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"But, Did It Work?"Effects of Teacher-Implemented Computer-Assisted Instruction in Oral Reading Fluency for Students with Learning Disabilities

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ABSTRACT: *Four students with learning disabilities participated in a supplemental repeated reading intervention in order to increase oral reading fluency (ORF) skills. Teachers implemented the computerized intervention with the students in an inclusive classroom during reading/language arts time. The students engaged with the computerized repeated reading program three times per week for 10 weeks. Teachers administered generalization passages once a week to determine each student's reading skills on passages that had not been read. Study data revealed mixed results as the students increased their ORF on progress monitoring generalization passages and tended to reach their goals, but only two of the four students showed a positive level change on the computerized repeated reading intervention passages. Implications, limitations, and future research are discussed.*

Keywords: *computer-assisted instruction, learning disabilities, older students, repeated reading, teacher-implementation*

I. Introduction

Because of requirements in the Individuals with Disabilities Education Improvement Act (IDEIA, 2004) and teacher evaluation systems that measure student growth over time (Joseph et al., 2014), school districts have placed greater responsibility on special education teachers to collect and document evidence of students' progress toward Individualized Education Program (IEP) goals. Documenting student performance has a positive influence on student achievement (Stecker, Fuchs, & Fuchs, 2005), in part because it facilitates teachers' informed decisions about providing intensive supplemental instruction (Hosp, 2008). When teachers collect progress-monitoring data, they can identify when students perform satisfactorily–or fail to perform satisfactorily–during research-based instructional interventions (e.g., Fuchs & Fuchs, 2007). As students with learning disabilities spend larger portions of their day included in general education classrooms (McLeskey, Landers, Hoppey, & Williamson, 2011), identifying time-efficient methods of delivering interventions that generalize to students' progress toward IEP goals is a must for special education teachers.

The most common reason students receive special education under the specific learning disability (LD) category is for reading difficulties (Fletcher, Lyon, Fuchs, & Barnes, 2007); unfortunately, data suggest that reading instruction provided to students with reading disabilities is inadequate (Swanson & Vaughn, 2010). The National Reading Panel report (NICHHD, 2000) identified *oral reading fluency* (ORF), the ability to read with speed, accuracy, and proper expression (Kuhn & Stahl, 2003), as critically important for effective reading (Lingo, 2014). The number of words students read correctly per minute is considered a reliable metric of reading competence and strongly predicts reading comprehension (Fuchs, Fuchs, Hosp, & Jenkins, 2001). Repeated reading (Samuels, 1979) directly targets ORF and involves repeatedly reading a specific passage a certain number of times or until the reader achieves a predetermined criterion. Extensive research shows that repeated reading improves ORF for students with and without disabilities (Bryant et al., 2000; Lane et al., 2007; O'Shea, Sindelar, & O'Shea, 1985; Rashotte & Torgesen, 1985; Rasinski, Padak, Linek, & Sturtevant, 1994; Sindelar, Monda, & O'Shea, 1990). Recent studies have demonstrated that computer-assisted instruction can be used to effectively implement repeated reading interventions (Gibson, Cartledge & Keyes, 2011; Gibson, Cartledge, Keyes, & Yawn, 2014)

1.1 Computer-Assisted Instruction

Computer-assisted instruction (CAI) can provide direct instruction and repeated practice in targeted areas as students with disabilities remain included in general education classes (Lee & Vail, 2005). Benefits of CAI include active engagement and modeling (Lonigan et al., 2003), immediate and corrective feedback (Hall, Hughes, & Filbert, 2000; McCulloguh, 1995; Sorrell, Bell, & McCallum, 2007), and opportunities for reinforcement (Macaruso & Walker, 2008). Students are often able to work at their own pace (McCullough,

1995), engage in interesting activities, receive multiple opportunities to repeatedly practice skills to build fluency (Macaruso et al., 2006), and develop mastery in an environment that is not threatening or embarrassing (Diem & Katims, 2002). Across reading skills, CAI has been shown to improve phonological awareness (Lonigan et al., 2003; Mathes et al., 2001; Wood, Mustian, & Lo, 2013); phonics (Macaruso et al., 2006; Macaruso & Walker, 2008); sight words (Lee & Vail, 2005; Lewandowski et al., 2006); vocabulary (Wood, Mustian, & Cooke, 2012); and a combination of reading skills (Cassady & Smith, 2005; Clarfield & Stoner, 2005).

