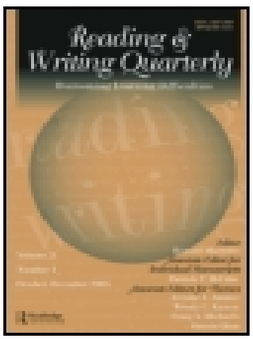

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Engaging Struggling Early Readers to Promote Reading Success: A Pilot Study of Reading by Design

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*In this study, we piloted a Tier 2 intervention designed to improve reading skills among struggling early readers using an intervention that included SRA Reading Mastery, listening-while-reading activities, strategies to increase motivation and engagement in reading, and parent involvement in reading homework. The study included 6 students in Grade 1 and 5 students in Grade 2 (*N = *11), all of whom were failing to meet grade-level reading benchmarks. We delivered the intervention in small, grade-based groups for 35 min 4 times per week for 4 months. Pretest and posttest performance on the Woodcock Reading Mastery Tests–Third Edition using grade-based standard scores indicated significant improvement on the Total Reading cluster (*p = *.0017,* d = *1.23) and the following subtests: Oral Reading Fluency (*p = *.0095,* d = *1.21), Word Attack (*p = *.0064,* d = *0.89), Passage Comprehension (*p = *.0207,* d = *0.66), and Word Identification (*p = *.0245,* d = *0.93). We discuss implications for practice and future research.*

Educators and policymakers have identified achieving proficiency in reading among all students as an essential national priority. Nonetheless, despite increased time allocation for reading instruction throughout the United States

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in recent years, national assessment results from 2013 showed that 17% of students in the United States were reading below basic levels in fourth grade (National Center for Education Statistics, 2013).

Students who struggle with early reading skills often receive interventions through multitiered systems of support (Gersten et al., 2008). Through regular screening of academic skills, those students who need more intensive instruction to meet benchmark goals are identified and placed into small groups for supplemental instruction. Research to date indicates that although tiered models of academic support offer the opportunity for students to receive timely intervention outside of the special education system (Gersten et al., 2008), it has proven difficult to design Tier 2 interventions that are powerful enough to close the gap between struggling early readers and their typically achieving peers (e.g., Gilbert et al., 2013). Thus, there is a need for innovative reading interventions that build on the existing empirical literature while offering novel strategies for potentially accelerating reading growth among youth with reading challenges. In this study, we piloted a multicomponent Tier 2 intervention that integrated phonics instruction with listening-while-reading (LWR) activities, strategies for increasing motivation and engagement, and parent involvement in reading at home. We titled the intervention *Reading by Design* to reflect our goal of designing an intervention that would draw struggling readers into the reading process, increasing not only their skills but also their enjoyment of reading and thereby their motivation to practice reading skills.

TIERED INTERVENTIONS FOR STRUGGLING EARLY READERS

In recent years, many schools throughout the United States have begun using tiered models of service delivery with the recognition that some children need more intensive instruction than others to meet benchmark academic goals (Gersten et al., 2008). These tiered models begin with Tier 1 instruction, in which evidence-based instructional strategies are used with all students and progress in skill acquisition is regularly monitored. For students who are not meeting benchmarks in Tier 1 instruction, Tier 2 offers more intensive instruction, typically in the form of small groups that meet several times per week to supplement Tier 1 instruction. At Tier 2, students again are regularly monitored, with those who make adequate progress returning to Tier 1 and those needing even more intensive instruction moving to Tier 3. Reading by Design was developed as a Tier 2 intervention to supplement Tier 1 instruction for students who were not meeting reading benchmarks in Grade 1 or Grade 2.

THE EFFICACY OF TIER 2 INTERVENTIONS

Several recent studies have examined the efficacy of Tier 2 interventions for struggling early readers. For example, Kerins, Trotter, and Schoenbrodt

(2010) identified 23 students reading below level in Grade 1 and randomly assigned them to (a) regular classroom instruction or (b) regular classroom instruction plus a 17-week Tier 2 intervention. The intervention included 8 weeks (60–90 min per week) of phonological awareness instruction by a speech-language pathologist followed by 9 weeks (60 min per week) of multisensory phonics instruction by a special educator. Results showed that students in both groups experienced significant improvement in overall reading (as measured by running records) and in blending, segmenting, and decoding (as measured by standardized tests), but no significant postintervention differences by group were found when preintervention differences were controlled.

In another study, Wanzek and Vaughn (2008) examined the benefits of doubling the intervention dose for Grade 1 students who had previously shown a low response to reading intervention. They randomly assigned previous low responders to either a single-dose intervention group (30 min/week; $n = 21$), a double-dose intervention group (60 min/week; $n = 14$), or one of two comparison groups ($n = 29$ for the single-dose comparison and $n = 22$ for the double-dose comparison). Both intervention groups received a scripted intervention focusing on phonics, phonemic awareness, fluency, vocabulary, and comprehension delivered over 13 weeks by trained graduate students and research associates. When pretreatment differences were controlled, students in the single-dose treatment did not differ from the comparison group at posttest, with no significant differences on the Word Identification, Word Attack, or Passage Comprehension subtests of the Woodcock Reading Mastery Tests (WRMT)–Revised or on curriculum-based measures of reading fluency. The double-dose group scored significantly higher than the control group only on Word Attack. Examination of pretest-to-posttest effect sizes (ESs) showed that all groups made large gains in oral reading fluency (ESs = 1.25–1.76). In contrast, the comparison groups had average score declines from pretest to posttest on Word Identification and Word Attack (ESs = −0.06 to −0.39), indicating that they were falling further behind their typical peers. The single-dose group also obtained a lower average posttest than pretest score on Word Identification (ES = −0.27). The double-dose group did not show any average pretest-to-posttest declines, but all of them remained far below the end of the first-grade benchmark oral reading score of 40 words per minute.

