



What's Known

April 2017

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# What is the evidence base to support reading interventions for improving student outcomes in grades 1–3?

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## Key findings

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This comprehensive review of research literature from 2002 to June 2014 assessed the evidence base supporting reading interventions in grades 1–3 to improve reading outcomes for students at risk of struggling with typical classroom reading instruction. The findings are based on studies of 20 interventions that the review team identified and determined met What Works Clearinghouse evidence standards. Among the findings:

- All but 1 of the 20 reading interventions demonstrated positive or potentially positive effects in at least one area of reading performance. Effects were strongest and most consistent in word and pseudoword reading, though several interventions also had effects in reading comprehension and passage reading fluency. No effects were found in vocabulary.
- All 11 individually administered interventions and 8 of the 9 small-group interventions had positive or potentially positive effects.
- All 20 interventions included high levels of ongoing support for teachers, paraeducators, volunteers, and other adults who worked with students.

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## Summary

Response to intervention (RTI) is a comprehensive early detection and prevention strategy used to identify and support struggling students before they fall behind. An RTI model usually has three tiers or levels of support. Tier 1 is generally defined as classroom instruction provided to all students, tier 2 is typically a preventive intervention offered to students who fall behind when given only classroom instruction, and tier 3 is more intensive intervention offered to students who failed to respond to the supports in tiers 1 and 2.

This review provides updated information on the evidence supporting the use of reading interventions for students who are at risk of reading difficulty in grades 1–3. The review was conducted by Regional Educational Laboratory Southeast in response to discussions with members of its Improving Literacy Research Alliance. Alliance members became even more interested in the topic after a recently completed national evaluation using intensive reading interventions in an RTI model failed to show positive impacts for students who scored at or slightly below the score that would make them eligible for RTI services in their school (Balu et al., 2015).

The review team conducted a comprehensive review of the research literature from 2002 (the year that the No Child Left Behind Act went into effect and triggered large-scale national implementation of reading interventions) to June 2014, when this study started. The purpose of the review was to assess the current evidence base on the use of reading interventions for improving student outcomes in grades 1–3. The review was limited to studies of tier 2 interventions, those designed to provide preventive services to students at risk of struggling with typical classroom reading instruction. It did not include studies whose subject was intensive (tier 3) intervention—that is, studies geared to students who require more than tier 2 support.

The literature search and review identified 27 efficacy studies<sup>1</sup> that the review team determined met What Works Clearinghouse (WWC) evidence standards either with or without reservations (What Works Clearinghouse, 2014a). Of the 27 studies, 23 compared the performance of students who received the intervention with the performance of students who did not. (Some interventions were examined in more than one study, and some studies examined more than one intervention.) The remaining four studies either explored variations in components of one specific intervention or contrasted two interventions, without a control condition. Of the 23 studies that compared students who did and those who did not receive the intervention, 15 studies examined 13 interventions in grade 1, and 8 studies examined 7 interventions in grades 2 and 3. Although this report relies heavily on WWC protocols, procedures, and standards, and WWC-certified reviewers conducted the reviews, this report is not a WWC product.

Key findings from the 23 efficacy studies of the 20 interventions include:

- All but 1 of the 20 interventions demonstrated positive or potentially positive effects in at least one of the four areas of reading performance: word and pseudoword<sup>2</sup> reading, passage reading fluency, reading comprehension, and vocabulary. Effects were strongest and most consistent in word and pseudoword reading, though some interventions also had effects in reading comprehension and passage reading fluency. No effects were found in vocabulary.

- All 11 of the individually administered interventions and 8 of 9 of the small-group interventions resulted in positive or potentially positive effects.
- All 20 interventions included high levels of ongoing support for the teachers, paraeducators, volunteers, and other adults who worked with students.

Though the reviewed studies showed that 19 of the 20 reading interventions were effective, most of the interventions included a component that is atypical of current school practice: ongoing support for the interventionist (the teacher, paraeducator, or member of the research staff responsible for delivering the intervention). In addition, the majority of interventions involved individual (one-on-one) interventions, as opposed to typical school implementations, which involve small groups of three to five students. When considering how to use these findings, it is important to consider that these studies do not reflect typical school practice, where weekly or biweekly monitoring of fidelity of implementation and onsite coaching are rarely available.

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## **Why this review?**

Over the past 15 years, U.S. schools have engaged in efforts to prevent reading failure through early intervention in grades 1–3, a system known as response to intervention (RTI). Using brief screening measures, educators identify students in grades 1–3 who are likely to experience difficulty learning to read with typical classroom instruction and provide them with 20–40 minute interventions, generally in small groups. By intervening early and using evidence-based practices whenever possible, educators hope to reduce the reading failure rate. Reading instruction provided to all students in a class is generally defined as tier 1. Preventive intervention is often called tier 2; students who fail to respond to that receive more intensive intervention, defined as tier 3.

Although several states initiated early reading interventions more than 15 years ago, large-scale national implementation began only after Congress passed the No Child Left Behind Act (2002) and was further encouraged after Congress passed the Individuals with Disabilities Education Act (2004). Both laws called on schools to use research-based practices. Therefore, many stakeholders were deeply interested in the nature of the evidence base on effective reading interventions for students in grades 1–3.

This review provides updated information on the extent of evidence available to support the use of reading interventions for students who are at risk of reading difficulty in grades 1–3, especially evidence of whether effects could be seen beyond grade 1 and in more complex areas of reading such as reading comprehension. Regional Educational Laboratory Southeast conducted this review in response to discussions with members of its Improving Literacy Research Alliance. Alliance members were even more interested in the topic after a recently completed national evaluation using intensive reading interventions in an RTI model failed to show positive impacts for students who scored at or slightly below the score that would make them eligible for RTI services in their school (Balu et al., 2015).

This comprehensive review covers research literature from 2002 to June 2014 to assess the evidence base for reading interventions for improving student reading outcomes in grades 1–3. These grades were chosen because, unlike in studies of interventions for kindergartners, the outcome measures include measures of actual reading performance rather than measures of reading-related skills such as phonological awareness, letter naming, or listening comprehension. Since the goal of this research synthesis was to report on impacts on students' reading performance, effects on phonological awareness were included only if they were accompanied by growth in actual reading outcomes. The goal of this report is to provide school and district administrators, school psychologists, school counselors, special education teachers, reading specialists, and interventionists (the teachers, paraeducators, or members of the research staff responsible for delivering the intervention) with a summary of the evidence that supports the use of reading interventions in grades 1–3. The review was limited to studies of interventions, those designed to provide preventive services to students at risk for reading difficulties (tier 2 interventions). It did not include studies involving more intensive interventions geared to students who require more than tier 2 support (tier 3 interventions).

***This comprehensive review assesses the evidence base for reading interventions for improving student reading outcomes in grades 1–3***

## What the review examined

This review used a systematic process modeled after the What Works Clearinghouse (WWC) study review process, Version 3.0 (What Works Clearinghouse, 2014a). Although the review relied heavily on WWC protocols, procedures, and standards and was conducted by WWC-certified reviewers, this report is not a WWC product.

The review addressed one primary research question:

- What rigorous evidence exists that reading interventions for grades 1–3 demonstrate a positive effect on students' reading performance in the four areas of reading performance (word and pseudoword<sup>3</sup> reading, passage reading fluency, reading comprehension, and vocabulary)?<sup>4</sup>

To better understand the nature of the interventions studied, the review also addressed three descriptive research questions:

- On what areas of reading or reading-related skills did the interventions focus?
- What proportion of the interventions used small groups, and how many interventions were conducted individually? Were effects similar?
- What level of training did the interventionists receive for implementing the intervention?

The review team then analyzed the studies that it determined met WWC evidence standards in three ways:

1. By calculating the average effect size for each of the four areas of reading performance according to WWC procedures to determine the impact of each intervention.
2. By calculating weighted mean effect sizes to gauge the impact of reading interventions across all the interventions for students in grade 1 and in grades 2 and 3.
3. By examining the descriptions of the interventions and cataloging the intervention characteristics to look for patterns that might explain the impacts.

If an effect is statistically significant, it is highly unlikely that the result was due to chance. Statistical significance thus indicates whether an intervention is effective but not how effective it is. For that reason, researchers increasingly use effect size to gauge how effective the intervention is. An intervention with an effect size of 0.40 is roughly twice as effective as one with an effect size of 0.20. To show how effective each intervention is, an average effect size can be calculated by averaging the effect on each outcome in each area of reading for each intervention. This review indicates which interventions were found to demonstrate a statistically significant average effect in any of the four areas of reading, which interventions demonstrated a potentially positive<sup>5</sup> average effect with an effect size greater than 0.25 that was not statistically significant, and which interventions failed to produce such an effect (see box 1 for definitions of the ratings).

The review also presents weighted mean effect sizes, which combine all the average effect sizes for interventions that measured an area of reading, to gauge how effective the full set of grade 1 or grade 2 and 3 interventions were in improving student performance in word and pseudoword reading, passage reading fluency, reading comprehension, and vocabulary.

*Although this review used a systematic process modeled after the What Works Clearinghouse (WWC) study review process, this report is not a WWC product*

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## Box 1. Intervention effects terminology used in this review

**Positive effect.** An intervention resulted in the treatment group performing better than the comparison group by a statistically significant margin in at least one area of reading in at least one study.

**Potentially positive effect.** An intervention resulted in the treatment group performing better than the comparison group in at least one study, with at least one area of reading having an effect size greater than 0.25 that was not statistically significant.

**Negative effect.** An intervention resulted in the comparison group performing better than the treatment group by a statistically significant margin in at least one area of reading in at least one study.

**Potentially negative effect.** An intervention resulted in the comparison group performing better than the treatment group in at least one study, with at least one area of reading having an effect size less than  $-0.25$  that was not statistically significant.

**Inconclusive result.** An intervention did not result in any statistically significant effect size or an effect size greater than 0.25 or less than  $-0.25$  between the two groups in any area of reading in any study.

**Source:** Adapted from What Works Clearinghouse (2014a).

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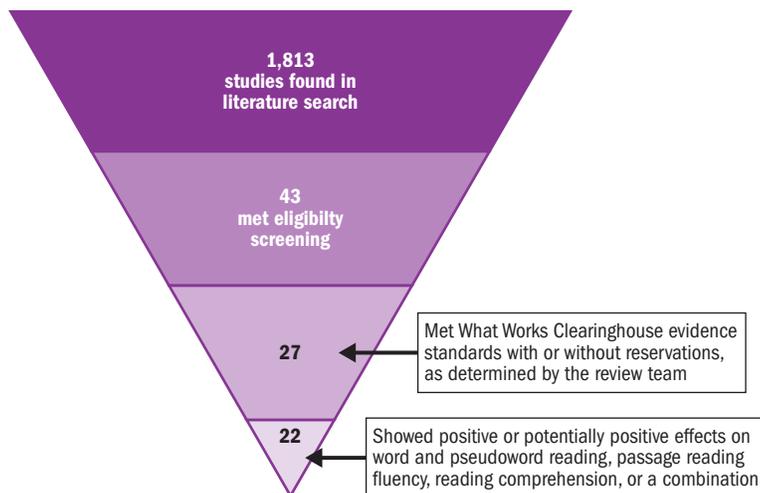
The calculation weights each average based on the number of participants involved in the study; therefore, a study with 20 participants would not count as much as one with 120 participants.