A series of studies (Gibson et al., 2011; Gibson et al., 2014; Keyes, Jacobs, Bornhorst, Gibson, & Vostal (2015); Keyes, Cartledge, Gibson, & Robinson-Ervin, in press) have recently examined the use of CAI as an ORF intervention. In each study, researchers implemented the Read Naturally CAI repeated reading intervention with students who were at risk for reading failure. Researchers examined the effects of differing performance criteria on the generalization of intervention results to progress monitoring probes and reported performance increases both within the intervention as well as on untrained progress monitoring passages. In each of these studies, the researchers implemented the intervention under strict experimental controls in separate classrooms from participants' typical rooms. Therefore, additional research examining whether the effects of the Read Naturally CAI intervention generalizes to progress monitoring when teachers (as opposed to researchers) implement the intervention is warranted.

1.2 Purpose

The current study was designed to extend previous research examining the Read Naturally CAI repeated reading intervention (e.g., Gibson et al., 2014). Our purpose was to investigate the effects of implementing the Read Naturally Live (RNL) intervention package with students identified with LD when implemented by teachers within inclusive classroom settings. Our research questions were: (a) What effect will a standard CAI repeated reading intervention have on ORF of students with LD on intervention passages? and (b) What effect will a standard CAI repeated reading have on the ORF of students with LD on generalization passages used for progress monitoring?

II. Methods

2.1 Setting and Participants

The study took place in a private, chartered elementary school in a Midwestern state. Approximately 100 students were enrolled in the school. Elementary classes were co-taught with two general education teachers in each classroom. There was one part-time special education teacher for the school; reimbursement for her hours came from the Local Education Agency (LEA) and was determined based on the number of minutes guaranteed in each IEP for each student receiving services. In this system, the students' home LEA was responsible for all educational testing, but the local LEA in which the private school was located was responsible for IEP development and implementation.

All intervention sessions took place in the participants' general education classroom during students' normally scheduled reading/language arts block. Participants worked at a classroom computer with headphones to complete RNL sessions. During reading/language arts blocks, students in the classrooms were engaged at various learning stations. Participants in the study were directed to use RNL as one of their station activities. Data for the generalization progress monitoring probes were collected when participants met individually with the special education teacher; these probes were conducted at a table in the corner of the general education classroom.

Participants in this study met the following criteria: (a) they were an elementary student (i.e., grades 1-6) identified with LD in reading, (b) they had a specific ORF goal on the IEP, and (c) parents completed an informed consent and the students' formally assented to participate. Four students met these criteria and were included in this study; pseudonyms are used to refer to all participants. Pete was of European decent and in 6th grade during the study; his most recent Evaluation Team Report (ETR) indicated that when assessed with the Wechsler Individual Achievement Test – Third Edition ([WIAT-III], Wechsler, 2009), he scored below average on word reading and pseudo-word decoding, but average on reading comprehension. Jared was of European decent and in 5th grade during the study; his most recent ETR indicated that when assessed with the Wechsler Intelligence Scale for Children – Fourth Edition ([WISC-IV], Wechsler, 2003), his reading comprehension, oral reading fluency, and word reading were all below average, while his pseudo-word decoding was average. Lila was of Asian decent and in 4th grade during the study; her most recent ETR indicated that when assessed with theKaufman Test of Educational Achievement – Second Edition([KTEA II], Kaufman & Kaufman, 2004), her reading comprehension and letter-word recognition were below average. Jenny was of European decent and in 3rd grade during the study; her most recent ETR indicated that when assessed on the WIAT-III, her reading comprehension and pseudo-word reading were below average.

