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Intensive Reading Interventions for Inadequate Responders in Grades K–3: A Synthesis

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Abstract

A subset of students fail to respond adequately to reading interventions. This synthesis systematically reviews studies in which students in grades K–3 responded inadequately to a Tier 2 reading intervention and were provided with a Tier 3 intervention. Descriptions of the Tier 3 reading interventions and effects are provided. To meet inclusion criteria, studies were required to (a) provide documented, multi-tiered reading interventions with at least one reading outcome measured; (b) include students in grades K–3 who previously responded inadequately to a Tier 2 intervention; (c) use experimental, quasi-experimental, or multiple-group designs; and (d) be peer reviewed and conducted in English. Twelve studies met inclusion criteria. Results demonstrate that students who responded inadequately to Tier 2 interventions can make significant growth from Tier 3 interventions compared with a control group of peers who were also inadequate responders, but often fail to catch up to their more responsive peers.

Keywords

reading interventions, inadequate responders, synthesis, reading disabilities, response to intervention, Multi-Tiered Systems of Support

Many students are not receiving the level of academic support needed to meet grade-level expectations in the area of reading. According to the National Center for Education Statistics (NCES), only 36% of fourth-grade students performed at or above the proficient level in reading, and by 12th grade, only 37% of students were performing at or above this same level. Evidence suggests that students who exhibit severe reading difficulties in the primary grades are likely to continue to struggle with reading throughout school (Foorman, Francis, Shaywitz, Shaywitz, & Fletcher, 1997). In 2013, 5.7 million school-age children received special education services under the Individuals With Disabilities Education Act (IDEA; DePaoli et al., 2015). It is estimated that 85% to 90% of students in special education are capable of meeting regular diploma requirements however; the graduation rate for students in special education remains 20% below that of their peers without disabilities (DePaoli et al., 2015). Students with disabilities are also at a higher risk for dropping out of school, unemployment, and incarceration (Newman et al., 2011), indicating that negative consequences for poor reading outcomes have effects that reach far beyond the classroom.

Although many studies demonstrate success with early reading interventions for students with reading difficulties, some students progress much slower, noticeably struggling with reading even after intervention (Al Otaiba & Fuchs, 2002). Although there have likely always been students who have responded inadequately to instruction, Vellutino et al. (1996) first conceptualized the term "minimal responder" by classifying students as difficult to remediate based on their minimal response to intervention (RTI). Students can be identified as inadequate responders only after being provided research-based interventions and failing to respond adequately (Vellutino, Scanlon, & Jaccard, 2003). Because research demonstrates that low-quality instruction is occurring too frequently in schools (Vaughn, Levy, Coleman, & Bos, 2002), it is challenging to determine which students are inadequate responders versus those who have not been adequately taught. Additional research is needed investigating the effects of intensive intervention for students who have received research-based reading instruction and continue to respond inadequately to instruction.

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When considering how to provide effective intensive reading interventions, it might be helpful to consider recommendations from the National Reading Panel (National Reading Panel & National Institute of Child Health and Human Development, 2000), the Simple View of Reading (Gough & Tunmer, 1986; Hoover & Gough, 1990), and the Information Processing Theory (Posner, Lewis, & Conrad, 1972). The National Reading Panel (National Reading Panel & National Institute of Child Health and Human Development, 2000) identified that the best approach to evidence-based reading instruction is one that incorporates each of the five components of reading: phonological awareness, phonics, fluency, vocabulary, and comprehension. The theoretical model of the Simple View of Reading includes two basic components: word recognition (decoding) and comprehension. The model posits that strong reading comprehension cannot occur unless both decoding skills and language comprehension abilities are strong (Gough & Tunmer, 1986). Information Processing Theory describes how humans think, reason, and learn by proposing that human cognitive functioning involves actively inputting, retrieving, processing, and storing information. From this theory, phonological awareness, phonics, fluency, and vocabulary are lower level processes that must be activated and become more automatic to achieve reading comprehension, the highest-level reading process, and the ultimate goal of reading instruction (Posner et al., 1972).

Research demonstrates that some students fail to make adequate progress despite being provided supplementary reading intervention (Lam & McMaster, 2014). Approximately 2% to 6% of early readers do not appear to respond to research-based, early reading interventions (Torgesen, 2000), and approximately 20% to 25% of students with learning disabilities do not benefit from the reading interventions that are currently provided in schools today (Fuchs & Fuchs, 2015). Despite the number of students struggling to make adequate progress, substantial research in beginning reading has documented that providing intensive, early reading interventions can produce significant improvements in reading outcomes for most students, reducing the performance gap between struggling readers and their higher performing peers (Denton, Fletcher, Anthony, & Francis, 2006; Denton et al., 2013; Gilbert et al., 2013; O'Connor, Fulmer, Harty, & Bell, 2005; Scanlon, Vellutino, & Small, 2005; Vellutino, Scanlon, Small, & Fanuele, 2006). For this reason, students responding inadequately to instruction require more intensive reading interventions to determine whether providing additional and more intensive support can help this subset of students achieve reading growth.

Multi-Tiered Systems of Support (MTSS) and RTI are terms that can be utilized interchangeably to describe a framework for providing multiple levels, or tiers, of academic support to struggling learners to both remediate skills and prevent disabilities (Fuchs, Fuchs, & Compton, 2012). There are several benefits to implementing MTSS compared with a more traditional model. First, all students receive multi-tiered screening and assessment to identify students at risk for academic difficulty. MTSS provides services to prevent the academic failure of students who are struggling in general education who have not been identified with a disability (Fuchs et al., 2012). When considering how MTSS is used to support students who demonstrate inadequate response, a focus on reading in grades K–3 was selected as this is the academic area and grade range with the largest body of research. Furthermore, RTI was initially conceptualized as a prevention approach (Council for Exceptional Children, 2008); thus, focusing on early grades is aligned with the intent of the RTI framework.

Researchers who study RTI recognize that a combination of research-based primary and secondary prevention will still be inadequate to meet the needs of about 5% of the student population, who will require additional Tier 3, intensive intervention (Fuchs et al., 2012). Schools are being charged with providing effective primary and secondary interventions to meet the needs of the majority of learners, while also determining how to allocate resources effectively to meet the more intensive needs of the small percentage of learners who previously responded inadequately to intervention and require additional support. A common approach to RTI is to provide multiple tiers of increasingly intensive interventions in which students are provided with standardized, research-based interventions (Fuchs, Mock, Morgan, & Young, 2003). Because students are provided with highly standardized interventions, only a subset of students with intractable reading difficulties or disabilities, who fail to respond to multiple tiers of research-based, standardized interventions, will require specialized instruction. Fidelity of implementation, or implementing a standardized, research-based intervention as designed and intended, is critical to ensure that students who have been identified as responding inadequately are true inadequate responders. Without high fidelity, it is unclear what the effects on the students will be (Hill, King, Lemons, & Partanen, 2012).

Despite the knowledge that many struggling readers require intensive interventions to be successful academically, some schools are currently pushing toward full-inclusion, resulting in students receiving less intensive interventions in the area of reading (Fuchs et al., 2015). The NCES (2015) took data indicating that the percentage of students, aged 6 to 21 years, who were served under IDEA and spent more than 80% of the school day in general education classrooms increased from 33% in 1990–1991 to 62% in 2013–2014. These data suggest that students with disabilities are receiving less intensive support in reading instruction, potentially negatively affecting the small percentage of learners research demonstrates will require more intensive academic support in reading to improve as readers.

Additional research is needed to determine how to provide more effective intensive reading interventions to students who are currently responding inadequately to instruction. To ensure that interventions are targeting inadequate responders, it is necessary to examine studies providing additional intervention after documenting students' inadequate response to a previous intervention. Several studies have documented these types of multi-tiered interventions to inadequate responders; however, to date, there has been no work done to synthesize the results of such studies. The objective of this review is to describe the features of the Tier 3 intervention provided in each study, as well as analyze the effect each Tier 3 intervention had on the reading outcomes of students in grades K–3 who previously responded inadequately to a documented, Tier 2 intervention.

Research Questions

Research Question 1: What reading interventions are provided to students in grades K–3 who previously responded inadequately to a documented, Tier 2 intervention?

Research Question 2: What are the effects of providing a Tier 3 reading intervention to students who have previously responded inadequately to a documented, Tier 2 intervention?

