling by a more proficient peer. Three studies examined modeling by a more proficient peer, which yielded favorable results for improving reading rate and comprehension but were ineffective for improving accuracy. Sáenz, Fuchs, and Fuchs (2005) compared Peer Assisted Learning Strategies to a traditional reading program for English-language learners also identified with LD; results yielded small effect sizes on a standardized measure of reading rate ($g = 0.42$) and a maze comprehension task ($g = 0.46$) but a large effect size for answering comprehension questions ($g = 0.91$). Decker and Buggey (2014) used echo reading with an adult to make a video recording of each student's reading. Excerpts of the student's reading were spliced together to present a complete model of fluent reading. Video self-modeling (VSM) and video peer modeling outperformed the comparison group in mean gain of words read correctly per minute; however, VSM outperformed peer modeling in reading rate during intervention and maintenance, more than doubling the mean gain in WCPM. Oddo, Barnett, Hawkins, and Musti-Rao (2010) found peer RR in mixed-ability groups to be moderately effective for improving reading rate and comprehension on standardized passages but ineffective for improving reading accuracy.

Modeling by a matched-reading-ability peer. Four multiple-base-line studies examined peer RR with matched-reading-ability pairs. RR among struggling reader pairs showed small gains in WCPM on standardized passages (Musti-Rao, Hawkins, & Barkley, 2009). Staubitz, Cartledge, Yurick, and Lo (2005) found that RR with a matched-ability peer increased reading rate, accuracy, and comprehension on below-grade-level children's books for one student with LD; however, the student was unable to progress to grade level passages. Finally, Yurick, Robinson, Cartledge, Lo, and Evans (2006) reported three studies, two of which met inclusion criteria, examining peer RR among matched-reading-ability pairs. Unlike Staubitz et al. (2005), Experiments 1 and 3 showed gains in reading rate using below-, on-, and above-grade-level passages. Experiment 1 also showed gains in comprehension and small gains in accuracy for the 2 fifth-grade students on fourth-, fifth-, and sixth-grade passages.

Generalization to novel passages. Staubitz et al. (2005) examined generalization results in three conditions (i.e., covert timing, overt timing, and overt timing with charting performance). The overt timing condition yielded the best reading rate, when the student was aware of being timed, but comprehension and accuracy decreased. Though the covert condition (i.e., the student was unaware of being timed) yielded a lower reading rate, it provided better accuracy and comprehension gains. Experiment 3 of Yurick et al. (2006) also assessed generalization under the same conditions. Results were inconsistent; the timed and charted condition provided the greatest increase in words per minute,

but all three conditions resulted in decreased accuracy. Each condition showed similar, yet minimal, gains in comprehension.

RR Interventions With Multiple Features

Table 3 includes one group design and two multiple-base-line studies that examined RR as part of a multicomponent intervention (e.g., combined with vocabulary or comprehension instruction). In Sáenz et al. (2005) Peer Assisted Learning Strategies (i.e., one RR of text with EC, summarizing, and making predictions) outperformed the no-treatment comparison group with a large effect size on a standardized measure of comprehension questions answered correctly ($g = 0.91$) and small effect sizes on standardized measures of reading accuracy ($g = 0.42$) and a comprehension maze task ($g = 0.46$).

Tam, Heward, and Heng (2006) compared RR of a familiar passage across sessions until a performance criterion was achieved to RR of a new passage each session without a criterion. Both conditions also included vocabulary instruction and EC. Students experienced similar gains in fluency, accuracy, and comprehension in both conditions. Hitchcock, Prater, and Dowrick (2004) compared tutoring in reading fluency (TRF; i.e., echo reading to a performance criterion), tutoring in reading fluency with VSM (TRF/VSM), tutoring in reading comprehension (i.e., fluency practice activities combined with direct instruction in story elements; Tutoring Reading Comprehension [TRC]), and tutoring in reading comprehension with VSM (TRC/VSM). TRF and TRF/VSM yielded ineffective to moderately effective results for improving WCPM, whereas TRC and TRC/VSM yielded highly effective results (i.e., 100% PND). Even though the results seem to favor TRC, it may be that students' reading rates progressively increased in each phase with continued choral and echo reading practice.