2.2 Independent Variable

The independent variable in this study was a repeated reading intervention delivered through a commercial CAI program (Read Naturally Live). Participants engaged with the program independently 3 times per week. Based on an agreement with the classroom teachers, there was a pre-determined set of 30 total sessions, with differing number of baseline sessions per each participant in order to adhere to the experimental design.

2.2.1 Baseline.

In baseline, each participant read a RNL passage that had been retyped in a Word document on the computer. These RNL baseline passages were not used again during the intervention. Participants were instructed to read as many words as possible in 1 min. The teacher stated, "This is a story that I would like you to read. Please try to read as many words as you can as quickly as you can until the timer goes off. Once you hear the timer, stop reading. If you do not know a word, I will tell it to you so that you can keep reading. Try to remember as much as you can about what you read because I will ask you to tell me about the story when you get finished." The teacher then set the timer to countdown 1 min and started the timer once the participant read the first word. If the participant did not read the first word within 3 s of telling them to begin reading, the teacher said the word and told the participant to continue reading. That word was marked incorrect. After the timer sounded, the teacher recorded the number of words correct per minute (WCPM) on the data collection sheet.

2.2.2 Training.

Immediately after baseline, participants were trained individually on RNL. During training, participants clicked through the program following a specified instructional sequence (see below). Participants were allowed to ask questions at any time, and they were considered trained if they could go through an entire story sequence without prompting. All four participants required one training session. A procedural integrity-training checklist was used to ensure students were properly trained to follow the intervention. An observer scored the training checklist for fidelity; training was completed with 100% fidelity for all participants.

2.2.3 Computer-assisted repeated reading.

Every intervention session followed the same procedure, and lasted approximately 30 minutes. Participants sat in front of their respective computers and entered a password into the RNL program. Participants selected a story from their specified level (i.e., as leveled by the RNL program) and followed an instructional sequence that included: (a) key words, (b) cold timing, (c) read along, (d) practice readings, (d) quiz questions, and (e) pass timing. Participants engaged with the program independently.

2.2.3.1 Key words. The computer presented vocabulary words from the story by reading the word and then providing a definition of the word, picture, and/or a sentence using the word. The program instructed the participant to read along silently and click on any word that the participant needed to hear repeated.

2.2.3.2 Cold timing. In this activity, the computer instructed the participant to read the passage for 1 min and click on any words that the participant did not know. Thecomputer counted the words that the participant clicked as errors. At the end of the minute, the participant had to click on the last word read. After that, the computer instructed the participant to click on the unknown words to have the words read. The computer then calculated the WCPM and showed the cold timing score on a bar graph.

2.2.3.3 Read along. The participant was instructed to read along silently with the model reading on the computer. The program highlighted sentences as they were being read, and the participant followed along. Vocabulary words were in blue and the computer instructed participants to click on the words they did not know to hear definitions. After the participant read along with the computer, the program presented the option to click next to move on to practice reading or read along with the computer again.

2.2.3.4 Practice reading. This activity allowed participants to time themselves reading the story. The computer instructed the participant to click on "Start Timing" at the top of the screen to begin the 1-min timing. The participant could click on unknown words, then the computer would read the word to the participant and score it as incorrect. At the end of one minute, a bell sounded and the computer advised the participant to click on the last word read. The computer then calculated the WCPM for the participant and displayed this number in a box on the right side of the screen.For the purposes of the intervention fitting into the allotted time within the classroom's schedule, the teachers and researchers agreed upon the students practicing the story three times. After the third time, the computer instructed them to click next to answer the comprehension questions.

