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Comparison of Repeated Reading and Question Generation on Students' Reading Fluency and Comprehension

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This study was conducted to ascertain if repeated reading or question generation was more effective at improving reading fluency and comprehension of fourth- through sixth-grade students with learning disabilities or reading problems. Adult tutors trained by the investigator conducted the interventions. Instructional components and training within each of the interventions were based on best practices reported in the literature. Repeated reading consisted of students rereading passages aloud until they reached a performance criterion. Question generation consisted of students reading passages purposefully in an attempt to adapt and answer story structure prompts. The results of the study indicate that (a) repeated reading improves students' fluency on passages that are reread and (b) when reading instructional-level material, repeated reading is more effective at improving factual comprehension than question generation.

Key Words: Reading Fluency, Comprehension, Repeated Reading, Question Generation, Learning Disabilities

Renewed concerns have recently been expressed about our schools' ability to teach students how to read (U.S. Department of Education, 2005). Unfortunately, such concerns are not unfounded, as research indicates that at least 20% of students have significant difficulties with reading acquisition (Lyon & Moats, 1997). Reading difficulties often continue past primary grades. According to the National Assessment of Educational Progress, 36% of fourth graders have not obtained a basic skill level in reading, and only 31% read proficiently (U.S. Department of Education, 2005). Additionally, 74% of children who are poor readers in third grade remain poor readers in ninth grade (Lyon & Moats, 1997). Moreover, reading difficulties are often a primary concern for students with learning disabilities (LD). Thus, 80% of the 2.8 million students with LD have identified needs in reading (Shapiro, Church, & Lewis, 2002).

Although the current reading crisis may appear to be insurmountable, much is known about how to effectively teach reading. In 2000, The Report of the National Reading Panel identified five essential skill areas for reading instruction: phonemic awareness, phonic instruction, vocabulary instruction, reading fluency, and text comprehension strategies (National Institute of Child Health and Human

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Development, 2000). Once foundational reading skills have been acquired, two of these skill areas in particular, reading fluency and text comprehension strategies, are often associated with poor reading comprehension for students with disabilities (Billingsley & Wildman, 1988; National Institute of Child Health and Human Development, 2000). This study examined the differential effects of reading fluency and comprehension interventions on the reading achievement of students with learning disabilities.

Literature Review

In the following section we define reading fluency and text comprehension monitoring and detail interventions that have been shown to improve students' skills in these areas. We indicate that although these interventions have demonstrated many positive effects, neither reading fluency nor comprehension monitoring interventions have been found to make consistent and dramatic improvement in students' comprehension. We hypothesize that this may be due to the skill difficulties of the targeted students and the dependent variable used to measure comprehension.

Reading fluency. Reading fluency (i.e., the ability to read with speed, accuracy, and proper expression) is a critical factor in ensuring that students understand what they read (Lyon, 1998). When reading is dysfluent, students need to devote a significant portion of their cognitive effort on decoding, leaving little cognitive capacity for comprehension (Adams, 2000; LaBerge & Samuels, 1974). The importance of reading fluency for comprehension is well established. In fact, students' ability to read fluently has been shown to predict reading comprehension better than direct comprehension measures (Fuchs, Fuchs, & Hosp, 2001).

Numerous interventions, including the neurological impress method (Hollingsworth, 1970), paired reading (Miller, Robson, & Bushell, 1986), and reading-while-listening (van Bon, Boksebeld, Font Freide, & van den Hurk, 1991), have targeted reading fluency. One intervention in particular, repeated reading, has the most extensive research base. Repeated reading is "a supplemental reading program that consists of rereading a short and meaningful passage until a satisfactory level of fluency is reached" (Samuels, 1979, p. 404).

Previous reviews of the literature indicate that repeated reading improves students' reading fluency and may improve comprehension (Meyer & Felton, 1999; Morgan & Sideridis, 2006; Therrien, 2004). The effectiveness of repeated reading for students with learning disabilities has also been examined (Bryant et al., 2000; Freeland, Skinner, Jackson, McDaniel, & Smith, 2000; Kamps, Barbetta, Leonard, & Delquadri, 1994; Mathes & Fuchs, 1993; Mercer, Campbell, Miller, Mercer, & Lane, 2000; O'Shea, Sindelar, & O'Shea, 1987; Rashotte & Torgesen, 1985; Sindelar, Monda, & O'Shea, 1990; Vaughn, Chard, Bryant, Coleman, & Kouzekanani, 2000; Weinstein & Cooke, 1992). Results from these investigations mirror overall findings. Students consistently made fluency improvements, but these improvements did not always result in improvements in reading comprehension.

