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Preventing Reading Failure for First-Grade Students in an Urban School

Alana Oif Telesman, MA[1], Moira Konrad, PhD[1], Gwendolyn Cartledge, PhD[1], Ralph Gardner III, PhD[1], and Morris Council III, PhD[2]

Abstract

This study sought to examine the effectiveness of Reading RACES (RR), a computer program designed to deliver a repeated reading intervention with culturally relevant passages. Specifically, this study examined the effects of RR on the oral reading fluency (ORF) and comprehension gains for first-grade learners in an urban setting and whether these gains would generalize to novel, generic passages. Five first-grade African American students at risk for reading failure were selected to participate in this study. Results indicated a functional relation between the use of RR and student gains in ORF and comprehension. All students who participated in this study demonstrated moderate to substantial gains on their ORF and comprehension on practiced passages. In addition, the data showed reading skills generalized to novel passages and maintained even 1 month following intervention. These findings extend the previous research base for RR. Limitations and future implications will be discussed.

Keywords

computer-assisted, culturally relevant, struggling readers

Reading achievement has significant implications for students' future success, and addressing reading concerns early and comprehensively should be paramount. Many studies on reading growth trajectories of struggling readers or students with learning disabilities (LD) have determined that once students fall behind their peers, it is unlikely that they will catch up (Judge & Bell, 2010; Juel, 1988; Wanzek, Otaiba, & Petscher, 2014; Wei, Blackorby, & Schiller, 2011). Outcomes are particularly bleak for young children who read below the 20th percentile, who are of low socioeconomic status (SES), from diverse racial/cultural backgrounds, or have a disability (Wanzek et al., 2014; Wei et al., 2011). Wanzek et al. found oral reading fluency (ORF) growth rates for second- and third-grade students with emotional disabilities or LD grew at a significantly slower linear rate than reading fluency rates for their nondisabled peers. Moreover, reading achievement gaps increased with each grade level. Similarly, Deno, Fuchs, Marston, and Shin (2001) reported growth rates of approximately 1.01 to 1.8 words correct per minute per week for first-grade students without disabilities compared with growth of .58 words per week for students with LD.

The above patterns notwithstanding, research has also indicated that systematic, explicit, and valid reading instruction can have a positive effect on improving growth standards for beginning readers who show reading risk (Deno et al., 2001; Judge & Bell, 2010; Phillips, Norris, Osmond, & Maynard, 2002). Thus, educators are advised to increase expectations for students with learning problems, ensuring high quality instruction (Deno et al., 2001) and consistent monitoring in early grades. Deno and colleagues document growth rates of 1.39 correct words per minute (CWPM) per week across grade levels and other researchers likewise show significant academic gains following effective intervention for students experiencing risk (Moats & Foorman, 2008; Musti-Rao & Cartledge, 2007; Torgesen et al., 2001).

Repeated Reading Instruction (RRI)

One research-based practice for increasing ORF is RRI, which should be used with students who have developed initial word reading skills but have inadequate reading fluency for their grade level. Many repeated reading studies report positive gains in both ORF and comprehension (e.g., Bennett, Gardner, Cartledge, Council, & Ramnath, 2017;

[1]The Ohio State University, Columbus, USA
[2]University of West Georgia, Carrollton, USA

Corresponding Author:
Alana Oif Telesman, The Ohio State University, 340 PAES Building, 305 Annie and John Glenn Avenue, Columbus, OH 43210, USA.
E-mail: telesman.3@buckeyemail.osu.edu

Lee & Yoon, 2017). Although the basic principle of repeated reading involves repeatedly reading specified text, researchers have employed slightly varied methodology. Yurick, Robinson, Cartledge, Lo, and Evans (2006), for example, used peer-mediated repeated reading where student dyads alternated reading and provided error correction to each other, resulting in increased fluency and comprehension. Therrien and Kubina (2007) found that the ORF of struggling elementary readers improved more when they repeatedly practiced reading with connected text compared with repeatedly reading isolated word lists. Lo, Cooke, and Starling (2011) employed a repeated reading package that included preview and practice of isolated passage words, unison reading, performance cueing and feedback, and error correction with three second-grade students on novel passages. Results mirrored findings of previously noted studies, showing the overall benefit of RRI on ORF.

Previous Research on Reading RACES (RR)

RR (Relevant and Culturally Engaging Stories) is a computer delivered intervention designed for students to take a more active and effective role in their learning. Through combining culturally relevant (CR) passages, reflecting the students' backgrounds, and a research-based repeated reading procedure, researchers aimed to provide a supplemental intervention to improve ORF and comprehension, thus, preventing or minimizing academic risk.

Because RRI is predicated on the use of meaningful material during repeated readings (Samuels, 1979), the researchers employed culturally relevant/responsive pedagogy, which uses the children's culture as a vehicle for learning and a means for teaching through the students' strengths (Gay, 2000; Ladson-Billings, 1995). The passages used in RR were developed from background information obtained from teachers, parents, student interviews, and direct observations of all the first and second graders, including those from Somali backgrounds. The passages were equated, reviewed by reading and multicultural children's literature experts, and deemed CR for target students (Cartledge, Keesey, Bennett, Gallant, & Ramnath, 2015; Cartledge, Keesey, Bennett, Ramnath, & Council, 2016). Research showed that second-grade students with reading risk read the CR passages more fluently than they read non-CR passages (Cartledge et al., 2015), that students valued most the passages with which they personally identified (Cartledge et al., 2016), and that used as an intervention within RR, students made ORF progress that generalized to non-CR passages (Bennett et al., 2017).