Slightly more promising results were reported by Mathes et al. (2005), who examined whether adding a Tier 2 intervention to high-quality Tier 1 classroom instruction would help struggling first-grade readers catch up to their typically achieving peers. Tier 2 instruction consisted of small groups instructed by a certified teacher for 200 min per week from October through May. Students were randomly assigned to a direct instruction (DI) group ($n = 92$), a cognitive strategy instruction group ($n = 92$), or Tier 1 instruction alone ($n = 114$). Tier 2 focused on word identification, phonics, and

phonemic awareness, although the DI group used a specific scope and sequence designed to build decoding skills through cumulative practice with specific phonemes whereas the cognitive strategy group used teacher coaching as students read and wrote connected text. Results showed that students who received either of the Tier 2 interventions performed significantly better at posttest than those in the enhanced Tier 1 group. Similar ESs (ES = 0.84 for DI and ES = 0.78 for cognitive strategy) were found for the Tier 2 interventions. It is important to note that students placed in a Tier 2 intervention achieved steeper slopes than their typically achieving peers on measures of untimed word reading, phonological awareness, and passage reading fluency. Nonetheless, the Tier 2 students did not catch up to their peers, except for the DI group, which only caught up on one measure (word attack skills).

Finally, Gilbert et al. (2013) examined the efficacy of Tier 2 interventions for Grade 1 nonresponders to Tier 1 instruction. Students were randomly assigned to either continue Tier 1 instruction ($n = 80$) or begin a 14-week Tier 2 intervention ($n = 148$). The intervention was administered by trained graduate research assistants in small groups and focused on phonics, phonemic awareness, and reading fluency. Students who did not respond to Tier 2 were randomly assigned to either continue ($n = 21$) or advance to Tier 3 ($n = 24$), which focused on the same skills but was delivered individually. At the end of first grade, students in the Tier 2 and Tier 3 interventions showed significantly greater pre-to-posttest change in reading skills than students who remained at Tier 1. However, at the end of first grade, only 59% of students in Tier 2 had word reading scores in the average range (compared to 53% of students who remained at Tier 1). By third grade, these percentages had dropped to 40% and 39%, respectively.

Overall, research on tiered intervention for struggling early readers indicates that among Tier 1 nonresponders, advancing to Tier 2 yields better outcomes than remaining at Tier 1. However, the research also demonstrates that Tier 2 interventions rarely close the gap between at-risk readers and their typically achieving peers. If the promise of tiered models of reading intervention is to be realized, more research is needed on how to accelerate reading growth for those students with early reading challenges. It is important to explore how systematic and strategic combinations of empirically supported strategies impact skill acquisition. In the current study, we asked the question of whether a multicomponent, integrated Tier 2 intervention for struggling readers in Grades 1 and 2 would result in greater than average growth in reading skills over the course of 16 weeks. The goal of our developmental work and subsequent pilot study was to create an approach that could be effective for virtually all children grouped together for reading assistance. We turn next to the research on the components of our intervention.

EMPIRICAL SUPPORT FOR THE COMPONENTS OF READING BY DESIGN

SRA Reading Mastery

Reading Mastery is a DI reading program that has been studied extensively in schools with students in general education, remedial education, and special education, with strong results (see Schieffer, Marchand-Martella, Martella, Simonsen, & Waldron-Soler, 2002, for a comprehensive review). Reading Mastery is designed to teach reading skills through the use of a controlled vocabulary, orthographical prompts, and careful introduction of phonics rules. Most researchers have found Reading Mastery to yield significant gains in reading in diverse samples (Kamps et al., 2008; Schieffer et al., 2002) For example, Kamps et al. (2008) studied a group of 83 students at high risk for reading failure in mid-kindergarten across 13 schools (eight experimental, five control). Students in the experimental schools ($n = 39$) received supplemental reading instruction using one of several DI programs, including Reading Mastery (1995 edition). Students in the control schools ($n = 44$) received supplemental reading instruction that was less structured and included less consistent use of phonics instruction. At follow-up in Grades 1 and 2, students in the experimental schools scored significantly higher on measures of nonsense word fluency and oral reading fluency than students in the control schools. Students in the experimental schools also scored significantly higher on subtests of the WRMT (Word Identification in Grades 1 and 2, Passage Comprehension in Grade 2) than students in the control schools. Students in the experimental schools (i.e., those instructed with DI programs) showed pre-to-post ESs of 1.22 for nonsense word fluency and 1.5 for oral reading fluency.

Reading Mastery—Fast Cycle has also been compared to other DI programs. For example, Cook, Gibbs, Campbell, and Shalvis (2004) examined reading outcomes for youth with mild disabilities in Grades 2–4 ($N = 30$) who received supplemental instruction using either Reading Mastery—Fast Cycle ($n = 15$) or Horizons Fast Track A–B ($n = 15$). Students in both programs improved, although the students in the Reading Mastery—Fast Cycle group showed slightly better performance on measures of decoding. Pre-to-post ESs for youth in the Reading Mastery—Fast Cycle group ranged from 0.20 on the Letter-Word Identification subtest of the Woodcock–Johnson Tests of Achievement–Revised to 0.71 on the state literacy assessment.

LWR

As the name implies, LWR activities involve having children listen to text while simultaneously reading it. Morgan and Sideridis's (2006) meta-analysis of

reading fluency interventions found that reading text while listening to the passage as read by a teacher or played by an audio recorder was moderately effective at increasing the fluency of young children (Grades K–5). In addition, LWR has been shown to increase reading comprehension (Hawkins, Musti-Rao, Hale, McGuire, & Hailley, 2010), allowing children to think deeply about text without having to exert enormous effort to decode it. When compared across multiple studies, the positive effects of LWR on fluency are consistent but somewhat less robust than those of reinforcement and goal-setting interventions (Morgan & Sideridis, 2006). Nonetheless, LWR activities are easy to implement and are thus strong candidates for supplementing other Tier 2 reading intervention components. Teachers can provide instruction to one or two students while the other students engage in LWR activities until it is their time to work with the teacher.

