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Targeted Reading Intervention: A Coaching Model to Help Classroom Teachers With Struggling Readers

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Abstract

This study examined the effectiveness of a classroom teacher intervention, the Targeted Reading Intervention (TRI), in helping struggling readers in kindergarten and first grade. This intervention used biweekly literacy coaching in the general education classroom to help classroom teachers use diagnostic strategies with struggling readers in one-on-one 15-min sessions. Five schools in low-income rural counties were randomly assigned to the experimental or control group. Five struggling and five nonstruggling readers were randomly selected to participate in each experimental and control classroom. There were 34 classrooms and 276 children. Experimental children achieved better gains in letter-word identification than did control children. Significant interactions were found with word attack skills. Children in the experimental group with poor rapid naming and better phonological awareness skills progressed the most compared with the control group. The TRI appeared to be a promising classroom teacher intervention to help young struggling readers.

Keywords

literacy coaching, early reading, diagnostic strategies

Although most children learn to read during early elementary school through instruction delivered by the classroom teacher, some children do not seem to profit from general education classroom instruction in reading. These children are at risk for reading failure and/or later identification for special education services. The purpose of this study was to examine whether a classroom teacher intervention for struggling readers would help kindergarten and first-grade children with these issues gain important basic word reading skills.

Major Deficits in Young Struggling Readers

Research has identified two major word-level deficits among young struggling readers: *phonological/phonemic awareness* and *rapid naming fluency* (Bowers & Newby-Clark, 2002; Foorman & Torgesen, 2001). Over the last 20 years, the lack of good *phonological* and *phonemic skills* has been found to be the most common type of reading disability (Foorman, Francis, Fletcher, Schatschneider, & Mehta, 1998; Torgesen et al., 2001). Reading interventions have found that children with phonological/phonemic deficits profit less from interventions compared with other children (Foorman, 2003).

There is also evidence that some struggling readers can decode adequately but still have difficulty with speed and fluency in their reading (Bowers & Newby-Clark, 2002; Wolf, Bowers, & Biddle, 2000). Problems with rapid naming fluency have been implicated in reading difficulties, particularly in relationship to reading rate (Denckla & Cutting, 1999). Results from studies have indicated that *rapid naming fluency* is related to later reading ability (Bowers & Newby-Clark, 2002; Wolf et al., 2000). Reviews of early reading interventions for struggling readers have found that children with rapid naming deficits appear to progress less in reading compared with children without this deficit (Al Otaiba & Fuchs, 2002; Nelson, Benner, & Gonzalez, 2003).

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Demographics of Early Reading Disability

Children from low-income families are especially at risk for word identification problems and are more at risk for being identified as having a learning disability, with rates 1.2 to 3.4 times higher than those of children who do not live in poverty (Blair & Scott, 2002). This is also true for minority children, who have been disproportionately diagnosed with disabilities over the last four decades (Hosp & Reschly, 2004). Children with a combination of these demographic characteristics have even higher rates of word identification problems (Hosp & Reschly, 2004; Lee & Burkham, 2002). Boys have generally been found to have more reading problems than girls, and even in epidemiological studies, boys have double to quadruple the rates of reading disabilities compared with girls (Rutter et al., 2007). In reviews of intervention studies over the past 30 years, researchers have found that these groups of low-income and/or minority children profited less from early reading interventions than other children (Al Otaiba & Fuchs, 2002; Foorman et al., 1998; Nelson et al., 2003).

Children who live in poverty in rural settings appear to be at particular risk for reading failure because of a lack of access to services and a lack of access by their schools and teachers to state-of-the art professional development opportunities (Provasnik et al., 2007; Vernon-Feagans, Gallagher, & Kainz, 2010). A greater percentage of children in rural areas live in poverty compared with children from urban/suburban areas, and they live in deeper poverty than children in urban/suburban areas. In addition, rural minority children have almost double the poverty rates of urban/suburban children (O'Hare, 2009).

Intervention for Struggling Readers

A host of early interventions for struggling readers have proven to be successful. Most interventions employ specialized professionals who deliver the intervention outside the classroom. Major components of these successful programs (Elbaum, Vaughn, Hughes, & Moody, 2000; Foorman & Torgesen, 2001; Schwartz, 2005) include (a) explicit word identification instruction, (b) intervention in early elementary school, and (c) small-group or one-on-one instruction.

Previous efforts to enhance classroom teachers' instruction to help struggling readers have not been as successful as using specialized teachers to deliver specific interventions (Al Otaiba & Fuchs, 2006; Garet et al., 2008; Gersten, Morvant, & Brengelman, 1995). Some recent efforts that used a Response to Intervention (RtI) approach have been more successful (Gersten & Dimino, 2006; Speece, Case, & Molloy, 2003). For instance, Speece et al. (2003) found that classroom teachers could be effective in helping readers with impairments increase their reading skills over time when provided with intensive research consultative support. In addition, there have also been classroom teacher professional development programs, such as the Interactive Strategies Approach (Vellutino & Scanlon, 2002), that provided evidence that helping classroom teachers offer individualized reading instruction for their struggling readers resulted in large reading gains for the students (Scanlon, Gelzheiser, Vellutino, Schatschneider, & Sweeney, 2008). Scanlon et al. (2008) concluded that

> importantly, instructional improvements were not accomplished via the implementation of a highly prescriptive program nor by the adoption of entirely new curricula but rather by encouraging teachers to analyze and respond to the instructional needs of their lower achieving students. (p. 359)

Targeted Reading Intervention (TRI)

The TRI was aimed at helping the classroom teacher individualize instruction for children who were not profiting from general education classroom instruction. This Tier II intervention focused on individualizing instruction, which has recently been shown to be important in all children's gains in reading (Connor et al., 2009; Morrison, Bachman, & Connor, 2003; Vernon-Feagans, Gallagher, Amendum, et al., 2010). The TRI helps teachers use efficient individualized word identification strategies in decoding and fluency within words and text that may create an efficient and effective way to promote rapid early reading improvement. An initial pilot study of the TRI demonstrated its effectiveness in kindergarten but not first grade. This finding was complicated by the fact that fidelity ratings were high in kindergarten but very low in first grade (Vernon-Feagans, Gallagher, Amendum, et al., 2010).