2.2.3.5 Pass timing. After each participant completed the instructional sequence, he/she called the classroom teacher over to the computer. The classroom teacher input a password, the student read the passage again, and the classroom teacher assessed WCPM and recorded this measure within the RNL system. This activity was identical to the cold timing and these scores were used for treatment probe data.

2.3 Experimental Design

A multiple baseline design across participants was used for this study (Cooper, Heron, & Heward, 2007). All participants began baseline at the same time. The order in which participants' started the intervention phase was determined a priori based on classroom teacher requests. After four baseline sessions, the first participant started intervention. Three baseline data points were collected before the next participant's start of intervention; this same pattern occurred for the third and fourth participants. A series of three progress-monitoring probes were administered at the end of the pre-determined baseline phase for each participant to closely reflect the timing of a typical intervention baseline measures collected by a teacher in a school setting, and recommended in practitioner-oriented literature (e.g.,Stecker et al.,2008). The median of progress monitoring probes (i.e., the best indicator of student performance on initial progress monitoring probes; Stecker et al., 2008) and the ambitious weekly growth rate (Fuchs, Fuchs, Hamlett, Walz, & Germann, 1993) were used to determine an individualized goal for each participant. A goal line is shown on the graph of intervention and generalization probes indicating this expected weekly growth; progress monitoring was collected once per week after participants started the intervention.

2.4 Dependent Variables

The dependent variable was the number of WCPM during 1-min readings of intervention (RNL) and generalization passages. Scoring procedures were the same as those published in Keyes et al. (in press); words were marked as correct if the participant read the word correctly within 3 s, or self-corrected within 3 s. Words were scored as incorrect if the participant did not read the word within 3 s of the last word, if they mispronounced or omitted a word, or if they added or substituted a word. During intervention sessions, WCPM was collected during the pass timing. Participants read this passage in front of a general education teacher as both looked at the computer screen; the general education teacher recorded the WCPM in the RNL system.

The dependent variable was also collected during progress monitoring probes one time per week once participants were in intervention. Progress monitoring passages were taken from the participants' instructional level of the Dynamic Indicators of Basic Early Literacy Skills (DIBELS; Good & Kaminski, 2002) progress monitoring probes typically used in the school. Participants read passages from a student-version paper copy, while the special education teacher marked on a teacher-version paper copy of the same passage, using the same procedures as described above. Progress monitoring probes were administered once per week during the intervention and can be compared against the goal line calibrated between the median of three baseline progress monitoring passages.If the teachers did not administer a progress monitoring probe for the week (e.g., student absence), then the teacher just administered a probe the following week. The teachers did not administer two probes in one week.

2.5 Fidelity and Agreement

Intervention fidelity was assessed for 33% of all sessions (i.e., 40/120 sessions). Dependent variable agreement was assessed on the same 33% of sessions for RNL probes and 36% (i.e., 12/33) of the progress monitoring probes. Intervention sessions and progress monitoring probes were video recorded so that the camera showed clearly the words on the computer screen (i.e., RNL sessions) or student-copy of the passage (i.e., progress monitoring passages), and participants' reading was audible. A second observer viewed the video and placed a check next to each intervention step completed and independently calculated the total number of WCPM on a copy of each passage. Agreement for WCPM was assessed on the same using the total agreement method (Kennedy, 2005). The smaller WCPM was divided by the larger WCPM and multiplied by 100. Agreement was calculated separately for each participant and passage and then averaged for all of the passages across all of the participants. Agreement on RNL probes was 94% (range 88% -100%) and on progress monitoring probes was 98% (range 94% - 100%).

2.6 Social Validity

We assessed participants' and teachers' satisfaction with the CAI intervention at the conclusion of the study. Participants answered five yes/no and why questions relating to their enjoyment of the program, whether they felt it helped them, and whether they would like to continue. Participants orally responded and a researcher recorded their answers. Teachers were interviewed by the researcher and asked their impression of the degree to which participants' ORF improved and whether or not participants enjoyed the intervention. We also asked whether the intervention was acceptable in the classroom setting, and what, if anything, they would change about it if they used this intervention again.