Strategies to Increase Motivation and Engagement

Three components were added to Reading by Design to increase engagement and motivation: (a) teacher-made games, (b) computer-based reading activities, and (c) tangible reinforcers. Using game-like activities to teach students to read is frequently recommended, especially for struggling learners who are difficult to engage in more traditional instructional approaches because of their reduced enthusiasm associated with repeated failure. Although a paucity of experimental research has been conducted on reading games within the past decade, the few studies that exist have reported promising results (Charlton, Williams, & McLaughlin, 2005; Jasmine & Schiesl, 2009).

Supplementing regular reading instruction with computer-based activities to teach reading also has been shown to result in significant reading improvement among first-grade students at risk for reading failure (Howell, Erickson, Stanger, & Wheaton, 2000). Howell and colleagues (2000) found that having students work with a teacher on a computer-based program including stories with decodable, predictable text and associated word study (similar to the program used in Reading by Design) for 30 min, four times per week over a 4-month period resulted in a large effect on onset, rime, word identification, and developmental spelling. Our review of the research did not identify any empirical studies of the computer program used in this study (Reader Rabbit Interactive Reading Journey II; The Learning Company, 1997). We selected this program because it fit well instructionally with Reading Mastery—Fast Cycle.

Finally, with regard to reinforcers more generally, a linear correlation between reinforcement and children's learning in school has been confirmed in a number of studies throughout the years. For instance, Luiselli, Putnam, Handler, and Feinberg (2005) found that the use of a token reinforcement system was associated with significant decreases in behavior problems and significant increases in reading comprehension among children in Grades K–5.

Parent Involvement

Research has consistently demonstrated that parent involvement in academic learning is associated with student success, and students who receive coordinated reading instruction from their parents and teachers have been shown to experience greater reading success than those who receive instruction from teachers alone (Lignugaris-Kraft, Findlay, Major, Gilberts, & Hofmeister, 2001). Sénéchal and Young's (2008) meta-analysis of parent involvement strategies found that children whose parents engaged them in specific, goal-oriented literacy activities had greater reading success than children whose parents just read with them. For this reason, Reading by Design incorporates specific Reading Mastery materials for parents to use.

Integration of Components

The four intervention components included in Reading by Design were selected because of the aforementioned empirical support as well as feasibility. Each component is relatively inexpensive and easy to implement, with the exception of the higher cost associated with Reading Mastery, although Reading Mastery (or another DI program) is an existing resource in many schools. We designed these four components to work together in a complementary fashion. Reading Mastery provided the bedrock on which the other interventions were established (e.g., the reading specialist created games for children to play using the errors they made while reading aloud from Reading Mastery). Parent involvement increased academic engaged time because children engaged in additional specific targeted reading activities outside of the scheduled intervention period. In addition, LWR activities using the Reading Mastery lesson and coordinated phonics instruction provided an engaging activity for students to perform with a partner while the reading specialist worked with one or two other students in the group; thus, learning was uninterrupted for all students. Reinforcement was used to maintain engagement, and the teacher-made games and computer activities allowed students to gain additional skills practice while keeping engagement levels high.

METHOD

Research Question

Do students who receive Reading by Design as a Tier 2 intervention show greater than average growth in (a) sight word reading skills, (b) decoding skills, (c) speed and accuracy of oral reading skills, (d) reading comprehension, and (e) overall reading skills?

Setting

This pilot study was conducted at one public charter school in a southeastern state January through June 2012. The target school served approximately 800 students in Grades K–9, with 80 students in Grade 1 and 78 students in Grade 2. About 69% of students at the school were White, 22% Hispanic, 4% Black, 4% multiracial, and 1% Asian/Pacific Islander; 8% of students qualified for free or reduced-price lunch. The school received a grade of A from the State Department of Education in 2012. All students in the county are eligible to attend the school; admission is through a lottery each spring. According to school administrators, retention is rarely used. The Tier 1 reading curriculum used in Grades 1 and 2 at the school during the 2011–2012 academic year was Open Court Reading (1995).

To be eligible for participation in the study, students had to be identified by the response to intervention (RtI) coordinator at the school as failing to meet grade-level expectations in reading during that school year. Children who were receiving Exceptional Student Education (ESE) services under any category (e.g., speech or language impairment) and who were in a general education classroom for the majority of the school day were eligible for participation.

Participants

Participants were 11 children (seven boys, four girls) who were 6 years 8 months old to 8 years 9 months old at the beginning of the intervention. All were identified by their current teachers (who had been instructing them for 4 months at the time of identification) as needing supplemental instruction in basic reading skills because they were performing below grade-level expectations on easyCBM probes measuring word reading fluency (Alonzo, Tindal, Ulmer, & Glasgow, 2006; administered weekly by the school's RtI coordinator) and were also performing below expectations in the classroom. Word reading fluency probes administered right before the start of the intervention ranged from 12 words per minute (<20th percentile) to 20 words per minute (between the 40th and 50th percentiles) for first graders and from 19 words per minute (approximately the 10th percentile) to 30 words per minute (approximately the 20th percentile) for second graders. None of the children in the sample had been retained, although two boys (i.e., Ricky and Eric; see Table 1) were 1 year older because their parents had delayed their kindergarten entry. Six participants were in Grade 1; the other five were in Grade 2. Two children received ESE services for speech-language concerns; all others were students in general education. All students spoke English as their first language. More information about each child, including pseudonym, gender, race, age, grade, parent concerns, teacher concerns, and parent involvement in the intervention, is included in Table 1.

