Reducing Risk through a Supplementary Reading Intervention: A Case Study of First- and Second-Grade Urban Students

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ABSTRACT: *This descriptive study examined whether a computer-based, repeated reading intervention (i.e., Reading Relevant and Culturally Engaging Stories) is associated with improved reading and social behavior for three primary-aged urban black girls who each showed both academic and behavioral risk. The Reading Relevant and Culturally Engaging Stories intervention utilized culturally relevant reading passages for repeated readings delivered through computer software to increase the reading fluency of the young learners. Single-subject data collection procedures (AB designs) were used to measure student performance in reading and behavior during the intervention. Reading and behavioral outcomes improved following implementation of the intervention for all three participants. The benefits of systematic, intensive, and culturally relevant intervention to reduce risk in beginning learners are discussed.*

■ Reading is the most essential skill for school success. Poverty, racial minority status, limited English proficiency, and inadequate schooling are the most salient factors associated with reading/special education risk (National Center for Educational Statistics [NCES], 2007). Furthermore, struggling readers often present chronic problem behavior, increasing their risk for a special education label (e.g., behavior disorders; Kaufman & Landrum, 2012). Children with behavior disorders traditionally have been subjected to a curriculum focused on behavior control (Knitzer, Steinberg, & Fleisch, 1990) and punishment (Center for Effective Collaboration and Practice [CECP], 2000), with considerably less attention to academics. More recently, however, the associative nature of combined behavior and academic deficits for children with

behavior disorders (Bierman et al., 2013) has increased attention to this dual relationship and related interventions.

Behavior Problems and Reading

The research and theoretical literature in the area of behavior disorders includes extensive discussions on the co-existence of problems with both reading and behavior. The common speculation that providing interventions for either academic or social behaviors might have a reciprocal, moderating effect on the corresponding behavior (Algozzine, Wang, & Violette, 2011; Kempe, Gustafson, & Samuelsson, 2011; Pierce, Wechsler-Zimring, Noam, Wolf, & Katzir, 2013; Pimperton & Nation, 2014) has limited empirical support (Algozzine et al., 2011). There is,

however, research evidence that intensive interventions that require high levels of academic responding not only affect academic gains but can also reduce disruptive behavior *during* instruction (e.g., Hagan-Burke, Gilmour, Gerow, & Crowder, 2015; Lane, Little, Redding-Rhodes, Phillips, & Welsh, 2007; Lo & Cartledge, 2004; Sutherland & Snyder, 2007). Although lacking evidence of lasting behavior outcomes, effective academic interventions that mitigate disruptive behaviors during instruction are extremely beneficial for students with behavior disorders.

Urban Minority Learners

Students who present reading and behavior problems are perhaps the most vulnerable youngsters in our schools and this risk is further aggravated among minority and low-income students. The professional literature repeatedly documents the disproportionate placement of African American students in programs for behavior disorders (Cartledge & Dukes, 2009). We know that students with behavior disorders not only experience more school failure than their peers with or without disabilities (Bowman-Perrott et al., 2011), but they also have poorer postschool outcomes (Zigmond, 2006). Bowman-Perrott et al. (2011), for example, examined national longitudinal data from the Special Education Elementary Longitudinal Study and found that compared to students with other disabilities (e.g., attention deficit hyperactivity disorder, learning disabilities) students with behavior disorders were most likely to be excluded from school and excluded multiple times. They also found that the two strongest predictors of exclusions were being male and being African American. Other risk factors included grade retention and self-contained secondary placement, which are predictive of early school leaving and subsequent diagnosis of conduct disorder (Bierman et al., 2013).

The poor school outcomes for students with behavior disorders (CECP, 2000) and the disproportionate enrollment of black students in programs for behavior disorders point to the urgency of highly effective interventions where children with disabilities experience the greatest risk. The problems are compounded in urban schools where educators' teaching experience, qualifications, and preparation may be significant issues (e.g., Kozleski, Sobel, & Taylor, 2003). Furthermore, in urban schools class sizes are often large, teachers are provided with fewer resources, and students present greater instructional needs than their peers in more affluent districts (Finch, 2012; Orosco & Klingner, 2010). Children with significant reading and behavioral needs require more, not less, instruction, which often does not occur (CECP, 2000). Instruction needs to be evidence based, teacher friendly, and minimize problem behaviors. Although this is the expectation for all schools, the need is greater in urban schools and the likelihood is less because of the higher incidence of students with risk characteristics (NCES, 2007), the issue of teacher qualifications (Kozleski et al., 2003), and limited resources (Finch, 2012; Orosco & Klingner, 2010). Thus, supplementary interventions that actively engage the learner without placing excessive demands on the classroom teacher are critical in urban, low-income classrooms.

Theoretical Framework

The overall focus of this intervention is to reduce reading failure (and, hence, the need for special education) for populations with high risk (e.g., urban racially and linguistically diverse learners). The proposed intervention is based on the premise that many young children vulnerable for reading risk and identification for special education require explicit instruction on oral reading fluency (ORF) that may be delivered efficiently and effectively through existing technology. Another key overarching principle is that the intervention may be made more attractive, and thus more effective, by appealing to particular learning attributes of the targeted learners. This specialized appeal is referred to as culturally relevant (CR) instruction. A final point is that within urban settings, overburdened with too many needs and too few resources, intervention delivery needs to be of minimum effort and maximum effect. Thus, this intervention offers three main features: (a) early ORF instruction taught with (b) CR reading passages, which are delivered through (c) computer software.

Most authorities agree fluency is a necessary component of reading proficiency (Hudson, Lane, & Pullen, 2005; Kuhn & Stahl, 2003) and correlates strongly with reading comprehension (Fuchs, Fuchs, Hosp, & Jenkins, 2001), but reading programs often neglect to include explicit instruction in fluency (Kame'euni & Simmons, 2001). There is increasing evidence that ORF begins as early as kindergarten or first grade and is predictive of subsequent reading proficiency (Baker et al., 2008). Additionally, ORF instruction should begin at the acquisition stage

of reading (Wolf & Katzir-Cohen, 2001), be practiced in connected text (Coyne, Kame'euni, Simmons, & Harn, 2004; Hapstak & Tracey, 2007; Lane et al., 2007), and be provided through systematic instruction. Gibson, Cartledge, Keyes, and Yawn (2014) found that repeated readings delivered through computer software was an effective approach for increasing the ORF of first-grade urban students evidencing reading/special education risk.