Generalization to novel passages. Both conditions in Tam et al. (2006) produced minimal generalization of comprehension skill to unfamiliar passages; however, the vocabulary instruction with RR of the same passage to a performance criterion yielded greater generalization results than RR of a new passage each session (Tam et al., 2006). Generalization results in Hitchcock et al. (2004) were reported at 100% PND; however, it is unclear to which condition this is attributed.

Studies Examining Fluency Interventions Other Than RR

Table 4 includes two studies that examined fluency interventions other than RR. Esteves and Whitten (2011) found assisted audiobook reading produced greater results on a standardized measure of oral reading fluency than sustained silent reading

Table 3. Studies Examining Repeated Reading With Multiple Features.

Author/research design	Participant age or grade/sample size	Treatment conditions	Session length/ treatment duration	Dependent measures	Results/effect sizes
Hitchcock, Prater, and Dowrick (2004) Multiple baseline	Age: 6–7 Grade: 1 $N = 4$ $n = 2$ LD	* Tutoring Reading Fluency (TRF): Choral and echo reading with tutor to fluency criterion. Student read independently then discussed text-self connections and played sight word game. * TRF With Video Self-Modeling (TRF/VSM): Same as TRF but student watched 2-min video of fluent reading before tutoring. * Tutoring Reading Comprehension (TRC): Student completed TRF activities, and tutor used a graphic organizer to teach story structure. * TRC with VSM (TRC/VSM): Same as TRC but student watched 2-min video of using a story map and answering comprehension questions prior to the session. * Generalization (G) probe * Maintenance (M) probe 6 months	All conditions: 30 min/total sessions NR	(a) WCPM (b) 15 comprehension questions	PND S1: (a) TRF = 0 TRF/VSM = 29 TRC = 100 TRC/VSM = 100 G = 100 M = 100 S2: (a) TRF = 14 TRF/VSM = 71 TRC = 100 TRC/VSM = 100 G = 100 M = 100 (b) Data not collected during TRF and TRF/VSM phases.
Sáenz, Fuchs, and Fuchs (2005)[WWC] Treatment-comparison Proficient peer	Mean age: 10.9 Mean grade: 4.3 $N = 132$ $n = 20$ LD, ELL	* Peer Assisted Learning Strategies (PALS): Partner reading (one RR) with retell and error correction, summarizing, and making predictions. Text appropriate for the weaker reader. $n = 10$ * Comparison (C): Traditional reading instruction. $n = 10$	PALS: 35 min/45 sessions C: 35 min/45 sessions	(a) CRAB words correct (b) CRAB questions correct (c) CRAB maze	(a) PALS vs. C: $g = 0.42$, SE = .45 (b) PALS vs. C: $g = 0.91$, SE = .47 (c) PALS vs. C: $g = 0.46$, SE = .45
Tam, Heward, and Heng (2006) Multiple baseline	Age: 9 Grade: 3 $N = 5$ $n = 2$ LD, ELL	* Baseline: Three rereadings of passage, then five literal comprehension questions. * Story-telling: Student listened to a story and answered literal comprehension questions (used as experimental control). * Vocabulary instruction + RR new passage per session (VRR$_{new}$): Vocabulary instruction before reading, passage read once with error correction, then three rereadings followed by charting words correct per minute and comprehension scores each trial. * Vocabulary instruction + RR to a fluency criterion on same passage (VRR$_{same}$): Same as VRR$_{new}$, but same passage used across sessions until a fluency criterion was met; then a new passage was introduced. * M: Three rereadings of a passage used in the VRR$_{new}$ condition; no performance criterion was used.	35 min; duration 10/17/22 and 14/15/7 sessions per condition for S1 and S2, respectively	(a) WCPM (b) EPM (c) Percentage correct comprehension questions ($n = 5$)	(a) M$_{gain}$ VRR$_{new}$, VRR$_{same}$, M S1: 0.9, 0.3, −3.2 S2: 19.8, 34.2, 35.2 (b) M$_{decrease}$ VRR$_{new}$, VRR$_{same}$, M S1: 12.2, 16.6, 13.1 S2: 5.8, 5.0, 5.6 (c) M$_{gain}$ (%) VRR$_{new}$, VRR$_{same}$, M S1: 42, 66, 40 S2: 54, 58, 64 G: (c) M$_{gain}$ (%) VRR$_{new}$, VRR$_{same}$ S1: 10, 14 S2: 18, 30