Barber (2015) and Green (2015) utilized an updated version of the RR program, which afforded more student independence, to increase the ORF of first-grade African American and Somali background students. Other subsequent studies with this population showed similar student gains for second graders partially supervised by a paraprofessional (Council, 2016) and for primary-aged students with attention deficits and behavior disorders (Council, Cartledge, Green, Barber, & Gardner, 2016).

The current study combined CR pedagogy and research-based RRI into RR to determine its effects on the fluency and comprehension of first-grade children within an urban setting who showed reading risk. Accordingly, the following research questions were addressed:

Research Question 1: What are the effects of RR on the ORF and comprehension of CR passages for first graders who are showing reading risk?
Research Question 2: What are the effects of RR the ORF generalization and comprehension with AIMSweb passages for first graders showing reading risk?
Research Question 3: What are the effects of RR on the reading growth rates of first graders showing risk?

Method

Setting

This study took place in an urban elementary school serving students pre-K through fifth grade. The school was located in a large Midwestern city, with more than 80% of the district's students coming from economically disadvantaged homes. The student population at the time of this study was 92% Black, 5% White (non-Hispanic), 2% Multiracial, and 1% Hispanic. Students for this study were selected from two different first-grade classrooms where reading instruction in both classrooms focused on whole group activities with follow-up worksheets and independent activities.

The study took place in the back of the school library, which contained a computer station with enough outlets to plug in the laptops to accommodate this research project. Four laptops were positioned on a small, round table.

Participants

Five first graders who showed reading risk participated in this study. The first-grade teachers identified for the researchers the lowest performing students in reading based on the beginning of the year using Fountas and Pinnell (2010) reading assessments. The researchers further screened these students with the Nonsense Word Fluency (NWF) and DIBELS Oral Reading Fluency (DORF) subtests from the Dynamic Indicators of Basic Early Literacy Skills Next Edition (DIBELS Next; Good & Kaminski, 2011) to determine decoding and oral reading skills. In addition to teacher referrals, students needed to meet the following criteria: (a) read a minimum of 18 correct letter sounds (CLS) on the NWF

Table 1. Participant Information and Screening Assessments.

			DIBELS	
Name	Age	Gender	NWF	Median ORF
Mia	7–0	Female	25	8
Tristen	6–9	Male	46	10
Jerry	6–5	Male	39	8
Jack	6–8	Male	22	4
Noah	6–1	Male	23	13

Note. First-grade students performing at benchmark: DIBELS middle of year = 23 words and above. DIBELS end of year = 47 words and above. DIBELS = dynamic indicators of basic early literacy skills; NWF = nonsense word fluency; ORF = oral reading fluency.

subtest (to demonstrate basic decoding skills), and (b) have the lowest ORF scores on the DORF assessment to demonstrate poor reading fluency compared with their classmates. Noah was the only participant who was not directly referred by his teacher; however, he was one of the lowest performers who also met the decoding criteria. Researchers could not use a specific cutoff for the DORF because there was no beginning of the year benchmark for first grade. See Table 1 for a summary of participant information and initial scores.

Materials

Computer equipment. Four Dell laptop computers delivered the RR software. One of these laptops was used as a server and connected to a Linksys Wireless Broadband Router to run the reading program. The other laptops were used to run the RR program and deliver CR and nonculturally relevant (NCR; that is, AIMSweb) passages. Each laptop had an accompanying wireless mouse and Logitech headset with microphones that enabled students to hear the program and also audio recorded their readings.

RR software. This software delivered CR and AIMSweb passages to students using the RRI sequence.

CR passages. Previous researchers on this project created 25 first-grade CR passages by interviewing teachers, parents, and students for background information to inform stories for this population (see Cartledge et al., 2015; Cartledge et al., 2016). The Spache Readability Index (n.d.) and a statistical procedure equated the passages with a grade range of 1.4 to 2.6.

CR maze passages. Researchers created maze comprehension assessments to mirror the CR passages by removing every seventh word from the passage; the students selected the appropriate word from a set of three choices to insert in the blank. The student showed comprehension when he or she clicked on the correct word. Following the maze, RR calculated the correct responses and generated a graph allowing students to see their progress on this assessment. If students received a perfect score on their maze assessment, a star was placed on their graph.

Generalization passages. Researchers selected generalization passages from a database called AIMSweb (aimsweb.pearson.com). In this study, AIMSweb passages were referred to as NCR passages because the passages were generic and not specifically focused on being culturally sensitive to this study's population. Passages were selected from this database based on the grade level difficulty of 1.4 to 2.6 as measured by the Spache readability formula.

Rewards. Students chose a sticker after completing an intervention session for that day.

Experimental Design

Researchers used a multiple baseline design across participants (Cooper, Heron, & Heward, 2007) to analyze the effects of the RR intervention on the students' ORF and comprehension on CR and AIMSweb passages. Researchers also collected procedural integrity to determine whether students independently followed the computer sequence.