Many advocates have pushed for the use of more CR teaching material, reporting some evidence of improved interest and performance with those materials (e.g., Bishop, 2007; Debnam, Pas, Bottiani, Cash, & Bradshaw, 2015). Self-identity is key for attraction to and sustained engagement in literacy activities (Cartledge, Keesey, Bennett, Ramnath, & Council, 2016) with indications that culturally diverse students respond more positively to literature that reflects their background (Ebe, 2010). Additionally, this intervention is intended to incorporate features Steele (2010) espoused to minimize threat and to maximize identity safety. We assume that reading materials that reflect the learner's background and assurance that educators will help the learner to succeed will be less threatening. For example, we gave learners researcher-developed reading passages with familiar CR content and then told them that we knew the reading goal was high but we knew they could do it and we would help them practice until the goal was reached.

Computers have been used successfully to deliver academic subjects such as math and reading (Fuchs et al., 2006; Leonard, Davis, & Sidler, 2005), including to students with disabilities (Kim et al., 2006). Computer software programs can alleviate some of the teacher resource problems encountered within inner city schools. Another potential benefit of computer-based teaching is that the instruction can be delivered in a consistent, pedagogically prescribed manner, fairly free of instructional error (Black, Tepperman, & Narayanan, 2011). Furthermore, computer programs are found to be especially beneficial for young, low-income urban children, elevating both academic and social behaviors (Laffey, Espinosa, Moore, & Lodree, 2003). Gibson et al. (2014) found that first-grade urban students quickly acquired the technical skills needed to master the sequences for the computer software. Additional research is needed to determine the viability of such interventions with young urban children who show reading/behavior risk.

Purpose

The purpose of this study was to examine whether a computer-delivered reading fluency intervention was associated with improved reading and social behavior for young children who showed reading/special education risk. These data are presented as a case study of three urban black girls (two first graders, one second grader) who evidenced risk and initially resisted the supplementary instruction, stating that they couldn't read, referred to themselves as failures, and refused or resisted reading activities in their class. The basic intervention involved a computer-delivered reading fluency intervention consisting of repeated readings of CR passages. Specifically, we examined whether (a) the intervention was associated with participants making gains in their reading fluency and comprehension, (b) any observed gains transferred to generalization reading passages, and (c) corresponding improvements were observed in the girls' behavior and reading attitudes during instruction.

Method

Participants and Settings

This study is part of a larger project (Cartledge, Keesey, Bennett, Gallant, & Ramnath, 2015; Cartledge et al., 2016) involving a fluency reading intervention (Reading Relevant and Culturally Engaging Stories [Reading Races or RR]), consisting of repeated reading instruction and CR passages delivered through computer software. Participants were recruited from three urban elementary schools in a public school system located in a large Midwestern metropolitan area. One participant was selected from each of the participating schools for this case study. Classroom teachers agreed to participate in the project and referred participants who were at high risk for reading failure, based both on classroom performance and the district-wide reading assessment. One student, Skylar, was referred also because of classroom behavior problems of tantrums and defiance. By midyear, prior to intervention, Skylar had over 20 out-of-school suspensions. The other two students had milder behavioral problems such as refusing to read (Hazel) and excessive activity (Grace), as reported by their teachers.

Despite these concerns, none of the girls were identified for special education at the time of the study.

Hazel (names of all schools and students are pseudonyms) was a first grader who was 6 years and 11 months old when she was identified for the study. Hazel's teacher recommended her for the study based on her low scores on the district-wide reading assessment results. Hazel was easily distracted from academic tasks and often made negative comments about her abilities. Her lack of confidence seemed to serve as a catalyst for noncompliance when asked to complete literacy tasks. Hazel attended Drexel Elementary School where 85.2% of students were black/Non-Hispanic, 7.0% white/Non-Hispanic, 5.3% multiracial, and 81.8% economically disadvantaged. Classroom instruction for Hazel included district-wide whole group instruction using a blend of phonics-based and whole language instruction. Her intervention took place in the school's community room (i.e., administrative office with desk and computer). Each session included one to two researchers. There were three to four sessions a week with each session lasting 20–30 min. Hazel was in intervention for 13 weeks.

Grace was a first grader who attended Graeter Elementary School, a charter school. She was 6 years, 5 months old and appeared slightly smaller than most of her first-grade peers. Over 75% of the students enrolled at her school were classified as English language learners, and 100% classified as economically disadvantaged. Approximately 95% of the children in the school were of Somali background, and that language was spoken in Grace's home. The remaining students were African American native English speakers. Though Grace was identified as an English language learner, her English Proficiency score on the Ohio Test of English Language Assessment (OTELA, 2015) indicated she was approaching proficiency in English for her age. Like Hazel, baseline instruction for Grace was the district's whole group approach using a blend of phonics-based and whole language instruction. The school did not provide pullout reading intervention for struggling students. Furthermore, school personnel did not utilize formative assessments to track students' progress in reading. Grace's teacher recommended her for the study due to poor reading skills. Grace was extremely active and social. During intervention she would easily get distracted and often deviated from the prescribed instructions. The study took place in the school's library and resource room to minimize distractions. Each session included one to two researchers. There were one to four sessions a week for a total of 34 sessions, with each session lasting 20–30 min. Grace was in intervention for 13 weeks.

Finally, Skylar, who was 7 years, 8 months when she was identified for the study, was a second grader at Hope Elementary School. Skylar's teacher identified her as a student with extreme problem behavior (e.g., tantrums) and limited reading ability. Skylar was frequently sent to the principal's office for discipline and had a history of out-of-school suspensions. The Hope Elementary student population was 90.9% black and 89.6% economically disadvantaged. Classroom reading instruction included whole group activities that emphasized comprehension and sight word vocabulary. The study was conducted in a second-grade classroom and teachers' lounge. Each session included one to two researchers. There were one to four sessions a week for a total of 12 sessions, with each session lasting 20–30 min. Skylar was in intervention for 4 weeks.

The researchers administered the Dynamic Indicators of Basic Early Literacy Skills Next Edition (DIBELS Next; Good & Kaminski, 2011) beginning/middle-of-the-year benchmark assessment to each participant. Hazel and Grace were assessed using the first-grade DIBELS Next and Skylar was assessed with the second-grade DIBELS Next. These assessments were used as academic screening measures to determine the participants' appropriateness for the intervention. All three participants demonstrated grade level decoding skills but poor reading fluency (i.e., well below benchmark) and engaged in problem behaviors. See *Table 1* for demographic information on participants.