The initial literature search identified 1,813 studies, which were then screened to determine whether they were relevant to the review. The screening identified 43 studies that examined tier 2 interventions to improve reading outcomes for grade 1–3 students at risk of reading difficulty that were published between 2002 and June 2014, were conducted in the United States, and used an experimental or quasi-experimental design (see appendix A for details on the search, screening, and review process and appendix B for a list of the 43 studies that met eligibility screening). Experimental and quasi-experimental studies that are done under tightly controlled conditions with careful monitoring of implementation and a good deal of support for interventionists are called efficacy studies. Those that are conducted in situations more aligned with typical school practice are called effectiveness trials.

Of the 43 studies that met eligibility screening, the review team determined that 27 efficacy studies<sup>6</sup> met WWC evidence standards (Version 3.0) either with or without reservations (figure 1; see appendix C for summary tables describing the studies that met WWC evidence standards) and that 16 studies did not (see table A1 in appendix A). Of the 27 studies that the review team determined met WWC evidence standards, 23 examined the impact of an intervention by comparing the performance of students who received the intervention with the performance of students who did not (a control condition). The 23 studies examined 20 reading interventions (some interventions were examined in more than one study, and some studies examined more than one intervention). This report focuses on the characteristics and findings of the 20 interventions that had studies that the review team determined met WWC standards.

**The 27 studies that the review team determined met WWC evidence standards examined 20 reading interventions. This report focuses on the characteristics and findings of those 20 interventions**

**Figure 1. The review team determined that 27 studies met What Works Clearinghouse evidence standards and that 22 studies demonstrated positive or potentially positive effects of 19 reading interventions on reading performance**



**Note:** Vocabulary was included in the search, but no studies found positive or potentially positive effects.

**Source:** Authors' analysis of primary data collected for the review; see appendix A.

The remaining 4 studies (that is, 4 of the 27 studies that met WWC evidence standards) either explored variations in components of one specific intervention (see table C3 in appendix C) or contrasted two interventions without a control condition (see table C4 in appendix C). Findings from these four studies are used for supplemental purposes. This report, however, focuses on the impact of the 20 interventions from the 23 studies.

***Of the 20 interventions, 19 produced positive or potentially positive effects in at least one area of reading; none had negative effects***

### What the review found

Of the 20 interventions represented in the 23 studies that the review team determined met WWC standards, 19 produced positive or potentially positive effects in at least one area of reading; none had negative effects (see figure 1).

#### **Twelve of the thirteen grade 1 interventions and all seven grade 2 and 3 interventions had positive or potentially positive effects**

Thirteen were grade 1 interventions. Of these, eight produced positive effects in at least one of the four areas of reading performance, and four produced effects considered potentially positive in at least one of the four areas of reading performance. Four of the 12 also had inconclusive findings in another area of reading. One of the 13 interventions had only inconclusive findings (and no positive or potentially positive effects; table 1).

Five of the seven grade 2 and 3 interventions produced positive effects, and two produced only potentially positive effects. None resulted in only inconclusive findings (table 2).

**Table 1. Effects of grade 1 reading interventions by area of reading performance**

Intervention	Word and pseudoword reading	Passage reading fluency	Reading comprehension	Vocabulary <sup>a</sup>
<b>Positive effects</b>				
Early Literacy Tutoring Program (Allor & McCathren, 2004)	●	■	●	
Intensive Tutorial Intervention (Scanlon, Vellutino, Small, Fanuele, & Sweeney, 2005)	●		●	
Interactive Strategies (Vellutino & Scanlon, 2002)	●			
Phonics-based Early Reading Intervention (Vadasy & Sanders, 2011)	●	●	○	
Reading Recovery (Schwartz, 2005)	●		■	
Researcher-modified Sound Partners (Jenkins, Peyton, Sanders, & Vadasy, 2004)	●		●	
Responsive Reading Instruction (RRI; Denton et al., 2010)	●		●	
University of Florida Literacy Initiative (Lane, Pullen, Hudson, & Konold, 2009)	●			
<b>Potentially positive effects</b>				
BRIC Supplemental Intervention (Wang & Algozzine, 2008)	○		■	
Combination of Foundations, Responsive Reading Instruction, and Read Naturally (Case et al., 2010, 2014)	○	■		
Reading intervention developed by Fuchs, Compton, Fuchs, Bryant, & Davis (2008)	○			
Volunteer Tutoring (Pullen, Lane, & Monaghan, 2004)	○			
<b>Inconclusive results</b>				
Reading intervention developed by Wanzek & Vaughn (2008)	■	■		

● Produced positive effects. ○ Produced potentially positive effects. ■ Produced inconclusive results.

a. No grade 1 interventions had outcome measures in vocabulary.

**Source:** Authors' analysis of primary data collected for the review; see appendix A.

### Among the four areas of reading, effects were strongest and most consistent in word and pseudoword reading

Weighted mean effects were strongest in word and pseudoword reading (0.452 for grade 1 interventions and 0.456 for grade 2 and 3 interventions; figure 2; see also tables D1 and D2 in appendix D). Twelve of the thirteen grade 1 interventions and all of the seven grade 2 and 3 interventions had studies that found positive or potentially positive effects in word and pseudoword reading (see tables C1 and C2 in appendix C). Word and pseudoword reading also had the most consistent results; only one grade 1 intervention had a study with inconclusive findings.

More than half of the grade 1 interventions and all but one of the grade 2 and 3 interventions were assessed using a reading comprehension measure. For grade 1 interventions, effects were lower in reading comprehension (0.386) than in word and pseudoword reading (0.452) but higher than in passage reading fluency (0.226). For grade 2 and 3 interventions,

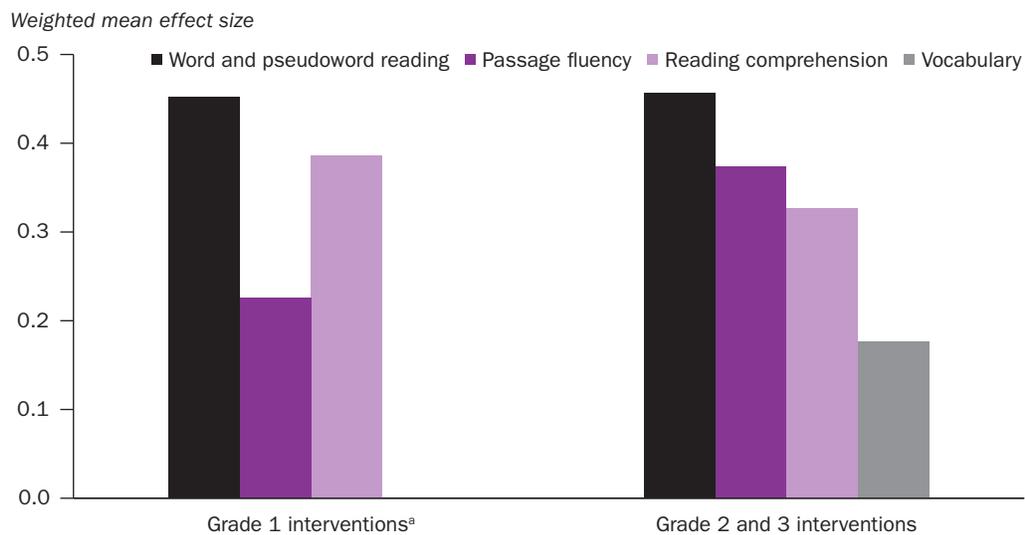
**Table 2. Effects of grade 2 and 3 reading interventions by area of reading performance**

Intervention	Word and pseudoword reading	Passage reading fluency	Reading comprehension	Vocabulary
<b>Positive effects</b>				
Explicit, sequential instruction in word reading and comprehension (Denton, Fletcher, Taylor, Barth, & Vaughn, 2014)	●	●	○	
Guided Reading (Denton et al., 2014)	●	■	■	
Reading intervention developed by Blachman et al. (2004)	●	●	●	
Reading Mastery/Corrective Reading (Gunn, Smolkowski, Biglan, Black, & Blair, 2005)	●	■	●	■
Reading to an adult listener (O'Connor, Swanson, & Geraghty, 2010)	○	●	○	■
<b>Potentially positive effects</b>				
Before/After School Reading Club (Berninger, Abbott, Vermeulen, & Fulton, 2006)	○			
Paraeducator-supplemented instruction (Vadasy, Sanders, & Peyton, 2006; Vadasy, Sanders, & Tudor, 2007)	○	○	○	

● Produced positive effects. ○ Produced potentially positive effects. ■ Produced inconclusive results.

Source: Authors' analysis of primary data collected for the review; see appendix A.

**Figure 2. For both grade 1 reading interventions and grade 2 and 3 reading interventions, weighted mean effect sizes were highest for word and pseudoword reading**



a. No grade 1 interventions had outcome measures in vocabulary.

Source: Authors' analysis of primary data collected for the review; see appendix A.

the weighted mean effects in reading comprehension (0.327) were lower than those for word and pseudoword reading (0.456) and passage reading fluency (0.374). Of the seven grade 1 interventions with a measure of reading comprehension, four had positive effects, and one had a potentially positive effect. For the six grade 2 and 3 interventions with a reading comprehension measure, two had positive effects, and three had potentially positive effects. Thus, some evidence suggests that these interventions often have positive effects in reading comprehension.

The effects were lower in passage reading fluency (0.226) than in word and pseudoword reading and reading comprehension for grade 1 interventions. For grade 2 and 3 interventions, the effects in passage fluency (0.374) were lower than those for word and pseudoword reading, but higher than those for reading comprehension. The weighted mean effect size in passage reading fluency was significant for grade 1 interventions delivered individually but not for grade 1 interventions delivered in small groups (see table D1 in appendix D). Four of the grade 1 interventions included a measure of passage reading fluency: one had positive effects, and three had inconclusive findings. Six of the grade 2 and 3 interventions included a measure of passage reading fluency: three had positive effects, one had potentially positive effects, and two had inconclusive findings. Thus, evidence of effectiveness in passage reading fluency is limited.

Although most interventions included a vocabulary component, vocabulary was not assessed at all in grade 1 and was assessed in only two studies of grade 2 and 3 interventions. The grade 2 and 3 interventions had a mean weighted effect size that was not statistically significant for vocabulary.

#### **Both individually administered and small-group interventions had positive or potentially positive outcomes**

Eight of the thirteen grade 1 interventions and three of the seven grade 2 and 3 interventions were administered individually, meaning that students met one on one with an interventionist (figure 3). All 11 of the interventions that were administered individually had positive or potentially positive effects for both grade 1 and grades 2 and 3.

Five of the thirteen grade 1 interventions and four of the seven grade 2 and 3 interventions were administered in small groups (figure 4). All but one of the grade 1 interventions that were administered in small groups had positive or potentially positive effects.

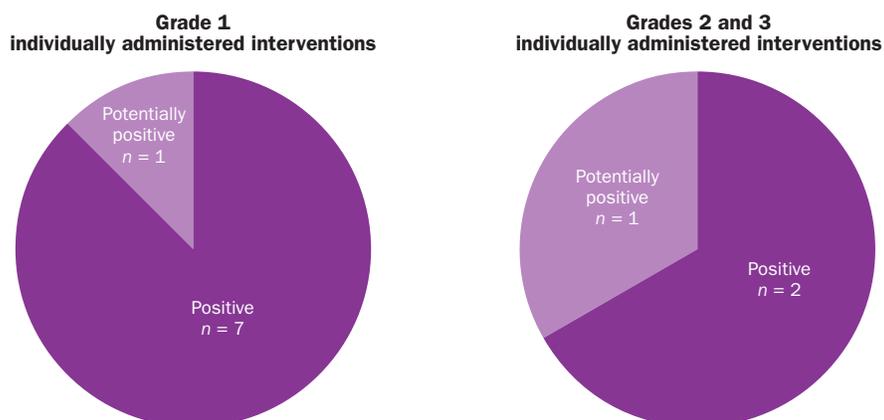
Two studies examined whether grouping structure (that is, individually administered or small-group structures) had an effect on the findings (see table C3 in appendix C). Schwartz et al. (2012) found that grade 1 students who received the Reading Recovery intervention individually (as it is intended to be delivered) performed better than students who received the intervention in small groups. Vaughn et al. (2003) found no difference between the performance of grade 2 students who received a tier 2 reading intervention individually and grade 2 students who received the same intervention in small groups.