Method

Search Procedures

A systematic search was conducted using various search methods, including an electronic search, ancestral search, and a hand search. First, the following electronic databases were searched: Education Source, ERIC, and PsycINFO to find studies related to the search terms. The primary search terms included *reading OR fluency OR phonics OR phonemic OR phonological.* These terms were chosen to represent the areas of reading most frequently used to measure progress of students in grades K–3 receiving intensive reading intervention. The secondary terms in the database search included: *"non respon*" OR "treatment resist*" OR "minimal respon*" OR unresponsive OR "difficult to remediate" OR "severe reading dis*" OR "severe dis*" OR remedia**. These were chosen to represent the following terms: nonresponder(s), treatment resistor(s), inadequate responder(s), minimal responder(s), unresponsive, difficult to remediate, severe reading disability/disabilities, severe disability/disabilities, or remedial. These terms were chosen in an attempt to capture all students who respond inadequately to instruction. Tertiary terms were added to the electronic search after discovering a large number of articles initially included pertained to mental health related topics. The following terms were added: *NOT "depress*" OR drug.* These were chosen to eliminate articles related to depression or responsiveness/non-responsiveness to any type of drug therapy. The initial search yielded 571 studies. From this list of studies, the titles and abstracts were read and sorted into one of three folders: yes, no, or maybe. The studies in the yes and maybe folders were analyzed more closely and coded to consider all inclusion criteria, and were moved to the appropriate category as needed.

Upon completion of the electronic search, seven studies were identified that met inclusion criteria. Several journals were hand-searched from 2014 through the present to identify articles missed during the electronic search. Hand-searched journals included the *Journal of Learning Disabilities*, *Reading and Writing*, *Reading Research Quarterly*, *Learning Disabilities Quarterly*, and *Exceptional Children*. These journals were selected due to their focus on students with disabilities who might require intensive support as well as their focus on reading. In addition, these were the journals in which the majority of the articles included in this synthesis were published. No additional articles were found from the hand search. Finally, reference lists from each eligible article were also reviewed as part of an ancestral search. Five additional articles were found during the reference list search.

Inclusion/Exclusion Criteria

To meet inclusion criteria for the synthesis, studies were required to:

- Provide multi-tiered reading interventions. This was defined as students responding inadequately to a documented, small-group or one-on-one, Tier 2 reading intervention, and then being provided another documented, small-group or one-on-one Tier 3 reading intervention
- Document inadequate response by a subset of students. The definition of inadequate response was any student responding insufficiently to a previous intervention. How inadequate response was defined was left up to the researcher and was coded for further analysis.
- Include at least one reading outcome, which was broadly defined as a standardized or researcher-developed measure including any of the five components of reading: phonological awareness, phonics, fluency, vocabulary, and comprehension.
- Include participants in kindergarten through third grade. Students could be identified for special education, but were not required to be in special education for inclusion in this synthesis due to the young age of the participants.

- Utilize experimental, quasi-experimental, or a multiple-group research designs.
- Be conducted in English and published in a peer-reviewed journal.

Studies were excluded if they involved only a single group or single-case design, reporting growth from pretest to posttest. These studies were excluded on the basis of not including a control group from which to compare student growth. Only one single-case study that met all criteria other than study design was identified through the search. Studies were also excluded if they did not include a multitiered reading intervention, as this was the mechanism for identifying studies classifying students as inadequate responders. It is likely that many research studies include students who have previously received small-group interventions, as struggling students are frequently provided interventions in schools; however, to ensure that the studies in this synthesis included inadequate responders, studies were excluded if they did not explicitly document students' inadequate response to a Tier 2 intervention.

Data Analysis

Coding procedures. A code sheet designed by researchers from the Meadows Center for Preventing Educational Risk (Vaughn, Elbaum, Wanzek, Scammacca, & Walker, 2014) was modified slightly for use in this synthesis. This code sheet was selected due to the initial version's reliability as well as its ability to capture a comprehensive picture of each study. The code sheet was modified to allow for a more complete recording of the demographic information and description of both the Tier 2 and Tier 3 interventions. Coding procedures were used to organize information from each of the studies related to the participants, type of research design, descriptions of the Tier 2 and 3 interventions provided to the treatment and comparison groups, clarity of causal inference, quality of the study, general findings, measures, and effect sizes.

There were two coders for each study. Interrater reliability was demonstrated by having each coder independently code a single study. The percentage of agreement was calculated by determining the number of responses indicating agreement divided by the total number of responses, both agreement and disagreement. Interrater reliability was established with 95% agreement between the two coders. Both coders independently coded each of the 12 studies included in the synthesis. If disagreements occurred, meetings were held to discuss the discrepancies in coding to reach agreement in how to proceed.

Participant information included socio-economic status, risk type, grade, age, and gender. The type of design used for both the Tier 2 and Tier 3 interventions was coded for, as well as a description of how participants were selected and assigned to condition. When coding for how students were selected for the Tier 3 intervention, the coding included a description of how students were determined to have responded inadequately to a previous, Tier 2 intervention. The description of interventions included the sample size, dosage, group size, implementer, name of program used for intervention, and a detailed description of the instructional program used. The clarity of causal inference was coded by considering differential attrition, equating procedures, evidence of local history events, and the possibility of intervention contaminants. All of these factors determined whether the study met standards as low, medium, or high quality. To code for measures and effect sizes, the code sheet captured the name of the measure, the reliability and validity, the minimum and maximum scores possible, and whether the measure was standardized or researcher-developed.

At the completion of coding, seven tables were created to summarize the results. Table 1 provides a summary of the reading components assessed after providing the Tier 2 intervention to determine whether students responded adequately. Table 2 provides a summary of how each Tier 3 intervention was intensified from the previous Tier 2 intervention provided. Table 3 describes the grade level, dosage, group size, and implementer of both the Tier 2 and Tier 3 intervention for each study. Table 4 describes the Tier 2 intervention provided in each study. Tables 5, 6, and 7 describe the Tier 3 treatment and comparison groups for each study and provide the effects of each Tier 3 intervention. Tables 5, 6, and 7 are organized by how students were selected for the comparison condition.

Effect size calculation. Effect sizes were calculated using Cohen's *d*, by taking the difference between the posttest mean of the Tier 3 intervention group compared with the posttest mean of the comparison group, divided by the pooled standard deviation. Cohen's recommendations were used to determine the size of the effect. An effect size of $d = 0.2$ was considered small, $d = 0.5$ was considered moderate, and $d = 0.8$ was considered large (Cohen, 1992).

Results

Twelve studies met criteria for inclusion in this synthesis. The studies used different terminology to refer to the first and second intervention provided to the inadequate responders. Some studies referred to the RTI system when discussing how to intensify the intervention, using the terminology of Tier 2 and Tier 3, while other studies used terms such as layers or levels to describe how a second intervention was provided with greater intensity due to students' inadequate response to the previous intervention. For the purpose of clarity, this synthesis uses the terms "Tier 2" and "Tier 3." Tier 2 refers to the first documented one-on-one or small-group intervention provided. If a subsequent intervention

Table 1. Components of Reading Assessed After Tier 2 Intervention to Determine Student Responsiveness.

Study	Phonological awareness	Phonics	Fluency	Vocabulary	Comprehension
Berninger et al. (2002)		X			X
Denton, Fletcher, Anthony, and Francis (2006)		X	X		X
Denton et al. (2013)		X	X		X
Gilbert et al. (2013)		X	X		
O'Connor (2000)		X	X		
O'Connor, Fulmer, Harty, and Bell (2005)		X	X	X	X
Scanlon, Vellutino, and Small (2005)	X	X			X
Vadasy, Sanders, and Abbott (2008)		X	X		X
Vaughn, Linan-Thompson, and Hickman (2003)	X	X			X
Vaughn et al. (2009)		X	X	X	X
Vellutino, Scanlon, Zhang, and Schatschneider (2008)		X			X
Wanzek and Vaughn (2008)		X	X		

Table 2. Method for Intensifying Intervention From Tier 2 to Tier 3.

Study	Increase frequency of sessions per week	Increase length of each session	Increase duration of intervention from start to finish	Decrease group size	Increase expertise of instructor	Adjust instruction by engaging in the process of DBDM
Berninger et al. (2002)			X	X		
Denton, Fletcher, Anthony, and Francis (2006)		X		X		
Denton et al. (2013)	X	X	X	X	X	X
Gilbert et al. (2013)	X			X		
O'Connor (2000)	X	X	X		X	
O'Connor, Fulmer, Harty, and Bell (2005)		X	X			X
Scanlon, Vellutino, and Small (2005)	X			X		
Vadasy, Sanders, and Abbott (2008)						
Vaughn, Linan-Thompson, and Hickman (2003)						X
Vaughn et al. (2009)		X	X	X		
Vellutino, Scanlon, Zhang, and Schatschneider (2008)	X		X	X		
Wanzek and Vaughn (2008)	X	X				

Note. DBDM = data-based decision making.

was provided to the students whose response was identified as inadequate, this small-group or one-on-one intervention was referred to as a Tier 3 intervention.