Materials and Outcome Measures

Pre-Intervention Assessment Instruments

Screening measures consisted of subtests from the DIBELS Next and, additionally, the OTELA for English Learners was analyzed for Grace.

DIBELS Next. Screening measures for the DIBELS Next consisted of two subtests: Nonsense Word Fluency (NWF), which assessed decoding skills, and DIBELS Oral Reading Fluency (DORF), which assessed reading fluency. Participants' ORF scores provided information about their prebaseline reading fluency. Dewey, Powell-Smith, Good, and Kaminski (2015)

TABLE 1
Participant Screening Information

Name	Age[a]	Race	Grade Level	DIBELS Next Scores	
				Phoneme Segmentation Raw Score (Risk Level)	**Oral Reading Fluency Raw Score (Risk Level)**
Hazel	6–11	AA	1st	46* (At or above benchmark)	7* (Well below benchmark)
Grace	6–5	S	1st	17** (At or above benchmark)	6** (Well below benchmark)
Skylar	7–8	AA	2nd	N/A	27** (Well below benchmark)

Note. Risk level according to DIBELS Next benchmark goals. AA = African American, S = Somali, N/A = not applicable (no Middle of the Year subtest for second grade Phoneme Segmentation).
[a]Age is reported in years–months at the time DIBELS Next Beginning of the Year* or Middle of the Year** subtests were administered.

reported that the alternate-form reliability of the first-grade NWF was .85 for a single test and .94 for the three-test form; and .91 and .96 for the single- and three-test forms, respectively, for first-grade DORF. Second-grade DORF reliability was .93 for single test and .97 for triad. The DIBELS Next does not provide a midyear NWF second-grade assessment. We followed administration procedures prescribed by the DIBELS Next authors (Good et al., 2013).

OTELA. Teachers at Graeter Elementary administered the OTELA to determine language proficiency of English learners. Test results were recorded in Levels 1 to 5, 1 being prefunctional and 5 being full English proficiency. The OTELA used "estimated form reliability based on the Spearman Brown prophecy formula for the OTELA as well as the coefficient alpha reliability estimates from the first operational administration of the English Language Development Assessment [ELDA]" (Moore, 2008, p. 17). OTELA (2010) reported reliability coefficients for the OTELA for first and second graders as: listening, .94; speaking, .95; reading, .96; and writing, .94.

CR Passages

This study is a continuation of a larger project where the research team created novel CR passages utilizing questionnaires and interviews of students, parents, and teachers in the schools. The CR passages were designed to reflect the interests and background of the target population (i.e., first- and second-grade urban learners). The team wrote a total of 30 first-grade and 30 second-grade passages that were validated and equated with reading, cultural, and psychometric authorities. See Cartledge et al. (2015) for

additional details on the creation and validation of the CR passages.

CR Maze Passages

Maze comprehension tests are curriculum-based measures commonly used with primary-aged learners to monitor reading comprehension (Fuchs & Fuchs, 2007). The CR maze passages are identical to the CR reading passages, except with approximately every sixth or seventh word replaced with three choices for the missing word. Learners select the appropriate word from the word choices to demonstrate reading comprehension. Maze passages were created to correspond to each set of CR passages to assess participants' comprehension of the CR passages. See Cartledge et al. (2015) for additional details on the creation and validation of the maze passages.

Generalization Passages

The generalization passages were taken from AIMSweb (n.d.). AIMSweb is a curriculum-based measurement system for screening and progress monitoring of basic academic (i.e., reading, language arts, math) and social skills. We viewed these passages as non-CR because the narratives are not specific to urban settings or diverse learners, even though the passages do contain content of general interest to this grade level. Similar to the DIBELS assessments, Grace and Hazel received AIMSweb materials designed for first graders and Skylar received second-grade materials. Generalization passages were administered during baseline and every time a participant successfully completed three to five sessions using CR passages (i.e., achieved her fluency goal).

Reading RACES

Reading RACES (RR) is a computer-assisted instruction (CAI) application designed to deliver a repeated reading intervention to first and second graders. A Toshiba laptop computer with specialized repeated reading software loaded was used to deliver the intervention. The program allowed students to listen to a human voice model read a passage and then for the student to read with the model. The program also had the capability to "listen" (i.e., record students' repeated readings session) to students as they read independently. Following student readings, the program calculated the total words read on 1-min timings based on voice recognition during these independent readings. The researcher recorded incorrect words and the total words read to verify the computer calculations. Students then verified the last word that they actually read by clicking on the word. A headset with a noise-cancelling microphone was used so that participants could listen to the stories with limited distractions and the computer could create an audio record of the students' oral reading. Using this information, the computer generated a correct words per minute (CWPM) score and displayed it to the student. During intervention, while the participant was reading practice passages, the CAI provided assistance with unknown words (i.e., read the word) when a student clicked on the unknown word or when there was a 3-s pause in their reading.

Reinforcers

Reinforcers (i.e., incentives) consisted of stickers and were used during the pretest, baseline, and intervention phases. During intervention (as discussed later) Hazel was provided access to additional reinforcers in the form of positive notes to take home and brief access to video games. Stickers were provided to the participants upon completion of each session.

Procedures

Baseline

Baseline consisted of alternating cold reads on three AIMSweb passages (i.e., the non-CR passages used for generalization) and three CR passages delivered on the computer. Maze comprehension tests were assessed on the computer for all cold reads. A cold read was a novel (i.e., not previously seen/read) passage that the participant attempted to read independently. The participants listened to and complied with the instructions delivered through the computer. For all passages, data were collected on participants' errors, CWPM, and number of items scored correct and incorrect on the maze comprehension passage.

Intervention

The intervention used in this study, RR, was the researcher-designed repeated reading application with CR passages delivered through voice-recognition software with a human voice model. Each participant was trained to use the computer-delivered intervention independently. They received the CAI approximately three to four times per week. Each participant individually worked on a laptop. The program consisted of the following sequence:

- *Setting of the ORF goal.* Each participant was shown her baseline data and goal prior to the start of the session (e.g., 20 CWPM). All goals were designed to be challenging but most importantly achievable for the learners. The goals were determined using the median CWPM score during baseline assessments. Goals were continually increased as students made progress in RR. Participants were taught to follow the instructions embedded into RR and the researchers prompted the girls if they were off task or if they forgot the next step in the instructional sequence.
- *Cold read.* Each session began by having the participants read the assigned story before receiving intervention, for a 1-min timing. The cold read was used to evaluate the effectiveness of intervention.
- *Practice words.* Each story was accompanied by a predetermined set of three to five practice words that were identified as nonphonetic sight words by the researchers. Upon completion of the cold read each participant was prompted to review the predetermined vocabulary. Participants were instructed to listen to the word, repeat after the computer, and read the word in the sentence. This sequence was repeated until all words were practiced.
- *Read to me.* Once participants selected the predetermined story, RR prompted them to click on "Read to Me." During this phase participants listened to the complete story and followed along by watching each

word be highlighted in blue as the story was read.