Note. [WWC] = meets What Works Clearinghouse group design standards without reservations; LD = learning disability; ELL = English-language learner; RR = repeated reading; NR = not reported; WCPM = words correct per minute; CRAB = *Comprehensive Reading Assessment Battery*; EPM = errors per minute; S1 = Student 1; S2 = Student 2; PND = percentage of nonoverlapping data points; SE = standard error.

Table 4. Studies Examining Fluency Interventions Other Than Repeated Reading.

Author/ research design	Participant age or grade/ sample size	Treatment conditions	Session length/ treatment duration	Dependent measures	Results/ effect sizes
Esteves and Whitten[a] (2011) Treatment-comparison	Age: NR Grade: upper elementary N = 19 n = 17 LD	* Assisted Reading with Digital Audiobooks (AB): Students listened to digital books while following along with the text. n = 9 * Comparison (C): Sustained silent reading. n = 10	For both conditions: 20–30 min/32–40 sessions	(a) DORF WCPM	(a) AB vs. C: g = 1.07, SE = .49 p = .02 η² = .25
Watson, Fore, and Boon (2009) Parallel treatment	Age: 11 Grade: 4 N = 3 n = 1 LD	* Probe: Student read four frustrational-level passages for 1 min each; miscues were recorded. * Word-supply Feedback (WSF): Correct word supplied during reading for miscues and hesitations of 3 s or more. * Phonics-based Feedback (PF): Student prompted to sound out miscues, sounds modeled, and word supplied if student still didn't read it correctly.	Both conditions: 3 min/5 sessions	(a) WCPM	(a) M_gain WSF, PF S1: 24.5, 4.5

Note. NR = not reported; LD = learning disability; DORF = *Dynamic Indicators of Early Literacy Skills Oral Reading Fluency;* WCPM = words correct per minute; SE = standard error; S1 = Student 1.
[a]Effect size is reported on all sample participants as more than 50% are identified with a LD.

(g = 1.07). Watson, Fore, and Boon (2009) compared word-supply and phonics-based feedback conditions, with the word-supply condition yielding a higher mean gain in WCPM. RR was not a focus of either intervention, but the same passage was used in each condition across five sessions. Thus, results may be more representative of the effects of RR combined with word-supply or phonics-based feedback.

Studies That Examined Types and Levels of PF in RR

PF during RR ranged from stating the number of correct words or errors per minute, to supplying the correct word, to providing syllable segmentation and blending instruction. Providing minimal feedback, such as reporting a student's WCPM, may increase the reading rate when combined with RR (i.e., according to visual inspection of the student's graph; Chafouleas et al., 2004). Word supply feedback improved reading rates when combined with RR but may not improve accuracy (Nelson et al., 2004). Word supply with RR produced higher reading rates than phonics-based feedback with RR (i.e., sounding out miscues; Watson et al., 2009). RR with phrase drill EC and syllable segmentation and blending increased WCPM and decreased EPM (Daly et al., 2005). Finally, incorporating EC feedback during paired RR yielded gains in reading rate for below-, on-, and above-grade-level texts (Yurick et al., 2006).

Discussion

Researchers have investigated the effects of fluency interventions since the release of the NRP report (Morgan & Sideridis, 2006; Strickland et al., 2013; Therrien, 2004).