Definition of Inadequate Response

Tables 4 to 7 describe the content of the interventions provided in Tier 2 and Tier 3. To ensure students are true inadequate responders, it is necessary to ensure that students have received research-based interventions implemented with high levels of fidelity. Three studies failed to report fidelity of implementation data for Tier 2 or Tier 3 (O'Connor, 2000; O'Connor et al., 2005; Scanlon et al., 2005). All other studies reported high levels of implementation fidelity for both the Tier 2 and Tier 3 intervention. One of the challenges in discussing intensive interventions for inadequate responders is the high level of variability in what is considered unresponsive and how this is defined, with little agreement on what constitutes adequate response to an intervention (Toste et al., 2014). All studies in this synthesis included participants who were described as having responded inadequately to a Tier 2 intervention;

Table 3. Grade Level, Dosage, Group Size, and Implementer of Tier 2 and Tier 3 Treatment Groups.

	Description of Tier 2 intervention				Description of Tier 3 intervention			
Study	Grade level	Dosage	Group size	Implementer	Grade level	Dosage	Group size	Implementer
Berninger et al. (2002)	1st	20 min, 2×/week, 8 weeks = 5.33 hr	2 students	Tutors	2nd	20 min, 2×/week, 16 weeks = 10.67 hr	1 student	Tutors
Denton, Fletcher, Anthony, and Francis (2006)	1st	40 min, 5×/week, ~ 8 months = ~ 106.67 hr	3 students	Certified teachers trained and supervised by the researchers	1st–3rd	Phono-Graphix: two 50-min sessions, 5×/week, 8 weeks = 66.67 hr; read Naturally: 60 min, 5×/week, 8 weeks = 40 hr	2 students	Certified teachers trained and supervised by the researchers
Denton et al. (2013)	1st	30 min, 2x–4×/ week, 8–16 weeks = 8 hr–32 hr	2–4 students	Tutors who were not certified teachers	2nd (some repeating 1st)	45 min, 5×/week, 24–26 weeks; mean number of hours of reported dosage = 76.5 hr	2–3 students	Certified teacher or experienced clinical reading tutors—all selected, trained, and supervised by the researchers
Gilbert et al. (2013)	1st	45 min, 3×/week, 7 weeks = 15.75 hr	3–4 students	Trained research assistants	1st	30 min, 5×/week, 7 weeks = 17.5 hr	1 student	Trained research assistants
O'Connor (2000)	K	12 min, 3×/week, 10 weeks = 6 hr	1 student	Teacher assistants, with one research assistant implementing in a classroom lacking a teacher assistant	1st	30 min, 4×/week, 14 weeks = 28 hr	3–5 students	A first-grade classroom teacher who was also a student at the university conducted lessons for two of the classes. A graduate student teaching at the school conducted the other 3 groups.
O'Connor, Fulmer, Harty, and Bell (2005)	K	10–15 min, 3×/ week, ~5 months = ~10–15 hr	2–3 students	Research associate, a doctoral student, and a certified special educator trained by the 1st author	1st–3rd	20–25 min, 3×/ week, ~7 months = ~28–35 hr	Small group—not specified	Research associate and a doctoral student along with a certified special educator trained by the first author

(continued)

Table 3. (continued)

	Description of Tier 2 intervention				Description of Tier 3 intervention			
Study	Grade level	Dosage	Group size	Implementer	Grade level	Dosage	Group size	Implementer
Scanlon, Vellutino, and Small (2005)	K	30 min, 2×/week, ~8.5 months = ~34 hr	3 students	Certified teachers trained and supervised by project staff	1st	30 min, 5×/week, ~ 8.5 months = 85 hr	1 student	Certified teachers trained and supervised by project staff
Vadasy, Sanders, and Abbott (2008)	1st	30 min, 4×/week, Fall–Spring = ~ 40 hr	1 student	Paraeducator	2nd	30 min, 4×/week, 20 weeks = 40 hr	1 student	Paraeducator
Vaughn, Linan-Thompson, and Hickman (2003)	2nd	~35 min, 5×/ week, 10 weeks = ~29.17 hr	3 students	Tutors who were experienced in teaching reading to students with reading difficulties and were trained and supervised by the research team leaders	2nd	~35 min, 5×/week, 10 weeks = ~29.17	NR	Tutors who were experienced in teaching reading to students with reading difficulties and were trained and supervised by the research team leaders
Vaughn et al. (2009)	1st	30 min, 5×/week, 13–26 weeks = 32.5–65 hr	4–6 students	Graduate students and research associates hired and trained by the research team	2nd	50 min, 5×/week, ~26 weeks = 108.33 hr	2–4 students	Graduate students and research associates hired and trained by the research team
Vellutino, Scanlon, Zhang, and Schatschneider (2008)	K	30 min, 2×/week, 25–30 weeks = 25–30 hr	small group, not specified	Certified teachers who were trained and supervised by project staff	1st	30 min, 5×/week, ~8 months = ~80 hr	1 student	Certified teachers who were trained and supervised by project staff
Wanzek and Vaughn (2008)	1st	30 min, 5×/week, 13 weeks = 32.5 hr	NR	Trained graduate students and research associates	1st	30-min sessions, 5×/ week, 13 weeks = 32.5 OR two 30-min sessions, 5×/ week, 13 weeks = 65 hr	4–5 students	Trained graduate students and research associates

Note. NR = not reported.

Table 4. Description of Instruction Provided in the Tier 2 Interventions.

Study	Description of Tier 2 intervention
Berninger et al. (2002)	Lessons included the following components: 5 min of explicit training in the connections between spelling units and phonemes, 10 min of modeling connections between units of written and spoken words, singly or in combination, 5-min reading engaging story books with the tutor providing assistance as necessary using the same kind of prompts as were modeled in the second segment.
Denton, Fletcher, Anthony, and Francis (2006)	Treatment Group 1: Students received either Proactive Beginning Reading Instruction (PBRI; Mathes, Torgesen, Menchetti, Wahl, & Grek, 1999), which incorporated a highly structured direct instruction approach based on a carefully designed scope and sequence, with students applying phonics skills in decodable text, with integrated fluency and comprehension instruction. Treatment Group 2: Students received Responsive Reading Instruction (RRI; Denton & Hocker, 2006). In this approach, there was no scripted scope and sequence and no decodable text. Teachers were provided with explicit phonics instruction based on a recommended sequence of phonic elements and the need for instruction in these elements as evidenced by student assessments and anecdotal records taken while students engaged in reading and writing. In RRI, students read text that was leveled for difficulty but not phonetically decodable, and they spent relatively more time reading and writing connected text than did students in the PBRI group.
Denton et al. (2013)	A modified version of the 1998 Read Well program (Sprick, Howard, & Fidanque, 1998) was used. Read Well was selected because it provides systematic, explicit instruction in both decoding and fluency with application in decodable text and because it has demonstrated efficacy for supporting word reading outcomes for at-risk students when delivered by uncertified preservice teachers in a relatively brief implementation (Denton, Anthony, Parker, & Hasbrouck, 2004). The Read Well program was modified by adding instruction in vocabulary and reading comprehension and by creating partially scripted lessons plans to support the tutors.
Gilbert et al. (2013)	The instructional focus of the activities included in the supplemental, remedial tutoring program were letter–sound correspondence, sight word recognition, phonemic awareness, decoding, spelling, and reading fluency (Foorman & Torgesen, 2001; Rayner, Foorman, Perfetti, Pesetsky, & Seidenberg, 2001).
O'Connor (2000)	The lesson format included cumulative introduction of letter names and sounds for 2–4 min, followed by alternated blending and segmenting activities at the level of onset and rime. Children matched letter sounds to words and used say-it-and-move-it activities (Ball & Blachman, 1991). As children learned the 8 letter sounds and onset-rime level blending and segmenting, activities changed to 3-phoneme blending and segmenting, but just over half the children reached that level by the end of the intervention.
O'Connor, Fulmer, Harty, and Bell (2005)	Teachers scaffolded blending and segmenting activities by using smaller instructional sets and easier levels of tasks and providing more repetition and practice to develop key concepts.
Scanlon, Vellutino, and Small (2005)	Focused on emergent literacy skills: reading to and with the children, promoting phonemic awareness, developing letter name and letter-sound knowledge, and writing. The intervention program was designed both to reinforce the child's classroom program and to help the child attain skills in the following areas: motivation to read and write, phoneme awareness, letter identification, letter sound associations, alphabetic principals, print awareness, print conventions, whole word identification
Vadasy, Sanders, and Abbott (2008)	Instruction emphasized letter-sound correspondences, phoneme blending, decoding, and encoding phonetically regular words, and reading irregular high-frequency words. The last 15 min of each tutoring session was allocated for oral reading practice in designated texts. Paraeducators chose a reading method that matched each student's reading skills (with assistance from researchers): independent reading, partner reading, or echo reading.
Vaughn, Linan-Thompson, and Hickman (2003)	The intervention focused on five elements of reading development that have been identified as essential for beginning readers: Phonemic awareness, phonics with special attention to systematic mastery of sound-letter relationships as well as word families, fluency (word and text), instructional level reading and comprehension, and spelling.
Vaughn et al. (2009)	Intervention was designed by the research team as a hybrid of two commercial products as well as extensions from other materials. It included instruction in phonics and word recognition, fluency, passage reading, and comprehension.
Vellutino, Scanlon, Zhang, and Schatschneider (2008)	The instructional program was a modified version of the program described by Vellutino et al. (1996). It included activities designed to foster motivation for reading and writing and to facilitate development of basic literacy skills, specifically, phonological awareness, knowledge of print concepts, letter identification, knowledge of the letter sounds, letter-sound decoding, and sight word identification. The acquisition of each of these skills entailed extensive practice in isolated contexts as well as ample opportunity to apply them in authentic reading and writing contexts. Lessons were tailored to a given child's individual needs but were also designed to support that child in his or her classroom instructional program.
Wanzek and Vaughn (2008)	A standard intervention protocol was used that provided the following: 15 min of phonics and word recognition, 5 min of fluency exercises addressing reading speed and accuracy, 10 min of passage reading and comprehension at each student's skill level, with both literal and inferential questions following each passage.