TABLE 1 Demographic Information and Referral Concerns for Participating Students

Pseudonym	Gender	Race	Age (grade) at pretest	Parent concerns	Areas of concern on the VADTRS	Parent involvement[a]
Rex[b]	Male	W	7;7 (1)	Poor listening skills, frustration with reading	None	High
Donovan	Male	W	6;10 (1)	General anxiety and obsessive-compulsive behaviors	None	Moderate
Allie	Female	W	7;3 (1)	Gives up easily during reading tasks, family history of dyslexia	None	Low
Mason	Male	W	7;0 (1)	Trouble paying attention to details, frustration with reading	None	Low
Kevin	Male	W	6;8 (1)	Difficulty with phonics and fluency	None	High
Bridget	Female	W	7;3 (1)	No reading instruction the previous year because of family circumstances	None	Moderate
Ricky	Male	W/H	8;9 (2)	Anxiety about reading	Anxiety	High
Eric	Male	W	8;5 (2)	Frustration with difficult tasks, disruptive behavior	Inattention, hyperactivity, anxiety	Moderate
Sam	Male	W	7;5 (2)	Language delays	Inattention, hyperactivity/ impulsivity, anxiety	Moderate
Gianna	Female	W	8;1 (2)	Anxious about reading, shy	None	High
Hayley[b]	Female	W	7;7 (2)	Problems with fluency, writing, sitting still, concentration, reversals, frustration, rushing through work	None	High

Note. VADTRS = Vanderbilt Attention-Deficit Hyperactivity Disorder Diagnostic Teacher Rating Scale; W = White; H = Hispanic.
[a]Levels (high, moderate, low) are operationalized in the text.
[b]Student was receiving speech-language services at school.

Measures

Parent questionnaire

A 10-item open-ended questionnaire was created to gather parents' perceptions of their child's learning, particularly in the area of reading. Items addressed current parent concerns about learning and/or behavior, what parents noted when they observed their child attempt reading tasks, the child's interests and strengths, and any other relevant information about the child that parents wanted to share with the reading specialist.

Rating of parent involvement

The reading specialist who delivered the intervention (the second author) rated each family's involvement in the nightly homework, which included a form that parents completed each night listing the errors that their child made while reading aloud to them. The reading specialist kept a log of how often these forms were returned and rated involvement levels as follows: high (returned the form 75% of the time or more), moderate (returned the form 34%–74% of the time), or low (returned the form 33% of the time or less).

Vanderbilt Attention-Deficit Hyperactivity Disorder Diagnostic Teacher Rating Scale (VADTRS)

The VADTRS is a 43-item measure of teacher-rated behavioral concerns among children ages 6–12, including symptoms of attention-deficit/hyperactivity disorder (ADHD), conduct disorder, oppositional defiant disorder, anxiety, and depression. Items consist of specific symptoms from the *Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition, Text Revision* (American Psychiatric Association, 2000) as well as academic and classroom behavioral performance. In this study, we used the 33 items related to *Diagnostic and Statistical Manual of Mental Disorders* symptoms, each of which is rated on a scale from 0 (*never*) to 3 (*very often*). To screen positive for a particular concern, the child had to be rated by the teacher as showing the behavior often (2) or very often (3) on the following number of *Diagnostic and Statistical Manual of Mental Disorders* symptoms: inattention = 6 of 9 items, hyperactive/impulsive = 6 of 9 items, oppositional defiant disorder or conduct disorder = 3 of 10 items, anxiety or depression = 3 of 7 items. The VADTRS has shown evidence of a strong factor structure, internal consistency (Cronbach's $\alpha > .90$), and validity when compared to other measures of ADHD (correlations greater than .70; Wolraich, Bard, Neas, Doffing, & Beck, 2003), although items representing depression and anxiety load onto only one factor representing overall internalizing distress (anxiety/depression; Wolraich et al., 2003). In the current study, the VADTRS was used to provide information on behavioral diversity in the sample. Results are shown in Table 1.

WRMT–Third Edition (WRMT–III; Woodcock, 2011)

The WRMT–III was used to assess children's reading skills before and after the intervention. The WRMT–III is an individually administered, norm-referenced measure of academic achievement in reading. The WRMT–III yields raw scores, age- and grade-based standard scores ($M = 100$, $SD = 15$), percentile ranks, and other specialized scores. In this study, we used grade-based standard scores for statistical comparison. These scores allowed us to compare the children in our sample with the 100 first-grade students and 100 second-grade students in the WRMT–III normative sample. At pretest, which took place in early January 2012, we compared each child's raw scores to winter grade-based norms to determine standard scores; at posttest, which took place in early June 2012, we used spring grade-based norms. The WRMT–III also offers a verbal description of how a child compares to his or her peers based on standard scores. The classification categories are as follows: 69 and below = well below average, 70–84 = below below average, 85–115 = average, 116–130 = above average, 131 and above = well above average.

The 10 subtests on the WRMT–III are grouped into four composite scores: Readiness, Basic Skills, Reading Comprehension, and Total Reading. We used the Total Reading composite because of its comprehensive representation of reading skills. Total Reading includes Word Identification, Word Attack, Word Comprehension, Passage Comprehension, and Oral Reading Fluency. Word Identification requires the untimed identification of words presented in order of increasing difficulty. Word Attack uses a similar task, with nonsense words that challenge the student's decoding skills. Word Comprehension involves the ability to produce synonyms, antonyms, and analogies related to words presented in increasing difficulty. Passage Comprehension uses a cloze procedure in which students identify missing words from text. Oral Reading Fluency measures students' performance speed and accuracy of reading passages aloud. In addition to analyzing Total Reading, we examined scores on selected subtests that were most closely related to the focus of the intervention, as described in the "Data Analysis" section.

The WRMT–III is a widely used measure with strong support for reliability and validity. Woodcock (2011) reported strong internal consistency, with split-half reliability for first- and second-grade students ranging from .97 to .98 for Total Reading and from .84 (Passage Comprehension) to .97 (Word Identification) for the subtests analyzed in the current study. Test–retest reliability over a 19- to 20-day interval was .89 for Total Reading and between .76 (Oral Reading Fluency) and .95 (Word Identification) among prekindergarten to Grade 2 students. Alternate-forms reliability for the prekindergarten to Grade 2 sample also was strong (.94 for Total Reading and from .74 [Passage Comprehension] to .93 [Oral Reading Fluency]).