#### **All grade 1 and grade 2 and 3 interventions covered multiple areas of reading**

All but one intervention included approximately 10–15 minutes devoted to systematic work in decoding (occasionally including sight word practice), and all devoted approximately

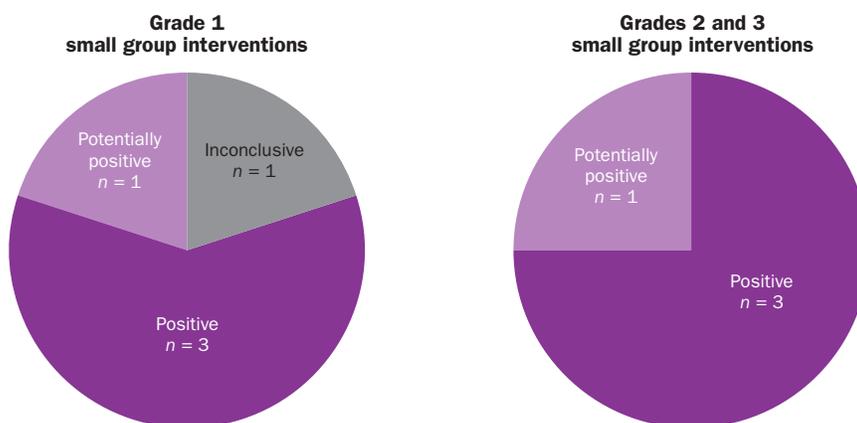
*All of the interventions that were administered individually had positive or potentially positive effects for both grade 1 and grades 2 and 3. All but one of the grade 1 interventions that were administered in small groups had positive or potentially positive effects*

**Figure 3. All individually administered reading interventions had positive or potentially positive outcomes for both grade 1 and grades 2 and 3**



Source: Authors' analysis of primary data collected for the review; see appendix A.

**Figure 4. Small-group reading interventions had positive or potentially positive effects in all but one case for grade 1 and in all cases for grades 2 and 3**



Source: Authors' analysis of primary data collected for the review; see appendix A.

10–15 minutes to passage or sentence reading, sometimes including occasional questions to see whether students understood what they were reading. This pattern was fairly similar across grade levels and group sizes (tables 3 and 4).

A larger proportion of time was spent on vocabulary development, comprehension instruction, and encoding (spelling) in the grade 2 and 3 interventions than in the grade 1 interventions. Slightly fewer than half of the interventions included a writing component.

None of the variations in lesson content contributed to a meaningful classification system for intervention types. In many respects, the interventions appeared to be similar to each other, although session length, group size, and amount of training varied, with Reading Recovery requiring far more training than the others. A mix of teachers, paraprofessionals, and research staff administered the interventions. The amount of training varied

*All but one intervention included approximately 10–15 minutes devoted to systematic work in decoding, and all devoted approximately 10–15 minutes to passage or sentence reading. This pattern was similar across grade levels and group sizes*

**Table 3. Characteristics of grade 1 reading interventions**

Intervention	Grouping	Time		Academic area of instruction						Implementation				
		Intensity and duration (intended implementation)	Total instructional time (approximate hours)	Decoding	Passage reading	Vocabulary	Reading comprehension	Phonological awareness	Writing	Encoding	Scripted	Interventionist	Hours of training	Ongoing support
BRIC Supplemental Intervention (Wang & Algozzine, 2008)	Small group	10–15 minute sessions, 5 days per week, for 22 weeks	23	✓	✓			✓			✓	P	nr	✓
Combined Foundations, Responsive Reading Instruction, and Read Naturally (Case et al., 2010, 2014)	Small group	40 minute sessions, 3 days per week, for 11–12 weeks	15–16	✓	✓	✓	✓	✓		✓	✓	R	20	✓
Early Literacy Tutoring Program (Allor & McCathren, 2004)	Individual	15–20 minute sessions, 3–4 days per week, for 17 weeks	10–14	✓	✓		✓	✓	✓	✓	✓	P	3	✓
Intensive Tutorial Intervention (Scanlon et al., 2005)	Individual	30 minute sessions, 5 days per week, for 30 weeks	75	✓	✓		✓	✓	✓		nr	T	35 <sup>a</sup>	✓
Interactive Strategies (Vellutino & Scanlon, 2002)	Individual	30 minute sessions, 5 days per week, for 16–32 weeks	39–78	✓	✓		✓	✓	✓			T	30	✓
Phonics-based Early Reading Intervention (Vadasy & Sanders, 2011)	Individual	30 minute sessions, 4 days per week, for 20 weeks	33	✓	✓					✓	✓	P	2	✓
Reading intervention developed by Fuchs et al. (2008)	Small group	45 minute sessions, 4 days per week, for 9 weeks	27	✓	✓					✓		R	nr	
Reading intervention developed by Wanzek & Vaughn (2008) <sup>b</sup>	Small group	30 minute sessions, 5 days per week, for 10 weeks	25	✓	✓		✓			✓	✓	R, P	15	✓
Reading Recovery (Schwartz, 2005)	Individual	30 minute sessions, 5 days per week, for 12–20 weeks	40	✓	✓	✓	✓		✓			T	nr <sup>c</sup>	✓
Researcher-modified Sound Partners (Jenkins et al., 2004)	Individual	30 minute sessions, 4 days per week, for 25 weeks	46	✓	✓					✓	✓	P	3	✓
Responsive Reading Instruction (Denton et al., 2010)	Small group	40 minute sessions, 5 days per week, for 25 weeks	62	✓	✓		✓	✓	✓	✓		T	18	✓
University of Florida Literacy Initiative (Lane et al., 2009)	Individual	32–38 min sessions, 3–4 days per week, for 10 weeks	23	✓	✓	✓	✓	✓	✓	✓		R	12	✓
Volunteer Tutoring (Pullen et al., 2004)	Individual	15 minute sessions, 3 days per week, for 12 weeks	9.5	✓	✓	✓	✓					P	4	✓

nr is not reported. T is certified teacher. R is researcher. P is paraprofessional.

a. Five-day workshop; estimated seven hours per day.

b. Intervention resulted in inconclusive findings.

c. Certified Reading Recovery interventionists receive at least a year of graduate-level training and ongoing professional development.

**Source:** Authors' analysis of primary data collected for the review; see appendix A.

**Table 4. Characteristics of grade 2 and 3 reading interventions**

Intervention	Grouping	Time		Academic area of instruction						Implementation				
		Intensity and duration (intended implementation)	Total instructional time (approximate hours)	Decoding	Passage reading	Vocabulary	Reading comprehension	Phonological awareness	Writing	Encoding	Scripted	Interventionist	Hours of training	Ongoing support
Before/After School Reading Club (Berninger et al., 2006)	Small group	60 minute sessions, 2 days per week, for 22 weeks	44	✓	✓				✓	✓		T, R	nr	nr
Explicit, sequential instruction in word reading and comprehension (Denton et al., 2014)	Small group	45 minute sessions, 4 days per week, for 23–25 weeks	59	✓	✓	✓	✓			✓	✓	P	27	✓
Guided Reading (Denton et al., 2014)	Small group	45 minute sessions, 4 days per week, for 23–25 weeks	59	✓	✓	✓	✓		✓	✓		P	27	✓
Paraeducator-supplemented instruction (Vadasy et al., 2006, 2007)	Individual	30 minute sessions, 4 days per week, for 15–20 weeks	32 <sup>a</sup>	✓	✓		✓			✓	✓	P	3	✓
Reading intervention developed by Blachman et al. (2004)	Individual	50 minute sessions, 5 days per week, for 28 weeks <sup>b</sup>	105	✓	✓	✓	✓	✓	✓	✓		T	45	✓
Reading Mastery/Corrective Reading (Gunn et al., 2005) <sup>c</sup>	Small group	30 minute sessions, 3–5 days per week, for 2 years	nr	✓	✓			✓		✓	✓	P	10	✓
Reading to an adult listener (O'Connor et al., 2010)	Individual	15 minute sessions, 3 days per week, for 20 weeks	15		✓	✓						P	2	

nr is not reported. T is certified teacher. R is researcher. P is paraprofessional.

**a.** Average hours across three studies with this intervention.

**b.** Daily 30 minute sessions for six to seven months during the first year, nine months during the second year, three 30 minute sessions per week for five weeks during the summer between years 1 and 2.

**c.** Includes parent education for some parents and social behavior training for some students; also K–4.

**Source:** Authors' analysis of primary data collected for the review; see appendix A.

dramatically, from 4 hours to 45 hours, and all but two of the interventions included ongoing support for the interventionists.

Two studies explored variations in content covered in two interventions. Lane et al. (2009) examined variations of the grade 1 intervention developed as part of the University of Florida Literacy Initiative by deleting one of three components. That study found that when the decoding component was excluded, the intervention was no longer effective. However, deleting either the writing or the text structure (a form of comprehension instruction) component did not reduce the effect. Scanlon et al. (2005) varied the amount of decoding instruction per session in the Intensive Tutorial Intervention and found that tripling the amount of decoding time per lesson (from 5 minutes to 15) did not increase the effect significantly.

### All interventions included implementation support

In all cases, the interventionist received some training prior to implementing the intervention, as well as some training over the course of the implementation or feedback or coaching after being observed implementing the intervention. Most of the interventions included scripts or detailed outlines specifying what the interventionist must say and do during each lesson. The type of person who served as the interventionist varied from study to study and included paraeducators/adult volunteers, certified teachers, and graduate students/researchers. All interventions were administered with a large amount of support for interventionists.

### Interventions varied in length

Most of the grade 1 interventions and grade 2 and 3 interventions with positive or potentially positive effects were implemented for 30–45 minutes a day, four to five days a week for 12–25 weeks. One was implemented for as much as 50 minutes a day, five days a week for 28 weeks (Blachman et al., 2004), and one was implemented for as few as 15 minutes a day, three days a week for 12 weeks (Pullen et al., 2004). Only one study (Denton et al., 2014) examined variations in an intervention’s duration and intensity; it found inconclusive results.

## Implications of the findings

The majority of interventions with studies that the review team determined met WWC standards had positive or potentially positive effects in at least one area of reading performance. Early interventions (particularly in grade 1) can lead to positive effects in word and pseudoword reading and in reading comprehension. Too few studies assessed passage reading fluency or vocabulary to draw any inferences.

However, the conditions in most of the studies do not reflect common RTI practice in schools (Balu et al., 2015), which is almost always small-group instruction rather than the individual instruction provided in the majority of grade 1 interventions examined in the identified studies. These results do not suggest that individual instruction is superior to small-group instruction, but only that researchers have done far more research on this approach, especially in grade 1. Also, virtually all studies included in this review indicated that a lot of ongoing support was provided for implementation. It is unclear how generalizable these findings are when the typical amount of ongoing support for interventionists is far more limited in practice.