Table 5. Tier 3 Interventions Comparing Inadequate Responders to Higher Responding Students.

Study	Description of Tier 3 treatment group	Description of comparison condition	Results of Tier 3 intervention
Berninger et al. (2002)	Included 2nd-grade students who responded inadequately to Tier 2; received a one-on-one, Tier 3 intervention for 20 min, 2×/week for 12 weeks targeting alphabetic principle or syllable awareness to improve decoding of polysyllabic words.	Included 2nd-grade students who responded adequately to Tier 2; received TSI, which may have included small-group instruction if provided by the school.	Treatment < Control: *WRMT-R Word ID: d* = −1.47; *WRMT-R Word Attack: d* = −0.85; *WRMT-R Reading Comprehension: d* = −1.07
O'Connor, Fulmer, Harty, and Bell (2005)	Included students in Grades 1–3 who responded inadequately to Tier 2; received a small-group Tier 3 intervention for 20–25 min, 3×/week for 8 months. The intervention was individualized based on student need, targeting word patterns, decoding, spelling, and reading aloud in text containing familiar spelling patterns. For students who had demonstrated greater mastery of decoding at pretest, the intervention targeted reading and re-reading text to build fluency and comprehension.	Included students in Grades 1–3; in 1st grade, the control group consisted of high-performing students who did not qualify for Tier 2 or Tier 3 interventions. Students in the control group received whole-class instruction provided by teachers trained by the research staff in implementing effective reading instruction. In Grades 2 and 3, the researchers used a longitudinal lagged design in which control data were collected prior to the study from 2nd- and 3rd-grade students at the school who did not participate in the intervention. For this reason, there were two control groups for Grades 2 and 3. One control group included students who received instruction by a teacher trained by the research staff, while the other control group included the student data collected at the beginning of the study, and students did not receive instruction from teachers trained by the research staff.	Treatment (1st grade) > Control: *Segmenting: d* = 0.72; *WRMT-R Word ID: d* = 0.41; *WRMT-R Word Attack: d* = 0.48; *WRMT-R Passage Comprehension: d* = 0.22; *Fluency: d* = 0.18 Treatment (1st grade) < Control: *PPVT-III: d* = −0.12 Treatment (2nd grade) > Control (students receiving whole-class instruction from teachers trained by research staff): *PPVT-III: d* = 0.10; *WRMT-R Word ID: d* = 1.20; *WRMT-R Word Attack: d* = 1.70; *WRMT-R Passage Comprehension: d* = 1.56; *Fluency: d* = 1.76 Treatment (2nd grade) > Control (data taken prior to intervention from students receiving whole-class instruction from teachers trained by research staff): *WRMT-R Word ID: d* = 0.32; *WRMT-R Word Attack: d* = 0.52; *WRMT-R Passage Comprehension: d* = 0.30; *Fluency: d* = 0.51 Treatment (2nd grade) < Control (data taken prior to intervention from students not participating in intervention: *PPVT-III: d* = −0.01 Treatment (3rd grade) > Control (data taken prior to intervention from students receiving whole-class instruction from teachers trained by the research staff: *WRMT-R Word ID: d* = 0.88; *WRMT-R Word Attack: d* = 1.79; *WRMT-R Passage Comprehension: d* = 1.10; *Fluency: d* = 1.30 Treatment (3rd grade) > Control (data taken prior to intervention from students not participating in intervention: *WRMT-R Word ID: d* = 0.64; *WRMT-R Word Attack: d* = 0.49; *WRMT-R Passage Comprehension: d* = 0.49; *Fluency: d* = 0.52
Vadasy, Sanders, and Abbott (2008)	Included 2nd-grade students who responded inadequately to Tier 2; received a one-on-one, Tier 3 intervention targeting decoding and oral reading for 30 min, 4×/week for 20 min	Included 2nd-grade students who responded adequately to Tier 2; received TSI	Treatment < Control: *WRMT-R Word Attack: d* = −0.63; *WRMT-R Word ID: d* = −1.07; *WRAT-R Spelling: d* = −0.74; *WRMT-R Passage Comprehension: d* = −0.96; *GORT-III Fluency: d* = −0.99

(continued)

Table 5. (continued)

Study	Description of Tier 3 treatment group	Description of comparison condition	Results of Tier 3 intervention
Vaughn, Linan-Thompson, and Hickman (2003)	Included 2nd-grade students who responded inadequately to Tier 2; received Tier 3 intervention in 10-week increments until meeting exit criteria. At posttest (after 30 weeks of Tier 3 intervention), the researchers compared 4 groups: (a) a control group of students who met exit criteria after the Tier 2 intervention that lasted for 10 weeks, (b) a treatment group that responded adequately to the Tier 3 intervention after 20 weeks, (c) a treatment group that responded adequately to a Tier 3 intervention after 30 weeks, and (d) a treatment group that failed to respond adequately to the Tier 3 intervention after 30 weeks. Instruction was adjusted for individual student skills depending on the rate of progress, targeting phonological awareness, word study, and fluency.	Included 2nd-grade students who responded adequately to Tier 2; received TSI	Treatment (Exit after 20 weeks) < Control (Exit after 10 weeks): *TORF Fluency: d* = −1.03; *WRMT-R Word Attack: d* = −0.58; *WRMT-R Passage Comprehension: d* = −0.56; *CTOPP Phonological Awareness: d* = −0.19; *CTOPP Rapid Naming: d* = −0.02 Treatment (Exit after 30 weeks) < Control (Exit after 10 weeks): *TORF Fluency: d* = =1.90; *WRMT-R Word Attack: d* = −0.85; *WRMT-R Passage Comprehension: d* = −1.01; *CTOPP Rapid Naming: d* = − 0.10 Treatment (Exit after 30 weeks) > Control (Exit after 10 weeks): *CTOPP Phonological Awareness: d* = 0.21 Treatment (no exit—inadequate response after 30 weeks < Control (Exit after 10 weeks): *TORF Fluency: d* = −3.46; *WRMT-R Word Attack: d* = −1.49; *WRMT-R Passage Comprehension: d* = −1.68; *CTOPP Rapid Naming: d* = − 1.17 Treatment (no exit—inadequate response after 30 weeks) > Control (Exit after 10 weeks): *CTOPP Phonological Awareness: d* = 0.25
Vaughn et al. (2009)	Included 2nd-grade students who responded inadequately to Tier 2; received a Tier 3 intervention in a small group of 2–4 students targeting sound review, phonics, word recognition, vocabulary, fluency, passage reading, and comprehension for 50 min, 5×/week, for approximately 26 weeks.	Included 2nd-grade students who responded adequately to Tier 2; received TSI	Treatment < Control: *WRMT-R Word ID: d* = −1.06; *WRMT-R Word Attack: d* = −0.11; *WRMT-R Passage Comprehension: d* = −1.19; *DIBELS ORF: d* = −1.74; *PPVT-III: d* = −0.83
Vellutino, Scanlon, Zhang, and Schatschneider (2008)	Included 1st-grade students who responded inadequately to Tier 2; received one-on-one, Tier 3 intervention for 30 min, 5×/week from October-mid-May focused on phoneme awareness, decoding, code and meaning-based strategies for word identification, and comprehension. The treatment group receiving the Tier 3 intervention was split into two groups: (a) difficult to remediate and (b) less difficult to remediate. The focus of the intervention depended on student need.	Included 1st-grade students. Three different comparison groups were included utilized. (a) The "No Longer at Risk" group received a Tier 2 intervention and responded adequately; therefore, they did not receive the Tier 3 intervention. (b) The "Average IQ" comparison condition did not participate in Tier 2 or Tier 3,but was included in assessment. (c) Finally, the "Above Average IQ" group also included students did not receive Tier 2 or Tier 3 intervention, but participated in assessment. All comparison groups received TSI.	Treatment (Difficult to Remediate) < Control (No Longer at risk): *WRMT-R Word ID: d* = −1.31; *WRMT-R Word Attack: d* = −0.95; *WIAT Reading Comprehension: d* = −1.66 Treatment (Difficult to Remediate) < Control (Normal IQ): *WRMT-R Word ID: d* = −2.13; *WRMT-R Word Attack: d* = −1.65; *WIAT Reading Comprehension: d* = −2.18 Treatment (Difficult to Remediate) < Control (Above-Average IQ): *WRMT-R Word ID: d* = −2.61; *WRMT-R Word Attack: d* = −3.81; *WIAT Reading Comprehension: d* = −2.92