Dependent variables. The first dependent variable was students' CWPM during the cold read of CR oral passages on RR. Words counted toward the student's score if a word was read correctly within 3 s or if the student made an initial error and then independently corrected his or her mistake. Words were incorrect if they were mispronounced by the student or not said within 3 s. After the 1-min timing, the researchers input the students' final words read along with the errors and the computer calculated the CWPM for the student. Students received "corrective feedback" by practicing the missed words on their cold read during the "practice words" component of the intervention following their cold read.

The second dependent variable was correct responses on the CR maze assessment. Answers were counted as correct if the word selected was the original word from the story. Correct responses generated a line graph for students to see. Corrective feedback was not provided for this assessment.

The third dependent variable was the students' CWPM on the generalization passages. Students read generalization passages after meeting their goal while reading the CR passages. If students were able to reach their reading goal on their first attempt for three consecutive CR stories, they received a generalization passage. If students needed to repeat a story for a second day, they were not given a generalization passage until they had successfully completed reading three CR stories.

The fourth dependent variable was the students' scores on the generalization mazes. These mazes functioned exactly as the CR mazes.

The fifth dependent variable was students' rate of improvement (ROI) based on their DIBELS Next benchmark assessments given at the beginning of the year (September) and at the end of the year (May). According to Hasbrouck and Tindal's (2006) ORF data, average weekly improvement for students' ORF can be calculated based on their initial CWPM. Participants' projected ROI was calculated by multiplying their average weekly word growth by the number of weeks they participated in intervention and adding this number to their initial median DIBELS ORF. DIBELS Next measures basic early literacy skills for students in kindergarten through third grade. Researchers followed specified administrative procedures prescribed by DIBELS Next creators (Good & Kaminski, 2011). Dewey, Powell-Smith, Good, and Kaminski (2015) reported that alternate-form reliability of the first-grade NWF was .85 for a single test and .94 for the three-test form. On the first-grade DORF, reliability was .91 and .96 for the single- and three-test forms.

Independent variable. The independent variable for this study was the RR intervention, which consisted of CR and generalization passages and the RRI delivered through computer software. There were three to four sessions a week per participant, with each session lasting approximately 25 to 40 min across 11 to 15 weeks. Participants received feedback from the RR program after reading a story and positive praise statements from the researchers. The RR computer program delivered a repeated reading intervention using 25 CR and 17 AIM-Sweb stories. Students listened to a human model read a selected passage and then RR provided the students with opportunities to practice reading that same passage. While practicing the stories, students could click on unknown words and the computer read the word to the students. The computer also provided students with any practice words that they missed during their cold read. During this portion, the computer modeled reading the isolated word and then read the word within the context of the sentence. When students reached their goal, the software delivered the maze comprehension assessment and charted students' progress on a graph. Students viewed their graphs after every completed maze; no specific data were collected to assess the relative effects of viewing the graphs on students' reading performances.

Praise and corrective feedback. At the end of the session, the researchers praised the students for focusing, working hard, or reaching their goals. During the practice phases of the intervention, the students received corrective feedback on any errors made during the reading. No feedback was given during the assessment portions (i.e., cold read, timed read, and maze).

Procedures

Baseline. Students read six stories, three CR and three AIM-Sweb, in a randomized order. To begin, students clicked the "timed reading" button and read one passage for 1 min. Researchers collected ORF data on these cold read assessments for this single read. Next, students completed the 3-min maze assessment coinciding with the passage they read. Students read one passage per day and after at least 6 days of baseline the researchers analyzed the data to determine which students should be placed in the first tier. Two participants with the lowest stabilized (i.e., steady state) scores entered intervention first.

Training students for RR. Before entering intervention, participants received training on how to use the RR program. A training script was created to ensure procedural fidelity for all of the participants. The researchers followed the script and modeled each step for the participants. Participants were taken through the exact sequence of the program using the training CR story "Grandma's House," which was used solely for the purpose of training and was not included in intervention. Participants needed to follow every step on the training checklist correctly, before beginning intervention. The instructional sequence of RR consisted of (a) a 1-min timing of a cold read of passage, (b) practicing missed and nondecodable words, (c) listening to computer model read the passage, (d) reading along with the computer model, (e) reading the passage independently for 1-min timings, (f) reading the passage in a 1-min timing to meet goal, and (g) after meeting goal, taking comprehension maze. Data of cold read, timed reading, and maze were graphed for students to view progress.

Social Validity

Student social validity. At the end of the study, students responded to an oral interview relative to how they felt about participating in the project, which components they viewed favorably, and what they would change about the intervention. The secondary researcher conducted the interviews to minimize response bias.

Teacher social validity. Researchers gave participants' classroom teachers questionnaires to assess teachers' feelings about the RR program and their perceptions of the intervention's benefits for their students' reading. After completing the questionnaires, researchers met with the teachers to go over their feedback.

Interobserver Agreement (IOA)

Two graduate assistants (GAs) were trained during all phases of the project (i.e., prescreening, baseline, training, intervention, generalization probes, maintenance, and social validity measures). Each GA took turns serving as the secondary observer to verify the first observers' data collection. A second observer was present for at least 50% of baseline, training, intervention, generalization probes, maintenance, and social validity for each participant in the study. Exact agreement was calculated by the total agreements divided by the number of agreements plus disagreements and multiplied by 100.