***All interventionists received some training prior to implementing the intervention, as well as over the course of the implementation; all interventions were administered with a large amount of support for interventionists***

### **Early intervention in reading that includes decoding words and passage reading is an evidence-based practice**

Twenty-two of the studies that were reviewed provide evidence for the use of tier 2 interventions in reading for students who are falling behind in grades 1–3. There is some evidence that the most promising interventions devote time to decoding words and to passage reading. Two studies examined the impact of including different amounts of decoding practice. Both suggest that, although time for decoding is likely very useful for students who are still learning to associate sounds with letters, doubling or tripling the amount of time may not necessarily be helpful (Lane et al., 2009; Scanlon et al., 2005).

### **Interventions will most likely improve word and pseudoword reading in grades 1–3**

In general, effects were most prevalent and strongest in word and pseudoword reading for both grade 1 interventions and grade 2 and 3 interventions. Results were also positive but less prevalent for reading comprehension at both grade levels. Results for passage reading fluency were positive only for grade 2 and 3 interventions. Very few studies looked at vocabulary, and none found effects in that area.

### **Both small-group and individually administered interventions demonstrated positive effects**

Slightly more than half of the interventions (11 of the 20) examined in studies that met WWC evidence standards were administered individually, but results of both small-group and individually administered interventions were found to have positive or potentially positive effects in at least one area of reading—with only one exception.

### **Research has not examined less intensive support for interventionists**

The majority of interventions studied provided a large amount of ongoing support for interventionists. Because studies of interventions with less support were not found during the search process, no conclusions can be drawn regarding levels of support.

## **Limitations of the review**

The findings are based on a large body of research, but some types of research literature that may be relevant to the field were excluded from the review, including gray literature (dissertations and reports from school districts, state departments, or commercial publishers).

This search excluded interventions that were shorter than eight hours and those that targeted a specific student population (such as English learner students or students with disabilities). These interventions may be relevant to the concerns of other districts. For information on interventions for English learner students, see Baker et al. (2014). For information on interventions for students with disabilities, see the WWC website (<http://ies.ed.gov/ncee/wwc/FWW/Results?filters=,Children-Youth-with-Disabilities>).

The literature search concluded in June 2014. More recent research may provide additional information relevant to RTI practice in reading, as well as WWC intervention reports and single-case study reviews. Relevant WWC resources on this topic, which include a Single

*In general, effects were most prevalent and strongest in word and pseudoword reading for both grade 1 interventions and grade 2 and 3 interventions*

Study Review of a Reading Recovery study, are available on the WWC website (<http://ies.ed.gov/ncee/wwc/Study/32027>).

Many other reading interventions exist beyond those presented here. Only interventions with studies that the review team determined met WWC evidence standards, Version 3.0, with or without reservations are included here. This report highlights these interventions because the research evidence is of the highest quality in determining the intervention's effect on student achievement, which is just one, albeit important, piece of evidence to consider when deciding whether to adopt an intervention.

The effect size calculations are limited to the small number of studies that met WWC evidence standards. A larger number of studies would increase the accuracy and decrease the variability of the results. As research continues to make progress in evaluating RTI and reading, summaries like the current review should be updated.

Studies that the review team rated as meeting WWC evidence standards can provide scientific evidence to support the intervention only as implemented in the study, with the sample and setting specified in the study. Although results suggest that many reading interventions are effective, most of the interventions included ongoing support for interventionists, a situation not typical of current school practice. Additionally, the majority involved individual (one-on-one) interventions, as opposed to typical school implementations, which usually involve small groups of three to five. When considering how to use these findings, it is important to remember that these studies do not reflect typical school practice, but rather tightly controlled implementation with a high degree of support for the interventionists.

## Appendix A. The search, screening, and review process

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This appendix describes the literature search, screening, and review processes used in this report.

### Literature search

To locate potentially eligible studies, the review team conducted a literature search using the following steps:

- A keyword search (see box A1 for keywords) was conducted using the following databases:
  - Academic Search Premier.
  - Campbell Collaboration.
  - Educator’s Reference Complete.
  - ERIC.
  - PsycINFO.
  - Social Sciences Citation Index.
  - WorldCat.
- The review team also solicited key researchers (for example, Stephanie Al-Otaiba, Scott Baker, Don Compton, Michael Coyne, Jack Fletcher, Barbara Foorman and Florida Center for Reading Research staff, Doug and Lynn Fuchs, and Sharon Vaughn) for recommendations of studies likely to meet eligibility criteria.

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### Box A1. Keywords used in database searches

#### Reading words

Reading  
Literacy  
Fluency  
Decoding  
Vocabulary  
Comprehension  
Reading ability  
Reading proficiency  
Reading achievement

#### Response to intervention and intervention

Reading intervention  
RTI  
Response to intervention  
Response to instruction  
Tier 2 intervention  
Tier 3 intervention  
Tutoring  
Small-group instruction  
One-on-one instruction  
Intensive intervention

#### At-risk students

At-risk  
Continued risk  
Non-responders  
Responders  
Reading difficulties  
Reading disabilities  
Struggling readers

#### Grade

Grade 1  
First grade  
Grade 2  
Second grade  
Grade 3  
Third grade  
Primary grades  
Elementary grades  
Early elementary grades  
Early literacy

#### Location

United States

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- The references of meta-analyses, literature reviews focused on reading interventions for grades 1–3, and What Works Clearinghouse (WWC) intervention reports in beginning reading were reviewed and cross-referenced with the previous results of the literature search to identify any additional studies that might not have been captured.

### Screening process and study eligibility criteria

The study abstracts and full reports of the 1,813 studies identified through the literature search were screened for eligibility. Studies that were eligible for review met the following relevancy criteria:

**Study design.** Studies used a randomized controlled trial or quasi-experimental design.

**Topic.** Studies examined a small-group or individual (one-on-one) intervention program aimed at helping students who are considered at risk of reading difficulties. The intervention was not required to be a part of a fully developed response to intervention or multi-tiered system of support.

**Publication status and date.** Studies were published in a peer-reviewed journal between January 1, 2002, and June 30, 2014.

**Sample.** Studies included a student sample that met the following criteria:

- **Grade levels.** The students at risk of reading difficulties in the study sample were in grades 1–3. The review did not include studies that contained students in other grades (such as K or upper elementary) unless the study findings disaggregated the results of students in eligible grades or students in eligible grades represented more than 50 percent of the aggregated mixed-age sample.
- **General education students.** At least 60 percent of the students in each study were general education students and not classified as an English learner student or a student with disabilities.
- **Location of the intervention.** The samples all resided in the United States or its territories.
- **Achievement level.** Students were considered at risk of reading difficulties if they met one of the following criteria:
  - A score on either a valid screener (such as AIMSweb or Dynamic Indicators of Basic Early Literacy Skills Next) or screening battery (such as the Texas Primary Reading Inventory; Foorman, Fletcher, & Francis, 2014) indicated that the student was likely to be at risk at the end of the school year.
  - A score on a norm-referenced standardized test (such as Woodcock Reading Mastery) indicated that a student performed below the 40th percentile at the beginning of the school year or the end of the previous school year.

**Type of intervention.** Studies had to include certain types of interventions; other types of interventions were excluded.

- The review included studies of the following interventions:
  - Interventions that were implemented for at least eight hours.
  - Interventions implemented during or after school or during the summer holiday.

- Interventions delivered by teachers, interventionists, researchers, tutors, parents, or paraprofessionals (as long as they followed a specific intervention program or an approach that was clearly spelled out).
- The review excluded studies of the following interventions:
  - Whole-class interventions or differentiated instruction (tier 1).
  - Whole-class interventions (tier 1) with subanalyses for at-risk readers.
  - Special education or tier 3 interventions.
  - At-home-only interventions.
  - Spanish interventions for at-risk or struggling readers.
  - Peer-tutoring interventions.
  - Professional development programs.
  - Phonemic awareness interventions.
  - Small-group interventions for low-income schools or students.
  - Computer-based interventions (if there was no interventionist).

**Outcomes.** The study had to include at least one student-level outcome that demonstrated sufficient reliability and content validity. Relevant outcomes were measures of student achievement, including nationally normed tests, other standardized tests, and researcher-developed measures, in the following areas:

- *Word and pseudoword reading.* This area included both timed and untimed measures. Possible measures included:
  - Word lists, such as Test of Word Reading Efficiency and Woodcock Letter-Word ID.
  - Pseudowords, such as Dynamic Indicators of Basic Early Literacy Skills Non-sense Word Fluency and Woodcock Johnson Word Attack.
- *Passage reading fluency.* This area included only timed measures. Possible measures include AIMSweb Standard Reading Assessment Passages.
- *Reading comprehension.* This area included both measures with questions and those that use cloze/maze procedures. Possible measures included the Woodcock Reading Mastery Tests Passage Comprehension subtest and the Group Reading Assessment and Diagnostic Evaluation reading comprehension subtest.
- *Reading vocabulary.* This area included reading vocabulary, receptive vocabulary, and academic vocabulary.<sup>7</sup> Possible measures included the Group Reading Assessment and Diagnostic Evaluation reading vocabulary subtest and the Ginn Total Vocabulary.
- *Overall reading achievement.* This area's outcomes include total scores on standardized reading tests. Possible measures included the Gates–MacGinitie Reading Test and the Stanford Achievement Test.<sup>8</sup>

This process screened out 1,770 studies, leaving 43 to be reviewed by a WWC-certified reviewer. Any study previously reviewed by the WWC that met standards (with or without reservations) was reviewed again using the current WWC standards (Version 3.0).

### Reviewing studies using What Works Clearinghouse standards

Studies were reviewed using the *WWC Procedures and Standards Handbook*, Version 3.0 (What Works Clearinghouse, 2014a) for group design studies. Although a WWC-certified reviewer reviewed each study that met the screening criteria and the review is modeled after the WWC approach to reviewing causal evidence, this report is not a WWC product.

A second reviewer independently reviewed studies that the first reviewer determined to have met standards. A senior reviewer double-checked each completed review to ensure accuracy and reconciled any differences between the reviewers. The summary of interventions and the evidence described in this review are limited to studies that the reviewers determined met WWC evidence standards with or without reservations.

Of the 43 studies reviewed, 16 were rated as does not meet evidence standards (table A1). Ten of the 16 (63 percent) were not able to demonstrate baseline equivalence for the treatment and comparison groups used for the statistical analysis, 5 of the 16 (31 percent) could not attribute the measure of effectiveness solely to the intervention, and 1 of the 16 (6 percent) did not include a valid and reliable outcome.

The remaining 27 studies that met WWC standards as determined by the review team are described in detail in appendix C.

### Methods of calculating effect sizes

The review team analyzed the studies that met WWC standards in three ways:

1. To determine the impact of each intervention, the review team calculated the average effect size (and its statistical significance) for each area of reading (that is, word and pseudoword reading, passage reading fluency, reading comprehension, and vocabulary).
  - For each continuous outcome, the review team calculated Hedges' *g* using the *WWC Study Review Guide* (What Works Clearinghouse, 2014b). Hedges' *g* is the difference between the mean outcome of the intervention group and the mean outcome of the comparison group divided by the pooled within-group standard deviation of the outcome measure. Impacts from dichotomous outcomes were computed using the log odds ratio (see What Works Clearinghouse, 2014a, for additional information).

**Table A1. Reasons studies were rated as does not meet What Works Clearinghouse standards, as determined by the review team**

Reason	Number of studies with rating	Share of total (percent)
Baseline equivalence of the treatment and comparison groups used for the analysis was not demonstrated <sup>a</sup>	10	63
The measure of effectiveness could not be attributed solely to the intervention	5	31
The eligible outcomes did not meet What Works Clearinghouse requirements for validity and reliability <sup>b</sup>	1	6
Total	16	100

**a.** According to What Works Clearinghouse standards for group design, baseline equivalence should be demonstrated based on a conservative boundary for quasi-experimental design studies as well as randomized controlled trials with high attrition or randomization problems.