(continued)

Table 5. (continued)

Study	Description of Tier 3 treatment group	Description of comparison condition	Results of Tier 3 intervention
			Treatment (Less Difficult to Remediate) < Control (No Longer at risk): *WRMT-R Word ID: d* = −0.33; *WIAT Reading Comprehension: d* = −0.51 Treatment (Less Difficult to Remediate) > Control (No Longer at risk): *WRMT-R Word Attack: d* = 0.01 Treatment (Less Difficult to Remediate) < Control (Average IQ): *WRMT-R Word ID: d* = −1.30; *WRMT-R Word Attack: d* = −0.71; *WIAT Reading Comprehension: d* = −1.19 Treatment (Less Difficult to Remediate) < Control (Above-Average IQ): *WRMT-R Word ID: d* = −1.92; *WRMT-R Word Attack: d* = −1.88; *WIAT Reading Comprehension: d* = −2.02

Note. TSI = typical school instruction; *WRMT-R = Woodcock Reading Mastery Tests–Revised*; PPVT-III = *Peabody Picture Vocabulary Test–Third Edition*; *WIAT = Wechsler Individual Achievement Test*; *WRAT-R = Wide-Range Achievement Test–Revised*; *CTOPP = Comprehensive Test of Phonological Processing*; *TORF = Test of Reading Fluency*; *DIBELS: Dynamic Indicators of Basic Early Literacy Skills*; ORF = oral reading fluency; *GORT-III = Gray Oral Reading Test-III*.

Table 6. Tier 3 Interventions Comparing Inadequate Responders to Other Inadequate Responders.

Study	Description of Tier 3 treatment group	Description of comparison condition	Results of Tier 3 intervention
Denton, Fletcher, Anthony, and Francis (2006)	Included students in Grades 1–3 who responded inadequately to Tier 2; received a Tier 3, Phono-Graphix intervention targeting phonics instruction and decoding in a 2:1 student to teacher ratio for two 50-min sessions, 5×/week for 8 weeks.	Included students in Grades 1–3 who responded inadequately to Tier 2; received TSI	Treatment > Control: *WJ-III Word Attack: d* = 1.77; *WJ-III Letter-Word ID: d* = 0.90; *WJ-III Spelling: d* = 0.36; *TOWRE Sight Word Fluency: d* = 0.39; *TOWRE Phonemic Decoding Fluency Nonwords per Minute: d* = 0.70; *GORT-4 Fluency: d* = 0.29; *WJ-III Passage Comprehension: d* = 0.37; *GORT-4 Comprehension: d* = 0.63
Denton et al. (2013)	Included both 2nd-grade students and students repeating 1st grade who responded inadequately to Tier 2; received a Tier 3 intervention in small groups of 2–3 students for 45 min, 4–5×/week for 24–26 weeks. The intervention was an adapted version of Responsive Reading and Read Naturally, as the instructors engaged in data-based decision making to adjust instruction to meet individual student needs. Responsive Reading targeted word study, oral reading fluency, reading comprehension, application of skills and strategies while reading connected text, and written response to text. Read Naturally targeted oral reading fluency.	Included both 2nd-grade students and students repeating 1st grade who responded inadequately to Tier 2; received TSI including supplemental reading intervention for some students if provided by the school.	Treatment > Control: *WJ-III Basic Reading: d* = .56; *WJ-III Letter-Word ID: d* = .44; *WJ-III Word Attack: d* = .65; *TOWRE Word Reading Efficiency: d* = .42; *TOWRE Phonemic Decoding: Efficiency: d* = .40; *TOWRE Sight Word Efficiency: d* = .39; *WJ-III Passage Comprehension: d* = .34; *Gates MacGinitie Passage Comprehension: d* = .35

(continued)

Table 6. (continued)

Study	Description of Tier 3 treatment group	Description of comparison condition	Results of Tier 3 intervention
Gilbert et al. (2013)	Included 1st-grade students who responded inadequately to Tier 2; received an intensified, one-on-one, Tier 3 intervention for 30 min, 5×/week for 7 weeks targeting letter–sound correspondence, sight word recognition, phonemic awareness, decoding, and reading fluency	Included 1st-grade students who responded inadequately to Tier 2; continued to receive Tier 2 intervention without intensification. The intervention targeted letter-sound correspondences, sight word recognition, phonemic awareness, decoding, spelling, and reading fluency.	Treatment < Control: *Sight Word Efficiency: d* = −0.49; *Phonemic Decoding Efficiency: d* = −0.57; *WRMT-R Word Attack: d* = −0.35; *WRMT-R Word Identification: d* = −0.60
Scanlon, Vellutino, and Small (2005)	Included 1st-grade students who responded inadequately to Tier 2; received a one-on-one, Tier 3 intervention for 30 min, 5×/week from mid-October to early June. Students receiving Tier 3 intervention were randomly assigned to one of two conditions that each targeted reading fluency by re-reading texts, phonological skills, sight word instruction, and writing. The Text-Emphasis condition spent more time reading and re-reading text, while the Phonological-Skills Emphasis devoted more time to phonologically based skills.	Included 1st-grade students who responded inadequately to Tier 2; received whatever form of remediation was normally available to them in school. The remedial support offered by the schools involved in the comparison condition varied in intensity from small-group remediation provided several times each week to intensive one-on-one tutorial approaches.	Treatment (Text Emphasis) > Control: *WRMT-R Basic Skills: d* = 0.58; *WRMT-R Word ID: d* = 0.59; *WRMT-R Word Attack: d* = 0.40; *WIAT Reading Comprehension: d* = 0.42 Treatment (Phonological-Skill Emphasis > Control: *WRMT-R Basic Skills: d* = 0.64; *WRMT-R Word ID: d* = 0.54; *WRMT-R Word Attack: d* = 0.59; *WIAT Reading Comprehension: d* = 0.07

Note. TSI = typical school instruction; *WRMT-R = Woodcock Reading Mastery Tests–Revised*; *WJ-III = Woodcock–Johnson III*; *TOWRE = Test of Word Reading Efficiency*; *GORT-4 = Gray Oral Reading Test-4*; *WIAT = Wechsler Individual Achievement Test.*

Table 7. Tier 3 Interventions Comparing Inadequate Responders to Low-Performing Students Who Did Not Receive Tier 2 or 3 Interventions.