The inability of repeated reading to consistently improve comprehension is disconcerting but not surprising. Improvement in comprehension due to repeated reading would only be expected if students had fluency difficulties prior to intervention implementation. Most studies that found little to no improvement in students' comprehension did not provide enough information to determine if students were

in need of fluency remediation. This is unfortunate because text difficulty determines in large part how text is processed (Faulkner & Levy, 1994). It is possible that the students in these studies were reading material in which fluency was not a concern. If this was the case, students' comprehension difficulties were probably due to higher order skill deficits (e.g., active text monitoring). Therefore, gains in comprehension due to repeated reading would be expected to be minimal at best. Conversely, the majority of studies (four out of five) that found significant improvement in students' reading comprehension reported information on both students' reading level and the reading level of the material used (Dowhower, 1987; O'Shea et al., 1985; O'Shea, Sindelar, & O'Shea, 1987; Sindelar et al., 1990). Further, the information provided indicated that students in these studies were rereading material where fluency was a concern.

The impact of repeated reading on comprehension is also likely mediated by how comprehension is measured. Repeated reading consists of students rereading a series of passages until they reach a satisfactory level of fluency (Samuels, 1979). Through rereading, students are provided with multiple opportunities to learn passage facts. Thus, students exposed to repeated reading are likely to do well on comprehension measures that target literal knowledge (i.e., knowledge that can be underlined directly in the text without requiring the integration of information from multiple sentences [Davey & McBride, 1986a, p. 257]). However, repeated reading does not directly target inferential knowledge (i.e., knowledge that requires the integration of information within and between the passage and the reader's prior knowledge [Davey & McBride, 1986a, p. 257]). Therefore, it is unlikely to have a dramatic effect on inferential comprehension.

In previous repeated-reading studies, comprehension was measured via story retell (N=7) or comprehension questions (N=7). As would be expected, repeated reading generally had a significant effect on comprehension measures that emphasized literal comprehension. Four of the seven studies that measured comprehension using story retell reported significant comprehension gains for students (O'Shea et al., 1985, 1987; Sindelar et al., 1990; Young, Bowers, & MacKinnon, 1996). Additionally, one study that measured comprehension via literal questions also reported significant findings (Dowhower, 1987).

Five of the remaining six studies that measured comprehension via questions either did not indicate what type of questions were asked (i.e., literal, inferential, or both) or did not separate the findings, instead reporting a total comprehension score that encompassed both literal and inferential questions. All these studies reported little to no gain in comprehension (Bryant et al., 2000; Mathes & Fuchs, 1993; Rashotte & Torgesen, 1985; Simmons, Fuchs, Fuchs, Hodge, & Mathes, 1994; Vaughn et al., 2000). The remaining study (Freeland et al., 2000), however, examined literal and inferential comprehension questions separately and reported that repeated reading had a significant effect on literal comprehension and a nonsignificant effect on inferential comprehension.

Text comprehension strategies. Unlike repeated reading, which primarily targets reading fluency and in turn literal comprehension, text comprehension strategies are aimed at both literal and inferential comprehension. These strategies help readers integrate information within the passage, relate passage information to

their own prior knowledge, and monitor their understanding while reading (Pressley, 2000). Although there is extensive empirical evidence for several text comprehension interventions, the strongest scientific evidence for the effectiveness of a text comprehension intervention was found for the instructional technique of question generation (National Institute, 2000, pp. 4-45).

Question generation consists of a range of interventions geared to the ability level of the learner with the ultimate goal of enhancing comprehension by teaching students to self-generate and answer questions while reading (Therrien, Gormley, & Kubina, 2006). To achieve this goal, scaffolded assistance is provided. For example, when implementing question generation with novice readers, students adapt and answer question-generation prompts (e.g., who is the main character? where did the story take place?) instead of generating their own questions (Therrien et al., 2006).

A majority of studies (13 out of 18) that investigated the use of question generation to improve students' reading comprehension reported significant findings (Andre & Anderson, 1979; Billingsley & Wildman, 1988; Cohen, 1983; Davey & McBride, 1986a; Gilroy & Moore, 1988; Griffey Jr., Zigmond, & Leinhardt, 1988; Helfeldt & Lalik, 1976; Lysynchuk, Pressley, & Vye, 1990; Nolte & Singer, 1985; Palincsar & Brown, 1984; Short & Ryan, 1984; Wong & Jones, 1982; Wong, Wong, Perry, & Sawatsky, 1986). Four of these studies reported significant comprehension improvement for students with LD (Billingsley & Wildman, 1988; Griffey Jr. et al., 1988; Wong & Jones, 1982; Wong et al., 1986).

Although the findings for comprehension were in general positive for question generation, the magnitude of the effects reported ranged from small to large (Rosenshine, Meister, & Chapman, 1996). Theory suggests that reading fluency may be a confounding variable that limits the potential effectiveness of question generation. That is, if students are reading material where fluency is a primary concern, they may need to expend a large percentage of their cognitive effort on decoding, leaving few resources for implementing text comprehension strategies.

An examination of question generation studies revealed that reading fluency was typically not addressed as a dependent variable or a prerequisite skill. No question generation study investigated the impact of the intervention on reading fluency. This is unfortunate, as reading fluency is an important indicator of reading competence (Fuchs et al., 2001). Further, only six studies explicitly reported that they ensured students were reading material below a frustration level. All these studies reported significant increases in students' comprehension (Billingsley & Wildman, 1988; Gilroy & Moore, 1988; Griffey Jr. et al., 1988; Lysynchuk et al., 1990; Palincsar & Brown, 1984; Short & Ryan, 1984).