- *Read along.* After the story was complete, the researcher prompted the participant to select "Read Along." During this phase, the computer prompted the participant to read along with the computer as it highlighted the word being read in blue.
- *Listen to me.* Immediately following "Read Along" the participants were prompted to click on "Listen to Me." During this phase of instruction, participants were instructed to read independently for up to three 1-min timings, trying to reach their CWPM goal while maintaining 95% accuracy. If participants did not know a word or paused for 3 s, the computer prompted them to continue reading. If the student did not know the word, the computer prompted the student to click on the word and the computer would pronounce the word for the student. After completing the passage, the computer reviewed the missed words, presenting them in the sentence as given in the passage. If the goal was reached within three attempts the participant was instructed to continue on to the timed reading step. If the student did not reach his/her goal after the third try, the computer said, "Good job, let's try again next time." The student then practiced the same passage the following session. If the student failed to reach the goal on the second session, the goal was then reduced by five words until the goal was met. No passage needed to be practiced more than three sessions.
- *Timed reading.* The timed reading was also known as the treatment probe. This phase replicated the procedures in "Listen to Me" with the exception that the computer did not provide corrective feedback. Participants were given two attempts to reach their CWPM goal. If the student failed to reach the goal after two tries, the computer said, "Good job, let's try again the next time." The same procedure was followed as with "Listen to Me."
- *Maze comprehension passage.* After participants met their goal during "Timed Reading" they were prompted to select "Maze." The maze tested participants' comprehension on the passage that they successfully read during the session.
- *Charting of data.* At the end of every session, data were displayed showing results

for the "Cold Read," "Timed Reading," and "Maze" assessment.

Maintenance

Maintenance probes on fluency and comprehension were collected 2 weeks after the conclusion of intervention. Maintenance data were not collected for Hazel due to her end of the year absences.

Procedural Integrity

Procedural checklists were used to examine treatment integrity for the participants and the primary experimenter. The procedural integrity checklists contained descriptions of 10 critical elements of the intervention (e.g., clicked "yes/listen" after directions were read, read the story loud and clear during Read with Me) and were completed by the researcher after each intervention session. Procedural integrity for the three participants ranged from 90%–100%. The procedural integrity data sheets also included space for the researcher to record notes on student behavior and attitudes, specifying how frequently they prompted (i.e., verbally cued) each participant. Prompting could occur at any point during a session and was provided to address noncompliant behavior and participant difficulties with RR (e.g., not reading along with voice model or difficulty clicking with the mouse).

Social Validity

Social validity questionnaires were used to assess the degree to which participants liked reading with RR, felt they had become better readers, and thought their peers would enjoy reading with RR. Social validity questionnaires were administered at the conclusion of intervention.

Interobserver and Interscorer Agreement

Procedural Fidelity

A second observer was present for a minimum of 33% of screening assessments (i.e., DIBELS Next); baseline (AIMSweb and CR), intervention (i.e., AIMSweb and CR timed reading results), treatment (i.e., CR cold reads), generalization (i.e., AIMSweb passages delivered during intervention), and maintenance probes; and social validity measures for each participant

with the exception of Hazel, for whom interobserver agreement data was not collected for maintenance and social validity. Exact agreement was used to calculate interobserver agreement (agreements divided by the number of agreements plus disagreements and multiplied by 100). Interobserver agreement for procedural fidelity across the three participants was 100% for screening assessments, 95.6% (range: 93.3%–100%) for baseline probes, 99.2% (range: 98.5%–100%) for intervention and treatment probes, 99.7% (range: 99.1%–100%) for generalization probes, and 100% for maintenance probes and social validity.

Academic Outcomes

Interscorer agreement for Hazel's baseline AIMSweb and CR passages was 100%, 90.0% for intervention sessions, 92.4% for treatment probes, and 98.6% for generalization probes. Interscorer agreement for Grace during each phase of the study were as follows: DIBELS Next DORF scores had 100% agreement and DIBELS Next NWF scores had 92.6% agreement. During baseline, interscorer agreement on Grace's CWPM scores on AIMSweb and CR passages averaged 87.4% and 100%, respectively. During treatment probes, interscorer agreement on Grace's cold reads averaged 98.0%, 98.8% on intervention, and 98.6% on generalization probes. Interscorer agreement for Skylar for the screening measures were 100% for DIBELS Next, 98.5% for AIMSweb baseline passages, and 98.7% for CR baseline passages. Interscorer agreement for intervention, treatment, and generalization probes was 100% for Skylar.

Results

Each of the three participants demonstrated improved reading achievement and social behavior. Due to participation in the larger research project, interruptions in school schedules, absences, delays in parent permissions, school suspensions, and so forth, the participants were in intervention for varying amounts of time. Moreover, the design did not permit us to draw conclusions as to the presence of a functional relation between the intervention and changes in student outcomes. Therefore, findings are descriptive and should be interpreted as being derived from a case study rather than from an experimental, single-case design.
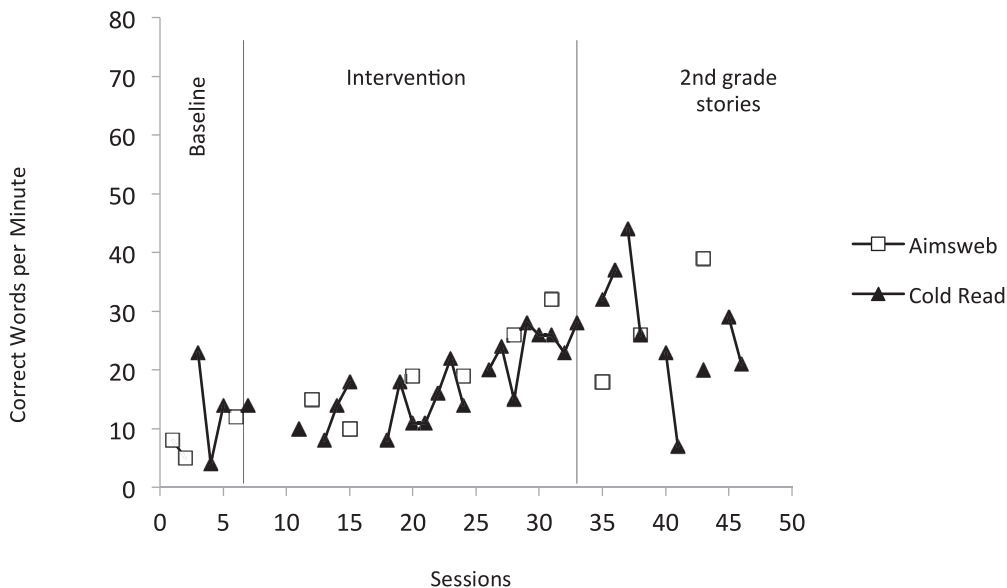
Hazel