**b.** According to What Works Clearinghouse standards for group design, outcome measures must demonstrate sufficient reliability and content validity. Reliability for group-design studies was assessed using the following standards determined by the What Works Clearinghouse: internal consistency (minimum of .50), temporal stability or test–retest reliability (minimum of .40), or interrater reliability (minimum of .50).

**Source:** Authors' analysis of primary data collected for the review.

- If a study had multiple outcomes within a reading area (that is, word and pseudo-word reading, passage reading fluency, reading comprehension, and vocabulary), the effect sizes for all of that study's outcomes were combined into a study average effect size using the simple, unweighted average of the individual effect sizes. Simple averages were used because the sample sizes of each outcome measure for a particular area of reading within a particular study are identical or virtually identical. These calculations were done using all eligible effect sizes (significant and nonsignificant) in the *WWC Study Review Guide*. According to the *Study Review Guide* instructions for group design studies, domain average effect sizes are calculated in column C, which is "a locked cell with a formula to calculate the average effect size for all outcomes in the domain entered in Column A" (What Works Clearinghouse, 2014b, p. 38).
2. Author-reported *p*-values were used unless otherwise noted for individual outcome measures. In certain circumstances, *p*-values calculated using the *WWC Study Review Guide* were used for individual outcome measures. The *Study Review Guide* also calculated the *p*-values for the average effect sizes for each area of reading. According to the *Study Review Guide* instructions for group design studies, "This is calculated based on the hidden *t*-statistic (Column N) which is based on the average effect size (Column C)" (What Works Clearinghouse, 2014b, p. 38). To gauge the impact of reading interventions across all the interventions for students in grade 1 and in grades 2 and 3, the review team also calculated weighted mean effect sizes for each area of reading. Each intervention was weighted in inverse proportion to its variance, which typically gives more weight to interventions with large sample sizes and less weight to interventions with small sample sizes. Thus, results from interventions with large samples will be less affected by sampling error and therefore are given more power in the analysis.
  3. The review team examined the description of the intervention and cataloged the intervention characteristics to look for patterns that might explain the impacts.

Interventions with studies that met standards were categorized using their average effect in an area of reading (see box 1 in main text). Interventions were found to demonstrate a statistically significant average effect in any of the four areas of reading, demonstrate a potentially positive average effect size greater than 0.25 that was not statistically significant, or fail to produce such an effect.

## **Appendix B. Forty-three studies reviewed using What Works Clearinghouse standards**

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Of the 1,813 studies identified in the literature search, the 43 studies listed in this appendix used an experimental or quasi-experimental design to examine the impact of interventions intended to improve reading outcomes for students who are at risk of reading difficulties in grades 1–3, were published since the adoption of No Child Left Behind in 2002, and were conducted in the United States. The review team determined that 27 of those met the What Works Clearinghouse standards (Version 3.0; 2014) either with or without reservations; an asterisk identifies these studies. Vadasy et al. (2006) and Allor and McCathren (2004) included two studies each; therefore, only 25 citations are identified with an asterisk. Although this review relies heavily on WWC protocols, procedures, and standards, and WWC-certified reviewers conducted the reviews, this review is not a WWC product.

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- Brown, K. J., Morris, D., & Fields, M. (2005). Intervention after grade 1: Serving increased numbers of struggling readers effectively. *Journal of Literacy Research, 37*(1), 61–94. <http://eric.ed.gov/?id=EJ728578>
- \*Case, L. P., Speece, D. L., Silverman, R., Ritchey, K. D., Schatschneider, C., Cooper, D. H., & Jacobs, D. (2010). Validation of a supplemental reading intervention for first-grade children. *Journal of Learning Disabilities, 43*(5), 402–417. <http://eric.ed.gov/?id=EJ896983>
- \*Case, L. P., Speece, D., Silverman, R., Schatschneider, C., Montanaro, E., & Ritchey, K. (2014). Immediate and long-term effects of tier 2 reading instruction for first-grade students with a high probability of reading failure. *Journal of Research on Educational Effectiveness, 7*(1), 28–53. <http://eric.ed.gov/?id=EJ1030356>
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- \*Fuchs, D., Compton, D. L., Fuchs, L. S., Bryant, J., & Davis, G. N. (2008). Making “secondary intervention” work in a three-tier responsiveness-to-intervention model: Findings from the first-grade longitudinal reading study of the National Research Center on Learning Disabilities. *Reading and Writing*, 21(4), 413–436. <http://eric.ed.gov/?id=EJ793405>
- Gattis, M. N., Morrow-Howell, N., McCrary, S., Lee, M., Jonson-Reid, M., McCoy, H., & Invernizzi, M. (2010). Examining the effects of New York Experience Corps® Program on young readers. *Literacy Research and Instruction*, 49(4), 299–314. <http://eric.ed.gov/?id=EJ897919>
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## **Appendix C. Research basis for the studies that the review team determined met What Works Clearinghouse evidence standards**

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Tables C1–C4 in this appendix report the research design, analysis sample, intervention implementation, nature of the comparison group, outcome measures, and effect size estimates (Hedges'  $g$ ) for the studies that the review team determined met What Works Clearinghouse evidence standards with or without reservations. The tables are organized by grade level and grouping arrangements (that is, small group or individual).

**Table C1. Impact of grade 1 reading interventions, by study**

Full citation	Study design	Analysis sample	Intervention name	Nature of the comparison group	Findings		
					Reading performance area	Average effect size for reading area	
Individual grouping							
Allor, J., & McCathren, R. (2004). The efficacy of an early literacy tutoring program implemented by college students. <i>Learning Disabilities Research &amp; Practice</i> , 19(2), 116–129.	Randomized controlled trial	Study 1: 86 grade 1 students in 8 schools	Early Literacy Tutoring Program	No additional support in reading	Reading comprehension	• WJ-R Passage Comprehension <sup>a</sup> (0.50*)	0.50*
					Word and pseudoword reading	• WJ-R Word Identification <sup>a</sup> (0.13)	0.35*
						• WJ-R Word Attack <sup>a</sup> (0.78***)	
						• TOWRE Sight Word Efficiency <sup>a</sup> (0.05)	
						• TOWRE Phonemic Decoding Efficiency <sup>a</sup> (0.44**)	
Reading comprehension	• DIBELS Nonsense Word Fluency <sup>a</sup> (0.33)	–0.16					
Passage reading fluency	• WJ-R Passage Comprehension <sup>a</sup> (–0.16)	–0.16					
					• Oral Reading Fluency <sup>a</sup> (0.13)	0.13	
Jenkins, J. R., Peyton, J. A., Sanders, E. A., & Vadas, P. F. (2004). Effects of reading decodable texts in supplemental first-grade tutoring. <i>Scientific Studies of Reading</i> , 8(1), 53–85.	Quasi-experimental design	99 grade 1 students in 11 schools in 1 district	Researcher-modified Sound Partners	No additional support in reading	Word and pseudoword reading	• WRMT-R Word Attack <sup>a</sup> (0.76**)	0.67*
						• WRAT-R Reading <sup>a</sup> (0.73**)	
						• Bryant Diagnostic Test of Basic Decoding Skills <sup>a</sup> (1.12***)	
						• TOWRE Phonemic Decoding Efficiency <sup>a</sup> (0.37)	
					Reading comprehension	• WRMT-R Word Identification <sup>a</sup> (0.50)	0.74**
• TOWRE Sight Word Efficiency <sup>a</sup> (0.52)							
					• WRMT-R Passage Comprehension <sup>a</sup> (0.74**)	0.74**	

(continued)

**Table C1. Impact of grade 1 reading interventions, by study** (continued)

Full citation	Study design	Analysis sample	Intervention name	Nature of the comparison group	Reading performance area	Findings	
						Individual measure (effect size)	Average effect size for reading area
Lane, H. B., Pullen, P. C., Hudson, R.F., & Konold, T. R. (2009). Identifying essential instructional components of literacy tutoring for struggling beginning readers. <i>Literacy Research and Instruction</i> , 48(4), 277–297.	Randomized controlled trial	41 grade 1 students in 12 schools in 1 district	University of Florida Literacy Initiative	No additional support in reading	Word and pseudoword reading	<ul style="list-style-type: none"> <li>• Nonword decoding (0.64*)</li> <li>• Sight words<sup>a</sup> (0.71*)</li> <li>• WDRB Word Attack<sup>a</sup> (1.24***)</li> </ul>	0.86*
		42 grade 1 students in 12 schools in 1 district	University of Florida Literacy Initiative minus manipulative letter component	No additional support in reading	Word and pseudoword reading	<ul style="list-style-type: none"> <li>• Nonword decoding (0.29)</li> <li>• Sight words (0.24)</li> </ul>	0.26
		43 grade 1 students in 12 schools in 1 district	University of Florida Literacy Initiative minus sentence writing strategy	No additional support in reading	Word and pseudoword reading	<ul style="list-style-type: none"> <li>• Nonword decoding (0.55)</li> <li>• Sight words (0.39)</li> </ul>	0.47
		46 grade 1 students in 12 schools in 1 district	University of Florida Literacy Initiative minus extending literacy component	No additional support in reading	Word and pseudoword reading	<ul style="list-style-type: none"> <li>• Nonword decoding (0.59)</li> <li>• Sight words (0.52)</li> <li>• WDRB Word Attack (1.02**)</li> </ul>	0.71*
Pullen, P. C., Lane, H. B., & Monaghan, M. C. (2004). Effects of a volunteer tutoring model on the early literacy development of struggling first grade students. <i>Literacy Research and Instruction</i> , 43(4), 21–40.	Randomized controlled trial	47 grade 1 students in 10 schools in 1 district	Volunteer tutoring	No additional support in reading	Word and pseudoword reading	<ul style="list-style-type: none"> <li>• Jump Start in Reading Assessment of Early Literacy Development: Sight Words<sup>a</sup> (0.24)</li> <li>• Jump Start in Reading Assessment of Early Literacy Development: Nonword Decoding<sup>a</sup> (0.81**)</li> <li>• WDRB Word Attack subtest (0.59*)</li> <li>• WDRB Letter-Word ID subtest (0.54*)</li> </ul>	0.55

(continued)

**Table C1. Impact of grade 1 reading interventions, by study** (continued)

Full citation	Study design	Analysis sample	Intervention name	Nature of the comparison group	Findings		
					Reading performance area	Average effect size for reading area	
Scanlon, D. M., Vellutino, F. R., Small, S. G., Fanuele, D. P., & Sweeney, J. M. (2005). Severe reading difficulties—can they be prevented? A comparison of prevention and intervention approaches. <i>Exceptionality</i> , 13(4), 209–227.	Randomized controlled trial	114 grade 1 students in 5 districts	Intensive Tutorial Intervention—Text Emphasis	Typical school-provided reading intervention	Word and pseudoword reading	• WRMT-R Word Identification <sup>a</sup> (0.55**) • WRMT-R Word Attack <sup>a</sup> (0.31)	0.43*
					Reading comprehension	• WIAT Reading Comprehension <sup>a</sup> (0.41*)	0.41*
					Word and pseudoword reading	• WRMT-R Word Identification <sup>a</sup> (0.51**) • WRMT-R Word Attack <sup>a</sup> (0.62**)	0.57***
		117 grade 1 students in 5 districts	Intensive Tutorial Intervention—Phonological Skills Emphasis	Typical school-provided reading intervention	Reading comprehension	• WIAT Reading Comprehension <sup>a</sup> (0.35)	0.35
Schwartz, R. M. (2005). Literacy learning of at-risk first-grade students in the Reading Recovery early intervention. <i>Journal of Educational Psychology</i> , 97(2), 257–267.	Randomized controlled trial <sup>b</sup>	74 grade 1 students	Reading Recovery	No additional support in reading	Word and pseudoword reading	• Ohio Word Test <sup>a</sup> (1.37***) • Slosson Oral Reading Test—Revised <sup>a</sup> (0.93***)	1.15***
					Reading comprehension	• Degrees of Reading Power Test <sup>a</sup> (0.14)	0.14
Vadasy, P. F., & Sanders, E. A. (2011). Efficacy of supplemental phonics-based instruction for low-skilled first graders: How language minority status and pretest characteristics moderate treatment response. <i>Scientific Studies of Reading</i> , 15(6), 471–497.	Randomized controlled trial	89 grade 1 students in 11 schools in 1 district	Phonics-based Early Reading Intervention	No additional support in reading	Word and pseudoword reading	• WRMT-R/NU Word Reading (Word Attack & Word Identification) <sup>a</sup> (0.51*)	0.51*
					Reading comprehension	• WRMT-R/NU Passage Comprehension <sup>a</sup> (0.29)	0.29
					Passage reading fluency	• Passage reading fluency <sup>a</sup> (0.69**)	0.69**