Theory further suggests that because question generation requires readers to integrate information within the passage and their prior knowledge, it is likely to have a greater impact on dependent measures that emphasize inferential knowledge. Consequently, improvement in comprehension should be maximized when inferential dependent measures are used. Three studies separated results based on literal and inferential comprehension. Ritchie (1985) examined literal comprehension only and found no significant difference between question generation and a control condition. Davey and McBride (1986b) studied both literal and inferential comprehen-

sion and found a significant effect for inferential comprehension and a nonsignificant effect for literal comprehension. In another study, Davey and McBride (1986a) reported significant effects for both literal and inferential comprehension; however, increases were greater for inferential comprehension.

Conclusions

Although repeated reading and question generation have strong empirical support indicating their efficacy, individual study results do not consistently mirror overall findings. An examination of previous studies and theory suggests that the inconsistent effect of these interventions on reading fluency and comprehension may be due to the skill difficulties of the targeted students as well as the dependent variables used to measure comprehension. The effectiveness of repeated reading appears to be maximized when fluency is a concern for the targeted students and when literal comprehension is emphasized. Conversely, the effectiveness of question generation is maximized when fluency is not a confounding variable and when inferential comprehension is emphasized.

Study Purpose

The purpose of this study was to ascertain if repeated reading and question generation have differential effects on reading fluency and comprehension. Specifically, the effects of repeated reading and question generation on the reading fluency and comprehension of students with reading disabilities were compared. It was hypothesized that repeated reading would have a greater effect on fluency and literal comprehension whereas question generation would have a more significant impact on inferential comprehension. A better understanding of how these strategies affect the reading achievement of students with learning disabilities will provide valuable information for teachers when they are selecting reading interventions for students.

Methodology

Overview

To compare the effect of repeated reading and question generation on reading fluency and comprehension, 32 students with LD in reading or who were at risk for reading failure were assigned randomly to repeated reading or question generation. Students received instruction in their respective intervention over a two-week period for five consecutive days (e.g., Friday through the following Thursday). Student achievement in reading fluency and comprehension was measured.

Subjects and Setting

Students (N=32) between 9 and 13 years of age (mean = 11.3) from a socioeconomically diverse public school district in central Pennsylvania participated in the study. Only students classified as having a LD in reading (N= 18) or reading two or more grade levels below current placement (N =14) were selected. Students with LD were identified via a discrepancy model (IQ and performance) following state of Pennsylvania guidelines. All students were reading at a second- or third-grade instructional level. See Table 1 for additional student demographic information.

Table 1
Student Demographics

Gender	Grade Level	Instructional Reading Level
19-Females	18-6th grade	8-3rd grade
13-Males	13-5th grade /-4th grade	24-2nd grade

Interventions

Repeated reading. The repeated reading condition consisted of four instructional components (Therrien, 2004). First, students were cued using the following directive: "Read the story the best you can and as quickly as you can. Pay attention to what you are reading as I will be asking you questions about it." Second, students reread the passage aloud until they reached a pre-established number of correct words per minute (CWPM). Regardless of the CWPM achieved, each passage was read a minimum of two or a maximum of four times. The criterion of CWPM was based on norms reported by Hasbrouck and Tindal (1992) of students reading at the 50th percentile at subjects' instructional reading level (second grade = 94 CWPM; third grade = 114 CWPM). Third, students received corrective feedback on word errors. If the student hesitated on a word for 3 seconds or omitted a word(s), error correction was provided immediately. Otherwise, error correction was provided after the passage had been read but prior to the student rereading it. Error correction in both cases entailed providing the word(s) and asking the student to repeat it/them. Fourth, after the dependent comprehension measures were collected, students moved to another passage and steps 1 through 3 were repeated.

Question generation. The question generation condition was geared for novice readers and was comprised of six instructional components compiled from the suggestions of Rosenshine and colleagues (1996) and Short and Ryan (1984). First, a cue card of the generic story structure questions was presented, and students were cued using the following statement: "Remember you will be reading this story in order to answer these questions." (See Figure 1 for generic story structure questions.) Second, students were prompted to read the cue card questions aloud. Third, students read the passage aloud one time. Fourth, students were provided with corrective feedback on word errors using the guidelines discussed in the repeated reading condition. Fifth, tutors prompted students to adapt and answer the cue card questions orally. If students provided a wrong answer(s) or no answer(s), a prompt to look for the information in the passage was given. If students answered the question(s) incorrectly or no answer(s) was provided a second time, the tutor pointed to the sentence(s) where the answer(s) could be found or inferred. If students were still unable to answer the question(s), the answer(s) was provided, and the tutor explicitly pointed out where the information needed to answer the question(s) could be found and/or provided the rationale(s) needed to answer the question(s) correctly. Sixth, after the dependent comprehension measures were collected, students moved to the next passage, and steps 1 through 5 were repeated.

Figure 1. Generic story structure questions.*

Who is the main character?
Where and when did the story take place?
What did the main character do?
How did the story end?
How did the main character feel?

* Questions utilized by Short and Ryan (1984).