Procedure

The charter school where this study took place regularly monitors student progress in reading using easyCBM (Alonzo et al., 2006). Based on this measure and teacher reports of student progress in reading at the end of the Fall 2011 semester, the RtI coordinator identified those students considered to be in need of specialized reading intervention. Parents of these children were sent a letter informing them of the study. The research team was not informed of the names or total number of students whose parents received this letter. The letter to parents informed them of the study and the opportunity for their child to participate and provided details about the intervention. Parents contacted the RtI coordinator at the school to express interest and/or have any questions answered. The RtI coordinator then provided the names of interested parents to the principal investigator, who distributed a letter seeking informed consent via the student's planner. All parents who received the consent form agreed to have their child participate in the study.

Once parent consent was obtained, the principal investigator distributed the parent and teacher measures. Children were individually tested on the WRMT–III by one of two school psychology graduate students who had successfully completed competency-based training in the administration of norm-referenced tests. Students were tested in a private room near their classrooms during the school day. Form A of the WRMT–III was administered the week prior to the start of the intervention (the last week of January); Form B of the WRMT–III was administered the week following the end of the intervention (the first week of June).

The intervention was delivered for 35 min, 4 days per week, in groups of five or six children for 16 weeks (February–May). Separate groups were conducted for first and second graders. The intervention took place in a small private classroom with a large round table and a laptop computer. The reading specialist who implemented the intervention (the second author) was a special education teacher who was not employed by the school. She held a master's degree in education and had worked with struggling learners for the past 25 years, both in school settings and in private tutoring. Intervention session attendance records kept by the reading specialist indicated that all 11 students were present for at least 80% of the intervention sessions.

Description of the Intervention

Reading by Design was developed by the second author based on her experience working with struggling readers. The focus of Reading by Design is on decoding, building a sight word vocabulary, and increasing fluency. Equally important is the emphasis on building these skills using methods that reduce frustration and increase enjoyment.

During each 35-min intervention period at school, students (a) worked in pairs on an audio lesson (LWR) that involved listening to and then

choral-reading a Reading Mastery story, (b) worked individually with the reading specialist for 7 to 10 min while other children were completing the auditory work, and (c) played teacher-made reading games or computer reading games. Games focused on errors children made during oral reading of the Reading Mastery material as well as sight words and phonics skills targeted during individual work with the reading specialist. Tangible reinforcers (e.g., M&Ms) were used to maintain on-task behavior. Homework completed outside of the intervention sessions included reading from Reading Mastery to a parent, completing a worksheet related to the Reading Mastery assignment, and playing reading games. Each aspect of the intervention is described in greater detail next.

SRA Reading Mastery

The readers and workbooks used in this study were SRA Reading Mastery—Fast Cycle and Reading Mastery 3 (Science Research Associates, 1995). The Reading Mastery program is designed to give children practice with a particular phonics rule over a period of many days. Each lesson is a long reading passage that provides practice for the new rule. Sight words are introduced slowly and practiced in a cumulative manner. The Fast Cycle version teaches all of the same skills as Reading Mastery I and II but at a quicker rate with less repetition. The Reading Mastery book and workbook were purchased for each student.

Work with the reading specialist at school. While other participating students were working on the auditory lesson (LWR; see the next subsection), children met individually with the reading specialist, who listened to them read selections from the Reading Mastery lesson and then tested them on words from the lesson and on similar words. The main emphasis during these sessions was on word attack skills. For example, if the lesson stressed the silent *e* rule, the list of test words included similar examples: *dim, dime, man, mane, pet, Pete*. While working with the reading specialist, children used a phonics phone (made by the reading specialist using polyvinyl chloride pipe and elbow joints) to break words into phonemes and to clarify individual sounds within words. The reading specialist compiled errors to be added to games and to make decisions regarding supplementary phonics materials. Children practiced until they were proficient in reading lists of target words with the reading specialist. New words had to be decoded; the lesson went beyond simply memorizing sight words. Children progressed through similar lessons, though the pace and emphasis varied. Some children needed increased time practicing certain phonics rules.

LWR

Participants were placed into pairs based on similar needs as determined by the WRMT–III pretest scores. Each pair first listened to auditory material

together and then immediately began choral reading when directed to do so by the recording. Children heard the lesson from Reading Mastery they had practiced at home the night before and then choral-read it together. This usually took 10 to 15 min. They also worked on additional phonics exercises that complemented the Reading Mastery lesson, following the same format of listening first and then choral-reading as well as completing written exercises. The additional phonics practice came from Explode the Code (Educators Publishing Service, 2003) or Primary Phonics Storybooks (Makar, 2001). A sample LWR script is shown in the Appendix.

Strategies to increase motivation and engagement

Games were played in pairs in the last 10 min of each session. Games were varied to keep interest high and meet individual needs.

Teacher-made games. Board games were used to practice sight words and word attack skills (e.g., the word *string* was broken into three connected steps on the board: *str ing string*). Children read all of the blocks as they moved their marker, and they assisted each other. Another game, Bear Toss, was a movement game in which a child threw plastic bears into a bucket while reading sight word cards aloud. The card game Memory was often played with sight words.

Computer-based learning. Reader Rabbit Interactive Reading Journey II (The Learning Company, 1997) also allowed children to practice sight words and word attack skills. This program includes a carefully sequenced learning progression with stories that can be read to children or that children can read aloud. The program also incorporates phonics games related to words in each story, which children played before they proceeded to the story. Children worked on the computer in pairs, first listening to the audio through headphones and then choral-reading the story. Reader Rabbit was chosen because it is instructionally well designed and allowed for the selection of specific stories to complement the Reading Mastery lessons.

Reinforcement in the form of candy (daily) and a treasure box (weekly) also was used to increase interest and engagement. Single M&Ms were administered intermittently throughout the lesson to students who were on task. For the first 3 weeks of the intervention, the reading specialist set a timer for every 5, 8, or 10 min, and whoever was working when the timer went off was rewarded. Children did not know when the timer would go off. After the third week, reinforcement was reduced to just twice during the lesson, and then it was reduced to once during the fifth week. At that point, the games and peer interaction were sufficient to maintain momentum. Children were allowed to pick from the classroom teacher's treasure box once a week based on compliant behavior during reading group.