These syntheses were limited by design type (single subject only) or intervention (RR); furthermore, the Strickland et al. (2013) synthesis did not disaggregate data for students with LD in all studies included. The Chard et al. (2002) synthesis is the most recent synthesis of fluency interventions, including those other than RR, that focused explicitly on students with LD in Grades K through 5. The review extends the Chard et al. synthesis on fluency interventions for students with LD between January 2001 and September 2014. Given the higher research standards set forth by WWC, the goal was to identify which fluency interventions produce the most improved outcomes in reading fluency and comprehension for this population. Unfortunately, only one study met WWC group design standards without reservations (Sáenz et al., 2005). Five studies were ineligible for review because they did not use a sample aligned with the review protocol (i.e., at least 50% of the students not identified with LD; Ardoin et al., 2009; Hapstak & Tracey, 2007; Musti-Rao et al., 2009; O'Connor et al., 2007; Oddo et al., 2010). Welsch (2007) did not meet WWC pilot single-case design standards due to interassessor agreement. WWC has not reviewed the remaining 11 studies (Chafouleas et al., 2004; Daly et al., 2005; Decker & Buggey, 2014; Esteves & Whitten, 2011; Hitchcock et al., 2004; Kubina et al., 2008; Nelson et al., 2004; Staubitz et al., 2005; Tam et al., 2006; Watson et al., 2009; Yurick et al., 2006).

In general, the results of this synthesis show that RR is associated with positive outcomes in reading rate, accuracy, and comprehension (Chafouleas et al., 2004; Kubina et al., 2008; Nelson et al., 2004; O'Connor et al., 2007; Welsch, 2007). Engaging in RR is an effective intervention for improving reading fluency for students with LD. Most fluency interventions yielded some gains in comprehension

even though comprehension was not a focal point of the intervention (O'Connor et al., 2007; Oddo et al., 2010; Staubitz et al., 2005; Welsch, 2007; Yurick et al., 2006). There is also evidence that gains in rate, accuracy, and comprehension as a result of RR generalize to new texts (Ardoin et al., 2009; Chafouleas et al., 2004; Daly et al., 2005; Welsch, 2007). Additionally, the results align with previous findings of the Chard et al. (2002) synthesis and provide further evidence in support of the theory of automaticity and the verbal efficiency model (LaBerge & Samuels, 1974; Perfetti, 1980, 1985). Developing automatic processing of text through repeated practice enables students with LD to read for understanding.

Provide a Model of Fluent Reading

One method for improving the effectiveness of RR is to provide a model of fluent reading prior to practice (Ardoin et al., 2009; Daly et al., 2005; Hapstak & Tracey, 2007). The Chard et al. (2002) synthesis found that LPP, provided by an adult before RR practice, increased comprehension potentially because it allowed students to focus initially on the meaning of text. However, due to the absence of comprehension measures in the LPP/RR studies included in this synthesis, it is unclear what additional effect, if any, LPP has on comprehension of text (Ardoin et al., 2009; Daly et al., 2005; Hapstak & Tracey, 2007). Findings for the current synthesis do suggest, however, that LPP alone is not an effective intervention for improving reading fluency (Welsch, 2007).

If adult modeling is unavailable due to limited resources or time constraints, a more proficient peer could provide LPP prior to RR practice. While the results from the Chard et al. (2002) synthesis regarding peer RR were unclear, the results from the current synthesis found RR with a proficient peer to be an effective intervention for improving reading rate and comprehension (Decker & Buggey, 2014; Oddo et al., 2010; Sáenz et al., 2005). Furthermore, if struggling readers are unable to be paired with proficient readers, findings suggest improvement in rate, comprehension, and accuracy using peer RR among matched-reading-ability pairs (Musti-Rao et al., 2009; Staubitz et al., 2005; Yurick et al., 2006).