Tutor Training

School district paraprofessionals (*N*=3), blind to the study's hypotheses, acted as tutors for the interventions. Tutors were trained to carry out both interventions. Training was provided during a four-hour inservice conducted by the first author. Explicit instruction techniques were used to teach intervention implementation. Both interventions were taught separately using the following five steps. First, tutors were provided with a laminated cue card that listed the steps and key phrases in the intervention. Tutors were advised to follow the cue card when implementing the intervention. Second, the investigator explained and modeled the steps in the intervention. Third, the investigator prompted tutors through intervention implementation. Fourth, tutors practiced intervention implementation with each other and the investigator. Fifth, tutors conducted mock intervention sessions with the investigator playing the role of the student until they demonstrated mastery by receiving a 100% on a treatment integrity checklist.

Reading Material

Reading material for the program was created using the following three steps: (a) six short (i.e., 100-200 words), separate (i.e., non-thematic) narrative passages at a second- or third-grade reading level were selected from published sources; (b) two passages, one at the second- and one at the third-grade level according to Flesch-Kincaid (Flesch, 1948; Microsoft, 2003) were randomly selected to be used as pretest passages; and (c) two versions of the remaining four base passages were adapted to create one for use with students reading at the second-grade level and one for use with students reading at the third-grade level. Two criteria were used when adapting the passages. First, base passages were adapted by shortening/lengthening sentences and adding/deleting words so that one version was at the second-grade and one at the third-grade level according to Flesch-Kincaid. Second, the length of the passages was modified so that each could be read in 1-1$^{1}/_{2}$ minutes by students with reading speeds at the 50th percentile for their respective instructional reading level (Hasbrouck & Tindal, 1992).

Comprehension questions (four factual and four inferential) for each of the instructional passages were created and/or modified from existing questions designed for use with the original base passages. Factual and inferential questions

were created/adapted using the following operationalized definitions: "Correct responses to factual questions can be underlined directly in the text without requiring the integration of information from multiple sentences. Correct responses to inferential questions either cannot be located in the text (i.e., cannot be underlined) or require integration of information from multiple sentences" (Davey & McBride, 1986a, p. 257).

Two "easy" narrative passages (i.e., passages at a kindergarten or first-grade instructional reading level according to Flesch-Kincaid) were adopted to be used during the intervention instruction phase. Easy passages were 84 and 96 words, respectively, with a Flesh-Kincaid reading level of 0.0 and 1.7.

Dependent Measures

Subjects' reading ability and treatment integrity data were gathered throughout the experiment. Three measures of subjects' reading ability (CWPM, factual and inferential questions) were collected. Specifically, number of CWPM was recorded each time a passage was read. Number of factual and inferential comprehension questions answered correctly was collected for each passage. Treatment integrity data were collected for 16.4% of the intervention sessions using checklists that contained the essential instructional components and key phrases for the interventions.

Design and Procedures

Design. A 2-level (repeated reading or question generation) single-factor design was used to compare the effect of the interventions on students' reading fluency and comprehension. Students were assigned via stratified (instructional reading level) random assignment to either the repeated reading or the question generation group.

Procedures. The study was conducted in seven steps as follows. (a) Tutors (N=3) were trained to conduct the interventions using the guidelines discussed in the tutor training section. (b) Prospective students' (N=40) instructional reading level was determined by having them read aloud the second- and third-grade pretest passages. Passages that students could read with word accuracy between 85% and 95% were considered to be within the students' instructional reading level (Salvia & Hughes, 1990). When both passages were found to be within a student's instructional reading level, the student was placed in the grade level where he or she achieved the highest accuracy percentage. Students who had instructional reading levels above third (N=2) or below second (N=6) grade did not participate in the remaining experimental sequence. (c) The remaining students (N=32), segmented by instructional reading level, were randomly assigned to the repeated reading or question generation condition. (d) Students received instruction in and practiced their respective intervention using two easy reading passages (i.e., passages at a kindergarten and first-grade reading level). Practice in the repeated reading condition entailed students repeatedly reading two easy passages aloud until they reached a rate of CWPM required for their instructional reading level. Instruction/practice in the question generation condition consisted of three steps. First, tutors informally assessed students' understanding of the story structure questions. Tutors provided instruction/clarification for students when needed. Second, tutors modeled appropriate questions and responses using the first easy passage. Third, tutors provided

guided practice using question generation on the remaining passage. (e) Interventions were implemented in 10- to 15-minute sessions over a consecutive four-day period using the guidelines described in the Intervention section. (f) Comprehension questions were asked 1 minute after the criterion of CWPM was reached in the repeated reading condition or 1 minute after the generic story questions were answered in the question generation condition. Students completed a filler task during the 1-minute delay that consisted of filling out their name and date on a reading passage sign-in sheet. (g) The investigator collected treatment integrity data and provided feedback to tutors during 16.4% of the intervention sessions.

Results and Discussion

Treatment integrity

Treatment integrity data were collected for 16.4% (21/128) of the sessions. An overall treatment integrity percentage of 94.9% was obtained, with percentages of 95% for repeated reading and 94.8% for question generation. Integrity data, based on tutor, ranged from 94% to 98%.