Parent involvement in reading at home

One lesson per night was read aloud from Reading Mastery by the child to the parent. All parents were instructed to sit with their child as the material was read and make corrections within 2 s. Parents were asked to refrain from working on decoding skills during oral reading practice and to simply offer encouragement and praise. These instructions were provided to parents at the beginning of the intervention via a phone conversation with the reading specialist. Parents recorded errors on a form that was returned to the reading specialist daily. Parents also helped their children complete the Reading Mastery workbook page accompanying the lesson (also returned daily). This work substituted for the 20 min of silent reading they otherwise would have been doing for homework. On occasion, the reading specialist sent home the teacher-made games played at school so that students could play with their parents. She also communicated weekly or bimonthly with parents by phone to check in on how things were going with reading at home.

Fidelity of implementation

Fidelity of implementation of the in-school portion of the intervention was tracked through notes kept by the interventionist. For each session, she noted whether all children (a) worked with audio materials, (b) participated in games, (c) met with the reading specialist for instruction, and (d) received positive reinforcement. Based on these criteria, fidelity of implementation was greater than 90%.

Data Analysis

Reading outcomes were assessed via comparison of pretest and posttest performance on selected subtests of the WRMT–III. Because the small sample size in the current study precluded multivariate analysis, pairwise *t* tests were conducted, and ESs are reported for each subtest and the Total Reading cluster. To control the risk of Type I error due to multiple pairwise *t* tests, we used a modified Bonferroni approach to produce a more conservative significance criterion by calculating a cutoff criterion of increasing strictness for the tests yielding the lowest *p* values. In addition, running *t* tests for all WRMT–III subtests would have either inflated Type I error or limited power via an excessively stringent Bonferroni adjustment. Therefore, only Total Reading and the subtests related to the intervention components were analyzed. Word Identification and Word Attack were included as measures of sight word and decoding skills. Oral Reading Fluency was included as a measure of speed and accuracy of oral reading skills. Passage Comprehension was included to examine whether gains in the targeted skills transferred to an overall ability to make sense of text.

RESULTS

Table 2 shows pretest and posttest scores on the WRMT–III for each participant and the combined sample. Table 3 shows results of significance tests, ESs, means, percentile ranks, and variability for group-level data on the Total Reading cluster and subtests analyzed. Here we describe baseline student functioning and pretest-to-posttest changes for the group as a whole as well as the number of students who had changes of at least 6 standard score points or more. We chose this cutoff because 6 points is 4/10 of a standard deviation on the WRMT–III, and Hattie (2009) has argued that ESs of 0.40 or higher "enhance achievement in such a way that we can notice real world differences" (p. 17).

Baseline Student Functioning

All students in this study were referred for Tier 2 intervention in reading because they were below grade-level benchmarks. However, as shown in Table 1, some students in this study also had additional challenges as described by teachers or parents. For example, some children had teacher-identified symptoms of anxiety or ADHD on the VADTRS (see Table 1); others had no teacher-reported behavioral concerns. With regard to parent reports, many parents described that their child got frustrated or gave up easily when presented with reading tasks. Pretest scores in Table 2 show that means for the combined sample were in the below-average range for the Total Reading cluster ($M = 84.18$), Word Identification ($M = 83.09$), and Oral Reading Fluency ($M = 84.91$) and at the lower end of the average range for Word Attack ($M = 85.91$) and Passage Comprehension ($M = 91.27$). In terms of individual scores, at pretest, most children had scores in the below-average range or the low end of the average range, although two children had some scores in the well-below-average range. Table 1 also shows that parent involvement in the intervention varied from low (two children) to moderate (four children) to high (five children).

Total Reading Cluster

As shown in Table 3, results from a one-way paired-samples *t* *t*est revealed significant pretest-to-posttest growth on the WRMT–III Total Reading cluster ($t = 3.81$, $p = .0017$, $df = 10$). The ES was computed as 1.23. According to Cohen's (1992) guidelines for *t* tests (i.e., 0.20 = a small effect, 0.50 = a medium effect, and 0.80 = a large effect), this represents a large effect. Regarding clinical significance, the group mean moved from below average ($M = 84.18$; 14th percentile) at pretest to average ($M = 90.12$; 25th percentile) at posttest. Of the 11 students, nine had increases from pretest to posttest in the range of 6 to 14 standard score points. Only three remained in the

TABLE 2 Standard Scores on Woodcock Reading Mastery Tests–Third Edition Subtests and Total Reading Cluster Pretest and Posttest (by Student)

	Word identification		Word attack		Passage comprehension		Oral reading fluency		Total reading	
Pseudonym	Pre	Post	Pre	Post	Pre	Post	Pre	Post	Pre	Post
Rex	91	104	95	116	101	99	78	92	89	100
Donovan	80	84	102	88	81	98	78	86	82	86
Allie	93	92	89	92	101	105	93	110	93	99
Mason	83	83	76	89	97	97	92	93	86	85
Kevin	80	87	92	103	86	105	78	101	84	94
Bridget	91	83	92	98	92	86	87	85	88	85
Ricky	83	98	90	89	97	114	83	92	89	100
Eric	80	89	68	94	66	86	86	92	70	84
Sam	80	81	68	82	90	89	83	97	74	81
Gianna	75	109	97	117	107	107	86	88	90	103
Hayley	78	83	76	91	86	93	90	82	81	82
M	83.09	90.45	85.91	96.27	91.27	98.09	84.91	92.55	84.18	90.82

TABLE 3 Paired *t*-Test Scores on Woodcock Reading Mastery Tests–Third Edition Total Reading Cluster and Subtests

Composite or subtest	Pretest			Posttest					Modified	
	M	*SD*	PR	*M*	*SD*	PR	*t*	*d*	*p*	α
Total Reading	84.18	7.04	14	90.82	8.4	25	3.81	1.23	.0017	.01
Oral Reading Fluency	84.91	5.47	16	92.55	7.93	32	2.79	1.21	.0095	.0125
Word Attack	85.91	11.84	18	96.27	11.39	39	3.03	0.89	.0064	.017
Passage Comprehension	91.27	11.42	27	98.09	9.12	45	2.34	0.66	.0207	.025
Word Identification	83.09	5.94	13	90.45	9.53	25	2.16	0.93	.0282	.05

Note. PR = percentile rank; Modified α refers to the significance criterion as indicated by a modified Bonferroni procedure.

below-average range on the Total Reading cluster at posttest. All of these children were second graders. Two had significant behavioral concerns reported by a teacher or parent. The other had significant language issues. Of note is that although the student with language concerns remained in the below-average range at posttest, his Total Reading score increased by 14 standard score points (almost 1 *SD*) from pretest to posttest.