Generalization to Unfamiliar Text

Generalization measures were not taken in the studies pairing struggling readers with more proficient peers, but matched-reading-ability pairs showed some generalization of faster reading rate to unfamiliar text (Staubitz et al., 2005; Yurick et al., 2006). In some cases accuracy decreased as reading rate increased (Staubitz et al., 2005; Yurick et al., 2006). One possibility is that students are more anxious when they are aware of being timed and thus are more likely to make errors while reading. Another possibility is a tradeoff in accuracy as

reading rate increases. This suggests a point at which improving rate becomes disadvantageous as it may negatively affect reading comprehension due to an increased error rate. Across all studies, accuracy gains don't appear to generalize or maintain as well as gains in comprehension or rate (Ardoin et al., 2009; Decker & Buggey, 2014; Staubitz et al., 2005; Tam et al., 2006; Yurick et al., 2006).

Multicomponent Interventions and Assisted Audiobook Reading

While results support RR as the most effective method for improving reading fluency and comprehension, assisted reading using audiobooks and multicomponent interventions also show promise for improving reading fluency and comprehension outcomes (Esteves & Whitten, 2011; Hitchcock et al., 2004; Sáenz et al., 2005; Tam et al., 2006). Chard et al. (2002) found that a tape or computer model of fluent reading was an effective method when combined with RR practice. However, more research is needed to determine the effectiveness of assisted reading with audiobooks on fluency and comprehension outcomes. RR combined with multiple features may be effective for improving reading fluency and comprehension; students may benefit from additional instruction in comprehension and vocabulary. Peer-mediated comprehension activities, VSM, and RR to a performance criterion may produce better gains in rate and comprehension; however, it's difficult to identify the efficacy of individual components within combined intervention packages.

Other Elements That Influence Fluency Performance

Other variables that may be associated with higher levels of fluency and comprehension performance include the number of RRs, setting a performance criterion, text difficulty, VSM, and PF.

Performance criterion for RR. Consistent with the Chard et al. (2002) findings, setting a performance criterion was associated with greater gains in rate, accuracy, and comprehension than RR with no criterion (Kubina et al., 2008). Using a higher performance criterion does not differentially effect the decrement of WCPM over time; as such, gains may not be sustainable over time (Kubina et al., 2008).

Number of RRs. Also consistent with the Chard et al. (2002) findings, increasing the number of RRs yields greater reading rates (Ardoin et al., 2009). However, it does not appear to differentially effect the generalization of rate to high-content-overlap passages (Ardoin et al., 2009). While increasing the number of RRs may immediately affect performance, gains may not generalize to unfamiliar but similar texts.

Text difficulty. Using easier level text produced greater gains in comprehension, accuracy, and rate for most students, but results may depend on individual needs and should be considered on a case-by-case basis (Daly et al., 2005; Nelson et al., 2004; Staubitz et al., 2005; Welsch, 2007; Yurick et al., 2006).

VSM. Two studies found favorable results using VSM; further research should explore the impact of using VSM techniques compared to other fluent models (e.g., adult, more proficient peer; Decker & Buggey, 2014; Hitchcock et al., 2004).

PF. In the Chard et al. (2002) synthesis, correction and feedback were associated with enhanced fluency performance, but a comparison of types and levels of feedback was not discussed. The results of the current synthesis showed EC alone was ineffective for improving reading rate and accuracy (Nelson et al., 2004). PF is most effective when combined with RR; however, it remains unclear which level of PF produces better gains in reading fluency. Students with LD may require more explicit feedback to improve reading accuracy (e.g., RR with word-supply feedback versus WCPM only). It is possible that the type of PF may not matter as much as providing it in conjunction with RR.

Amount of text. Unlike the Chard et al. (2002) synthesis, no studies examined varying the amount of text used in RR practice.