Study	Description of Tier 3 treatment group	Description of comparison condition	Results of Tier 3 intervention
O'Connor (2000)	Included 1st-grade students who responded inadequately to Tier 2; received a Tier 3 intervention in small groups of 3–5 students for 30 min, 4×/week for 14 weeks targeting blending and spelling decodable words	Included 1st-grade students who did not participate in a Tier 2 intervention. Instead, this group was made up of students who qualified for participation in the study due to low reading performance on the Woodcock–Johnson literacy subtests at the start of the study. Some students remained in the control group because the whole-class instruction provided during kindergarten was sufficient for progress; however, most remained because parents did not give consent for participation in treatment; received TSI, in which reading and language arts instruction was conducted for 60–80 min, 4–5 times per week. Instruction varied depending on classroom.	Treatment (High Gain) > Control: *Rapid Letter Naming: d* = 0.62; *Blending: d* = 1.53; *Segmenting: d* = 3.38; *WJ-III Subtests: d* = 1.22; *Spelling: d* = 0.99; *Fluency: d* = 1.20 Treatment (Low Gain) > Control: *Blending: d* = 0.75; *Segmenting: d* = 1.03; *WJ-III Subtests: d* = 0.88; *Spelling: d* = 0.18; *Fluency: d* = 0.83 Treatment (Low Gain) = Control: *Rapid Letter Naming: d* = 0

(continued)

Table 7. (continued)

Study	Description of Tier 3 treatment group	Description of comparison condition	Results of Tier 3 intervention
Wanzek and Vaughn (2008)	Included 1st-grade students who responded inadequately to Tier 2; students were assigned to one of two Tier 3 intervention groups: (a) Students received Tier 3 instruction for 30 min, 5×/week; (b) students received Tier 3 instruction for two 30-min sessions, 5×/week. All Tier 3 interventions were researcher-developed, targeting phonics, word recognition, fluency, and reading comprehension.	The study was conducted in successive school years in the same schools with two non-overlapping samples of 1st-grade students. Students in the comparison group were identified each year as at risk for reading difficulties prior to the Tier 2 intervention, but instead of receiving a Tier 2 or Tier 3 intervention, they were randomly assigned to a control group. The control group received school services.	Treatment (one 30-min session daily) < Control: *WRMT-R Word ID: d* = −0.01; *DIBELS ORF: d* = −0.22 Treatment (one 30-min session daily) > Control: *WRMT-R Word Attack: d* = 0.81 Treatment (two 30-min sessions daily) < Control: *WRMT-R Word ID: d* = −0.16; *WRMT-R Word Attack: d* = −0.66; *DIBELS ORF: d* = −0.05

Note. TSI = typical school instruction; *WRMT-R = Woodcock Reading Mastery Tests–Revised*; *WJ-III = Woodcock–Johnson III*; *DIBELS: Dynamic Indicators of Basic Early Literacy Skills*; ORF = oral reading fluency.

however, there was great variability in how researchers defined inadequate response. Eleven of 12 studies reported inadequate response based on student performance on posttest reading measures. The 12th study (Vadasy, Sanders, & Abbott, 2008) used a classroom teacher's judgment to determine which students required additional Tier 3 intervention due to inadequate response.

Of the studies utilizing posttest reading measures to determine inadequate response, there was variability in how researchers determined what performance level constituted inadequate response. All studies included at least one measure of the *Woodcock–Johnson III* (WJ-III; Woodcock & Johnson, 1977) or the *Woodcock Reading Mastery Test–Revised* (WRMT-R; Woodcock, 1987) to determine who had responded adequately to the Tier 2 intervention. Three studies used summed z scores to rank order students to determine which percentage of students fell in the range of being considered inadequate responders (Gilbert et al., 2013; Scanlon et al., 2005 Vellutino, Scanlon, Zhang, and Schatschneider, 2008), while two studies evaluated response on the WJ-III or WRMT-R based on a student performing within the average range for their grade level (Berninger et al., 2002; O'Connor, 2000). Two other studies selected a cut score or a percentile which students were required to obtain to be considered an adequate responder (Denton et al., 2006; Denton et al., 2013). Three studies used the *Dynamic Indicators of Basic Early Literacy Skills* (DIBELS) oral reading fluency measure to determine inadequate response to a Tier 2 intervention (Denton et al., 2013; Vaughn et al., 2009; Wanzek & Vaughn, 2008). On the DIBELS oral reading fluency measure, three studies selected a predetermined criterion for adequate response. One study identified first-grade students reading below 27 words correct per minute as inadequate response, while another study required first graders to only read 20 words per minute. Another study identified second-grade students reading below 50 words per minute as inadequate responders. In the final study, students were rank ordered and a predetermined percentage of students were considered inadequate responders.

The studies also varied in which components of reading were assessed to determine a student's response to a Tier 2 intervention. In this synthesis, 16.7% of the studies assessed students' performance in phonological awareness, 100% assessed performance in phonics, 66.7% in fluency, 16.7% in vocabulary, and 75% in reading comprehension. Refer to Table 1 for a description of which components of reading were assessed in each study.

Intensification of Instruction From the Tier 2 to Tier 3

Thirty-three percent of studies increased the frequency of sessions, 50% of studies increased the session length, and 66.7% of studies increased the duration of intervention from start to finish. Reducing group size was used by seven of 12 studies (58.3%) to address intensifying a Tier 3 intervention for inadequate responders. Three studies (25%) explicitly stated that increasing the level of expertise of the implementer from the Tier 2 intervention was a method used to intensify the Tier 3 intervention. Only three studies (25%) adjusted Tier 3 instruction by engaging in the process of data-based decision making. Refer to Tables 2 and 3 for detailed descriptions of how instruction was intensified from Tier 2 to Tier 3 in each study.

Effects of Tier 3 Interventions

All 12 studies included in this synthesis involved experimental, quasi-experimental, or multiple-group designs in which the Tier 3 intervention treatment group of inadequate responders was compared with a control group. There was large variability in how participants were selected for the comparison condition in each study. For example, in Berninger et al. (2002), the comparison condition was comprised of students who responded adequately to the Tier 2 intervention. In contrast, in Denton et al. (2006), the comparison condition consisted of students who failed to respond adequately to the Tier 2 intervention. Finally, O'Connor (2000) is an example of a study in which the comparison condition consisted of students who were low-performing but did not participate in a Tier 2 intervention, so it is unknown how the students would have responded to a Tier 2 intervention. Tables were created to organize studies with comparable control conditions. Table 5 includes studies that utilized control groups with higher responding students. Table 6 includes studies that utilized control groups that also included students who responded inadequately to a Tier 2 intervention. Table 7 includes two studies that did not fit into either of the previous categories. For both of these two studies, students in the comparison condition were low-performing students, but did not participate in either Tier 2 or Tier 3 intervention; therefore, we do not know whether the students in these studies would have responded adequately or inadequately to intervention. In Tables 5, 6, and 7, each study is described by (a) the Tier 3 intervention provided to students who responded inadequately to Tier 2 intervention, (b) how students were selected for the comparison condition as well as the instruction received in the comparison condition, and (c) results.

Tier 3 Interventions With Comparable Control Groups

In this synthesis, four studies included comparable control groups comprised of students who responded inadequately to Tier 2 intervention. Three of the four studies demonstrated that Tier 3 interventions produced significant positive effects for students who previously responded inadequately to Tier 2 interventions. Although it is not possible to conclude that the Tier 3 interventions from these three studies were more effective than the interventions in the studies without comparable control groups, the studies with comparable control groups offer the most promise at examining what features of Tier 3 instruction might potentially benefit students who have previously responded inadequately to intervention. By utilizing the three studies with comparable control groups that demonstrated positive results, we can learn more about the Tier 2 interventions that were previously unsuccessful at remediating the reading deficits of the nonresponders included in the study. In addition, we can more closely examine Tier 3 interventions that produced successful results to inform future practices with inadequate responders.

In Denton et al. (2006), Tier 2 intervention was provided to low-performing students in first and second grade for 40 min, 5×/week, from October through May. A certified teacher supervised by the researcher provided explicit phonics instruction to students in groups of three. Students were identified as inadequate responders to the Tier 2 intervention based on continued below-average reading abilities, as measured by performing at or below the 30th percentile criterion on the WJ-III Basic Reading Composite (Woodcock, McGrew, & Mather, 2001). The students who responded inadequately to the Tier 2 intervention were assigned to either a Tier 3 intervention or to a control group that received typical school instruction. Tier 3 intervention involved two 50-min sessions, 5×/week for 8 weeks. Students received the Phono-Graphix intervention targeting phonics instruction and decoding in a 2:1 students to teacher ratio. The Tier 3 intervention produced positive effects, with the inadequate responders who received Tier 3 intervention performing significantly better than the inadequate responders who were assigned to the control condition on all measures of reading (*WJ-III Word Attack: d* = 1.77; *WJ-III Letter-Word ID: d* = 0.90; *WJ-III Spelling: d* = 0.36; *TOWRE Sight Word Fluency: d* = 0.39; *TOWRE Phonemic Decoding Fluency Nonwords per Minute: d* = 0.70; *Gray Oral Reading Test-4 (GORT–4) Fluency: d* = 0.29; *WJ-III Passage Comprehension: d* = 0.37; *GORT-4 Comprehension: d* = 0.63).