(continued)

**Table C1. Impact of grade 1 reading interventions, by study** (continued)

Full citation	Study design	Analysis sample	Intervention name	Nature of the comparison group	Reading performance area	Findings	
						Individual measure (effect size)	Average effect size for reading area
Vellutino, F. R., & Scanlon, D. M. (2002). The Interactive Strategies approach to reading intervention. <i>Contemporary Educational Psychology, 27</i> (4), 573–635.	Randomized controlled trial	118 grade 1 and 2 students in 17 schools in 5 districts <sup>c</sup>	Interactive Strategies	Typical school-provided reading intervention	Word and pseudoword reading (above the 15th percentile)	• WRMT-R Basic Skills Cluster <sup>a</sup> (0.38*)	0.38*
Small group							
Case, L. P., Speece, D. L., Silverman, R., Ritchey, K. D., Schatschneider, C., Cooper, D. H., Jacobs, D. (2010). Validation of a supplemental reading intervention for first-grade children. <i>Journal of Learning Disabilities, 43</i> (5), 402–417	Randomized controlled trial	30 grade 1 students in 3 schools in 1 district	Combined Foundations, Responsive Reading Instruction, and Read Naturally	No additional support in reading	Word and pseudoword reading	• WRMT-R/NU Word Attack <sup>a</sup> (0.73) • WRMT-R/NU Word Identification <sup>a</sup> (0.73) • Word Identification Fluency <sup>a</sup> (0.48)	0.65
Case, L. P., Speece, D. L., Silverman, R., Schatschneider, C., Montanaro, E., & Ritchey, K. D. (2014). Immediate and long-term effects of tier 2 reading instruction for first-grade students with a high probability of reading failure. <i>Journal of Research on Educational Effectiveness, 7</i> (1), 28–53.	Randomized controlled trial	123 grade 1 students	Combined Foundations, Responsive Reading Instruction, and Read Naturally	No additional support in reading	Word and pseudoword reading  Passage reading fluency	• Word Identification Fluency <sup>a</sup> (0.17) • WRMT-R/NU Word Attack <sup>a</sup> (0.23) • TOWRE Phonemic Decoding Efficiency <sup>a</sup> (0.02) • WRMT-R/NU Word Identification <sup>a</sup> (0.21) • Graphophonemic fluency <sup>a</sup> (0.00) • Passage Reading Fluency <sup>a</sup> (0.20)	0.12     0.20

(continued)

**Table C1. Impact of grade 1 reading interventions, by study** (continued)

Full citation	Study design	Analysis sample	Intervention name	Nature of the comparison group	Findings		Average effect size for reading area
					Reading performance area	Individual measure (effect size)	
Denton, C. A., Nimon, K., Mathes, P. G., Swanson, E. A., Kethley, C., Kurz, T. B., & Shih, M. (2010). Effectiveness of a supplemental early reading intervention scaled up in multiple schools. <i>Exceptional Children</i> , 76(4), 394–416.	Randomized controlled trial <sup>e</sup>	422 grade 1 students in 31 schools in 16 districts	Responsive Reading Instruction	Typical school-provided reading intervention	Word and pseudoword reading	• TOWRE Phonemic Decoding Efficiency <sup>a</sup> (0.42***)	0.42***
					Reading comprehension	• WJ-III Passage Comprehension <sup>a</sup> (0.51***)	
Fuchs, D., Compton, D. L., Fuchs, L. S., Bryant, J., & Davis, G. N. (2008). Making “secondary intervention” work in a three-tier responsiveness-to-intervention model: findings from the first-grade longitudinal reading study of the National Research Center on Learning Disabilities. <i>Reading and Writing</i> , 21(4), 413–436.	Cluster randomized controlled trial	64 grade 1 students in 16 schools in 2 districts	Reading intervention developed by Fuchs et al.	No additional support in reading	Word and pseudoword reading	• TOWRE Sight Word Efficiency <sup>a</sup> (0.65)	0.40
						• Word Identification Fluency <sup>a</sup> (0.46)	
						• WRMT-R/NU Word Identification <sup>a</sup> (0.26)	
						• WRMT-R/NU Word Attack <sup>a</sup> (0.38)	
						• TOWRE Phonemic Decoding Efficiency <sup>a</sup> (0.26)	
Wang, C., & Algozzine, B. (2008). Effects of targeted intervention on early literacy skills of at-risk students. <i>Journal of Research in Childhood Education</i> , 22(4), 425–439.	Cluster randomized controlled trial <sup>d</sup>	139 grade 1 students in 6 schools in 1 district	BRIC Supplemental Intervention	No additional support in reading	Word and pseudoword reading	• WRMT-R Word Attack <sup>a</sup> (0.45)	0.27
						• WRMT-R Word Identification <sup>a</sup> (0.39)	
						• DIBELS Nonsense Word Fluency <sup>a</sup> (–0.03)	
					Reading comprehension	• WRMT-R Passage Comprehension <sup>a</sup> (0.17)	0.17

(continued)

**Table C1. Impact of grade 1 reading interventions, by study (continued)**

Full citation	Study design	Analysis sample	Intervention name	Nature of the comparison group	Reading performance area	Findings	
						Individual measure (effect size)	Average effect size for reading area
Wanzek, J., & Vaughn, S. (2008). Response to varying amounts of time in reading intervention for students with low response to intervention. <i>Journal of Learning Disabilities, 41</i> (2), 126–142.	Quasi-experimental design	50 grade 1 students in 6 schools in 1 district	Reading intervention developed by Wanzek & Vaughn	Typical school-provided reading intervention	Word and pseudoword reading	<ul style="list-style-type: none"> <li>WRMT-R Word Identification<sup>a</sup> (0.12)</li> <li>WRMT-R Word Attack<sup>a</sup> (0.18)</li> </ul>	0.15
					Passage reading fluency	<ul style="list-style-type: none"> <li>DIBELS Oral Reading Fluency<sup>a</sup> (–0.20)</li> </ul>	–0.20

\* Significant at  $p < .05$ ; \*\* significant at  $p < .01$ ; \*\*\* significant at  $p < .001$ .

DIBELS is Dynamic Indicators of Basic Early Literacy Skills. TOWRE is Test of Word Reading Efficiency. WDRB is Woodcock Diagnostic Reading Battery. WIAT is Wechsler Individual Achievement Test. WJ-III is Woodcock Johnson III. WJ-R is Woodcock Johnson, Revised, Tests of Achievement. WRAT-R is Wide Range Achievement Test, Revised. WRMT-R/NU is Woodcock Reading Mastery Test, Revised/Normative Update.

**Note:** Individual effect sizes are presented only for outcomes that were eligible or met standards. All individual effect size  $p$ -values are review team reported unless otherwise noted. Average effect sizes for reading area include significant and nonsignificant outcomes and were calculated by the review team.

- a. WWC-computed statistical significance.
- b. Randomized controlled trial; however, attrition information was not available. Baseline equivalence was established.
- c. Some grade 1 students continued to receive the intervention after they transitioned to grade 2.
- d. Randomization was compromised. Clusters had nonequal random assignment.
- e. Randomization was compromised. Nonequal random assignment of students.

**Source:** Authors' analysis of primary data collected for the review; see appendix A.

**Table C2. Impact of grade 2 and 3 reading interventions, by study**

Full citation	Study design	Analysis sample	Intervention name	Nature of the comparison group	Findings		Average effect size for reading area
					Reading performance area	Individual measure (effect size)	
Individual grouping							
Blachman, B. A., Schatschneider, C., Fletcher, J. M., Francis, D. J., Clonan, S. M., Shaywitz, B. A., & Shaywitz, S. E. (2004). Effects of intensive reading remediation for second and third graders and a 1-year follow-up. <i>Journal of Educational Psychology</i> , 96(3), 444–461.	Randomized controlled trial <sup>a</sup>	69 grade 2 and 3 students in 11 schools in 4 districts	Reading intervention developed by Blachman et al.	Typical school-provided reading intervention	Word and pseudoword reading	• WRMT-R Word Attack (0.74***) • WRMT-R Word ID (0.87***)	0.80***
					Reading comprehension	• GORT-3 Comprehension (0.53*)	0.53*
					Passage reading fluency	• GORT-3 Quotient (0.70**)	0.70**
O'Connor, R. E., Swanson, H. L., & Geraghty, C. (2010). Improvement in reading rate under independent and difficult text levels: Influences on word and comprehension skills. <i>Journal of Educational Psychology</i> , 102(1), 1–19.	Randomized controlled trial	40 grade 2 students in 5 schools	Reading to an adult listener—Independent Level	No additional support in reading	Word and pseudoword reading	• WRMT-R/NU Word Identification <sup>b</sup> (0.56) • WRMT-R/NU Word Attack <sup>b</sup> (0.10)	0.33
					Reading comprehension	• WRMT-R/NU Passage Comprehension <sup>b</sup> (0.48) • GORT-4 Comprehension <sup>b</sup> (0.53)	0.51
					Passage reading fluency	• GORT-4 Fluency <sup>b</sup> (0.60) • Grade 2 passages <sup>b</sup> (0.76*) • Primer-level passage <sup>b</sup> (0.87**) • Grade 1 passage <sup>b</sup> (0.75*)	0.75*
		Vocabulary	• WRMT-R/NU Vocabulary <sup>b</sup> (–0.12)	–0.12			
		43 grade 2 students in 5 schools	Reading to an adult listener—Difficult Level	No additional support in reading	Word and pseudoword reading	• WRMT-R/NU Word Identification <sup>b</sup> (0.57) • WRMT-R/NU Word Attack <sup>b</sup> (0.25)	0.41
					Reading comprehension	• GORT-4 Comprehension <sup>b</sup> (0.44) • WRMT-R/NU Passage Comprehension <sup>b</sup> (0.37)	0.40
					Passage reading fluency	• GORT-4 Fluency <sup>b</sup> (0.81*) • Grade 2 passages <sup>b</sup> (0.84**) • Primer-level passage <sup>b</sup> (1.33***) • Grade 1 passage <sup>b</sup> (0.93**)	0.98***
Vocabulary	• WRMT-R/NU Vocabulary <sup>b</sup> (–0.04)				–0.04		

(continued)