The mean IOA calculations for the five student participants for each phase of intervention were as follows: During baseline CR and AIMSweb passage IOA was 98.9% (range: 85.7%–100%), treatment probes (i.e., cold reads) was 98.9% (range: 93.1%–100%), generalization probes (i.e., AIMSweb passages) was 99.4% (range: 93.5%–100%), intervention (i.e., timed reading) mean agreement was 98.2% (range: 95.3%–100%), and the maintenance was 99.7% (range: 97.2%–100%).

Treatment Integrity

A second observer used a prewritten checklist to observe each researcher for at least 70% of the subtests during baseline, training, intervention, and maintenance. Each researcher was observed by a second observer using a prewritten checklist DIBELS Next pre- and posttests, baseline for CR and AIMSweb passages, and maintenance. The breakdown is as follows: pre- and posttests 100%, 100% of baseline including CR and AIMSweb passages, 80.4% of treatment probes (i.e., cold reads), 78.9% of intervention sessions (i.e., timed readings), 82.1% of generalization probes, and 100% of maintenance.

Results

CR Fluency and Maze

ORF gains for both CR and AIMSweb passages for students during baseline, intervention, and maintenance are presented in Figure 1. All five students show an increasing trend from baseline through intervention when reading novel CR passages. Also noteworthy, Jerry and Noah had zero or almost no overlapping data points from baseline through intervention when reading CR passages, showing a strong intervention effect. Maze scores on CR passages mirrored the increasing trends found for CR passages (see Figure 2). Table 2 depicts mean ORF and maze scores for CR passages from baseline through intervention as well as percent increase. Three of the five students (i.e., Jerry, Jack, and Noah) showed percent increases of more than 200% on their reading fluency. Maze scores on CR passages also increased significantly for four out of five students (i.e., Mia, Tristen, Jerry, and Noah; see Table 2).

AIMSweb Fluency and Maze

Students made similar gains on their AIMSweb generalization probes and maze assessments as those found on CR passage and maze assessments (see Figures 1 and 2). All students made noticeable gains, especially Tristen and Jerry who had zero overlapping data points from baseline through intervention. Noah also showed substantial improvement with only one overlapping data point from baseline through intervention. Researchers used AIMSweb passages for maintenance checks taken 2 weeks and 1 month after students finished intervention; all five students surpassed their baseline fluency scores on maintenance probes (see Figure 1). During maintenance, all students with exception of Jack had zero overlap from baseline to intervention on their maze assessments (see Figure 2). Table 3 shows students' percent increases on AIMSweb passages and maze assessments. All students had percent increases of more than 100%.

ROI

Four out of five students (i.e., Mia, Tristen, Jerry, and Noah) well exceeded their projected growth according to these preset norms (Hasbrouck & Tindal, 2006). According to the data in Figure 3, the students' reading fluency surpassed the expected growth that would have occurred without targeted intervention.

DIBELS

As noted in Table 4, all participants made moderate to significant growth on the DORF assessment when looking at their increase in CWPM and percentage growth. Most notable is Jerry, who went from only reading eight CWPM at the beginning of the year to reading 44 CWPM at the end of the year.

Social Validity

All students reported that they enjoyed using the RR software and would like to continue to receive intervention in the future. They also reported that the CR passages were their favorite stories to read. In addition, all of the students said they felt that their reading had improved using the program. Classroom teachers also responded favorably to student gains in reading and mentioned that they would use RR in their classroom in the future.

Discussion

All five participants made clear progress demonstrating a functional relation between participants' ORF on novel CR