Efficacy of Repeated Reading and Question Generation

Supporting previous literature reviews (Faulkner & Levy, 1999; Meyer & Felton, 1999; Therrien, 2004), findings from this analysis indicate that repeated reading improves students' reading fluency and comprehension. Specifically, students in the repeated reading condition dramatically improved their reading fluency on passages that were reread. In fact, in an average of only 2.42 readings, students improved their reading speed to a level commensurate with students reading at the 50th percentile norm for their respective reading level. This result echoes a consistent finding of previous repeated reading studies; that is, repeated reading improves students' fluency on passages that are reread (Herman, 1985; Kamps et al., 1994; Levy, Abello, & Lysynchuk, 1997; Meyer & Felton, 1999; O'Shea et al., 1985, 1987; Sindelar et al., 1990; Stoddard, Valcante, Sindelar, O'Shea, & Algozzine, 1993; Weinstein & Cooke, 1992).

Unlike previous studies, this analysis directly compared repeated reading and question generation. Two fluency comparisons were made (see Table 2 for CWPM within conditions). First, a comparison was made of CWPM between the last time passages were read in repeated reading and the only time passages were read in question generation. ANCOVA results, using CWPM on the pretest passage as the covariate (r= .83), indicated that rereading a passage dramatically improved students' reading speed, $F(1, 29) = 43.0$, $p < .005$. In fact, the average difference (d= .94) in CWPM of 22.7 would allow a repeated reading student to read a 200-word passage 25 seconds faster than a question generation student.

To assess whether fluency gains generalized to subsequent passages, a comparison of CWPM on first passage readings was made. ANCOVA results using CWPM on the pretest passage as the covariate (r=.96) indicated that the average difference (d= .05) in CWPM of 1.5 in favor of repeated reading was not statistically significant, $F(1, 29) = 0.68$, $p = .42$. One potential reason for the lack of transfer may reside in the impact of question generation on fluency. Homan, Klesius, and Hite (1993) found that reading connected text, without repetition, can also improve reading fluency. Another possible reason why fluency transfer was not found for repeat-

ed reading is the limited number of sessions in the repeated reading intervention. Additional sessions are probably needed before a significant transfer effect will be found.

Table 2
Correct Words per Minute Within Conditions

	Mean	Standard Deviation	Cohen's *d*
	Repeated Reading Condition		
CWPM first reading	95.1	24.20	
CWPM last reading	116.3	20.30	
Average gain score	21.2	22.25	.94
	Question Generation Condition		
CWPM first reading	93.6	33.60	
CWPM last reading	---*	---*	---*

Note. CWPM= Correct words per minute.
*= Passages read one time only in the question generation condition. Cohen's *d* is the effect size difference between first and terminal reading in repeated reading condition.

The effect of repeated reading and question generation on factual and inferential comprehension was also compared (see Table 3 for comprehension question answered correctly within conditions). ANOVA results indicated that students in repeated reading answered significantly more, $F(1, 30) = 6.20$, $p = .019$, factual comprehension questions ($d = .85$), whereas there was no statistically significant difference, $F(1, 30) = 0.87$, $p = .36$, between interventions on inferential comprehension ($d = .61$).

Table 3
Comprehension Questions Answered Correctly Within Conditions

	Total Answered Correctly*	Standard Deviation	Cohen's *d*
	Repeated Reading Condition		
Factual	14.4	1.26	.85
Inferential	12.4	0.53	.61
	Question Generation Condition		
Factual	13.0	1.93	
Inferential	11.6	2.76	

* Out of a possible 16. Cohen's *d* is the effect size difference in favor of repeated reading group on factual and inferential comprehension questions.

No other study has directly compared the impact of repeated reading and question generation. However, the findings from the present investigation can be examined from theoretical perspectives. According to the theory of automatic word processing (LaBerge & Samuels, 1974), repeated reading improves reading fluency by providing students with numerous exposures to the same words. Improved fluency, in turn, allows students to allocate more of their resources to comprehension. Through rereading, students are also exposed to the facts of the passage numerous

times. Question generation does not address fluency or factual comprehension directly but is a metacognitive strategy that requires students to adapt and answer questions in order to develop an integrated understanding of the passage (Billingsley & Wildman, 1990). Question generation students, therefore, may have been at a disadvantage for answering factual questions as they only read passages once. Furthermore, fluency was an issue for these students as passages were at an instructional reading level indicating that they had difficulty reading 5-15% of the words. Difficulty reading words forced students to allocate a high percentage of their cognitive resources to decoding, leaving fewer resources available to learn passage facts.

One might expect question generation to have a distinct advantage over repeated reading when it comes to answering inferential questions. Question generation, it is hypothesized, directly targets inferential knowledge by having students ask and answer questions in order to integrate information within the passage and with the reader's prior knowledge (Billingsley, 1988). Repeated reading, on the other hand, does not address inference generation. The above theoretical perspective assumes that students are on an equal playing field when it comes to factual knowledge. As discussed above, question generation students in this study acquired less factual knowledge than repeated reading students, which, in turn, decreased the number of building blocks (i.e., factual knowledge) at their disposal to make inferences. Although not prompted to make inferences, repeated reading students were able to compensate and achieve similar scores on inference questions due to their solid factual knowledge base.