Current Study

This study was designed to test the effectiveness of the TRI in a larger sample of children with better implementation and to understand the kinds of children that might benefit most from the intervention.

We posed three major questions/hypotheses for this study. First, we examined whether struggling readers who received the TRI in kindergarten and first grade (a) would gain more than a control group of struggling readers, (b) could gain as much as nonstruggling readers in the same classrooms, and (c) might actually be catching up to their nonstruggling peers. Second, we examined whether child demographic characteristics (maternal education, gender, minority status) interacted with treatment, such that children

from homes of parents with less education, boys, and minorities might profit less from our intervention, as has been shown in previous research. Third, we examined whether initial child skills in phonological awareness (PA) and rapid naming might interact with treatment, such that children with poor *rapid naming* and poor PA might gain the most from our intervention in comparison with control children, given the emphasis in our intervention on decoding and fluency.

Method

Research Design

This study was a cluster randomized control trial in which randomization was at the school level. Pair-matching within county was done before randomization, based on school size, percentage of free and reduced-cost lunch students, percentage of minorities, and involvement in Reading First. This procedure resulted in three experimental and three control schools. One experimental school withdrew just after randomization because the original principal, who was excited about the project, resigned, whereas the new principal had never been an administrator and so did not want the added responsibility of a research project. The withdrawal of this one school compromised the causal inferences from this study. All kindergarten and first-grade teachers in each school participated in the study.

In one county, the reading curriculum used for kindergarten and first-grade students was the North Carolina Course of Study in Reading. In the second county, both schools followed Reading First, using *Open Court* (SRA/McGraw-Hill, 2000) for reading instruction and *Voyager Passport* (Cambium Group, 2004) for struggling readers.

At the beginning of the school year, using state diagnostic assessment data and her knowledge of the child's progress in the first 6 weeks of school, each teacher was asked to rate all children in the classroom as being above grade level, at grade level, or below grade level in reading. From those children who were rated as below grade level, we randomly selected a maximum of five children who were struggling readers in both the experimental and control schools. We called these struggling readers in the experimental schools *experimental focal children*. The children who were struggling readers in the control schools were called *control focal children*. In addition, from those children who were not identified as below grade level in reading, we randomly selected a maximum of five nonstruggling children in each classroom in both the experimental and control schools. Children who were not struggling in experimental classrooms were called *experimental nonfocal children;* children who were not struggling in control schools were called *control nonfocal children*.

Participants

Schools and teachers. The schools were Title I schools in the rural southeastern United States with more than 65% of children eligible for free or reduced-cost lunch. There were 18 kindergarten and 16 first-grade teachers. All selected teachers were female, and one third was minorities. On average, teachers had almost 15 years of experience, and 8 had a master's degree. There were no experimental/control differences on teacher background characteristics.

Students. There were 142 girls and 134 boys in the study, with 132 kindergarten children and 144 first-grade children. The kindergarten group consisted of 29 experimental focal children, 31 experimental nonfocal children, 36 control focal children, and 36 control nonfocal children. The first-grade group consisted of 34 experimental focal children, 33 experimental nonfocal children, 36 control focal children, and 41 control nonfocal children. One third of the children were Caucasian. Only 10% of the mothers had completed college.

Measures

Two word identification subtests were administered to all children in the fall and the spring of the school year. In addition, a PA test and fluency test were administered to all children in the fall.

The Letter-Word Identification (LWI) subtest from the *Woodcock Johnson III, Diagnostic Reading Battery* (WJ III; Woodcock, Mather, & Schrank, 2004) measured the child's early letter and word reading skills. The initial items required the child to identify letters and the remaining items required the child to pronounce words correctly. The LWI subtest had a median reliability of .91 in the 5- to 19-year age range (Woodcock et al., 2004). The Word Attack (WA) subtest from the WJ III measured skill in applying phonic and structural analysis skills to the pronunciation of unfamiliar printed sounds and words. WA had a median reliability of .87 in the 5- to 19-year age range (Woodcock et al., 2004). Raw scores were converted into *W* scores, which are a special transformation of the Rasch ability scale. The *W* scale has mathematical properties (e.g., equal interval units) that make it well suited for use as an intermediate step in the interpretation of test performance and especially useful for interpreting gain scores.

Two subtests from *Comprehensive Test of Phonological Processing* (CTOPP; Wagner, Torgesen, & Rashotte, 1999) measured PA and fluency. PA was composed of three CTOPP subtests—Elision, Blending Words, and Sound Matching—each of which contained 20 items. Elision required the child to say a word and then say the remainder of the word after deleting designated sounds. Blending Words required the child to repeat a word by combining a

Table 1. Child Demographic Characteristics, *W* Scores, Fall Phonological Awareness, and Rapid Color Naming Scores by Grade and Treatment Group

	Kindergarten				First Grade			
Demographic/score	Control nonfocal[a]	Control focal[a]	Experimental nonfocal[b]	Experimental focal[c]	Control nonfocal[d]	Control focal[a]	Experimental nonfocal[e]	Experimental focal[f]
Mother education (years)								
M	13.43	12.56	12.83	11.93	12.82	12.63	12.81	11.70
SD	1.72	2.11	2.04	1.96	2.19	2.16	2.02	2.13
Male (%)	41.7	55.6	32.3	41.4	39.0	58.3	51.5	67.7
White (%)	41.7	38.9	32.3	20.7	34.2	36.1	37.5	15.2
Fall letter-word								
M	370.68	344.51	355.03	330.48	429.68	405.34	416.52	394.79
SD	12.54	18.81	23.38	22.17	21.42	17.67	17.79	20.56
Spring letter-word								
M	409.47	379.82	398.90	375.96	456.44	437.63	458.17	433.55
SD	17.96	26.03	16.37	23.89	21.04	16.07	21.61	29.87
Fall word attack								
M	418.38	393.69	400.45	383.72	462.28	449.00	454.45	433.48
SD	19.24	21.21	25.82	17.81	21.45	19.74	24.12	28.68
Spring word attack								
M	450.25	432.74	449.28	430.61	478.28	466.69	481.00	461.45
SD	24.75	33.33	24.79	25.58	16.94	18.20	23.49	33.65
Fall PA								
M	−0.40	−0.87	−0.57	−0.98	0.76	0.23	0.64	−0.17
SD	0.54	0.35	0.57	0.30	0.77	0.57	0.82	0.65
Fall RCN								
M	103.93	118.04	110.21	133.27	76.49	93.64	84.36	94.88
SD	29.27	47.34	28.56	39.65	16.33	50.92	32.59	26.29