Future Research

Results from this synthesis confirmed previous findings that RR is associated with improved outcomes in reading rate, accuracy, and comprehension for students with LD. Given that only one study met WWC research design standards and 11 were not yet WWC reviewed, further research of high quality and rigor as defined by the WWC guidelines is needed to resolve unanswered questions related to specific elements of RR and potentially promising interventions, such as technology-based literacy interventions or VSM. For example, studies in this corpus did not report comprehension measures when an adult modeled fluent reading. Research is also needed to compare the effects of RR with adult versus peer modeling on reading comprehension outcomes. Two studies included choral or echo RR, but the extent to which these RR variations, or a combination of these variations, affect fluency and comprehension outcomes remains unknown. There are also unanswered questions concerning which level of PF (e.g., WCPM reporting, word-supply feedback, or syllable segmentation and blending) produces the greatest gains in reading rate and accuracy when combined with RR. While RR interventions improve reading rate, there appears to be a point at which students' accuracy decreases, which may negatively affect

comprehension. Future research should investigate whether an increase in reading rate becomes counterproductive for improving reading comprehension as a result of the tradeoff in reading accuracy.

In spite of the increase in technology-based literacy interventions within the past decade (Ihnot, Matsoff, Gavin, & Hendrickson, 2001; Kennedy & Deshler, 2010), no studies examining computerized fluency interventions met the inclusion criteria of this synthesis. What effect, if any, do technology-based interventions have on reading fluency and comprehension outcomes? Esteves and Whitten (2011) yielded large effect sizes on a fluency measure when using assisted reading with digital audiobooks. However, the effect of assisted reading with RR is unclear. A comparison of assisted reading, assisted reading with RR, and RR alone on fluency and comprehension outcomes is warranted. If digital audiobooks can be used in place of adult modeling of fluent reading, this may provide teachers with greater flexibility to implement RR routines classwide.

Two studies showed promising results for VSM as a reading fluency intervention (Decker & Buggey, 2014; Hitchcock et al., 2004). Further research is needed to identify the particular aspects of self-modeling that influence reading fluency and comprehension outcomes and whether these gains are sustainable or generalizable. Furthermore, proficient peer-modeling studies did not address generalization of skill to unfamiliar text. Do the generalization results differ between proficient peer versus matched-ability-peer dyads? Finally, this body of research assumes that reading fluency precedes comprehension; however, to what extent does comprehension facilitate fluent reading?

Implications for Practice

The findings of the present synthesis support previous research that RR remains the most effective intervention for improving reading fluency for students with LD. Sustained silent reading is widely implemented as a mechanism to increase reading fluency, but it is not supported as an effective method for improving oral reading fluency. Teachers may consider using an easier level text and require students to read to a performance criterion to promote gains in fluency. When possible, teachers may also consider providing PF, such as WCPM or EPM, word-supply, or repeated practice of miscues via syllable segmentation and blending.

Teacher modeling might be the best example of fluent reading; however, this may not be feasible within a classroom context. As such, practitioners might consider implementing peer RR routines. Students with LD can be paired with more proficient readers; however, peer RR in matched-ability pairs may also improve reading fluency and comprehension when proficient readers are unavailable (e.g., resource setting). Finally, students may also benefit from multicomponent interventions that combine RR with vocabulary or comprehension instruction.

Limitations

There are several limitations to this systematic review. First, this body of research consists of primarily single-subject design studies, none of which meet WWC design standards for single-subject research. Only one identified group-design study met WWC standards without reservations. Future group design research is needed with larger sample sizes and adequate treatment duration to enhance confidence in findings, generalizability of results, and to further investigate the aspects of RR that best facilitate generalized fluency gains over time. Second, most studies used proximal measures, such as basal reading passages, to assess students' reading fluency. Thus, the extent to which fluency interventions affect reading fluency and comprehension outcomes on standardized reading measures remains unclear. Use of standardized measures in future research will also enhance confidence in findings. Third, in addition to the differences in study design, the variability of proximal measures used made it difficult to compare results across studies. It was not possible to report single-subject-design results on a common metric because some studies reported an increase in WCPM or decrease in EPM while others reported PND. Furthermore, some proximal measures contained high content overlap while others did not. Due to the limited number of studies meeting WWC standards, we did not aggregate findings across studies. In spite of these limitations, the results of this review support the use of fluency-building activities for students with LD.

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