Significance of Reading Material Used

A critical component of this investigation was the use of carefully formatted reading material. Many previous studies, in both the repeated reading and question generation literature, provided little information on the reading material used. This is unfortunate, as the effectiveness of any reading intervention may hinge on the material used. In fact, according to Faulkner and Levy (1994), text difficulty determines in large part how text is processed.

Care was taken to construct passages amenable to both repeated reading and question generation. Passages were within students' instructional reading level, could be read in 1½ minutes, and contained complete narratives. However, the need to use short passages may have given an advantage to repeated reading. Longer passages would have made integrating information within the passage more essential, a hypothesized strength of question generation. The use of passages at students' instructional level may have also given an advantage to repeated reading. For example, Nolte and Singer (1985) found that the effectiveness of question generation rose and fell with the readability of the passages: the easier the passage was to read the better students achieved using question generation. Consequently, the effectiveness of both repeated reading and question generation is likely to some extent to be a by-product of the reading material used.

Limitations

Four limitations to the conclusions of this analysis are noteworthy. First, only students who read between the second- and third-grade level participated in the investigation. Thus, the effectiveness of the interventions for students who read below second or above third grade remains unknown. Students reading below a sec-

ond-grade level probably would not benefit from either intervention as they have not yet mastered foundational reading skills. Students reading above the third grade, on the other hand, may benefit more from question generation as they have surpassed the learning-to-read stage where fluency is a major goal and have begun reading to learn where learning to integrate passage information becomes paramount. Second, no measure of reading prosody was taken; therefore, it remains unknown if either intervention impacted this component of reading fluency. Third, only narrative passages were used throughout study implementation. It remains unknown if results obtained would generalize to expository passages. Fourth, as pre- and posttest measures were not taken, it remains unknown whether gains in reading achievement attained transferred to readings outside of the investigation and/or if the interventions caused an increase in students' overall reading achievement.

Conclusions

Taking into account the limitations of this analysis, three unambiguous findings have emerged that both confirm and extend previous knowledge. First, the study confirms previous repeated reading investigations, which found that rereading improves fluency on passages that are reread. Students in the repeated reading condition were able to improve their reading speed to a level commensurate with students reading at the 50th percentile norm for their respective reading level. Second, a direct comparison of repeated reading and question generation extends our knowledge by indicating that when reading instructional level material designed for use with repeated reading and question generation, repeated reading is more effective at improving factual comprehension for students with LD who read at a second- or third-grade instructional level.

Implications for Future Research

Although results from this analysis confirmed previous findings and extended our knowledge by directly comparing the two, many critical questions remain unanswered. Most pressing are questions relating to the interaction of fluency and comprehension, the effectiveness of non-repetitive interventions on reading fluency, and the importance of reading material on program effectiveness.

Results from this analysis indicate that remediating reading fluency directly is more effective at improving factual comprehension than directly targeting comprehension when reading instructional-level material. Although previous studies have shown that fluency and comprehension are highly correlated (Fuchs et al., 2001), additional research is needed before we will fully understand the complex interaction between reading fluency and comprehension. It is also important to note that these skills can be targeted simultaneously. For example, Therrien and colleagues used a combined repeated reading and question generation intervention and significantly increased students' reading fluency and comprehension (Therrien, Wickstrom, & Jones, 2006).

Results from this investigation failed to conclusively prove that repeated reading, a repetitive oral reading intervention, is superior to a non-repetitive oral reading intervention. Additional research is warranted to determine if it is necessary to reread passages in order to improve students' ability to read novel passages fluently.

Study results confirm previous findings indicating the importance of reading material used on program effectiveness. Future studies that systematically alter passage characteristics within reading interventions need to be conducted in order to gain a complete understanding of the impact of reading material on program effectiveness.

References

Adams, M. J. (2000). *Beginning to read: Thinking and learning about print.* Cambridge, MA: The MIT Press.

Andre, M.D.A., & Anderson, T. H. (1979). The development and evaluation of a self-questioning study technique. *Reading Research Quarterly, 14*, 605-623.

Billingsley, B. S., & Wildman, T. M. (1988). The effects of prereading activities on the comprehension monitoring of learning disabled adolescents. *Learning Disabilities Research, 4*, 36-44.

Billingsley, B. S., & Wildman, T. M. (1990). Facilitating reading comprehension in learning disabled students: Metacognitive goals and instructional strategies. *Remedial and Special Education, 11*(2), 18-31.

Bryant, D. P., Vaughn, S., Linan-Thompson, S., Ugel, N., Hamff, A., & Hougen, M. (2000). Reading outcomes for students with and without reading disabilities in general education middle-school content area classes. *Learning Disability Quarterly, 23*, 238-252.

Cohen, R. (1983). Students generate questions as an aide to reading comprehension. *Reading Teacher, 36*, 770-775.