III. Results

The CAI study lasted 10 weeks; Fig. 1 displays data for WCPM on the pass timing on RNL probes and progress monitoring generalization passages. In addition to visual analysis of the graphed data, we calculated the percentage of non-overlapping data points (PNDs) to determine the overall effect of RNL on the participants' performance and report those data. PNDs are calculated by determining the highest baseline data point, counting the number of intervention points above the highest baseline data point, and then calculating the proportion of non-overlapping data points to the total number of intervention points (Scruggs, Mastropieri, & Casto, 1987). The PNDs range from 0-100%: 90% and above is highly effective, 70-90% is fairly effective, 50-70% is minimally effective, and less than 50% is ineffective. We also compared the generalization data to a goal line calculated using the median of baseline progress monitoring probes and ambitious goals of WCPM increases per week (Fuchs et al., 1993) based on each participant's instructional grade level and number of weeks in intervention.

3.1 Pete

Pete's data in Fig. 1 showed variability in both baseline and intervention on RNL passages. Pete averaged 73.3 WCPM (range 65-81) on baseline RNL passages, which increased to 86.7 WCPM (range 52-116) during intervention, indicating a positive level change. The PND for RNL passages were 69.2%, indicating the intervention was minimally effective, though on the boarder of fairly effective. On progress monitoring generalization probes, his WCPM were consistently above the goal line. In baseline, the median of three probes was 70 (i.e., 65, 70, 77), and using the ambitious goal for 6th grade of .65 WCPM increase per week across 9weeks of intervention, Pete's goal was 76 WCPM. Only 6 out of 9 possible progress monitoring probes were completed, with the highest at 95 WCPM and lowest at 85 WCPM. Based on progress monitoring guidelines, the student's goal could have been increased as he was exceeding the expected progress toward it.