In Denton et al. (2013), Tier 2 intervention was provided to first-grade students who had been identified as responding inadequately to Tier 1 (whole-class) instruction. Tier 2 intervention was provided to students for 30 min, 2 to 4×/week for 8 to 16 weeks. A tutor who was not a certified teacher provided the Tier 2 intervention with groups of two to four students using a modified version of the Read Well program, which incorporates systematic and explicit instruction in the areas of decoding and fluency with application in decodable text. Students were considered inadequate responders due to either a score below 93 on the WJ-III Basic Reading Skills composite, a score below 90 on the Test of Word Reading Efficiency composite, or an oral reading fluency score of fewer than 20 words correct per minute. The students who responded inadequately to the Tier 2 intervention were assigned to either a Tier 3 intervention or to a control group that received typical school instruction, which included supplemental reading intervention for some students if provided by the school. The Tier 3 intervention involved mostly second-grade students (with a few students repeating first grade), and a certified reading teacher or experienced clinical reading tutor utilized an adapted version of Responsive Reading. Read Naturally

was also utilized for students who were identified as needing increased emphasis on fluency. The Tier 3 intervention produced positive effects, with the inadequate responders who received Tier 3 intervention performing significantly better than the inadequate responders who were assigned to the control condition on all measures of reading (*WJ-III Basic Reading: d* = .56; *WJ-III Letter-Word ID: d* = .44; *WJ-III Word Attack: d* = .65; *TOWRE Word Reading Efficiency: d* = .42; *TOWRE Phonemic Decoding: Efficiency: d* = .40; *TOWRE Sight Word Efficiency: d* = .39; *WJ-III Passage Comprehension: d* = .34; *Gates MacGinitie Passage Comprehension: d* = .35).

In Scanlon et al. (2005), Tier 2 intervention was provided to kindergarten students identified as at risk for reading difficulties or disabilities for 30 min, 2×/week, from October through early June. Certified teachers trained and supervised by the project staff provided a researcher-developed, emergent literacy skills intervention to students in a 3:1 student to teacher ratio. Students were considered inadequate responders based on their response on the letter identification, word identification, and word attack subtests of the WRMT-R. A composite based on the summed *z* scores for each of the tests was computed for each student, and any student scoring below the midpoint of all of the students who had participated in the Tier 2 intervention were identified as inadequate responders. The students identified as inadequate responders were either assigned to one of two, Tier 3 treatment groups, or to a control group that received whatever form of remediation was normally available to them in school. This remediation varied from small-group intervention provided several times each week to an intensive one-on-one tutorial approach. Both treatment groups received a one-on-one, Tier 3 intervention for 30 min, 5×/week, from October to early June. Both treatment conditions targeted reading fluency by re-reading texts, phonological skills, sight word instruction, and writing. The Text-Emphasis condition spent more time reading and re-reading text, while the Phonological-Skills Emphasis devoted more time to phonologically based skills. Both of the Tier 3 interventions produced positive effects. The Text-Emphasis Tier 3 intervention produced statistically significant effects on all reading measures compared with the control group of inadequate responders who did not receive Tier 3 intervention (*WRMT-R Basic Skills: d* = 0.58; *WRMT-R Word ID: d* = 0.59; *WRMT-R Word Attack: d* = 0.40; *Wechsler Individual Achievement Test [WIAT] Reading Comprehension: d* = 0.42). In addition, the Phonological-Skill Emphasis also produced statistically significant effects on all reading measures compared with the control group of inadequate responders who did not receive Tier 3 intervention (*WRMT-R Basic Skills: d* = 0.64; *WRMT-R Word ID: d* = 0.54; *WRMT-R Word Attack: d* = 0.59; *WIAT Reading Comprehension: d* = 0.07).

Gilbert et al. (2013) was the final study that included a comparable control group of students who responded inadequately to Tier 2 intervention. Interestingly, this study failed to produce positive effects for the implementation of the Tier 3 intervention. When comparing the three studies that produced positive effects to Gilbert et al. (2013), an important difference exists in the instruction received in the comparison condition. In Denton et al. (2006), Denton et al. (2013), and Scanlon et al. (2005), students in the comparison condition were assigned to typical school instruction. Unfortunately, the instruction received was not described in detail, but sufficient information was provided to allow one to infer that for some students, typical school instruction meant that some students received little to no supplemental instruction beyond what was provided in Tier 1 in the general education classroom, while other students received supplemental support in either small groups or one-on-one. This differed from Gilbert et al. (2013), as students assigned to the comparison condition in this study were not assigned to an intensive, Tier 3 intervention, but did continue to receive an intervention identical to what they were provided in Tier 2 by a trained research assistant. Instead of being assigned to the Tier 3 intervention which was provided one-on-one for 30 min, 5×/week, for 7 weeks, students continued with Tier 2 intervention, provided in groups of three to four students, for 45 min, 3×/week for 7 weeks. Students assigned to the Tier 3 intervention received a total of 17.5 hr of intervention, while students assigned to the control group who continued with Tier 2 intervention received a total of 15.75 hr of intervention. Although the Tier 3 intervention increased in frequency, it decreased in the number of minutes per session, resulting in just a minimal increase in dosage.

Three of the four studies with comparable control groups demonstrate that students who have previously responded inadequately to instruction can likely benefit from being provided with intensive intervention. The three studies that produced positive effects provided daily Tier 3 interventions focused on phonics and fluency skills. These studies also suggest that the inadequate responders included in the comparison condition of these studies were not receiving the level of support they required for continued reading growth from their school.

Tier 3 Interventions Comparing Inadequate Responders to Low-Performing Students Who Did Not Receive Tier 2 or Tier 3 Interventions

In two studies included in this synthesis (O'Connor, 2000; Wanzek &Vaughn, 2008), researchers did not provide enough information to know whether students in the control group had previously responded adequately or inadequately to intervention. In O'Connor (2000), students assigned to

the control group had not participated in a Tier 2 intervention. Instead, this group was made up of students who qualified for participation in the study due to low performance on the *Woodcock–Johnson* literacy subtests at the start of the study (WJ < 86, segment < 4, and letter naming <15). Some students remained in the control group because the whole-class instruction provided during kindergarten was sufficient for progress; however, most remained because parents did not give consent for participation in treatment. At posttest, the Tier 3 treatment group was broken into two subgroups for analysis based on the amount of growth each student demonstrated after receiving 14 weeks of targeting intervention focused on blending and spelling decodable words for 30-min sessions, 4×/week. The "high-gain" treatment group outperformed the control group on all reading measures (Rapid Letter Naming: $d = 0.62$; Blending: $d = 1.53$; Segmenting: $d = 3.38$; *WJ-III* Subtests: $d = 1.22$; Spelling: $d = 0.99$; Fluency: $d = 1.20$). The "low-gain" treatment group also outperformed the control group on all reading measures (Blending: $d = 0.75$; Segmenting: $d = 1.03$; WJ-III Subtests: $d = 0.88$; Spelling: $d = 0.18$; Fluency: $d = 0.83$), except for rapid letter naming ($d = 0$).

In Wanzek and Vaughn (2008), the study was conducted in successive school years in the same schools with two nonoverlapping samples of first-grade students. Students in the comparison group were identified each year as at risk for reading difficulties prior to the Tier 2 intervention, but instead of receiving a Tier 2 or Tier 3 intervention, they were randomly assigned to a control group and received typical school services. The Tier 3 treatment group was provided with either one 30-min session of a targeted phonics, word recognition, fluency, and reading comprehension intervention 5×/week, or two 30-min sessions of the same intervention 5×/week. For the treatment group assigned to one 30-min session of Tier 3 intervention daily, statistically significant gains were demonstrated in word attack (*WRMT-R Word Attack:* $d = 0.81$), but the intervention did not demonstrate significant effects in word identification (*WRMT-R Word ID:* $d = -0.01$) or oral reading fluency (*DIBELS ORF:* $d = 0.22$). The Tier 3 intervention failed to produce positive effects for the treatment group assigned to two 30-min sessions daily (*WRMT-R Word ID:* $d = -0.16$; *WRMT-R Word Attack:* $d = -0.66$; *DIBELS ORF:* $d = -0.05$).