Davey, B., & McBride, S. (1986a). Effects of question-generation on reading comprehension. *Journal of Educational Psychology, 78*, 256-262.

Davey, B., & McBride, S. (1986b). Generating self-questions after reading: A comprehension assist for elementary students. *Journal of Educational Research, 80*(1), 43-46.

Dowhower, S. L. (1987). Effects of repeated reading on second-grade transitional readers' fluency and comprehension. *Reading Research Quarterly, 22*(4), 389-406.

Faulkner, H. J., & Levy, B. A. (1994). How text difficulty and reader skill interact to produce differential reliance on word content overlap in reading transfer. *Journal of Experimental Child Psychology, 58*, 1-24.

Faulkner, H. J., & Levy, B. A. (1999). Fluent and nonfluent forms of transfer in reading: Words and their message. *Psychonomic Bulletin and Review, 6*(1), 111-116.

Flesch, R. (1948). A new readability yardstick. *Journal of Applied Psychology, 32*(3), 221-233.

Freeland, J. T., Skinner, C. H., Jackson, B., McDaniel, C. E., & Smith, S. (2000). Measuring and increasing silent reading comprehension rates: Empirically validating a repeated reading intervention. *Psychology in the Schools, 37*(5), 415-429.

Fuchs, L. S., Fuchs, D., & Hosp, M. K. (2001). Oral reading fluency as an indicator of reading competence: A theoretical, empirical, and historical analysis. *Scientific Studies of Reading, 5*(3), 239-256.

Gilroy, A., & Moore, D. (1988). Reciprocal teaching of comprehension-fostering and comprehension monitoring activities with ten primary school girls. *Educational Psychology, 8*, 41-49.

Griffey Jr., Q., Zigmond, N., & Leinhardt, G. (1988). The effects of self-questioning and story structure on the reading comprehension of poor readers. *Learning Disabilities Research, 4*(1), 45-51.

Hasbrouck, J. E., & Tindal, G. (1992). Curriculum-based oral reading fluency norms for students in grades 2 through 5. *Teaching Exceptional Children, 24*(3), 41-44.

Helfeldt, J. P., & Lalik, R. (1976). Reciprocal student-teacher questioning. *Reading Teacher, 30*(3), 283-287.

Herman, P. A. (1985). The effects of repeated readings on reading rate, speech pauses, and word recognition accuracy. *Reading Research Quarterly, 20*(5), 553-565.

Hollingsworth, P. M. (1970). An experiment with the impress method of teaching reading. *The Reading Teacher, 24*, 112-114,187.

Homan, S. P., Klesius, J. P., & Hite, C. (1993). Effects of repeated readings and nonrepetitive strategies on students' fluency and comprehension. *Journal of Educational Research, 87*(2), 94-99.

Kamps, D. M., Barbetta, P. M., Leonard, B. R., & Delquadri, J. (1994). Classwide peer tutoring: An integration strategy to improve reading skills and promote peer interactions among students with autism and general education peers. *Journal of Applied Behavior Analysis, 27*(1), 49-61.

LaBerge, D., & Samuels, S. J. (1974). Toward a theory of automatic information processing in reading. *Cognitive Psychology, 6*, 293-323.

Levy, B. A., Abello, B., & Lysynchuk, L. (1997). Transfer from word training to reading in context: Gains in reading fluency and comprehension. *Learning Disability Quarterly, 20*, 173-188.

Lyon, G. R. (1998). *Overview of reading and literacy initiatives.* Statement to Committee on Labor and Resources. Retrieved May 1, 2004, from http://www.nichd.nih.gov/publications/pubs/jeffords.htm

Lyon, G. R., & Moats, L. C. (1997). Critical conceptual and methodological considerations in reading intervention research. *Journal of Learning Disabilities, 30*(6), 578-588.

Lysynchuk, L., Pressley, M., & Vye, G. (1990). Reciprocal instruction improves reading comprehension. *Elementary School Journal, 40*, 471-484.

Mathes, P. G., & Fuchs, L. S. (1993). Peer-mediated reading instruction in special education resource rooms. *Learning Disability Research and Practice, 8*(4), 233-243.

Mercer, C. D., Campbell, K. U., Miller, M. D., Mercer, K. D., & Lane, H. B. (2000). Effects of a reading fluency intervention for middle schoolers with specific learning disabilities. *Learning Disability Research and Practice, 15*(4), 179-189.

Meyer, M. S., & Felton, R. H. (1999). Repeated reading to enhance fluency: Old approaches and new directions. *Annals of Dyslexia, 49*, 283-306.

Microsoft. (2003). *Word* (Version 2003). Redmont, WA: Author.

Miller, A., Robson, D., & Bushell, R. (1986). Parental participation in paired reading: A controlled study. *Educational Psychology, 6*, 277-284.

Morgan, P. L., & Sideridis, G. D. (2006). Contrasting the effectiveness of fluency interventions for students with or at risk for learning disabilities: A multilevel random coefficient modeling meta-analysis. *Learning Disabilities Research and Practice, 21*, 191-210.