Oral Reading Fluency Subtest

On the subtest that measured oral reading fluency, results from a one-way paired-samples *t* test indicated significant growth ($t = 2.79$, $p = .0095$, $df = 10$). The ES was large ($d = 1.21$). The group moved from the below-average range ($M = 84.91$; 16th percentile) to the average range ($M = 92.55$; 32nd percentile). Of the 11 students, seven showed increases of 7 to 23 standard score points. Three others showed little change on this subtest, although all three of these students began in the average range. One other student, who also began in the average range at pretest, scored in the below-average range at posttest.

Word Attack Subtest

On the subtest that measured decoding skills, results from a one-way paired-samples *t* test indicated significant growth ($t = 3.03$, $p = .0064$, $df = 10$) with a large ES ($d = 0.89$). The group as a whole began and remained in the average range; however, the students moved as a group from the 18th to the 39th percentile. Seven of 11 students made gains of 11 to 26 points. Two students experienced little change, and one experienced a 14-point decrease. This latter student was a first grader with parent-reported anxiety.

Passage Comprehension Subtest

On the subtest measuring comprehension of connected text, results from a one-way paired-samples *t* test indicated significant growth ($t = 2.34$, $p = .0207$, $df = 10$) with a medium ES ($d = 0.66$). Mean pretest ($M = 91.27$) and posttest ($M = 98.09$) scores were in the average range, although the mean percentile rank increased from 27 at pretest to 45 at posttest. Five students made gains in the range of 7 to 19 points. Five students experienced little change on this subtest, and one showed a 6-point decrease; all six of these students began and remained in the average range.

Word Identification Subtest

On the subtest measuring the reading of words in isolation, results from a one-way paired-samples *t* test indicated significant pretest-to-posttest growth ($t = 2.16$, $p = .0282$, $df = 10$) with a large ES ($d = 0.93$). The group moved from below average ($M = 83.09$) into the average range ($M = 90.45$). Of the 11 students, six made gains in the range of 7 to 34 points. Four students made little or no change, and one student decreased by 8 points, moving from the average range to below average. This student had had no formal academic instruction the year prior because of family circumstances.

Parent Involvement and Reading Outcomes

Because we included a rating of each child's parent involvement, we were able to examine outcomes in relationship to those ratings. Most of the parents in this study had moderate to high involvement in the intervention. However, two students (Mason and Allie) had low parent involvement. Mason showed a 13-point increase in decoding skills but no appreciable growth on the other four indices of reading. Allie improved considerably in oral reading fluency (17-point increase) and total reading (6-point increase) but showed little growth on the other indices. In contrast, all but one of the students with high parent involvement (i.e., Hayley) had score increases of 7 or more points at least on three of the five reading measures used in the study.

DISCUSSION

Our goal in conducting this study was to pilot a Tier 2 intervention for struggling readers to determine whether first- and second-grade students would make greater than average reading growth after receiving the intervention for 16 weeks. Reading by Design combined four empirically supported components that were integrated to allow for continuity throughout the intervention. At the core of the intervention was a DI reading program (Reading Mastery) that was supplemented with LWR exercises, strategies to make learning to read

more motivating and enjoyable, and parent involvement in reading homework.

Changes from pretest to posttest using standard scores on a well-established norm-referenced test of reading skills show that, on average, children who received the intervention made significant gains in word identification, decoding skills, oral reading fluency, reading comprehension, and overall reading skills. Although no control group was included in this pilot study, using standard scores allowed us to compare children receiving this intervention to children in the WRMT–III normative sample. If our participants had made typical levels of reading growth from winter to spring (i.e., from pretest to posttest), their scores would have remained relatively constant because standard scores take into account the fact that the average student is making reading gains over time. The growth in our students' standard scores shown in Table 2 indicates that they made faster growth during the 16 weeks of the intervention than did children in the normative sample, suggesting that Reading by Design was effective in accelerating growth so that our children could potentially catch up to their peers. ESs in this pilot study ranged from 0.66 (Passage Comprehension) to 1.23 (Total Reading), indicating a medium to large effect on reading skills.

Given our research design, we are unable to disentangle the four components in the intervention to estimate their relative importance in the outcomes observed. However, we hypothesize that these four components had a synergistic effect on children's reading given that they were designed to work in tandem with one another. For example, the LWR exercises in which children engaged during the school-based intervention included the Reading Mastery passages they were reading both at school and at home with their parents. Similarly, the Reader Rabbit stories they read and games they played at the end of the intervention period were selected by the reading specialist to correspond with the word study skills they were learning in Reading Mastery. This integration of components was purposeful and allowed for reinforcement of similar concepts with varying instructional methods.

The one component that our research design did allow us to disentangle from the others to some degree was parent involvement. Overall, our results suggest that parent involvement did make a difference in outcomes. The two students with low levels of parent involvement did not make as much progress as did students with high levels of parent involvement.