Reading Achievement

Hazel participated in 39 RR lessons and made consistent progress during the intervention. Her CWPM mean score on cold readings of the CR passages during baseline was 13.6 (range: 4–23) but increased to a mean of 22.0 (range: 8–37) during intervention cold reads for a 61.7% growth (see *Figure 1*). The generalization AIMSweb passages (*Figure 1*) show a mean fluency score of 8.3 (range: 5–12) during baseline that increased to a mean of 19.9 (range: 10–39) during intervention with a final score of 39 CWPM at the end of her instruction. Hazel's mean performance on the CR comprehension maze during baseline was 1.6 (range: 0–3), which increased 437% during intervention to a mean of 8.6 (range: 3–15; see *Figure 2*). Her AIMSweb mean comprehension score on the mazes was 1.6 (range: 0–3) during baseline, which rose to a mean of 3.9 (range: 2–5) during intervention, more than doubling her baseline performance. Hazel completed all 25 first-grade CR stories in the intervention set. To continue her intervention in RR, Hazel was then introduced to the CR stories for second grade.

Social Behavior

During the first sessions with Hazel, several significant problem behaviors emerged, including pouting, refusing to read, and reading in an extremely low voice. On one occasion the entire session was discontinued due to her noncompliance. During this initial period, she required an average of five behavior prompts (i.e., reminder about the expectation for on-task behavior) and seven task prompts (i.e., directions to move to the next task) for an overall average of 12 prompts. The researcher frequently prompted Hazel to follow the passages on the computer screen and to respond as directed. To increase her participation we initially sent positive notes home to her mother, which did help but by the seventh intervention session Hazel stated she no longer wanted the notes, because she believed her mother stopped reading them. Hazel expressed great interest in video games so the reinforcer was then switched to playing a Ninja Turtles game for 3 min if she participated and met her CWPM goal. Two sessions after the new reinforcer Hazel began responding without constant prodding, reading even beyond the 1-min timings and receiving prompts only
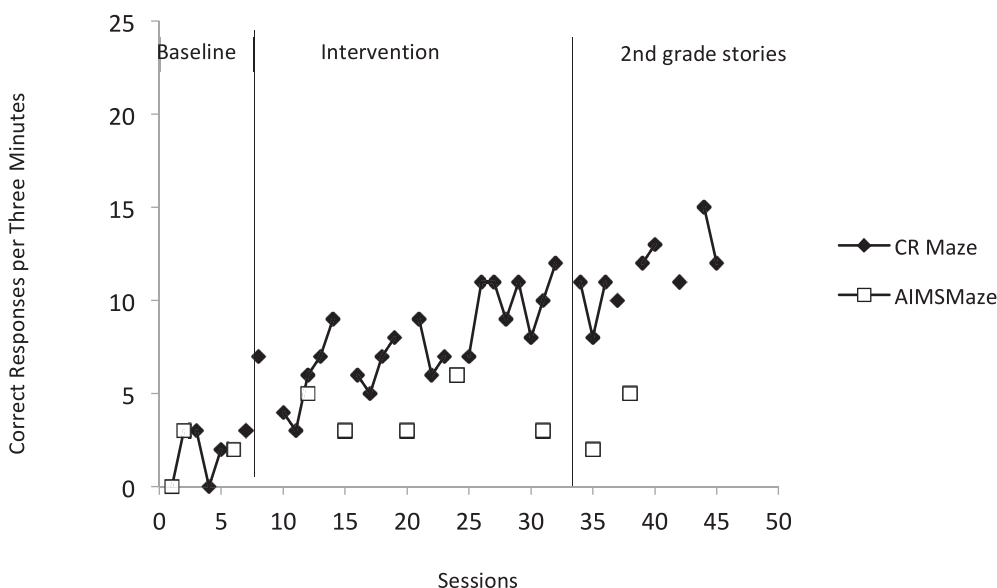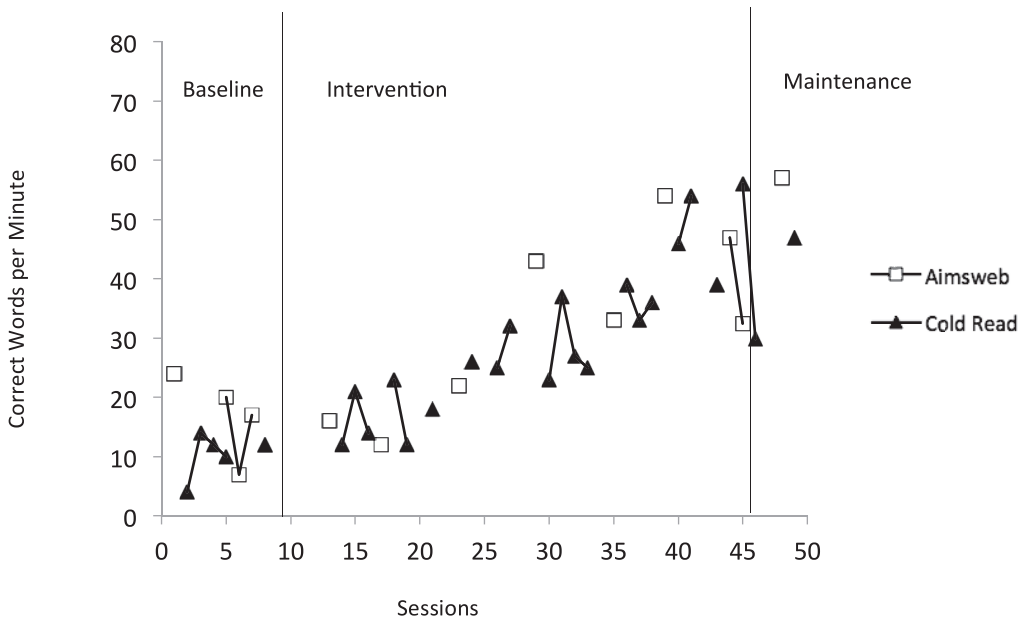
Figure 1. Hazel's correct words per minute. Cold read represents unpracticed CR passages. Breaks in data path for cold read represent student absences.

when she forgot the next step. At this point she required an average of only one prompt per session and that prompt was just to raise her hand when the graph of her reading was shown. She stated that she felt silly raising her hand, and because raising her hand was not an essential component of the intervention, it was discontinued as a requirement. With "hand

raising" removed, Hazel's prompts dropped to zero by the final intervention sessions. Other positive changes were that Hazel began to talk more to the researcher, and she stated that she read a story to her dad without missing any words. Especially noteworthy was that her classroom teacher reported that Hazel displayed greater reading confidence.