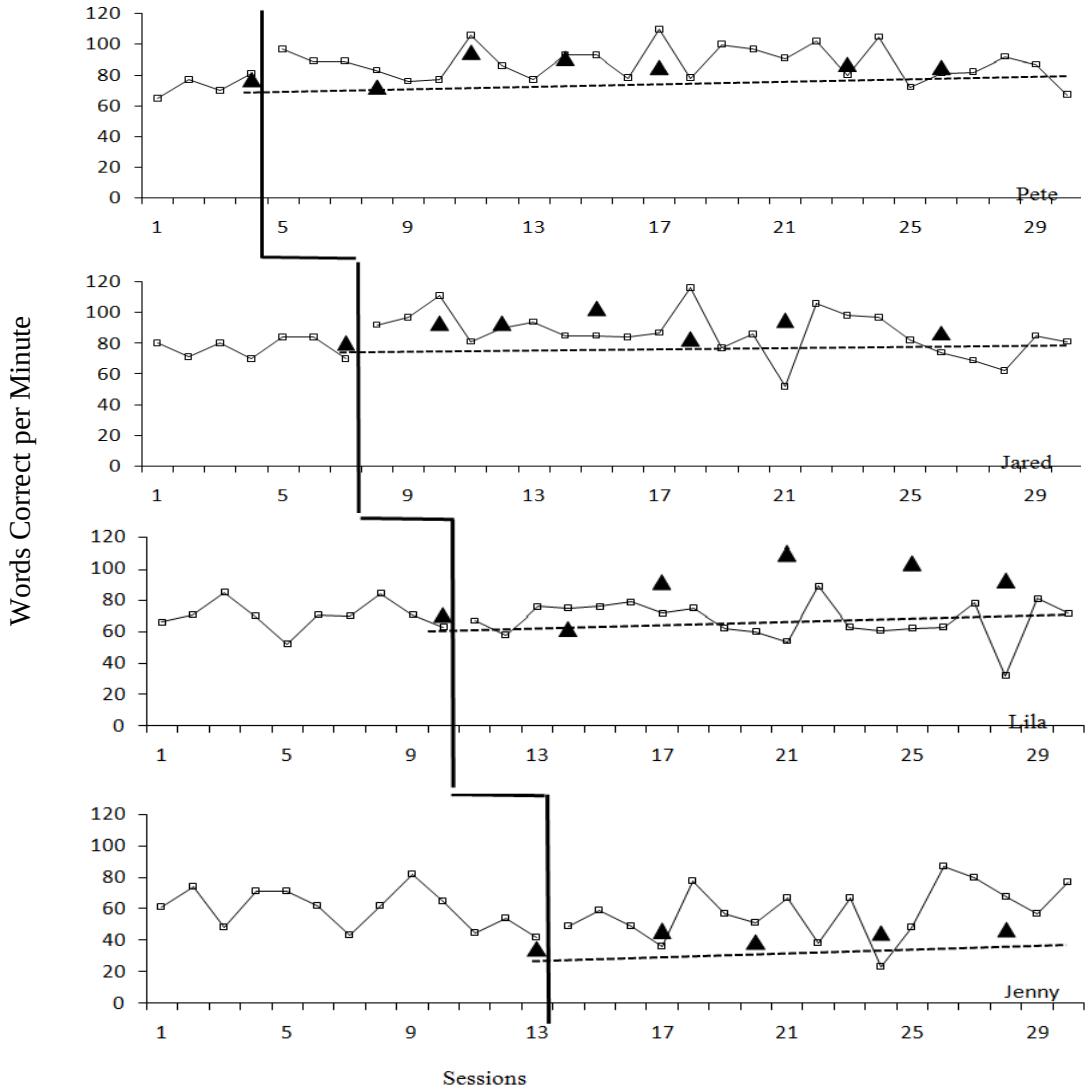

Figure 1

Oral reading fluency for students in baseline, CAI repeated reading intervention, and generalization progress monitoring probes.

3.2 Jared

Jared's data in Fig. 1 showed some variability in baseline and much more variability during intervention on RNL passages. Jared averaged 77 WCPM (range 70-84) on baseline RNL passages, which increased to 88.4 WCPM (range 67-106) during intervention, indicating a positive level change. The PND for RNL data were 60.5%, indicating the intervention was minimally effective. On progress monitoring generalization probes, his WCPM were above the goal line initially, then hovered just below or above the goal line for the last three probes. In baseline, the median of three probes was 80 (i.e., 74, 80, 89), and using the ambitious goal for 5th grade of .8 WCPM increase per week across 8 weeks of intervention, Jared's goal was 86.4 WCPM. Only 6 out of 8 possible progress monitoring probes were completed, with the highest at 103 WCPM and lowest at 83 WCPM. Based on progress monitoring guidelines, the student's goal would not have changed, as he was making successful progress toward the goal.

3.3 Lila

Lila's RNL data in Fig. 1 showed some variability in baseline and a decreasing trend during intervention. Lila averaged 70.3 WCPM (range 52-85) on baseline RNL passages, which decreased to 67.75WCPM (range 32-89) during intervention, indicating a slightly negative level change. The PND for RNL data were 5%, indicating the intervention was ineffective. On progress monitoring generalization probes, all but the first probe's WCPM were above the goal line. In baseline, the median of three probes was 71 (i.e., 59, 71, 77), and using the ambitious goal for 4th grade of 1.1 WCPM increase per week across 7 weeks of intervention, Lila's goal was 78.7 WCPM. Only 5 out of 7 possible progress monitoring probes were completed, with the highest at 110 WCPM and lowest at 62 WCPM. Based on progress monitoring guidelines, the student's goal would have changed, as she was exceeding successful progress toward it.