Note: PA = phonological awareness; RCN = rapid color naming. *W* scores are used in the analysis. These scores are based on the Rasch measurement model, yielding an equal interval scale. Extensive research has documented the reliability and construct validity of the *W* scores (Woodcock, Mather, & Schrank, 2004).

[a] $n = 36$.

[b] $n = 31$.

[c] $n = 29$.

[d] $n = 41$.

[e] $n = 33$.

[f] $n = 34$.

group of phonemes presented via an audiocassette recording. Sound Matching required the child to listen to a word spoken by the examiner while the child looked at three pictures in a picture book. The child then had to select the picture that started with the same sound or ended with the same sound. Internal consistencies for the subtests are all above .80. A PA composite was created by transforming the raw scores of each composite (Elision, Blending Words, and Sound Matching) and then averaging the standard scores to create an overall composite for PA. Rapid Color Naming (RCN) required the child to name 72 colored blocks that were arranged left to right and top to bottom. The total time in seconds to complete the task was used as the child's score. Reliability ranged from .70 to .97 for individual subtests. Table 1 presents the means and standard deviations for the fall and spring measures.

Description of the TRI

The TRI was a Tier II intervention that used the classroom teacher to deliver individualized instruction in one-on-one sessions with struggling readers. A skilled reading coach provided biweekly consultation during TRI sessions in the general education classroom. The classroom teacher used one-on-one instruction for 15 min a day, 4 days a week, with struggling readers individually. When the consultant and teacher decided that the child could profit from general education classroom instruction in reading and could work successfully on his or her own, the child was transitioned into small groups and/or individual seatwork to promote continued gains in reading. The number of weeks for the one-on-one sessions varied considerably, depending on the initial skill level of the child and his or her rate

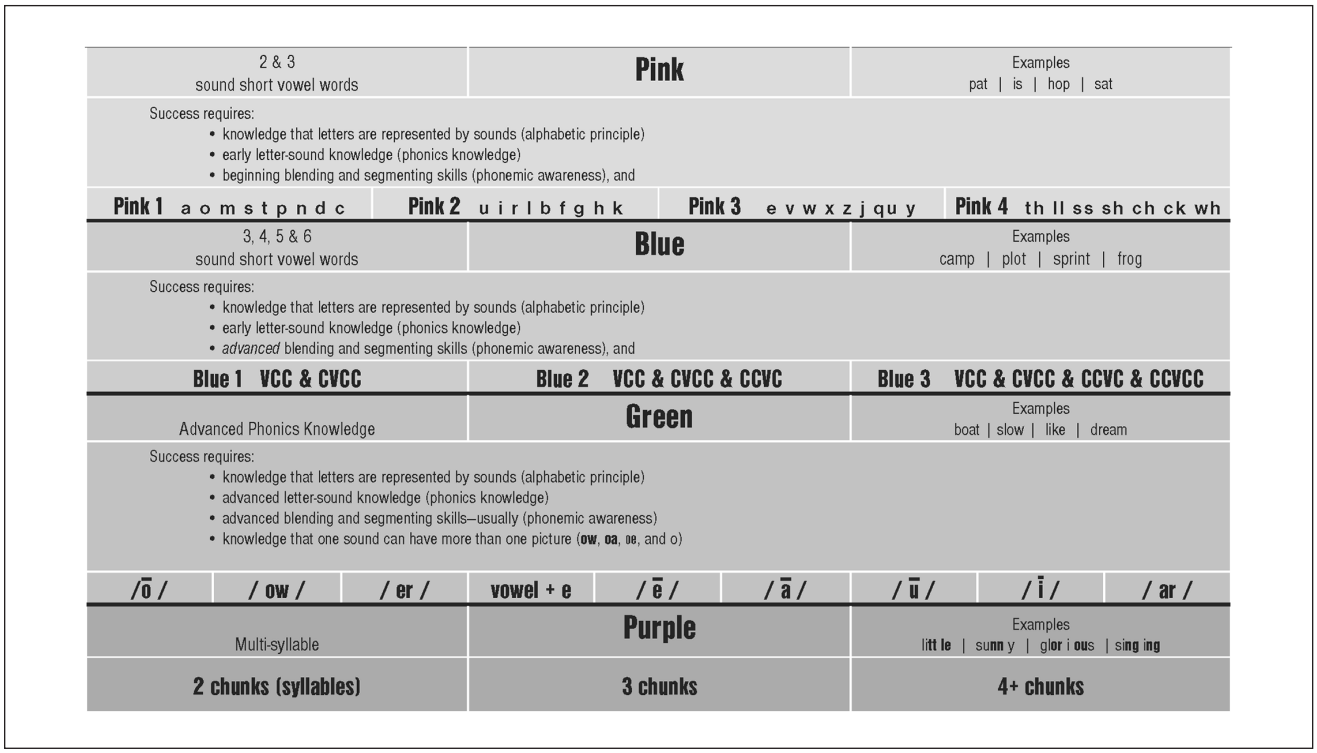

Figure 1. Levels of Word Work

of progress. Unlike many other interventions, the TRI was always delivered in the context of the word and text so that children understood the meaning and context of reading. In each 15-min one-on-one TRI lesson, the teacher led a student through Rereading for Fluency (2 min), Word Work (6 min), and TRI Guided Oral Reading (GOR; 7 min).