Figure 2. Hazel's correct responses per 3 min on maze assessments. CR = culturally relevant passages. Breaks in data path for CR Maze represent student absences.

Figure 3. *Grace's correct words per minute. Cold read represents unpracticed CR passages. Breaks in data path for cold read represent student absences.*
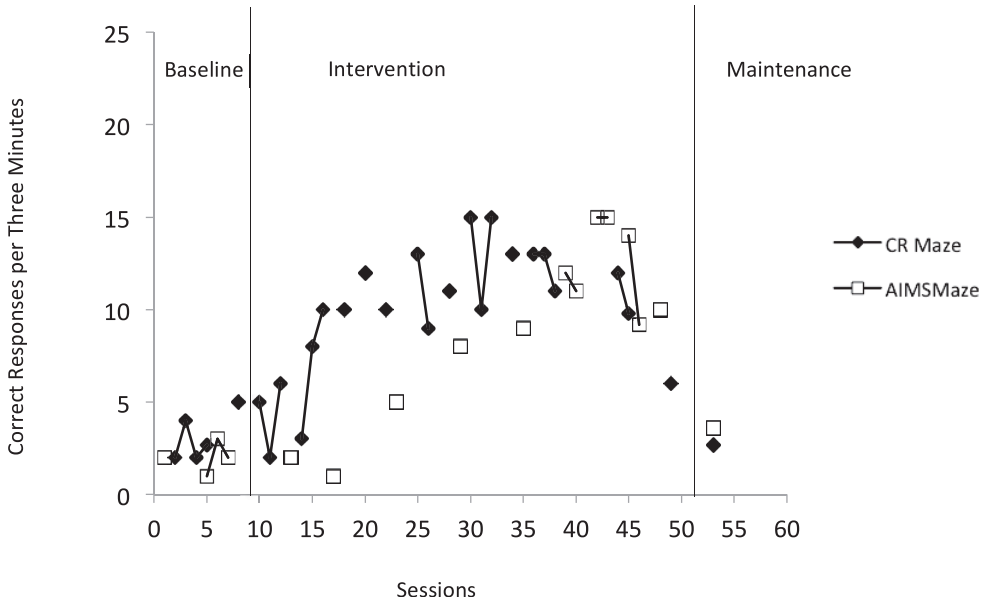
Grace

Reading Achievement

Grace participated in 32 RR lessons. During baseline, Grace's CWPM on cold readings of CR passages averaged 9.8 CWPM (range 4–14) and increased to an average of 29.9 (range: 12–56) during intervention for a 205% growth. As shown in *Figure 3*, Grace steadily increased her CR cold read fluency with a high score of 56 CWPM. Her CR maintenance score 2 weeks after intervention was 47 CWPM. Grace's data for the CWPM on AIMSweb generalization passages show a baseline mean fluency score of 17.0 (range: 7–24) that increased during intervention to a mean of 32.4 (range: 12–54). This was a 91% growth over her baseline score. Two weeks after intervention Grace read 57 CWPM on a novel AIMSweb passage, which was 40 CWPM and 235% better than her baseline average. Grace's data for the CR maze responses (*Figure 4*) show her mean comprehension score was 2.7 (range: 2–4) during baseline. After intervention, she averaged 9.7 (range: 2–15) correct responses for a 259% increase. Two weeks after intervention, she scored 3 on a novel CR maintenance maze, which was slightly higher than baseline mean. For the maze comprehension responses on AIMSweb Grace had a mean score of 2 during baseline (range: 1–3), but increased her average to 10.1 (range: 1–15) over the course of intervention. This was a 405% percentage growth over baseline. On the maintenance probe 2 weeks after intervention, Grace scored 4 correct on the maze, doubling her baseline mean.

Social Behavior

Grace initially required frequent behavior prompts to complete the intervention. During Grace's first six intervention sessions, she averaged seven behavior prompts. Behavior prompts were verbal or nonverbal urging her to proceed with a prescribed task (e.g., what should you click next?) or a reminder of the expectation for on-task behavior (e.g., your headphones should be on at all times). On occasion Grace's off-task behavior was so problematic that she had to be escorted back to her classroom because she refused to comply with the directions given on the computer or provided by the researcher. Reading on the computer at times seemed to be frustrating for Grace. During the sixth session Grace stated that "reading on the computer was so hard." During other early sessions Grace made comments that the readings were "too long" or that she "can't read fast." However, as Grace's reading proficiency improved, so did her on-task behavior. By the end of the study she required only an average of four behavior prompts and, despite earlier resistance, stated she liked reading on the

Figure 4. Grace's correct responses per 3 min on maze assessments. CR = culturally relevant passages. Breaks in data path for CR Maze represent student absences.

computer and enjoyed seeing her progress as graphed on the computers.
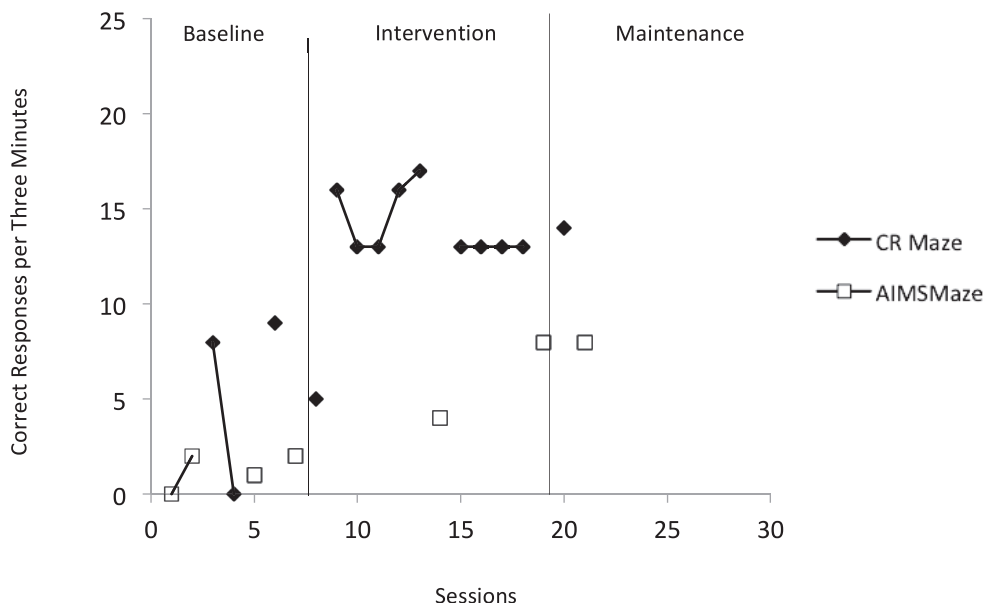
Skylar