3.4 Jenny

Jenny's data in Fig. 1 showed large variability in baseline and during intervention on RNL passages. Jenny averaged 60 WCPM (range 42-82) on baseline RNL passages and 59 WCPM (range 23-87) during intervention, indicating no level change. The PND for RNL data were 0%, indicating the intervention was ineffective. On progress monitoring generalization probes, her WCPM hovered just below or above the goal line across probes. In baseline, the median of three probes was 48 (i.e., 36, 48, 49), and using the ambitious goal for 2nd grade of 2 WCPM increase per week across 6 weeks of intervention, Jenny's goal was 60.5 WCPM. Only 4 out of 6 possible progress monitoring probes were completed, with the highest at 73 WCPM and lowest at 45 WCPM. Based on progress monitoring guidelines, the student's goal would not have changed, as she was making successful progress toward the goal.

IV. Discussion

The main purpose of this study was to determine if teacher-implemented CAI in reading would be effective for students with learning disabilities in an inclusive classroom setting. The results were mixed as students generally made adequate progress toward meeting goals on progress monitoring generalization passages, however, the RNL intervention data were variable and often overlapped with baseline passage data.

Student results in this study were in stark contrast to the results of first grade students in Keyes et al. (2015), which revealed medium to strong intervention effects for the RNL program. However, researchers implemented the Keyes et al. study under more "typical" school conditions (e.g., noisy computer lab). Given that the researchers implemented the intervention, they had more control over day-to-day operations, whereas the researchers in the current study did not have any control over the classroom environment or when the intervention would be implemented. Another difference is the number of practice reads. In the current study, the teachers and researchers agreed upon three practice reads to make the intervention easier for the teachers, however, this may have reduced the effectiveness of the intervention. Read Naturally (2015) posits that if students are in the right level text with an accurate goal, then they should practice reading stories three to10 times. It is possible that more practice reads might have increased the WCPM on RNL pass timings. One last difference is students in the Keyes et al. study were in the early stages of learning to read and were at risk for reading failure, and students in the current study had learning disabilities and more persistent reading difficulties.

The importance of early intervention is common knowledge in education, as we know that interventions tend to be most successful for students in second grade and younger. Denton and Vaughn (2008) state, "…we know considerably less about effectively remediating older students with significant reading

disabilities than we do about preventing reading difficulties with younger students" (p. 61). Indeed, researchers have discussed the importance of early intervention as multiple studies have demonstrated more treatment resisters in older struggling readers as opposed to younger students (i.e., Kim et al., 2010; Vaughn, et al., 2010). Moreover, Vaughn et al. (2011) reported their studies and other similar studies showed that older students with reading difficulties will likely need more than a year of intervention in order to remedy reading deficits. Likewise, Vaughn et al. (2012) purport that students with reading difficulties in fourth grade and above need long-term interventions. Their findings demonstrated that students in the eighth grade who received reading interventions over a three-year timeframe were able to maintain reading gains, however, comparison students who did not receive the reading intervention actually showed decreases in reading skills. The current study was very brief and was the only reading intervention the students received, so the lack of progress is not surprising. The findings from the current and aforementioned studies underscore the importance of not only intervening early, but also providing continued intervention throughout struggling readers' schooling.

One interesting point is that some of the RNL scores tended to be lower than the generalization progress monitoring probe data. This was especially true for Jared and Lila. The school where this study was conducted has a highly student-focused curriculum and students overall tend to perform well. It is quite possible that typical school conditions were helping to increase student achievement, and the RNL intervention was not enough to increase student gains more dramatically. Wanzek and Roberts (2012) also noted that there were no significant increases in students' reading skills after implementing various reading interventions with fourth graders with severe reading difficulties who were already receiving research-based instruction in reading.