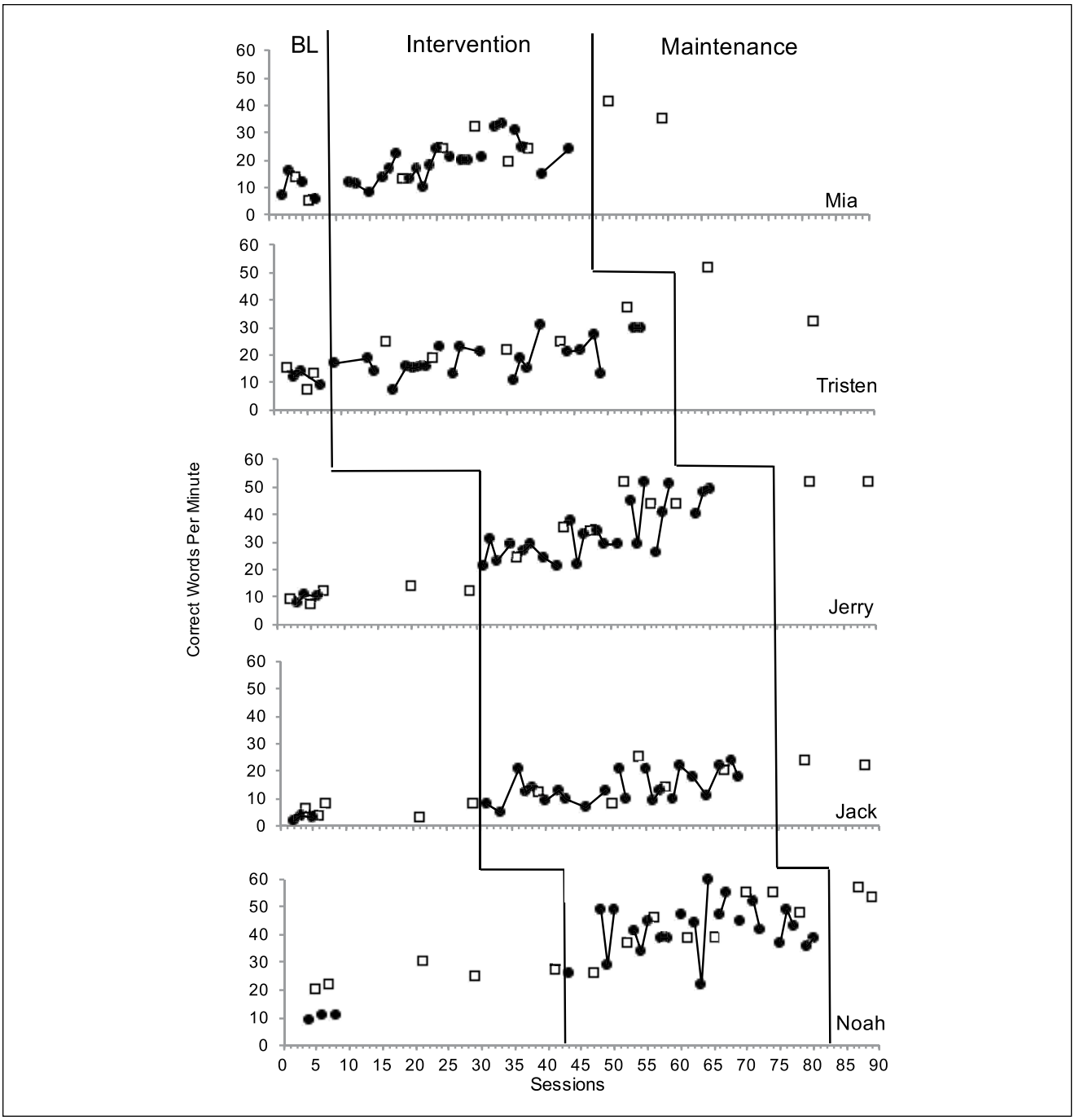

Figure 1. Tier 1 through Tier 3 correct words per minute per session.
Note. Cold reads are passages that have never been read before. Breaks in data represent generalization probes. Circles represent cold CR reads and boxes are cold AIMSweb passages. BL = baseline; CR = culturally relevant.

passages and the RR program; however, some variance is noted. For instance, three of the five students (Mia, Tristen, and Jack) had overlapping data on their CR passages. Mia originally struggled with reading stamina and frequently complained about having to read for such long durations of time. Toward the second half of the study, however, with explicit evidence of improvement, Mia made positive comments about her progress and appeared motivated to focus and try harder during the cold reads. Tristen also had one overlapping CR data point on a passage that contained many nondecodable words such as "La'Kisha" and "Jamal." Jack had many overlapping data points and made slight but