Reading Achievement

Skylar participated in 10 RR lessons over a 4-week period due to her high absenteeism.

Skylar did, however, show growth in both reading fluency and comprehension. During baseline, Skylar averaged 39.6 CWPM (range: 30–43) on CR cold readings, which improved to an average 52.5 CWPM (range: 41–77) after intervention (see *Figure 5*). Her baseline AIMS-Web ORF was 30.5 CWPM (range: 30–31), which improved to an average of 48.5 CWPM
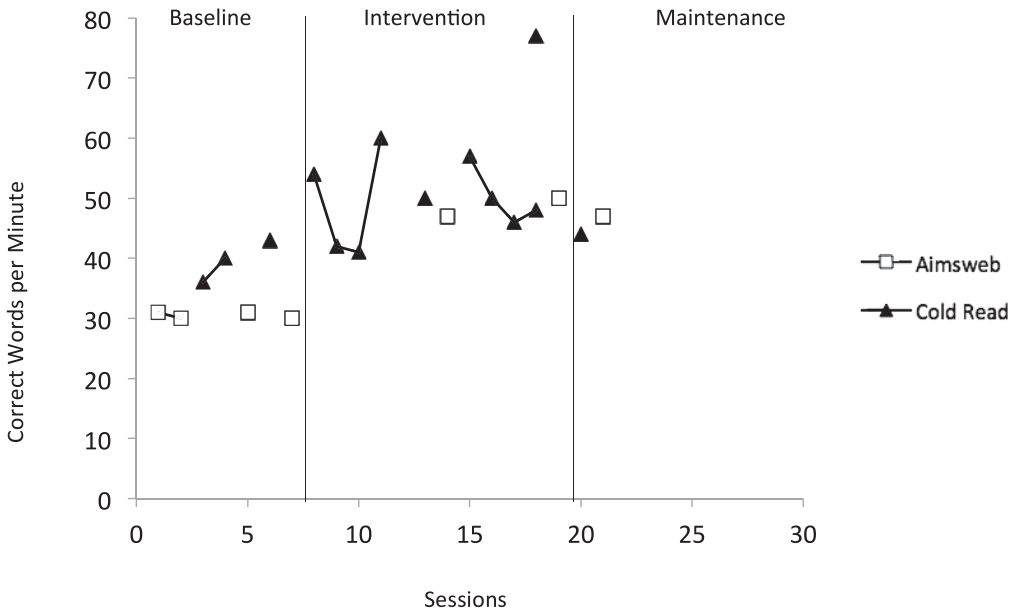
Figure 5. Skylar's correct words per minute. Cold read represents unpracticed CR passages. Breaks in data path for cold read represent student absences.

Figure 6. Skylar's correct responses per 3 min on maze assessments. CR = culturally relevant passages. Breaks in data path for CR Maze represent student absences.

(range: 47–50), for a 59% growth. Her comprehension also improved from a baseline average of 5.6 correct responses (range: 0–9) on CR mazes to an average of 13.2 correct responses (range: 5–17) (i.e., 136% growth) during intervention (see *Figure 6*). Skylar's generalization comprehension scores improved from a baseline average of 1.2 correct responses to an intervention average 6.0 correct responses for 400% growth. Her maintenance probe score 2 weeks after intervention was 44 CWPM with 14 correct maze responses, and her generalization maintenance probe was 47 CWPM with eight correct maze responses.

Social Behavior

Skylar's teacher identified her as a student with extreme problem behavior (e.g., tantrums) and limited reading ability. Throughout the academic year, prior to initiating this reading program, Skylar missed a great deal of instruction as a result of suspensions, absences, and timeouts, which increased during a 2-month period with a long-term substitute teacher who was less aware of Skylar's special needs. Skylar was extremely hesitant to participate in the study, mentioning on several occasions during the initial assessment that she could not read. Despite her significant behavior problems, even during the early stages of the intervention, Skylar required few adult prompts to

stay focused on RR. Skylar averaged two prompts with a range of 0–4. At no point during the study was Skylar removed from intervention due to noncompliance or tantrums. As she gained experience with RR, she became highly motivated to progress through stories and see her reading improve. During intervention sessions, Skylar consistently followed the rules and executed the routines necessary to participate (e.g., place headphones on ear and adjust microphone) without prompting.

Discussion

The students profiled in this study were part of a larger project examining the effects of the RR intervention on the reading fluency of first- and second-grade urban students who showed reading/special education risk. These three girls were selected for this analysis because they presented behavior problems as well as reading risk, thereby increasing their vulnerability for school failure. Identified by their classroom teachers and low performance in reading fluency verified with formal assessments, the girls met the criteria of reading risk. Their behavior, as reported by their teachers and informally observed in the clinic setting, differed in topography and severity, but in each case interfered with their schooling and reading achievement. In terms of our specified research questions, all three girls made substantial gains in reading

fluency that generalized to the nonpracticed passages and all three improved in their reading behavior/confidence. We observed several patterns or commonalities.

First, all three girls were not only initially resistant to the intervention, but also stated they could not read and were not good readers. We had no evidence that the girls believed they could succeed in reading. This observation is somewhat related to the *stereotype threat* work of Claude Steele (2010). According to Steele, stereotypes embedded from a very early age psychologically block the affected students' performance when the students are in an evaluative situation. Although the threat articulated by Steele functions largely under testing conditions, we extend this concept to the acquisition stage, suggesting that stereotyped groups may be inhibited by negative self-perceptions in other circumstances. Stereotyped groups, according to Steele, need *identity safety*, which essentially provides positive, nonthreatening environments for learning. As such, learners are affirmed, high expectations are set, and learners are assured that they can reach these standards. Similarly, Lee (2008) recommended that culturally and linguistically diverse children need to be affirmed and that cultural resources could serve as buffers to external forces that communicate directly and indirectly that they cannot learn.