Additionally, Wanzek and Roberts (2012) point out that interventions for older students in effective classrooms should be more intense in order to boost students' reading achievement. Increasing intensity involves implementing quantitative (i.e., intervention frequency, length, duration, environment) and qualitative changes (i.e., instruction in cognitive processing strategies, modifying how instruction is delivered; The IRIS Center, 2015). However, Vaughn and colleagues (2010) state that it is oftentimes difficult for teachers to provide increased intervention time due to curricular demands and not denying students the opportunity to partake in other school activities (e.g., art, band). In the current study, this was true for Pete, as the RNL intervention was sometimes interrupted or missed due to his scheduled band practice.

The data were variable for the students with LD in this study. Variability oftentimes suggests that the intervention or assessment administration were not implemented with fidelity, or that the student was not motivated. In this case, it was likely due to motivation as fidelity data were quite high. It may have been beneficial for the teachers to determine the reinforcers to which each student would respond. For example, Pete and Lila may have been more motivated had the teachers increased their goals as data showed they were exceeding expected growth rates; maybe the students did not feel challenged by the goals. It is also possible that the students would have been more motivated by receiving tangible reinforcers (e.g., candy, pens) for their efforts on the RNL program. It is quite common for struggling readers to need external motivation. Yet another possibility is that reading different stories continuously might motivate older students more than repeated readings of one story (Wexler, Vaughn, Roberts, & Denton, 2010).

Other factors that may affect the effectiveness of interventions include intervention components, environmental factors, and teachers/interventionists. According to Wexler and colleagues (2010), interventions for older students with reading deficits should likely include explicit instruction in decoding, vocabulary, and comprehension. The students in the current study did not receive explicit instruction in the aforementioned areas. Environmental factors (e.g., other students, noise, schedule, teacher supervision) can also impact an intervention's success. McCullough (1995) maintains the notion of "high tech, high touch," that is, having a person there to guide and encourage the students while engaging with the technology. The teachers in this study were with the students during the pass timing at the end. The students, therefore, may not have been completely engaged with the RNL program. Kim, Samson, Fitzgerald, and Hartry (2010) underscore the importance of using CAI with teacher-led instruction to remediate reading deficits. Lastly, teachers impact intervention effectiveness because they need to "buy in" (i.e., believe in the intervention's importance) and feel comfortable making changes to the intervention. Perhaps if the researchers in the current study would have provided regularly scheduled professional development (PD) trainings or booster sessions, as opposed to on an "as needed" basis, the teachers would have had more facility with individualizing the intervention (e.g., making quantitative changes). By intensifying the intervention, student results would likely have increased and teachers' feelings toward the intervention would likely have been more positive.

V. Conclusion

Even though the data revealed mixed results regarding the effectiveness of RNL with students with learning disabilities, this study does have some important implications. Namely, CAI in reading for older students with learning disabilities requires extended intervention time, more PD for teacher implementation, and closer monitoring for students. RNL has been shown to be effective for at-risk students in lower grades when

implemented by researchers (Gibson et al., 2011; Gibson et al., 2014; Keyes et al., 2015; Keyes et al., in press); however, more research regarding RNL with older students with learning disabilities is warranted. Future studies of longer duration with multiple phases when data indicate students are not making adequate progress on intervention and/or progress-monitoring probes would be beneficial. As Wanzek and Roberts (2012) discussed, more research needs to be conducted on how to further promote the reading achievement of older students who receive effective reading instruction in the general education class, yet interventions do not significantly increase these students' reading gains. Future research also needs to be completed with teacher-implemented CAI interventions with regularly scheduled PD and booster sessions. Limitations of the study included the brevity of the intervention and a lack of pre-planned PD for the teachers. Nevertheless, this study does provide preliminary information about the effectiveness of CAI for older students with disabilities when implemented by teachers in an inclusive classroom, which is lacking. Researcher-implemented interventions are often quite effective, however, these same interventions when implemented in a practical setting by teachers may not be as effective. In order to increase intervention effectiveness in inclusive classroom settings, adjustments will likely need to be made to the environment, and teacher training provided on a regular basis. Despite that, reading interventions whether delivered by computers or humans, are vital for all struggling readers, especially older students with disabilities.

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