Rereading for Fluency. The teacher asked the student to reread a selection that she or he had read at least once in the recent past. The teacher typically timed and charted the student's reading speed for 1 min and might model fluent, expressive reading. This could be done even with children who were nonreaders through scaffolding. For example, asking a child with extremely limited alphabetic knowledge where to start reading and identifying initial sounds in words was a way to help the child.

Word Work. Word Work provided the teacher with a variety of assessment-based instructional strategies for helping the child manipulate, say, and write words (Bear, Invernizzi, Templeton, & Johnston, 2003; Beck, 2006; Clay, 1993; Moats, 1998; Morris, Tyner, & Perney, 2000). TRI has developed four levels—lowest to highest—of child skills in Word Identification. Within each of these four levels were sublevels that helped the teacher make a more fine-grained decision about the level of skill of each child (see Figure 1). The teacher was given a diagnostic map to use as a guide for assessing each child's word identification skills on a daily basis and linking this assessment to the appropriate level of Word Work. There were also four basic Word Work strategies: Segmenting Words; Change One Sound; Read, Write, and Say; and Pocket Phrases. As an example of how the levels and strategies were matched, a child with limited alphabetic knowledge began at the lowest level of Word Work and used the Segmenting Words strategy. Children were presented the following letters: *a, s, m, t,* and *p*. Three-letter words with elongated beginning consonants, such as *sat* or *mop* and **not** *top,* were chosen because during pronunciation, the teacher could stretch out the beginning sounds of each word. The teacher used our Word Work board for the Segmenting Words strategy and placed three letter-sound cards at the top of the Word Work board. Using these letter cards, the teacher asked the child, "What is the first sound you hear?" The child put the letter sound on the bottom of the board and repeated the sound. The teacher repeated the exercise for each sound in the word and then had the child blend the sounds together and say the word again. Another strategy, "Change One Sound," also used our Word Work board. Children in this strategy had to choose the target vowel to make the correct word. This strategy was very effective in helping children contrast sounds, such as spelling *map* and *mop* on the Word Work Board.

GOR: At a summer institute (see below), teachers were provided with a myriad of books that have been leveled but also have high interest. Teachers were asked to choose an

interesting text at the child's instructional reading level that also contained some of the sounds the child had been working on in Word Work. Teachers paid particular attention to scaffolding children's abilities to pronounce words fluently as well as summarize, predict, and answer abstract questions about the story line.

Training classroom teachers. To train teachers to become proficient in using the TRI, we used four main training mechanisms:

1. All experimental classroom teachers and on-site facilitators attended a 3-day summer institute led by the TRI intervention director, who headed all intervention activities for the TRI. The on-site facilitator was generally a specialist in the school (e.g., the school psychologist or counselor) who understood the TRI and could help coordinate activities related to the TRI in each classroom. The summer institute introduced teachers to the diagnostic strategies through training videos, small-group sessions, modeling, and practice.
2. In late fall of the academic year, our TRI consultants began meeting weekly and then biweekly with each classroom teacher in her classroom to watch her one-on-one sessions with struggling readers and to give her real-time feedback. The intervention director also visited schools monthly to monitor the implementation by the consultants.
3. Grade-level and across-grade-level meetings were held biweekly with the TRI literacy consultant to problem solve issues regarding individual struggling readers and to generally promote teacher efficacy with the strategies.
4. Bimonthly workshops were conducted for all experimental teachers, based on the needs that teachers voiced throughout the year.

Fidelity of Implementation

To monitor implementation, we reviewed the quality and quantity of TRI instruction for each experimental focal child from November to May. We developed two separate 5-point Likert-type scales—one assessed quantity of TRI practices and the other assessed quality of implementation of TRI practices. TRI consultants reported the quantity of TRI intervention biweekly by child. The quality of implementation assessment was completed in the spring using observation and weekly records on classroom teacher implementation. Based on notes from the intervention director and consultants' biweekly records and notes, consensus coding was used to create a quality implementation score for each child. This consensus coding was conducted in a series of meetings over the course of the year. Notes from their biweekly meetings and notes from the intervention director were discussed at length so that quality ratings were based on the same set of understood criteria across consultants and their teachers. Data were available on 62 of the 63 experimental children.

The quantity of TRI implementation was reported by teachers in their regular biweekly meetings with TRI consultants. The scale reflected the total number of weeks an experimental focal child received TRI-specific literacy practices. For each week that a teacher reported working with one of the target children, she needed to work with the child at least 4 times a week in 15-min sessions. A rating of "1" indicated no weeks of TRI intervention, a rating of "2" indicated 1 to 3 weeks of intervention, "3" indicated 4 to 9 weeks of total TRI intervention, "4" indicated 10 to 18 weeks, and "5" indicated 19 weeks or more. This coding created a normally distributed variable. The mean quantity of implementation was 2.91, which meant that most children received the one-on-one TRI sessions for 4 to 9 weeks.

The Quality of Implementation Scale rated the classroom teachers' use of diagnostic assessing/planning tools, and faithfulness to TRI strategies for each focal student as assessed by the TRI literacy consultants. TRI consultants were trained to rate teachers' use of the TRI before they were allowed to go into the schools. In making the quality of intervention ratings for individual children, the TRI consultants used anchor points, along with their discussion checklists over the year, to guide the ratings. These included regular delivery of the TRI (at least 15 min/4 times per week), use of diagnostic assessing/planning tools, and adherence to the TRI strategies. A score of "1" indicated little or no instruction related to the TRI; a score of "2" indicated (a) some instruction that was part of the TRI and (b) use of the TRI at least once a week and with at least one component (Fluency, Word Work, or GOR); "3" indicated at least moderate fidelity at least twice a week, with use of at least two of the three components and some of the diagnostic tools available in the TRI; a rating of "4" indicated use of the TRI 3 times a week with nearly consistent use of all three components, including the diagnostic tools; and a rating of "5" indicated high-quality TRI instruction at least 4 times a week, including all three major components, and consistent use of the TRI diagnostic tools. The mean quality of implementation was 2.72, which indicated moderate implementation of the TRI.