Intervention Promise

The bedrock of Reading by Design was Reading Mastery. We built on this DI program with three additional components to help to reinforce the concepts taught in Reading Mastery. When comparing our results to previous studies of Reading Mastery used in isolation, we find that our intervention yielded higher ESs. For example, Cook et al. (2004), whose study included students

with mild disabilities in Grades 2 to 4 who participated in an intervention in a similar dose (16 weeks), reported ESs of 0.20 for word identification, 0.25 for decoding, and 0.36 for reading comprehension. In contrast, our ESs were 0.93 for word identification, 0.89 for decoding, and 0.66 for passage comprehension. Our ESs are similar to those reported by Kamps et al. (2008) for DI programs used with struggling readers in kindergarten. In that study, in which nonsense word fluency and oral reading fluency were measured, ESs ranged from 1.22 (nonsense word fluency) to 1.50 (oral reading fluency). Our study also found large ESs for word identification ($d = 0.93$), decoding ($d = 0.89$), and oral reading fluency ($d = 1.21$).

Our results suggest a particularly strong effect on oral reading fluency. We hypothesize that Reading by Design resulted in a strong effect on oral reading fluency because of (a) the immediate error correction procedure used by both the reading specialist and parents in working with their children at home and (b) the LWR exercises. First, the immediate correction strategy, which involved having the adult provide any unknown words that the child could not read within 2 s, was meant to decrease frustration and allow for the flow of reading to continue even when a child could not read a particular word quickly. Separate phonics activities were used to build decoding skills outside of reading connected text so children could develop these skills without having to struggle through reading passages. Second, having children listen to the Reading Mastery and Reader Rabbit stories provided the opportunity for modeling of oral reading skills and allowed children to use their listening skills to facilitate the ease with which they could read a passage. We believe these two strategies increased children's confidence in reading connected text. It is notable that those students with reported anxiety at the start of the intervention showed considerable gains in oral reading fluency.

Limitations

One limitation of our study is that we did not use a matched control group from the participants' school. Thus, we cannot rule out the possibility that the schoolwide reading curriculum or other factors were responsible for the improvements in reading seen in this study. Nonetheless, we do know that the students in this study made faster reading growth than children in the normative sample, which is notable because they had been making slower than typical growth prior to the intervention. Another limitation is that the relative influence of each of the intervention components is unknown because students received the components simultaneously rather than through the use of a multiple baseline approach.

Implications for Practice

Results of our pilot study suggest that using an integrated, multicomponent intervention to engage struggling early readers resulted in significant growth.

Those working with students in Tier 2 interventions can maximize learning by providing engaging reading activities that students can complete in pairs or groups of three while the reading specialist works one on one with other students in the small group. Similarly, aligning reading homework assignments that parents work on with their children with the Tier 2 intervention being delivered at school allows for parents to be actively involved in the intervention and increases time spent learning by expanding the intervention outside of the school. The error correction procedure we used also has the capacity to increase enjoyment of reading with parents for those children who previously experienced frustration (which many parents in this study anecdotally reported to us).

Moreover, our results suggest that an intervention using a controlled vocabulary and a focus on basic skills, including decoding, can accelerate rates of growth among students who are behind their peers in reading even when the Tier 1 reading program at their school is phonics based (as is the case with Open Court Reading, 1995). The format used in Reading by Design allows for the efficient use of time while still providing opportunities for one-to-one instruction for all students in the group. This contrasts with interventions in which students are primarily engaged in instruction through computer-based programs. Our belief is that the reading specialist's supervision allowed for regular monitoring and modification of intervention components to meet individual needs. For example, some children needed more time with a particular Reading Mastery story in order to achieve the lesson objectives. When this was the case, the reading specialist designed additional games to help the child master particularly challenging words so that the story could eventually be read fluently.

Directions for Future Research

First, to further explore the integration of these intervention components, future researchers may wish to begin with the core (i.e., Reading Mastery or another DI reading program) and individually add the other components using a multiple baseline approach. Another approach would be to randomly assign a large group of students to conditions that include different combinations of components (Reading Mastery plus parent involvement, Reading Mastery plus LWR, etc.). Second, evaluation of Reading by Design with a larger sample and a control group would increase the power to detect change and help to determine whether changes in reading resulted from the intervention or other factors. Third, because the integration of multiple components was found to be effective for a heterogeneous group of students (including those with attention problems, anxiety, and low frustration tolerance), future researchers may wish to attempt a similar intervention with students facing reading challenges of different origins (e.g., students with behavioral challenges, English language learners, or youth living in poverty).

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APPENDIX

Script for Listening-While-Reading Activity

Today we will start with three activities: Reading Mastery, your word strips, and Explode the Code. Open Reading Mastery to page 37, Story 93 (*book mark*). Follow along as I read. When I stop, pause the recorder and go back to the top of the paragraph and read together. Use soft voices but read clearly. Remember, you are practicing this story so that you can play a game later. *(Stories are marked approximately every paragraph. This story was broken into three sections.)*

Now we'll practice with your word strip.* Some of these words are new. First let's say the long *e* rule: *Ea* says /ē/ as in *eat*. What does *ea* say? Tell your partner. Next rule: *ee* says /ē/ as in *eel*. What does *ee* say? Tell your partner. Now the words:

seal	Fred	couch	Deck
lead	Long *e* /ē/	mountain	Rent
reach	reap	Long *e* /ē/	Belt
clean	seed	steep	Press
dream	steam	eats	Self
Short *e* /ĕ/	/ou/ words	creep	Long *e* /ē/
check	sound	deer	Jeep
send	Pouch	sweep	Real
Nell	mound	Short *e* /ĕ/	Queen
sled	found	mess	Treat

Now we'll do Explode the Code. Open up your workbook to page 77 (*book mark*). Work together and read aloud. Take turns. Then do page 78 and 79. On page 79, just draw a line to the correct word.

**Prepare activity: Cut two holes in a stuffed toy so a cardboard strip can be pulled through the mouth of the toy. Write words to be studied vertically on strip. The child will pull the strip to reveal a word and say it immediately after hearing it through headphones. This is an echo activity and is used as a warm-up for doing workbook pages in Explode the Code and as preparation for a board game.*