**Table C2. Impact of grade 2 and 3 reading interventions, by study** (continued)

Full citation	Study design	Analysis sample	Intervention name	Nature of the comparison group	Findings		Average effect size for reading area
					Reading performance area	Individual measure (effect size)	
Vadasy, P. F., Sanders, E. A., & Peyton, J. A. (2006). Paraeducator-supplemented instruction in structural analysis with text reading practice for second and third graders at risk for reading problems. <i>Remedial and Special Education</i> , 27(6), 365–378.	Quasi-experimental design	31 grade 2 and 3 students in 12 schools in 1 district	Paraeducator-supplemented instruction	No additional support in reading	Word and pseudoword reading	<ul style="list-style-type: none"> <li>Reading accuracy composite measure: WRAT Reading, WRMT-R/NU Word Identification, WRMT-R/NU Word Attack<sup>b</sup> (0.61)</li> <li>Reading efficiency composite measure: TOWRE Phonemic Decoding Efficiency, TOWRE Sight Word Efficiency<sup>b</sup> (0.72)</li> </ul>	0.67
					Reading comprehension	<ul style="list-style-type: none"> <li>WRMT-R/NU Passage Comprehension<sup>b</sup> (0.50)</li> </ul>	0.50
					Passage reading fluency	<ul style="list-style-type: none"> <li>Grade-level passages<sup>b</sup> (0.81)</li> </ul>	0.81
	Randomized controlled trial	21 grade 2 and 3 students in 5 schools	Paraeducator-supplemented instruction	No additional support in reading	Word and pseudoword reading	<ul style="list-style-type: none"> <li>Reading accuracy composite measure: WRAT Reading, WRMT-R/NU Word Identification, WRMT-R/NU Word Attack<sup>b</sup> (0.75)</li> <li>Reading efficiency composite measure: TOWRE Phonemic Decoding Efficiency, TOWRE Sight Word Efficiency<sup>b</sup> (0.67)</li> </ul>	0.71
					Reading comprehension	<ul style="list-style-type: none"> <li>WRMT-R/NU Passage Comprehension<sup>b</sup> (0.21)</li> </ul>	0.21
					Passage reading fluency	<ul style="list-style-type: none"> <li>Grade-level passages<sup>b</sup> (0.55)</li> </ul>	0.55
Vadasy, P. F., Sanders, E. A., & Tudor, S. (2007). Effectiveness of paraeducator-supplemented individual instruction: Beyond basic decoding skills. <i>Journal of Learning Disabilities</i> , 40(6), 508–525.	Randomized controlled trial	43 grade 2 and 3 students in 9 schools in 1 district	Paraeducator-supplemented instruction	No additional support in reading	Word and pseudoword reading	<ul style="list-style-type: none"> <li>WRMT-R/NU Word Identification and Word Attack composite<sup>b</sup> (0.47)</li> </ul>	0.47
					Passage reading fluency	<ul style="list-style-type: none"> <li>Grade-level passages from DIBELS (0.52)<sup>b</sup></li> </ul>	0.52

(continued)

**Table C2. Impact of grade 2 and 3 reading interventions, by study** (continued)

Full citation	Study design	Analysis sample	Intervention name	Nature of the comparison group	Findings		Average effect size for reading area
					Reading performance area	Individual measure (effect size)	
Small grouping							
Berninger, V. W., Abbott, R. D., Vermeulen, K., & Fulton, C. M. (2006). Paths to reading comprehension in at-risk second-grade readers. <i>Journal of Learning Disabilities</i> , 39(4), 334–351.	Randomized controlled trial	93 grade 2 students in 8 schools in 1 district	Before/ After School Reading Club	No additional support in reading	Word and pseudoword reading	• WRMT-R Word Attack <sup>b</sup> (0.35)	0.35
Denton, C. A., Fletcher, J. M., Taylor, W. P., Barth, A. E., & Vaughn, S. (2014). An experimental evaluation of guided reading and explicit interventions for primary-grade students at-risk for reading difficulties. <i>Journal of Research on Educational Effectiveness</i> , 7(3), 268–293.	Randomized controlled trial	103 grade 1 and 2 students in 9 schools in 2 districts <sup>c</sup>	Guided Reading	No additional support in reading	Word and pseudoword reading	• WJ-III Letter-Word Identification (0.50*) • WJ-III Word Attack (0.34) • Composite: TOWRE Phonemic Decoding Efficiency, TOWRE Sight Word Efficiency (0.40)	0.41*
					Reading comprehension	• WJ-III Passage Comprehension (0.13) • Gates-MacGinitie Reading Comprehension (0.08)	0.11
		Passage reading fluency	• TPRI progress monitoring for beginning readers (0.16)	0.16			
		Word and pseudoword reading	• WJ-III Word Attack (0.63**) • WJ-III Letter-Word Identification (0.50*) • Composite of TOWRE Phonemic Decoding Efficiency and TOWRE Sight Word Efficiency (0.31)	0.48*			
		112 grade 1 and 2 students in 9 schools in 2 districts <sup>d</sup>	Explicit, sequential instruction in word reading and comprehension	No additional support in reading	Reading comprehension	• Gates-MacGinitie Reading Comprehension (0.29) • WJ-III Passage Comprehension (0.46*)	0.37
					Passage reading fluency	• TPRI progress monitoring for beginning readers (0.45*)	0.45*

(continued)

**Table C2. Impact of grade 2 and 3 reading interventions, by study (continued)**

Full citation	Study design	Analysis sample	Intervention name	Nature of the comparison group	Findings		
					Reading performance area	Individual measure (effect size)	Average effect size for reading area
Gunn, B., Smolkowski, K., Biglan, A., Black, C., & Blair, J. (2005). Fostering the development of reading skill through supplemental instruction: Results for Hispanic and non-Hispanic students. <i>Journal of Special Education</i> , 39(2), 66–85	Randomized controlled trial	245 grade 1–4 students in 13 schools in 4 districts <sup>e</sup>	Reading Mastery/ Corrective Reading	No additional support in reading	Word and pseudoword reading	• WJ-R Letter-Word Identification <sup>b</sup> (0.30*) • WJ-R Word Attack (0.52***)	0.41***
					Reading comprehension	• WJ-R Passage Comprehension <sup>b</sup> (0.32*)	0.32*
					Passage reading fluency	• DIBELS Oral Reading Fluency <sup>b</sup> (0.24)	0.24
					Vocabulary	• WJ-R Vocabulary <sup>b</sup> (0.22)	0.22

\* Significant at  $p < .05$ ; \*\* significant at  $p < .01$ ; \*\*\* significant at  $p < .001$ .

DIBELS is Dynamic Indicators of Basic Early Literacy Skills. GORT-3 is Gray Oral Reading Tests, 3rd edition. GORT-4 is Gray Oral Reading Tests, 4th edition. TOWRE is Test of Word Reading Efficiency. TPRI is Texas Primary Reading Inventory (Foorman et al., 2004). WJ-III is Woodcock Johnson III. WJ-R is Woodcock-Johnson Revised Tests of Achievement. WRAT is Wide Range Achievement Test. WRMT-R/NU is Woodcock Reading Mastery Test, Revised.

**Note:** Individual effect sizes are presented only for outcomes that were eligible or met standards. All individual effect size  $p$ -values are review team reported unless otherwise noted. Average effect sizes for reading area include significant and nonsignificant outcomes and were calculated by the review team.

- a. Randomization was compromised. Nonequal random assignment of students.
- b. What Works Clearinghouse—computed statistical significance.
- c. Some students who were repeating grade 1 were included (15 percent of the sample).
- d. Some students who were repeating grade 1 were included (13 percent of the sample).
- e. The intervention was conducted over two years for students in grades 1–4. At baseline, 54 percent of the sample consisted of students in grades 2 and 3. Results reported are for the combined sample of Hispanic and non-Hispanic students.

**Source:** Authors’ analysis of primary data collected for the review; see appendix A.

**Table C3. Impact of studies with variations in aspects of treatment**

Full citation	Study design	Analysis sample	Intervention A	Intervention B	Findings									
					Reading performance area	Individual measure (effect size)	Average effect size for reading area							
Modifications														
Denton, C. A., Cirino, P. T., Barth, A. E., Romain, M., Vaughn, S., Wexler, J., & Fletcher, J. M. (2011). An experimental study of scheduling and duration of “tier 2” first-grade reading intervention. <i>Journal of Research on Educational Effectiveness</i> , 4(3), 208–230.	Randomized controlled trial <sup>a</sup>	130 grade 1 students in 9 schools in 2 districts	Read Well Extended Group	Read Well Concentrated Group	Word and pseudoword reading	<ul style="list-style-type: none"> <li>• WJ-III Letter Word ID<sup>b</sup> (–0.15)</li> <li>• WJ-III Word Attack<sup>b</sup> (–0.10)</li> <li>• TOWRE<sup>b</sup> (–0.17)</li> </ul>	–0.14							
					Reading comprehension	<ul style="list-style-type: none"> <li>• WJ-III Passage Comprehension<sup>b</sup> (–0.25)</li> <li>• GRADE Passage Comprehension<sup>b</sup> (0.15)</li> </ul>	–0.05							
					Passage reading fluency	<ul style="list-style-type: none"> <li>• Continuous Monitoring of Early Reading Skills<sup>b</sup> (–0.07)</li> </ul>	–0.07							
					128 grade 1 students in 9 schools in 2 districts	Read Well Extended Group	Read Well Distributed Group	Word and pseudoword reading	<ul style="list-style-type: none"> <li>• WJ-III Letter Word ID<sup>b</sup> (–0.04)</li> <li>• WJ-III Word Attack<sup>b</sup> (0.08)</li> <li>• TOWRE<sup>b</sup> (–0.07)</li> </ul>	–0.01				
								Reading comprehension	<ul style="list-style-type: none"> <li>• WJ-III Passage Comprehension<sup>b</sup> (–0.13)</li> <li>• GRADE Passage Comprehension<sup>b</sup> (–0.06)</li> </ul>	–0.09				
								126 grade 1 students in 9 schools in 2 districts	Read Well Concentrated Group	Read Well Distributed Group	Word and pseudoword reading	<ul style="list-style-type: none"> <li>• WJ-III Letter Word ID<sup>b</sup> (0.12)</li> <li>• WJ-III Word Attack<sup>b</sup> (0.18)</li> <li>• TOWRE<sup>b</sup> (0.10)</li> </ul>	0.13	
		Reading comprehension	<ul style="list-style-type: none"> <li>• WJ-III Passage Comprehension<sup>b</sup> (0.13)</li> <li>• GRADE Passage Comprehension<sup>b</sup> (–0.20)</li> </ul>	–0.04										
		Passage reading fluency	<ul style="list-style-type: none"> <li>• Continuous Monitoring of Early Reading<sup>b</sup> Skills (–0.02)</li> </ul>	–0.02										
		Jenkins, J. R., Peyton, J. A., Sanders, E. A., & Vadasy, P. F. (2004). Effects of reading decodable texts in supplemental first-grade tutoring. <i>Scientific Studies of Reading</i> , 8(1), 53–85. <sup>c</sup>	Randomized controlled trial	79 grade 1 students in 11 schools	Researcher-modified Sound Partners—More Decodable Words	Researcher-modified Sound Partners—Less Decodable Words	Word and pseudoword reading	<ul style="list-style-type: none"> <li>• WRMT-R Word Attack<sup>b</sup> (0.18)</li> <li>• WRAT-R Reading<sup>b</sup> (0.05)</li> <li>• Bryant Diagnostic Test of Basic Decoding Skills<sup>b</sup> (–0.12)</li> <li>• TOWRE Phonemic Decoding Efficiency<sup>b</sup> (0.00)</li> <li>• WRMT-R Word Identification<sup>b</sup> (0.02)</li> <li>• TOWRE Sight Word Efficiency<sup>b</sup> (0.08)</li> <li>• Text word list<sup>b</sup> (0.14)</li> </ul>	0.05					
							Reading comprehension	<ul style="list-style-type: none"> <li>• WRMT-R Passage Comprehension<sup>b</sup> (0.10)</li> </ul>	0.10					
							Passage reading fluency	<ul style="list-style-type: none"> <li>• Phonetically controlled passages—accuracy<sup>b</sup> (0.18)</li> <li>• Nonphonetically controlled passages—accuracy<sup>b</sup> (0.00)</li> <li>• Phonetically controlled passages—fluency (0.09)</li> <li>• Nonphonetically controlled passages—fluency (–0.01)</li> </ul>	0.06					