The Quantity of Implementation and Quality of Implementation Scales were highly correlated (r = .80) and thus were combined to form a *Total Fidelity* score. Mean Total Fidelity was 2.82 (SD = 1.29; range = 1–5), suggesting moderate fidelity. In all, 26% of treated students experienced very high fidelity, whereas 19% experienced low fidelity.

Data Preparation Procedures

Missing data amounted to less than 10% of the total. To avoid imprecise estimation due to missing data, we created and analyzed multiple imputed data sets in SAS v. 9.1. Multiple imputation procedures used an iterative method to estimate the multivariate relationships among study variables for cases with available data. These observed relationships among study variables were then used to estimate plausible values for missing data (Graham, Olchowski, & Gilreath, 2007; Shafer & Graham, 2002). Consequently, the regression models presented below were run on each of 20 imputed data sets, and model parameters were aggregated across the data sets using the PROC MIANALYZE function in SAS.

Results

Analysis Strategy

The purpose of the hierarchical linear models (HLM) was to account for the nested structure of our data while testing three progressive questions:

1. Does treatment have an effect on student literacy gains, and is there evidence that treatment helps struggling readers catch-up to their classroom peers?
2. Does the treatment effect vary by student demographic characteristics?
3. Does the treatment effect vary due to student skill in RCN and PA?

Separate models were conducted for LWI and WA. Because preliminary three-level HLM (students nested in classrooms, classrooms nested in schools) indicated nonsignificant variation between schools and between classrooms within schools, we dropped the school level from the analysis, although the number of schools was so small (n = 5) that variance between schools was probably not well specified in our models. Two-level models yielded significant variation at Levels 1 and 2. Consequently, all subsequent models were estimated in SAS v. 9.1 as two-level HLM accounting for the nesting of students within classrooms. Effect sizes for significant treatment effects were calculated by dividing the comparison coefficient (mean difference) by the square root of total variation in the model.

The model addressing Question 1 was a two-level HLM predicting gain scores as a function of a four-category treatment fixed effect at Level 2 and a set of Level 1 fixed effects used as covariates across all models: gender (0 = male, 1 = female), mother's education (number of years), grade (K = 0, Grade 1 = 1), and race (0 = White, 1 = Black). This model estimated random effects for classroom intercepts. All covariates were centered for analysis so that the intercept in the models reflected average gains for the treatment reference group, experimental focal students. Treatment effects were established by estimating the significance of the conditional mean difference between gains for focal experimental and focal control students. Catch-up effects were established by estimating the significance of the conditional mean difference between gains for focal and comparison students in each setting: experimental and control schools. The difference in gains for focal experimental and focal control students did not vary significantly across grade. Therefore, the treatment by grade interaction was dropped from subsequent models. The reduced form equation for Question 1 was as follows:

$$Y_{ij} = \gamma_{00} + \gamma_{01}\,(\text{treatment})_j + \gamma_{02}\,(\text{male})_{ij} + \gamma_{03}\,(\text{mother's ed.})_{ij} + \gamma_{04}\,(\text{grade})_{ij} + \gamma_{05}\,(\text{White})_{ij} + u_{0j} + r_{ij}.$$

In this notation, fixed effects are represented by gammas (γ), and random effects are reflected in the two error terms: a term for Level 2 variation between classrooms (u_{0j}) and a term for Level 1 variation between students within classrooms (r_{ij}).

The model addressing Question 2 added a set of treatment by demographic background cross-level interactions to the initial model for Question 1. These interactions were "treatment by gender is male," "treatment by mother's education," and "treatment by race is White." Again, treatment main effects were estimated by testing conditional mean differences in gains for focal experimental and focal control students. The formal test of whether treatment effects varied due to background characteristics was established by estimating whether mean differences in gains between focal experimental and focal control students varied significantly for male compared with female students, White compared with non-White students, and across levels of mother's education. The reduced form equation for Question 2 was as follows:

$$Y_{ij} = \gamma_{00} + \gamma_{01}\,(\text{treatment})_j + \gamma_{02}\,(\text{male})_{ij} + \gamma_{03}\,(\text{mother's ed.})_{ij} + \gamma_{04}\,(\text{grade})_{ij} + \gamma_{05}\,(\text{White})_{ij} + \gamma_{06}\,(\text{treatment} \times \text{male})_{ij} + \gamma_{07}\,(\text{treatment} \times \text{mother's ed.})_{ij} + \gamma_{08}\,(\text{treatment} \times \text{White})_{ij} + u_{0j} + r_{ij}$$

The model addressing Question 3 substituted a set of treatment by baseline cross-level interactions for the treatment by demographic background interactions investigated in the previous model. These interactions were "treatment by baseline RCN" and "treatment by baseline PA." Treatment effects and interactions were estimated using the same method as the previous model. The estimates compared gains for focal experimental and focal control students across levels of PA and levels of RCN. The reduced form equation for Question 3 was as follows:

Table 2. Word Attack HLM Models

	Question 1				Question 2				Question 3			
Effect and comparison	*B*	*SE*	*p*	*d*	*B*	*SE*	*p*	*d*	*B*	*SE*	*p*	*d*
Fixed effect												
Male	−2.57	2.82	0.36	—	−5.15	5.65	0.36	—	3.02	2.12	0.16	—
Motedyrs	−0.89	0.75	0.24	—	1.01	1.46	0.49	—	−0.40	0.54	0.46	—
Grade	−18.72	5.17	0.00	—	−18.41	5.01	0.00	—	−7.82	4.03	0.05	—
White	0.95	3.06	0.76	—	−3.95	7.52	0.60	—	4.37	2.30	0.06	—
CNF	−13.85	5.95	0.02	—	−14.09	5.95	0.02	—	−10.48	4.52	0.02	—
CF	−10.01	5.87	0.09	—	−9.84	5.86	0.09	—	−11.15	4.29	0.01	—
ENF	−0.08	3.96	0.98	—	−0.99	4.15	0.81	—	−1.93	3.54	0.59	—
Fall PA	—	—	—	—	—	—	—	—	3.74	4.13	0.37	—
Fall RCN	—	—	—	—	—	—	—	—	−0.12	0.07	0.09	—
White × CNF	—	—	—	—	7.73	9.68	0.42	—	—	—	—	—
White × CF	—	—	—	—	−1.29	9.33	0.89	—	—	—	—	—
White × trtgrp ENF	—	—	—	—	10.88	9.91	0.27	—	—	—	—	—
Motedyrs × trtgrp CNF	—	—	—	—	−2.16	2.06	0.29	—	—	—	—	—
Motedyrs × trtgrp CF	—	—	—	—	−4.15	2.04	0.04	—	—	—	—	—
Motedyrs × trtgrp ENF	—	—	—	—	−1.14	2.09	0.58	—	—	—	—	—
Male × trtgrp CNF	—	—	—	—	9.39	7.96	0.24	—	—	—	—	—
Male × trtgrp CF	—	—	—	—	−4.59	7.78	0.56	—	—	—	—	—
Male × trtgrp ENF	—	—	—	—	5.56	8.10	0.49	—	—	—	—	—
Fall PA × trtgrp CNF	—	—	—	—	—	—	—	—	−7.17	4.74	0.13	—
Fall PA × trtgrp CF	—	—	—	—	—	—	—	—	−5.98	5.27	0.26	—
Fall PA × trtgrp ENF	—	—	—	—	—	—	—	—	−3.69	4.43	0.40	—
Fall RCN × trtgrp CNF	—	—	—	—	—	—	—	—	0.09	0.10	0.41	—
Fall RCN × trtgrp CF	—	—	—	—	—	—	—	—	0.04	0.09	0.67	—
Fall RCN × trtgrp ENF	—	—	—	—	—	—	—	—	0.04	0.10	0.68	—
Random effect												
Level 2 variation	159.37	58.48	0.01	—	144.75	55.01	0.01	—	162.77	60.44	0.01	
Level 1 variation	425.65	41.73	<.0001	—	425.39	42.64	<.0001	—	405.51	41.26	<.0001	
Comparison												
EF vs. CF	10.01	5.87	0.09	—	9.84	5.86	0.09	—	11.86	6.39	0.06	—
EF vs. ENF: Catch-up	.08	3.96	.98	—	—	—	—	—	—	—	—	—
CF vs. CNF: Catch-up	3.84	3.71	.30	—								
White by EF vs. CF	—	—	—	—	1.29	9.33	0.89	—	—	—	—	—
Motedyrs by EF vs. CF	—	—	—	—	4.15	2.04	0.04	—	—	—	—	—
Male by EF vs. CF	—	—	—	—	4.59	7.78	0.56	—	—	—	—	—
Fall RCN by EF vs. CF	—	—	—	—	—	—	—	—	0.26	0.12	0.03	
Fall PA by EF vs. CF	—	—	—	—	—	—	—	—	17.17	7.20	0.02	

Note: HLM = hierarchical linear models; Motedyrs = Mother education in years; CNF = Control nonfocal; CF = Control focal; ENF = Experimental nonfocal; PA = phonological awareness; RCN = rapid color naming; trtgrp = treatment group; EF = experimental focal. EF students are reference group in treatment group effect variable.

$$Y_{ij} = \gamma_{00} + \gamma_{01}\,(\text{treatment})_j + \gamma_{02}\,(\text{male})_{ij} + \gamma_{03}\,(\text{mother's ed.})_{ij} + \gamma_{04}\,(\text{grade})_{ij} + \gamma_{05}\,(\text{White})_{ij} + \gamma_{06}\,(\text{treatment} \times \text{RCN})_{ij} + \gamma_{07}\,(\text{treatment} \times \text{PA})_{ij} + u_{0j} + r_{ij}$$

Results from the HLM using *W* scores from WA and LWI appear in Tables 2 and 3. Each table contains fixed effects, random effects, and group comparisons obtained through estimate statements. Formal tests of treatment effects are represented twice in the tables: first as the coefficient for the focal control group listed in the fixed effects (representing the difference between focal control students and the focal experimental students) and second as the formal comparison of focal experimental and focal control conditional means.

WA Results

Question 1. There was no evidence for a significant main effect of treatment on WA gains. Though the difference in gains between focal experimental and focal control students was sizable (10.01 points), as was the standard error of that difference, the resulting probability value was .09. There was no evidence for catch-up effects in experimental or control schools. Although grade equivalents were difficult