National Institute of Child Health and Human Development. (2000). *Teaching children to read: An evidence-based assessment of the scientific literature on reading and its implications for reading instruction.* Washington, DC: U.S. Government Printing Office.

Nolte, R. Y., & Singer, H. (1985). Active comprehension: Teaching a process of reading comprehension and its effects on reading achievement. *The Reading Teacher, 39*, 24-31.

O'Shea, L. J., Sindelar, P. T., & O'Shea, D. J. (1985). The effects of repeated readings and attentional cues on reading fluency and comprehension. *Journal of Reading Behavior, 17*(2), 129-141.

O'Shea, L. J., Sindelar, P. T., & O'Shea, D. J. (1987). The effects of repeated reading and attentional cues on the reading fluency and comprehension of learning disabled readers. *Learning Disabilities Research, 2*(2), 103-109.

Palincsar, A. S., & Brown, A. L. (1984). Reciprocal teaching of comprehension-fostering and comprehension-monitoring activities. *Cognition and Instruction, 2*, 117-175.

Pressley, M. (2000). What should comprehension instruction be the instruction of? In M. Kamil, P. B. Mosenthal, P. D. Pearson, & R. Barr (Eds.), *Handbook of reading research* (Vol. 3, pp. 545-561). New York: Longman.

Rashotte, C. A., & Torgesen, J. K. (1985). Repeated reading and reading fluency in learning disabled children. *Reading Research Quarterly, 20*(2), 180-188.

Ritchie, P. (1985). The effects of instruction in main idea and question generation. *Reading Canada Lecture, 3*, 139-146.

Rosenshine, B., Meister, C., & Chapman, S. (1996). Teaching students to generate questions: A review of the intervention studies. *Review of Educational Research, 66*(2), 181-221.

Salvia, J., & Hughes, C. (1990). *Curriculum-based assessment.* New York: MacMillan Publishing Company.

Samuels, S. J. (1979). The method of repeated readings. *The Reading Teacher, 32*(4), 403-408.

Shapiro, B., Church, R. P., & Lewis, M.E.B. (2002). Specific learning disabilities. In M. L. Batshaw (Ed.), *Children with disabilities* (5 ed., pp. 417-442). Washington, DC: Paul H. Brookes.

Short, E. J., & Ryan, E. B. (1984). Metacognitive differences between skilled and less-skilled readers: Remediating deficits through story grammar and attribution training. *Journal of Educational Psychology, 76*, 225-235.

Simmons, D. C., Fuchs, D., Fuchs, L. S., Hodge, J. P., & Mathes, P. G. (1994). Importance of instructional complexity and role reciprocity to classwide peer tutoring. *Learning Disability Research and Practice, 9*(4), 203-212.

Sindelar, P. T., Monda, L. E., & O'Shea, L. J. (1990). Effects of repeated readings on instructional- and mastery-level readers. *Journal of Educational Research, 83*(4), 220-226.

Stoddard, K., Valcante, G., Sindelar, P. T., O'Shea, L., & Algozzine, B. (1993). Increasing reading rate and comprehension: The effects of repeated readings, sentence segmentation, and intonation training. *Reading Research and Instruction, 32*(4), 53-65.

Therrien, W. J. (2004). Fluency and comprehension gains as a result of repeated reading: A meta-analysis. *Remedial and Special Education, 25*(4), 252-261.

Therrien, W., Gormley, S., & Kubina, R (2006). Boosting fluency and comprehension to improve reading achievement. *Teaching Exceptional Children, 38*(3), 22-26.

Therrien, W., Wickstrom, K., & Jones, K. (2006). Effect of a combined repeated reading and question generation intervention on reading achievement. *Learning Disabilities Research and Practice, 21,* 89-97.

U.S. Department of Education. (2005). *The nation's report card: Reading 2005.* Washington, DC: U.S. Government Printing Office.

Vaughn, S., Chard, D. J., Bryant, D. P., Coleman, M., & Kouzekanani, K. (2000). Fluency and comprehension interventions for third-grade students. *Remedial and Special Education, 21*(6), 325-335.

van Bon, W.H.J., Boksebeld, L. M., Font Freide, T.A.M., & van den Hurk, A.J.M. (1991). A comparison of three methods of reading-while-listening. *Journal of Learning Disabilities, 24*, 471-476.

Weinstein, G., & Cooke, N. L. (1992). The effects of two repeated reading interventions on generalization of fluency. *Learning Disability Quarterly, 15*, 21-28.

Wong, B.Y.L., & Jones, W. (1982). Increasing metacomprehension in learning disabled and normally achieving students through self-questioning training. *Learning Disability Quarterly, 5*, 228-239.

Wong, B.Y.L., Wong, W., Perry, N., & Sawatsky, D. (1986). The efficacy of a self-questioning summarization strategy for use by underachievers and learning-disabled adolescents. *Learning Disabilities Focus, 2*, 20-35.

Young, A., Bowers, P. G., & MacKinnon, G. E. (1996). Effects of prosodic modeling and repeated reading on poor readers' fluency and comprehension. *Applied Psycholinguistics, 17*(1), 59-84.

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