Programmed into the intervention were identity safety statements, telling the children that we knew that the reading goals were high but we were there to help them and make sure that they reached their goals. We also encouraged *growth mind set* principles (Dweck, 2007), advising that these practice passages will help to exercise their brain, helping them to work harder and to learn better. The children received these messages every session both through the computer software and from the researchers. Although the specific effects of the multicomponent intervention cannot be discerned, empirical evidence of the benefits of such messages does exist (Steele, 2010). The important point here is that within a relatively short period of time all the children began to see the intervention setting as nonthreatening and the researchers as comforting, and that they came to believe that they not only could meet their goals but that they had the capacity to become competent readers. The CR practice passages, which the researchers developed to reflect the background and interests of this population (Cartledge et al., 2015; 2016), may

have further contributed to participants' improved attitudes. In earlier studies in the same schools, the students indicated that they liked the CR passages mainly because they identified with them (Cartledge et al., 2016). In the previous study the students read the CR passages with slightly greater fluency than the non-CR passages (Cartledge et al., 2015).

A second commonality pertains to the role of behavior and reading risk. Although the relationship between problem behavior and reading is more likely to be correlational than causal (e.g., Algozzine et al., 2011), it is certainly possible that participants' behavior problems aggravated their reading problems. Certainly Skylar— who spent long stretches, sometimes as long as 20 or more days, suspended from school—could have been much further along in reading given a learning environment that better supported her behavioral needs. Even the two girls who did not have extensive out-of-school suspensions either shut down and refused to participate in (Hazel) or were too active/distracted to focus on (Grace) instruction. The students benefitted behaviorally from this intervention. The intervention incorporated key principles of effective instruction, including the critically needed components of structure and consistency. Skylar, who resisted change in classroom activities, thrived within the structured intervention setting. Each day she came in with a very brief acknowledgement of the researcher, put on her headphones and immediately began her lessons. Even though Skylar presented the most serious behavior problems, she learned the sequence quickly, requiring fewer initial prompts than her peers. These findings support empirical studies showing intensive, systematic instruction increasing academic responding, academic learning, and more adaptive behavior among students with behavior disorders (Hagan-Burke et al., 2015; Hagan-Burke et al., 2011; Lane et al., 2007; Sutherland & Snyder, 2007).

The importance of incentives to engage the students in the intervention is a third important observation from these cases. The RR intervention is designed so that students select stickers at the end of each session when they reach their goals. The computer software also calculated errors and produced a graph showing students their progress compared to previous performances. Students liked receiving the stickers and they were especially excited to see their progress over a series of sessions. These three students, in contrast to most of the students in the larger project, needed

additional reinforcement and prompting to become engaged. For example, we used video games to reinforce Hazel's participation. Additionally, her improved reading performance seemed to serve as a natural reinforcer; her desire to participate increased corresponding with her reading skill. Indeed, she often continued reading beyond the allotted time during the intervention sessions; reported her reading prowess to her family and teacher; and, according to her teacher, she declared with excitement, "I can read." A similar sense of confidence and self-efficacy was noted with the other two students, who by the end of their interventions were stating that they liked reading and felt they had become better readers.

Finally, all three girls were subjected to moderate to extreme instability in their personal and school lives. Grace, for example, was an English learner in a family of refugee status where English was not the language spoken at home. She was attending a charter school where there was constant change in the school staff and the physical facilities were inadequate. Similar volatility was observed for the other two girls except Hazel did have the benefit of experienced, stable school personnel. Nevertheless, the urban school setting did present special problems even for the two girls in the established city schools. To illustrate, things deteriorated greatly for Skylar when she had a substitute teacher for 2 months. This teacher, new to Skylar's situation, did not know how to engage her productively and frequently used exclusionary practices with Skylar. The urban schools for these low-income children presented the previously noted limitations of inadequate resources, staff volatility, and staff inexperience. In all three schools, class sizes were large (approximately 30 students) with considerable transitioning among the pupil population. None of the girls had been targeted for supplementary or Tier II interventions. Despite these conditions, the students responded positively to the RR intervention with increases in reading fluency, reading comprehension, and in their attitudes towards themselves as readers.

Limitations

There are several limitations for this study. First, the study used an AB design that only provides descriptive data. Although each participant demonstrated improvement in reading and a decrease in problem behavior, a causal relationship between (a) the intervention and participant outcomes and (b) behavior problems and reading performance cannot be determined. Second, due to the end of the school year, maintenance data on reading fluency and comprehension are limited. Additionally, maintenance and generalization data on social behavior were not collected. Future studies should incorporate analyses of social behavior both after the conclusion of the intervention and in various untrained environments. Third, because each participant demonstrated a unique set of maladaptive behaviors combined with one-on-one adult (i.e., researcher) attention during intervention it is difficult to generalize these findings to other students with reading/special education risk or to other educational settings. For example, Hazel required more powerful reinforcers (e.g., video game time) to engage actively in the intervention. Hazel's reinforcement continued through the end of the study, therefore becoming part of her intervention package. Although she demonstrated greater interest in reading and often continued reading beyond the required time, we did not determine if these improvements would continue without the incentive. Nor did we determine if the participants would have appropriately engaged in the intervention without the researcher's constant presence. Fourth, although all participants reported they had become better readers, formal social validity data were not collected from the teachers. Fifth, we measured social behavior by counting the number of experimenter prompts to participants rather than directly observing participants' off-task behaviors. Although these data indicated improvement in following the sequence, reliability observations were not conducted and it cannot be determined how focused the learners would have been if not under the researchers' constant scrutiny. Finally, it is also worth noting that we did not conduct a component analysis on the multicomponent intervention to determine which specific features were associated with the observed changes. These limitations notwithstanding, the findings highlight a potentially viable intervention for young urban children with reading and behavior risk.

Conclusion

These participants and other research (e.g., Hagan-Burke et al., 2011; Sutherland & Snyder, 2007) show intensive interventions with high rates of academic responding

can result in academic gains and improved behavior during instruction. As these preliminary findings suggest, we believe that evidence-based interventions that incorporate CR instruction and are delivered through well-designed technology can help to address the many instructional and resource challenges diverse learners with dual behavioral and academic risk experience in urban schools.

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