Table 3. HLM Letter-Word Identification Models

	Question 1				Question 2				Question 3			
Effect and Comparison	*B*	*SE*	*p*	*d*	*B*	*SE*	*p*	*d*	*B*	*SE*	*p*	*d*
Fixed effect												
Male	3.32	2.12	0.12	—	4.55	4.26	<.0001	—	3.15	2.13	0.14	—
Motedyrs	−0.83	0.56	0.14	—	0.47	1.08	0.66	—	−0.69	0.58	0.23	—
Grade	−6.54	3.27	0.05	—	−6.62	3.26	0.04	—	−7.80	4.07	0.06	—
White	4.85	2.30	0.04	—	6.79	5.64	0.23	—	4.69	2.31	0.04	—
CNF	−7.88	3.94	0.05	—	−9.37	4.05	0.02	—	−10.35	4.53	0.02	—
CF	−8.23	3.88	0.03	—	−8.88	3.98	0.03	—	−11.04	4.33	0.01	—
ENF	1.52	3.00	0.61	—	1.30	3.13	0.68	—	−1.82	3.59	0.61	—
Fall PA	—	—	—	—	—	—	—	—	4.72	4.20	0.26	—
Fall RCN	—	—	—	—	—	—	—	—	−0.09	0.07	0.24	—
White × CNF	—	—	—	—	−3.12	7.25	0.67	—	—	—	—	—
White × CF	—	—	—	—	−4.31	7.00	0.54	—	—	—	—	—
White × trtgrp ENF	—	—	—	—	−1.45	7.41	0.85	—	—	—	—	—
Motedyrs × trtgrp CNF	—	—	—	—	−1.24	1.53	0.42	—	—	—	—	—
Motedyrs × trtgrp CF	—	—	—	—	−1.66	1.56	0.29	—	—	—	—	—
Motedyrs × trtgrp ENF	—	—	—	—	−2.23	1.52	0.14	—	—	—	—	—
Male × trtgrp CNF	—	—	—	—	−2.83	5.99	0.64	—	—	—	—	—
Male × trtgrp CF	—	—	—	—	−7.93	5.85	0.18	—	—	—	—	—
Male × trtgrp ENF	—	—	—	—	7.15	6.11	0.24	—	—	—	—	—
Fall PA × trtgrp CNF	—	—	—	—	—	—	—	—	−8.31	4.83	0.09	—
Fall PA × trtgrp CF	—	—	—	—	—	—	—	—	−6.50	5.35	0.22	—
Fall PA × trtgrp ENF	—	—	—	—	—	—	—	—	−4.64	4.52	0.30	—
Fall RCN × trtgrp CNF	—	—	—	—	—	—	—	—	0.03	0.11	0.75	—
Fall RCN × trtgrp CF	—	—	—	—	—	—	—	—	0.03	0.09	0.74	—
Fall RCN × trtgrp ENF	—	—	—	—	—	—	—	—	0.01	0.10	0.90	—
Random effect												
Level 2 variation	53.25	22.92	0.02	—	144.75	55.01	0.01	—	55.58	24.39	0.02	
Level 1 variation	244.64	23.90	<.0001	—	425.39	42.64	<.0001	—	239.67	24.21	<.0001	
Comparison												
EF vs. CF	8.23	3.88	0.03	—	9.84	5.86	0.09	—	11.04	4.33	0.01	0.64
EF vs. ENF: Catch-up	−1.52	2.99	.61	—	—	—	—	—	—	—	—	—
CF vs. CNF: Catch-up	−0.35	2.80	.90	—								
White by EF vs. CF	—	—	—	—	1.29	9.33	0.89	—	—	—	—	—
Motedyrs by EF vs. CF	—	—	—	—	4.15	2.04	0.04	—	—	—	—	—
Male by EF vs. CF	—	—	—	—	4.59	7.78	0.56	—	—	—	—	—
Fall RCN by EF vs. CF	—	—	—	—	—	—	—	—	−0.03	0.09	0.74	
Fall PA by EF vs. CF	—	—	—	—	—	—	—	—	6.50	5.35	0.22	

Note: HLM = hierarchical linear models; Motedyrs = Mother education in years; CNF = Control nonfocal; CF = Control focal; ENF = Experimental nonfocal; PA = Phonological awareness; RCN = Rapid color naming; trtgrp = treatment group; EF = Experimental focal. EF students are reference group in treatment group effect variable.

to compute for struggling readers in kindergarten, gains at first grade suggested that the experimental focal children gained 1.03 grade levels from November to May, whereas the focal control children gained 0.57 grade levels.

Question 2. There was some indication that treatment effects on WA gains varied due to mother's education. The difference in gains between focal experimental and focal control students was greater at higher levels of mother's education ($p = .04$). There was no evidence that treatment effects on WA gains varied for White compared with non-White students ($p = .89$) nor for male compared with female students ($p = .56$).

Question 3. Treatment effects varied significantly based on students' baseline RCN ($p = .03$) and PA ($p = .02$) scores. We probed these interactions by estimating and plotting the simple slopes of RCN (see Figure 2) and PA (see Figure 3) on WA Gains for focal experimental and focal control students separately. As RCN scores increased, so did the differences in WA gains between focal experimental and focal control students. This pattern suggests that focal students with slower processing skills benefited more from the intervention. After an initial crossover, increases in PA skills led to greater differences in WA gains between focal experimental and focal control students. This pattern suggests that focal students with higher PA skills benefited more from the intervention.

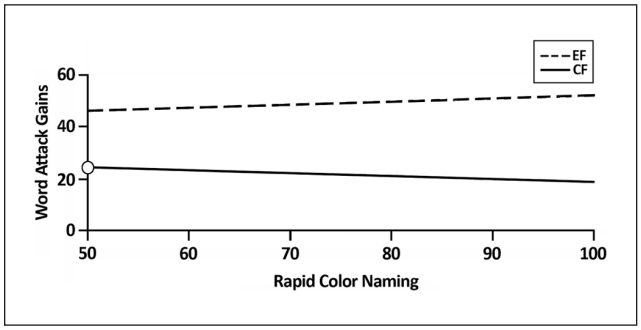

Figure 2. Linear relationship between fall RCN scores and Word Attack gains for EF and CF
Note: RCN = rapid color naming; EF = experimental focal; CF = control nonfocal.

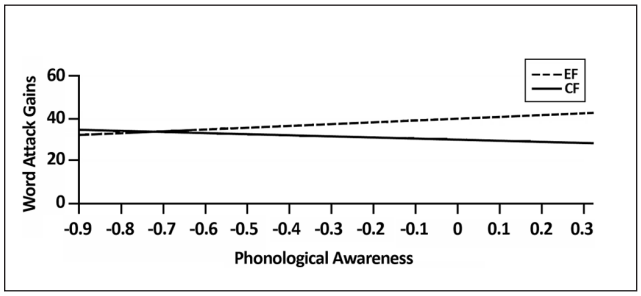

Figure 3. Linear relationship between fall PA scores and Word Attack gains for EF and CF
Note: PA = phonological awareness; EF = experimental focal; CF = control nonfocal.