Discussion

What reading interventions are provided to students in grades K–3 who previously responded inadequately to a documented, Tier 2 intervention?

Identifying the features of Tier 3 interventions that appear to have an impact on the effectiveness of interventions for inadequate responders could allow future researchers and practitioners to determine what types of interventions produce effective reading growth for previous inadequate responders, who we hypothesize might require a different level of support than students who respond adequately. It also allows for the analysis of what types of interventions have not been effective with inadequate responders.

Although inclusion criteria required students to be in grades K–3, the majority of studies in this synthesis provided Tier 3 interventions to first and second graders. No studies involved a Tier 3 intervention with kindergarten students and only two studies (Denton et al., 2006; O'Connor et al., 2005) included third-grade students. Additional research is needed on the effectiveness of providing Tier 3 interventions with kindergarten and third-grade students who received Tier 2 interventions and failed to respond adequately to analyze whether students in these grade levels profit from intensive, Tier 3 interventions to the same degree as first- and second-grade students.

The group size, implementer, type of intervention provided (researcher developed or commercially-based), or dosage did not appear to have a significant impact on the effectiveness of Tier 3 interventions for the studies included in this synthesis. Both small-group and one-on-one interventions produced significant results in various studies, but there was no noticeable difference in impact depending on group size. The size of the impact was not dependent upon whether Tier 3 interventions were implemented by a certified teacher versus research staff. Finally, some studies implementing Tier 3 interventions with a greater dosage failed to produce significant results, while other studies implemented for a much shorter duration of time produced positive results for previous inadequate responders; therefore, duration of the Tier 3 intervention from start to finish did not appear to impact the effectiveness.

When considering the effectiveness of the Tier 3 interventions in this synthesis, it is crucial to consider the comparison condition when interpreting results, as the comparison condition is a potential moderating variable for the effectiveness of a Tier 3 intervention. Six of 12 studies (Berninger et al., 2002; O'Connor et al., 2005; Vadasy et al., 2008; Vaughn, Linan-Thompson, & Hickman, 2003; Vaughn et al., 2009; Vellutino et al., 2008) utilized control groups containing students who had either responded adequately to a Tier 2 intervention, therefore not requiring a Tier 3 intervention, or students who did not participate in either Tier 2 or Tier 3 interventions due to performing at a higher level at the start of the study. Of these studies using a control group consisting of students who were adequate responders, five of six (Berninger et al., 2002; Vadasy et al., 2008; Vaughn et al., 2003; Vaughn et al., 2009; Vellutino et al., 2008) demonstrated results in which the control group outperformed the treatment group in all or almost all reading outcome measures at posttest, supporting the fact that inadequate responders appear to frequently struggle to catch up to their peers despite receiving intensive, Tier 3 intervention.

Four of 12 studies (Denton et al., 2006; Denton et al., 2013; Gilbert et al., 2013; Scanlon et al., 2005) utilized control groups mirroring the treatment group by also containing students who had demonstrated inadequate response to a Tier 2 intervention. It is critical to recognize that in these studies, the control group likely performed at a similar level to the treatment group prior to receiving a Tier 3 intervention. These types of studies are not measuring how inadequate responders compare to higher performing students after intensive intervention. Instead they are measuring whether intensive, Tier 3 intervention allows students who have previously failed to benefit from intervention to make significant growth compared with a group of peers that have also previously demonstrated inadequate response. In this synthesis, three of the four studies using a control group of inadequate responders demonstrated results in which the treatment group outperformed the control group (Denton et al., 2006; Denton et al., 2013; Gilbert et al., 2013), demonstrating promising effects to support the idea that students who have previously responded inadequately to Tier 2 reading interventions can make significant reading progress if provided an intensive, Tier 3 intervention.

> What are the effects of providing a Tier 3 reading intervention to students who have previously responded inadequately to a documented, Tier 2 intervention?

Overall, the effects of Tier 3 interventions included in this synthesis offer promising results for students who have previously responded inadequately to Tier 2 intervention. Three of four studies (Denton et al., 2006; Denton et al., 2013; Scanlon et al., 2005) included in this synthesis concluded that Tier 3 interventions can help inadequate responders can make statistically significant gains in reading compared with a matched control group including other inadequate responders. These results demonstrate that students who have previously responded inadequately to intervention are capable of making meaningful gains in reading skills, despite their inability to catch up to higher performing peers. The studies demonstrating that inadequate responders failed to catch up to their higher-performing peers suggest that expecting grade-level performance from all students might be unrealistic; however, significant reading growth made by low-performing students has the potential to have a positive impact on students' academic and non-academic outcomes.

Limitations

The conclusions that can be drawn are limited by several factors unique to each of the studies included in this synthesis. First, the studies differed in how students were selected for the comparison condition. Only four studies utilized a control group of students who also responded inadequately to Tier 2 intervention, allowing for a true comparison between the treatment and control groups. Six studies used a control group including students who had responded adequately to a Tier 2 intervention. These studies were conducted with the goal of examining whether students who responded inadequately during a Tier 2 intervention could make significant academic gains to catch up to their higher performing peers if provided a more intensive, Tier 3 intervention. Despite the importance of this research question, it is essential to note that the groups in these studies were not equal at pretest. The control group consisted of stronger readers than the treatment group before intervention; therefore, a negative effect size after the Tier 3 intervention is not necessarily indicative of an ineffective intervention or a lack of student growth. Instead, a negative effect size demonstrates that intensive Tier 3 intervention does not appear, in some cases, to help students close the gap between their own performance and higher performing students. Finally, two studies used a control group of high-performing students who did not qualify for a Tier 2 or Tier 3 intervention. In these two studies, the students in the comparison groups were low performing at the start of the study, but the comparison groups did not receive Tier 2 intervention; therefore, we do not know whether the students would have responded adequately or inadequately to intervention. Some low-performing students respond quickly and make significant academic gains when provided high-quality, intensive intervention, while others do not. For this reason, it is difficult to interpret the results of these studies as the lack of consistency in the population used as a control group makes it difficult to compare the effects of one study to the next.

Second, there is not a universal definition of what constitutes an inadequate responder. Each study used different criteria to identify students who responded inadequately to a Tier 2 intervention. For this reason, the studies included in this synthesis are not easily comparable. All students could be considered struggling students, but it would be useful for research to develop a clear definition for an inadequate responder, so that studies looking at this population were comparing students with similar profiles. Finally, no studies included kindergarten students and only two studies included students in third grade. With the majority of studies only providing Tier 3 interventions to students in first and second grade, this synthesis is unable to draw conclusions related to the effectiveness of Tier 3 interventions for kindergarten or third-grade students.

Implications for Future Research and Practice

Further research is needed to examine the relationship between the dosage of a Tier 3 intervention and effects for inadequate responders in grade K–3. To examine the role dosage plays on the effectiveness of Tier 3 interventions, it is necessary to identify a larger group of studies utilizing a

comparable control group. It is also necessary that the field develops and uses a universal definition for inadequate responder if this is an area that will continue to be investigated. Further research could assess the effectiveness of Tier 3 interventions with students in grades four and above to see whether the reading struggles of inadequate responders would be more difficult to remediate than in grades K–3. Additional intervention studies evaluating the effectiveness of Tier 3 interventions for kindergarten and third-grade students are needed. Additional research is also needed to determine whether data-based individualization would produce more significant effects for inadequate responders than standard, scripted curricula. Finally, conducting an observational study looking at the characteristics of interventions actually being implemented with inadequate responders in schools today would provide insight into how Tier 3 interventions are being used in practice.

The results of the studies including comparable control groups suggest that the inadequate responders included in the comparison condition who were assigned to typical school instruction were not receiving the level of support they required for continued reading growth from their school. With three of these four studies providing intensive Tier 3 intervention to inadequate responders demonstrating promising positive effects, it is important that schools adopt practices and systems to support interventions serving students who previously have not responded adequately to intervention. Schools would benefit from having multitiered systems in place delivering standard, scripted early reading interventions with high fidelity at the Tier 1 and Tier 2 level. Only with this level of high fidelity, can schools be certain that students who fail to respond to the instruction are true inadequate responders versus students who were inadequately taught. Once schools have identified true inadequate responders, interventions need to be put into place allowing students to receive ongoing intensive, Tier 3 intervention. Providing services to students with the greatest academic needs is a social justice issue in the sense that there is no acceptable failure rate. Students who have responded inadequately to previous intervention might not always show growth at the same rate as their more responsive peers, but several of the studies included in this synthesis demonstrate that it is possible for students to make significant growth in reading with adequate support and intensive intervention.

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