(continued)

**Table C3. Impact of studies with variations in aspects of treatment** *(continued)*

Full citation	Study design	Analysis sample	Intervention A	Intervention B	Findings		
					Reading performance area	Individual measure (effect size)	Average effect size for reading area
O'Connor, R. E., Swanson, H. L., & Geraghty, C. (2010). Improvement in reading rate under independent and difficult text levels: Influences on word and comprehension skills. <i>Journal of Educational Psychology, 102</i> (1), 1–19. <sup>d</sup>	Randomized controlled trial	43 grade 2 students in 5 schools	Practice reading aloud with independent levels of text (Independent)	Practice reading aloud with difficult levels of text (Difficult)	Word and pseudoword reading	<ul style="list-style-type: none"> <li>• WRMT-R/NU Word Identification<sup>b</sup> (0.03)</li> <li>• WRMT-R/NU Word Attack<sup>b</sup> (–0.16)</li> </ul>	–0.07
					Reading comprehension	<ul style="list-style-type: none"> <li>• WRMT-R/NU Passage Comprehension<sup>b</sup> (0.10)</li> <li>• GORT-4 Comprehension<sup>b</sup> (0.08)</li> </ul>	0.09
					Passage reading fluency	<ul style="list-style-type: none"> <li>• GORT-4 Fluency<sup>b</sup> (0.21ns)</li> <li>• Grade 2 passages<sup>b</sup> (–0.03)</li> <li>• Primer-level passage<sup>b</sup> (0.16)</li> <li>• Grade 1 passage<sup>b</sup> (0.15)</li> </ul>	0.12
					Vocabulary	<ul style="list-style-type: none"> <li>• WRMT-R/NU Vocabulary<sup>b</sup> (0.08)</li> </ul>	0.08
Scanlon, D. M., Vellutino, F. R., Small, S. G., Fanuele, D. P., & Sweeney, J. M. (2005). Severe reading difficulties—can they be prevented? A comparison of prevention and intervention approaches. <i>Exceptionality, 13</i> (4), 209–227. <sup>e</sup>	Randomized controlled trial	113 grade 1 students in 5 districts	Intensive Tutorial Intervention–Phonological Skills Emphasis (PSE)	Intensive Tutorial Intervention–Text Emphasis (TE)	Word and pseudoword reading	<ul style="list-style-type: none"> <li>• WRMT-R Word Identification<sup>b</sup> (–0.10)</li> <li>• WRMT-R Word Attack<sup>b</sup> (0.25)</li> </ul>	0.08
					Reading comprehension	<ul style="list-style-type: none"> <li>• WIAT Reading Comprehension<sup>b</sup> (–0.08)</li> </ul>	–0.08
<b>Group size</b>							
Schwartz, R. M., Schmitt, M. C., & Lose, M. K. (2012). Effects of teacher-student ratio in response to intervention approaches. <i>Elementary School Journal, 112</i> (4), 547–567.	Randomized controlled trial	149 grade 1 students	Reading Recovery	Reading Recovery Small Groups of 2, 3, or 5	Word and pseudoword reading	<ul style="list-style-type: none"> <li>• Ohio Word Test (0.43*)</li> <li>• Slosson Oral Reading Test—Revised (0.45*)</li> </ul>	0.44*

*(continued)*

**Table C3. Impact of studies with variations in aspects of treatment** *(continued)*

Full citation	Study design	Analysis sample	Intervention A	Intervention B	Findings		
					Reading performance area	Individual measure (effect size)	Average effect size for reading area
Vaughn, S., Linan-Thompson, S., Kouzekanani, K., Bryant, D. P., Dickson, S., & Blozis, S. A. (2003). Reading instruction grouping for students with reading difficulties. <i>Remedial and Special Education</i> , 24(5), 301–315.	Quasi-experimental design	26 grade 2 students in 10 schools in 2 districts	1:1	1:3	Word and pseudoword reading	• WRMT-R Word Attack <sup>b</sup> (0.41)	0.41
					Reading comprehension	• WRMT-R Passage Comprehension <sup>b</sup> (0.42)	0.42
					Passage reading fluency	• TORF <sup>b</sup> (0.03)	0.03
		25 grade 2 students in 10 schools in 2 districts	1:1	1:10	Reading comprehension	• WRMT-R Passage Comprehension <sup>b</sup> (0.78)	0.78
					Passage reading fluency	• TORF <sup>b</sup> (0.21)	0.21
					27 grade 2 students in 10 schools in 2 districts	1:3	1:10
Passage reading fluency	• TORF <sup>b</sup> (0.22)	0.22					

\* Significant at  $p < .05$ ; \*\* significant at  $p < .01$ ; \*\*\* significant at  $p < .001$ .

GORT-4 is Gray Oral Reading Tests, 4th Edition. GRADE is Group Reading Assessment and Diagnostic Evaluation. TORF is Test of Oral Reading Fluency. TOWRE is Test of Word Reading Efficiency. WDRB is Woodcock Diagnostic Reading Battery. WIAT is Wechsler Individual Achievement Test. WJ-III is Woodcock Johnson III. WRAT-R is Wide Range Achievement Test, Revised. WRMT-R is Woodcock Reading Mastery Test, Revised. WRMT-R/NU is Woodcock Reading Mastery Test, Revised/Normative Update.

**Note:** Individual effect sizes are presented only for outcomes that were eligible or met standards. All individual effect size  $p$ -values are review team reported unless otherwise noted. Average effect sizes for reading area include significant and nonsignificant outcomes and were calculated by the review team.

- a. Randomization was compromised. Nonequal random assignment of students.
- b. What Works Clearinghouse—computed statistical significance.
- c. This study also included a comparison of the combined treatment groups with a control group and was displayed in table C1.
- d. This study also included a comparison of each treatment group with a control group and was displayed in in table C2.
- e. This study also included a comparison of each treatment group with a control group and was displayed in table C1.

**Source:** Authors' analysis of primary data collected for the review; see appendix A.

**Table C4. Impact of studies that compare treatments**

Full citation	Study design	Analysis sample	Intervention A	Intervention B	Findings		Average effect size for reading area
					Reading area	Individual measure (effect size)	
Denton, C. A., Fletcher, J. M., Taylor, W. P., Barth, A. E., & Vaughn, S. (2014). An experimental evaluation of guided reading and explicit interventions for primary-grade students at-risk for reading difficulties. <i>Journal of Research on Educational Effectiveness</i> , 7(3), 268–293. <sup>a</sup>	Randomized controlled trial	109 grades 1 and 2 students in 9 schools in 2 districts <sup>b</sup>	Guided Reading	Explicit, sequential instruction in word reading and comprehension	Reading comprehension	• WJ-III Passage Comprehension (0.33) • Gates-MacGinitie Reading Comprehension (0.21)	0.27
					Passage reading fluency	• TOSREC (0.12)	0.12
Mathes, P. G., Denton, C. A., Fletcher, J. M., Anthony, J. L., Francis, D. J., & Schatschneider, C. (2005). The effects of theoretically different instruction and student characteristics on the skills of struggling readers. <i>Reading Research Quarterly</i> , 40(2), 148–182.	Randomized controlled trial	163 grade 1 students in 6 schools in 1 district	Proactive Reading	Responsive Reading	Word and pseudoword reading	• WJ-III Letter Word ID (0.15) • WJ-III Word Attack (0.38*)	0.27

\* Significant at  $p < .05$ .

TOSREC is Test of Silent Reading Efficiency and Comprehension. WJ-III is Woodcock Johnson III.

**Note:** Individual effect sizes are only presented for outcomes that were eligible or met standards. All individual effect size  $p$ -values are author reported unless otherwise noted. Average effect sizes for reading area include significant and nonsignificant outcomes, and were calculated by the study team.

**a.** This study also included a comparison of each treatment group with a control group, which was displayed in in table C2.

**b.** Some students who were repeating grade 1 were included.

**Source:** Authors' analysis of primary data collected for the review; see appendix A.



**Table D2. Weighted mean effects of grade 2 and 3 interventions, by area of reading**

Area of reading performance	Number of interventions	Average sample size	Hedges' $g^b$	Standard error	95 percent confidence interval <sup>a</sup>		p-value	Hedges' $g$ and 95 percent confidence interval											
					Lower limit	Upper limit		-0.6	-0.4	-0.2	0	0.2	0.4	0.6	0.8	1.0			
<b>Individual grouping</b>																			
Word and pseudoword reading	3	47	0.629	0.174	0.287	0.971	<.001												
Passage reading fluency	3	47	0.733	0.176	0.388	1.077	<.001												
Reading comprehension	3	46	0.476	0.175	0.133	0.819	.006												
Vocabulary	1	42	-0.080	0.311	-0.690	0.530	.797												
<b>Small group</b>																			
Word and pseudoword reading	4	138	0.414	0.086	0.245	0.582	<.001												
Passage reading fluency	3	153	0.272	0.094	0.088	0.456	.004												
Reading comprehension	3	153	0.285	0.094	0.101	0.468	.002												
Vocabulary	1	245	0.220	0.128	-0.031	0.471	.086												

a. There is a 95 percent probability that the “true” effect size lies between the lower and upper limits. If the interval includes 0, the weighted mean effect size is not statistically significant.

b. Weighted mean effect size.

Source: Authors’ analysis of primary data collected for the review; see appendix A.

## Notes

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1. Efficacy studies are tightly controlled studies during which fidelity of implementation is carefully monitored and interventionists receive high levels of support. Effectiveness trials, in contrast, assess effectiveness under more typical school conditions. Note that the study of Reading Recovery (Schwartz, 2005) is technically an effectiveness trial; however, all the Reading Recovery interventionists received extensive training, which is typical of an efficacy study.
2. A pseudoword (or nonsense word) is not a real word but rather one created to test a student's ability to decode unfamiliar words. It consists of a string of letters that resembles a real word (for example, fot, vap, muke). Thus, students' knowledge of sight words will not influence scores on pseudowords measures.
3. See note 2.
4. The four areas of reading performance are those identified in U.S. Department of Health and Human Services (2000).
5. Potentially positive findings, or findings that approach but do not quite reach the traditional level of significance, should be interpreted with caution because they may have been a result of chance.
6. The study of Reading Recovery (Schwartz, 2005) is technically an effectiveness trial, but all the Reading Recovery interventionists received extensive training, which is typical of an efficacy study.
7. Academic vocabulary represents a set of words that are used in academic classrooms and text much more often than in everyday social and informal settings. Academic vocabulary words include both general academic words and domain-specific words.
8. None of the eligible studies included an overall reading achievement measure.

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## The Regional Educational Laboratory Program produces 7 types of reports



### **Making Connections**

Studies of correlational relationships



### **Making an Impact**

Studies of cause and effect



### **What's Happening**

Descriptions of policies, programs, implementation status, or data trends



### **What's Known**

Summaries of previous research



### **Stated Briefly**

Summaries of research findings for specific audiences



### **Applied Research Methods**

Research methods for educational settings



### **Tools**

Help for planning, gathering, analyzing, or reporting data or research