LWI Results

Question 1. There was a significant treatment effect for LWI. Focal experimental students gained 8.23 points more across a year than focal control students did ($p = .03$, $d = .48$). There was no evidence for catch-up effects. Although it was difficult to compute grade equivalents in kindergarten because of such low kindergarten entry scores, first-grade gains were 0.94 grade levels for the experimental focal children and 0.66 for the experimental control children.

Question 2. There was no evidence that treatment effects on LWI gains varied due to student demographic background. Probability values for nonsignificant comparisons of means for White versus non-White students, varying levels of mother's education, and male versus female students were .54, .29, and .18, respectively. The main effect for treatment on LWI remained significant with the addition of demographic interactions and was slightly stronger.

Question 3. There was no evidence that treatment effects on LWI gains varied due to baseline RCN or PA. Probability values for nonsignificant comparisons of means across levels of RCN and PA were .74 and .22, respectively.

Discussion

The results from this study suggested that young struggling readers could gain significantly from individualized instruction from the classroom teacher with the help of ongoing consultation by a literacy specialist. The effect sizes were moderate and suggested grade equivalent gains that were double the number of months by intervention children in comparison with control children. Our effect sizes were similar to those reported by Elbaum et al. (2000), who examined the effects of early elementary reading programs that used a tutor to help struggling readers, reporting an average effect size of .41. Thus, our classroom teachers seemed to be as effective as outside tutors in helping struggling readers.

Our findings also suggested that children with certain background characteristics (boys and minority children), who have not previously been reported to profit as much as other children from reading interventions, could be helped by the TRI (Blair & Scott, 2002; Torgesen et al., 2006). For both minority children and boys, individualized instruction may have matched the different needs of these children so that they benefited as much as other children from the intervention. With respect to children with low rapid naming skills, these children gained the most compared with children in the control group on WA skills and gained similarly on LWI. The TRI may be particularly beneficial for children with low rapid naming skills because it combined fluency training and GOR that stressed text features, like left to right and top to bottom, in the context of practice in fluent reading. These results were encouraging because previous reviews and meta-analyses of reading intervention studies (Al Otaiba & Fuchs, 2002; Nelson et al., 2003) have found that low rapid naming skills were associated with unresponsiveness to intervention.

Unfortunately, children from low-income families and who had PA deficits did not profit as much from the TRI on WA, although they responded similarly to other children on LWI. This lack of responsiveness on WA was consistent with previous reviews of intervention studies (Al Otaiba & Fuchs, 2002; Nelson et al., 2003). Although this was disappointing because the TRI focused on teaching phonological skills, it may have been the combination of not enough time in the intervention along with only moderate levels of fidelity by teachers that prevented the children from low-income families and with PA deficits from profiting as much as we would have liked from the TRI.

Implications for Practice

The most important implication of our study is that classroom teachers can be taught to be effective in helping struggling readers gain as much as nonstruggling readers in the

general education classroom over the academic year. In addition, the classroom teacher only needed to work with each child for 4 to 9 weeks to produce the same effect sizes as interventions using a skilled professional who worked with a child for longer periods of time and usually outside the general education classroom (Haager, Klingner, & Vaughn, 2007). In addition, the results provided evidence that a teacher could produce reading gains in as many as five struggling readers over the course of a year.

Using the classroom teacher to intervene is a much more cost-effective way to help struggling readers, and this is especially true in poor rural areas where there are fewer resources to help the children most at risk for reading failure (Provasnik et al., 2007). The classroom teacher is the professional who spends the most instructional time with struggling readers and may be the most effective professional to intervene with young struggling readers. In addition, the classroom teacher can sustain the intervention in future years, unlike interventions that use specialized professionals who may leave the school after the specialized program is completed and evaluated (Foorman, 2003).

These results also have implications for the children who may need more intervention than the TRI can provide. Children from low-income families and children with PA deficits may need more intensive or longer interventions with supplemental services because they seem to be the least responsive to interventions in general and to this intervention in particular.

Limitations

Although the TRI was effective, there were a number of limitations to this study. First, the study was a small, randomized control trial with only two experimental and three control schools, with one school dropping out. Because of the small sample size and the design, the power to detect small effects was diminished, and the withdrawal of one school compromised the causal inferences that could be made. Second, fidelity of implementation was only moderate. This certainly may have reduced the gains for the struggling readers. Third, similar to previous studies (Vellutino, Scanlon, Small, Fanuele, & Sweeney, 2007), the struggling readers in this study were not able to "catch up" with their nonstruggling peers but did make similar gains to their nonstruggling peers. This finding suggested that the struggling readers might need another year of intervention or a more intensive word identification intervention to actually catch up to their nonstruggling peers in the same classroom. Like many other studies, it is difficult to remediate all children who are struggling in early elementary school in 1 year, even with intensive interventions (Denton, Fletcher, Anthony, & Francis, 2006; Haager et al., 2007).

Future Research

In future work, it might be important to maximize fidelity through longer training periods for classroom teachers in the 1st year or extend training into a 2nd year, when teachers might be more effective in implementation. Although the TRI was a more real-life sustainable intervention because it was delivered by the classroom teacher, working under the constraints of school schedules, Reading First mandates and state regulations made the implementation challenging. Recently, there has been discussion in the field of education about fidelity of implementation of programs and the difficulty this poses in real-life school settings. There has also been a recent call for research on the development of strategies that help ensure that teachers will be able to implement with high fidelity (Downer, Locasale-Couch, Hamre, & Pianta, 2009). Future research is needed on strategies that can be used to maximize fidelity of implementation when working with classroom teachers.

Finally, our study did not follow the children to evaluate if the gains in word recognition translated into successful reading performance in later years. Future studies of classroom teacher interventions like the TRI should evaluate whether children continue to sustain their reading gains into later school years and also evaluate whether the classroom teachers can sustain their individualized instruction for struggling readers in subsequent years after the consultant is no longer coaching the teacher while she works with a struggling reader.

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