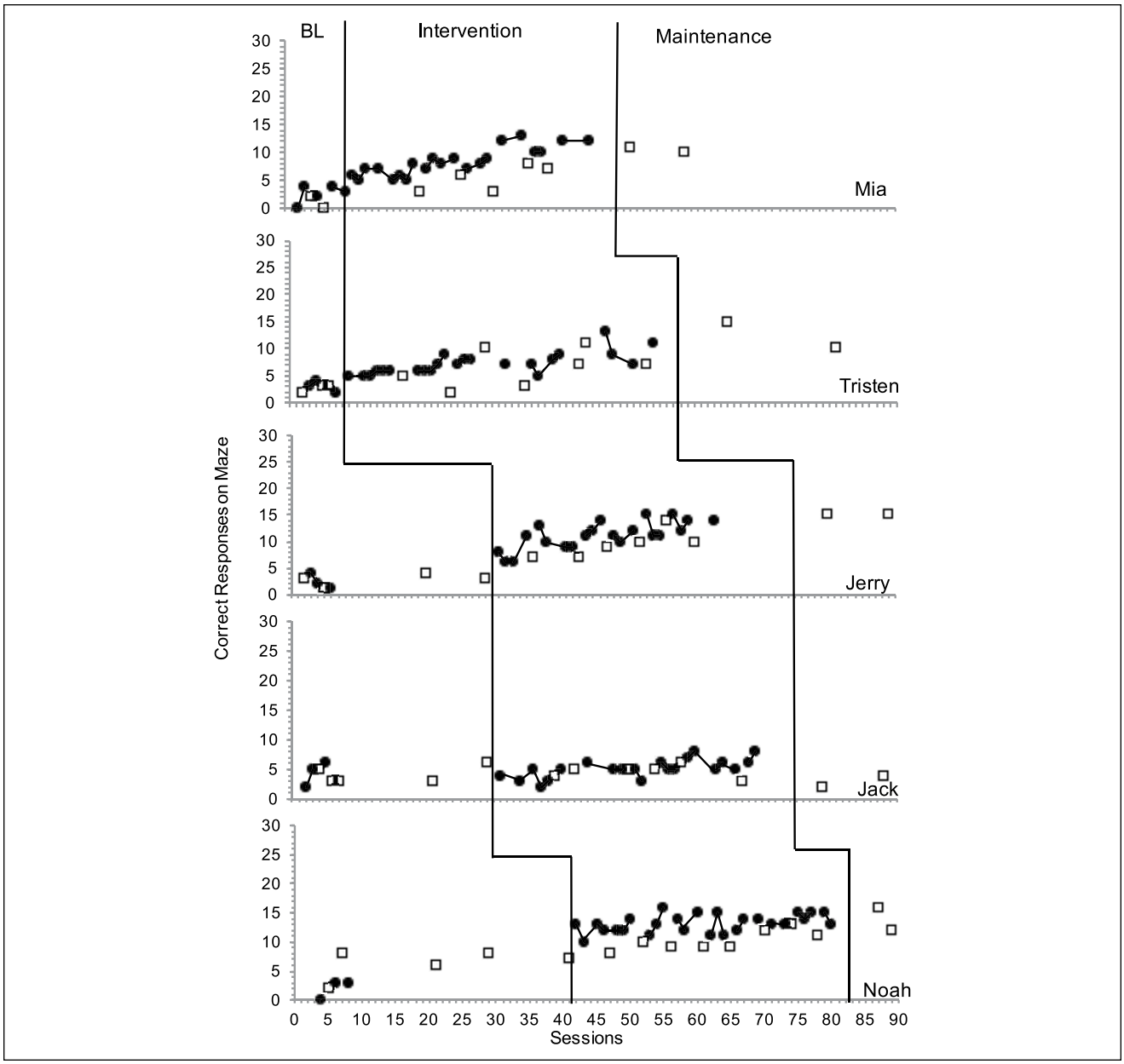

Figure 2. Correct responses to maze comprehension per session.
Note. Breaks in data represent generalization probes that occurred. Circles represent CR passages and squares are AIMSweb passages. BL= baseline; CR = culturally relevant.

Table 2. Student Growth Based on Baseline and Intervention Scores on CR Passages.

	Mean (and range) CWPM on CR passages			Mean (and range) Correct responses on CR maze		
Student	BL	Int.	PI %	BL	Int.	PI %
Mia	11.7 (7–6)	19.5 (11–33)	66.7	2.0 (0–4)	7.8 (3–13)	290
Tristen	11.7 (9–14)	18.0 (11–13)	53.8	3.0 (2–4)	7.3 (5–13)	143.3
Jerry	9.6 (8–11)	33.5 (21–52)	248.9	2.3 (1–4)	11.4 (6–15)	395.6
Jack	3.0 (2–4)	14.4 (5–25)	380.0	4.3 (2–6)	5.2 (2–8)	20.9
Noah	10.3 (9–20)	41.0 (26–60)	298.1	2.0 (0–3)	13.2 (9–15)	560

Note. CWPM = correct words per minute; CR = culturally relevant; BL = baseline; Int. = intervention; PI = percent increase.

Table 3. Student Growth Based on Baseline and Intervention Scores on AIMSweb Passages.

	Mean (and range) CWPM and percentage of increase on AIMSweb passages				Mean (and range) correct responses on AIMSweb maze			
Student	BL	Int.	PI	M	BL	Int.	PI %	M
Mia	9.7 (5–14)	22.4 (13–32)	130.9	42	1.3 (0–2)	7.8 (5–13)	500	11.5
Tristen	11.7 (7–15)	25.6 (19–37)	118.8	42	2.7 (2–3)	6.3 (2–11)	133.3	12.5
Jerry	8.4 (6–12)	38.8 (21–44)	361.9	54	3.75 (2–4)	9.5 (7–14)	153.3	12
Jack	6 (3–9)	15.8 (8–25)	163.3	23	4 (3–6)	4.7 (3–6)	17.5	3
Noah	20 (3–30)	46.5 (37–55)	132.5	55	6.3 (0–8)	9.8 (7–13)	55.6	15.5

Note. First graders performing at 50th percentile on AIMSweb: Fall = 13 CWPM, Winter = 36 CWPM, Spring = 67 CWPM. CWPM = correct words per minute; BL = baseline (mean scores); Int. = intervention (mean scores); PI = percent increase; M = maintenance.

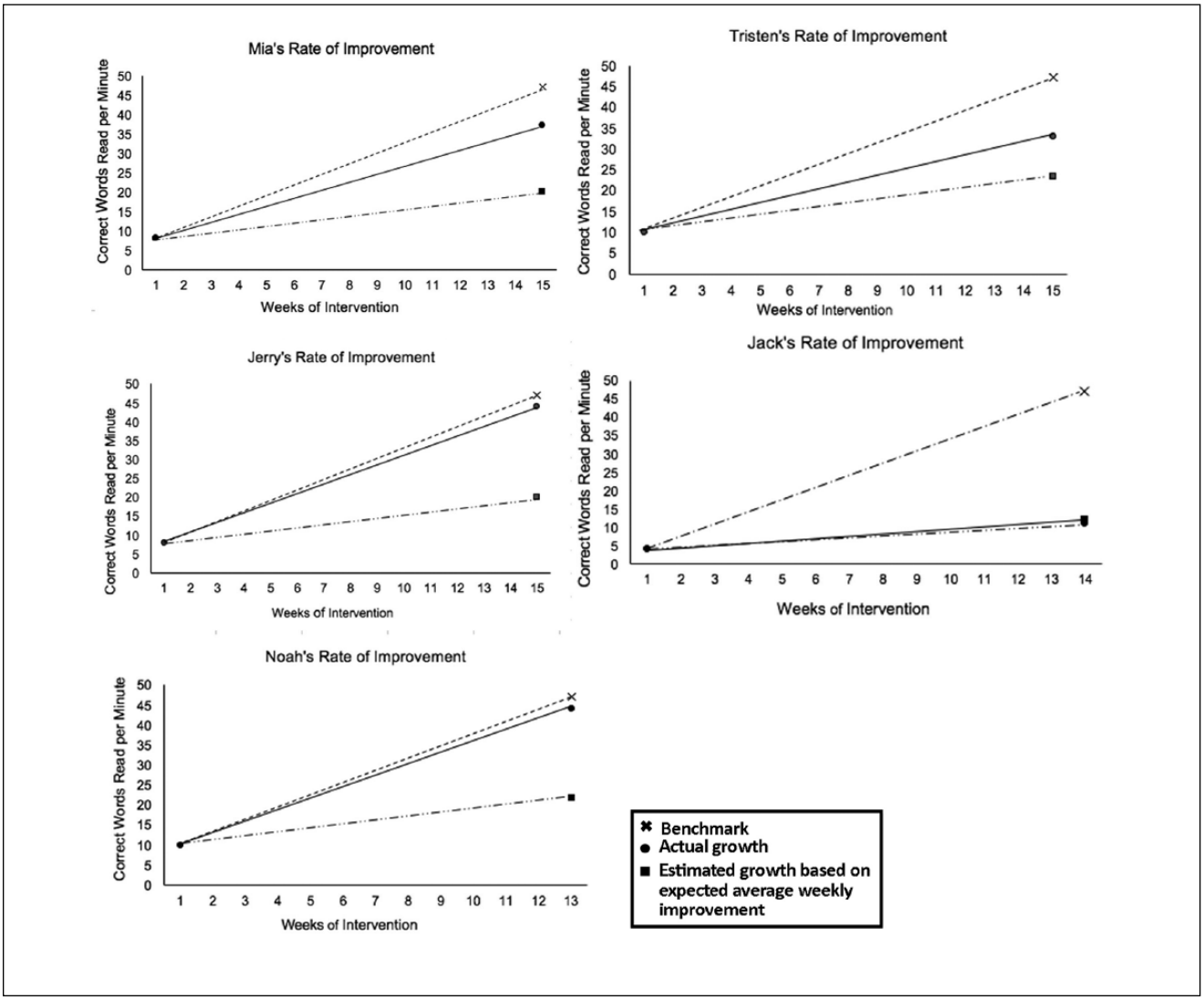

Figure 3. Rate of improvement for each participant.
Note. Graphs compare estimated (i.e., predicted) growth with actual growth from intervention.

steady progress. Jerry and Noah, however, had no overlapping data points and showed substantial change in reading fluency from baseline to intervention.

The comprehension maze assessments also documented student progress. As with the other measures, Noah and Jerry had the strongest comprehension performance, managing to

Table 4. DIBELS Next Scores on Oral Reading Fluency for BOY and EOY.

Name	BOY		EOY		(Percentage growth from BOY)
	Raw score median	Risk level	Raw score median	Risk level	
Mia	8	NA[a]	37	Below benchmark	362.5
Tristen	10	NA	33	Below benchmark	230.0
Jerry	8	NA	44	Below benchmark	450.0
Jack	4	NA	12	Well below benchmark	200.0
Noah	10	NA	44	Below benchmark	340.0

Note. BOY = beginning of the year; EOY = end of the year.
[a]No risk level assigned at the beginning of first grade.

achieve eight perfect scores on the CR maze assessments. One possible explanation is that because these passages were only probes, students did not have any exposure to the text through the repeated reading procedure. Interestingly, four out of five students surpassed their baseline maze scores during their 2-week and 1-month maintenance probes. These results are consistent with other research (Fuchs, Fuchs, Hosp, & Jenkins, 2001) indicating that ORF is an important indicator of overall reading competence, including reading comprehension. When looking at students' data, a positive correlation between their CWPM and maze score is clear.

Researchers noticed that during baseline, nearly all of the participants were inclined to click on as many bubbles as possible to complete the maze. This was especially true for Jack, whose data fluctuated much longer than his peers. For this reason, January and Ardoin (2012) argued to use multiple comprehension measures and not only rely on the maze. However, we also observed that as students' reading fluency improved on their passages, they developed a better understanding of how to complete the maze and no longer randomly clicked on bubbles. Consistent with the work of other researchers (e.g., Hale et al., 2011), we found a strong correlation between the ORF increases and correct mazes, supporting the position that the maze could be a viable measure of comprehension when students gain in fluency.

The students' responses on the AIMSweb generalization passages were commensurate with those of the CR passage. This is especially true for the fluency data where the AIMSweb data tended to be slightly higher than the CR data and maintained these higher fluencies into maintenance. On the contrary, overall, the maze comprehension responses on AIMSweb were lower than on the CR passages. One possible explanation is that the CR passages had more nondecodable words or patterns that they had not yet learned in first grade, but the CR passages had more personally relevant content, thus contributing to greater comprehension on the CR mazes. This speculation cannot be verified without further research. The four more responsive students maintained progress on their AIMSweb ORF probes taken 2 weeks and 1 month after completing intervention. None of their data overlapped with their baseline performance. Mia, Jerry, and Noah demonstrated their highest ORF scores on these maintenance probes. Despite these gains, more maintenance data are needed to make conclusions about the lasting beneficial effects of intervention. On maze maintenance checks, four out of five students showed scores higher than baseline. Jack was the only student who had overlapping data points. However, the latter scores were a more valid reflection of his comprehension compared with his random clicking during baseline. Likewise, with their ORF maintenance probes, Mia, Jerry, and Noah had the highest scores during these maintenance checks.

All participants made steady gains on their DIBELS Next assessments with four of the five participants making substantial gains and one participant, Jack, making minimal gains. Jack was the only student who remained in the *Well Below Benchmark* risk level. Although Jack was compliant and persisted with the intervention, he had extreme difficulty retaining basic information needed to perform academic tasks. For example, all of the children received a card with their computer log in information, which they quickly committed to memory. Jack, however, failed to memorize his password and copied from his card throughout the intervention. The other four students made good progress in reading fluency. Jerry's gains from eight CWPM to 44 CWPM, for example, were remarkable, leaving him only three CWPM from reaching benchmark. Similarly, Noah also made impressive improvement, increasing from 10 CWPM to 44 CWPM on the end of the year assessment, three words short of benchmark.

Equally, if not more convincing of the students' reading growth, are the data depicted on the ROI graphs in Figure 3. Comparing benchmark to expected and actual growth, four of the students made very good to modest progress, either nearly reaching benchmark or at least clearly exceeding the lower level of expected performance had they not received intervention. A longer, more robust intervention might have resulted in at least two of the students exceeding benchmark. Jack continued at very low response rates, evidencing minimal improvement. Along with his previously noted

memory issues, Jack's poor learning was aggravated by attendance and home disruption problems. More intense and extensive interventions were warranted. The participants' ORF improvements on reading passages further strengthens Kuhn and Stahls's (2003) argument that fluency interventions can and should be implemented for students younger than third grade. These first graders were able to make critical gains and generalize these skills, providing some evidence that effective, early intervention can help enhance students' skills and possibly prevent larger subsequent achievement gaps.

Limitations

Despite the technological changes aimed at greater pupil independence, at the time of this study, adult supervision was needed to support the program with error correction (clicking on the errors the students made while reading) and troubleshooting any technological glitches while the program was running.

Procedural integrity checklists showed that the participants were able to execute the program with more than 90% accuracy. Although students found their progress graphs to be reinforcing, researchers incorporated the sticker station as a way of providing additional reinforcement to the participants.

The RR intervention was designed to deliver 25 CR stories. Students who started the intervention in the first tier finished all 25 stories early and could have benefited from additional intervention. CR stories were also designed to be culturally sensitive and many of the participants struggled to decode the names of the characters (i.e., La'Kisha, Jamal, Jonetta) in these stories as opposed to the AIMSweb passages that had decodable names such as Tom and Ben. Although most of the CR names could technically be decoded, AIMSweb names were more appropriate for decoding patterns typically seen in first grade.

DIBELS Next assessments were not designed to determine risk level at the beginning of first grade. Although researchers were able to independently calculate the ORF scores for each participant, because researchers could only use midyear scores, it could not be determined whether this intervention improved their risk level.

Maze assessments are a common measure for progress-monitoring young children (Parker, Hasbrouck, & Tindal, 1992). However, initially, the maze assessments were not always a valid indicator of the student's performance, especially during baseline due to random responding, which inflated some of the scores. Over time, however, students began to respond more meaningfully and accurately.

Finally, researchers did not provide additional CR probes for the students in Tiers 2 and 3 immediately before the students started intervention, allowing substantial time to lapse between CR baseline and intervention. It is possible that students could have "naturally" improved their CR scores before starting intervention. However, because the CR passages served principally for treatment and the AIMSweb passages were used as the essential measure of reading growth, the AIMSweb probes gave a valid indication of student performance prior to intervention and support the position of experimental control. Ideally, we would administer CR and AIMSweb probes immediately before intervention for all participants, but CR passages were limited to 26, and these passages were needed for the training and intervention. CR passages were critical for getting students invested in reading but reading success was based on the steady reading improvement with AIMSweb passages upon the introduction of treatment.

Conclusion

Findings from this study support previous research that RR can effectively be used to improve reading fluency and comprehension for first-grade students in urban settings at risk for reading failure. Data showing the ORF and comprehension scores for each student demonstrated a functional relation between RR and reading outcomes. These findings are supported by the ROI graphs showing reading growth rates substantially higher than those expected for four of the five participants. In addition to collected data, anecdotal reports showed improved reading confidence and initiative in the participants. Social validity questionnaires revealed that using RRI was motivating for students. Student participants demonstrated that they were capable of independently utilizing the software and following the procedures with minimal staff support. RR utilized research based procedures (repeated reading) to provide a multilevel reading intervention that helped improve reading for first-grade students. This intervention shows potential to minimize reading risk for first-grade students in urban classrooms with limited resources. It will be critical to continue to make technological improvements to this program to ensure that it can be implemented under typical classroom/school conditions.

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