ABSTRACT

THE EFFECTS OF REPEATED READINGS AND QUESTION GENERATION ON READING FLUENCY AND COMPREHENSION

by Michael Albrecht

Identifying effective intervention strategies for improving reading comprehension skills is a critical task for modern educational professionals. Research has pointed many efforts firmly toward development of early reading skills. The current study focused on the strong but sometimes idiosyncratic link between reading fluency and comprehension of text. Eight elementary school students were identified as having deficits in oral reading fluency skills. The effects of a paired intervention strategy combining reading fluency skill improvement with comprehension strategy instruction were examined over the course of several weeks of treatment. Progress was monitored using both oral reading fluency probes and a questioning assessment designed to measure comprehension skills. Results help to demonstrate the linear relationship between oral reading fluency and comprehension as well as illuminate the variance in degree and nature of effect between individuals. Strengths and limitations of the study as well as ideas for future research are discussed.
THE EFFECTS OF REPEATED READINGS AND QUESTION GENERATION ON
READING FLUENCY AND COMPREHENSION

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Literature Review

Special education eligibility and placement decisions encompass a wide variety of methods and goals, and the delivery of effective reading instruction has remained one of the key elements of the process. More than half of all students referred to special education have been identified as having severe reading deficits (Lloyd, Kauffman, Landrum, & Roe, 1991). Of the 2.8 million students with specific learning disabilities (SLD), roughly 80 percent or 2.4 million students also have difficulties with reading (Shapiro, Church, & Lewis, 2002).

Dealing with this problem is complicated. The ultimate purpose of reading is to comprehend or understand what is being read. Comprehension, however, is a complex composite skill which can not be mastered without a careful integration of many simpler component skills (National Institute of Child Health and Human Development, 2000). In other words, comprehension requires the blending of skills and knowledge in two broad areas (Pressley, 2000): lower-order processes and higher-order processes. Lower-order processing includes skills such as decoding individual words and reading them in a fluent manner. Higher-order processing involves taking the information presented by each word, sentence, and paragraph and somehow linking it all together to extract the meaning of the passage.

There has been much research and success in understanding how to teach lower-order reading skills and the component skills that integrate into higher-order skills. The National Reading Panel has laid out five essential areas for reading instruction: phonemic awareness, phonics, reading fluency, vocabulary, and text comprehension strategies. These areas address both the higher- and lower-order skills. Research shows that reading comprehension difficulties are often associated with one or more of these skill areas. Research also indicates that problems with lower-order skills often predict higher-order difficulties better than the very measures (questioning, retelling, and cloze) of those higher-order skills themselves (Fuchs, Fuchs, & Hosp, 2001). However, not all higher-order problems can be attributed to lower-order difficulties. Studies have indicated that some poor readers simply lack the strategies needed to monitor their own comprehension and do not actively process information as they read it (Torgesen, 1977). In other words, they are deficient in higher-order skill strategies, but not necessarily lower-order skills. Students in this mode, absent of disability classification, are often seen as passive learners who fail to actively process information (Griffey, Zigmond, & Leinhardt, 1988). These students
may lead one to believe that lower-order skills are not sufficient for achieving effective reading comprehension, but, as the previous cases suggest, such skills are certainly a necessary pillar.

Interventions have been designed and empirically validated to remediate both reading fluency and reading comprehension problems separately. Two of these techniques, repeated reading (fluency) and question generation (comprehension), have large bodies of research to support their effectiveness (Meyer & Felton, 1999; National Institute of Child Health and Human Development, 2000; Therrien, 2004).

Repeated Reading

Repeated reading is described as “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). It has been show to produce fluency gains for both students without disabilities (Bryant et al., 2000; O’Shea, Sindelar, & O’Shea, 1985; Rasiniski, Padak, Linek, & Sturtevant, 1994) and also students with SLD (Bryant et al., 2000; Freeland, Skinner, Jackson, McDaniel, & Smith, 2000; Gilbert, Williams, & McLaughlin, 1996; 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, & Kouzekenani, 2000).

It is important to remember that fluency alone, as discussed above, may not be sufficient for good comprehension skills. One meta-analysis shows that repeated readings provide only a moderate impact on comprehension (Therrien, 2004). Many individual studies also support this finding (Bryant et al., 2000; Homan, Klesius, & Hite, 1993; Levy, Abello, & Lysynchuk, 1997; Mathes & Fuchs, 1993; Rashotte & Torgesen, 1985; Simmons, Fuchs, Fuchs, Hodge, & Mathes, 1994; Stoddard, Valcante, Sindelar, O’Shea, & Algozzine, 1993; Vaughn et al., 2000).

Repeated reading alone does not seem to improve comprehension in all cases, as it is most likely only providing one of the component skills that make up the intricate process of understanding text. It does help some students with comprehension, but this is most likely because the extra practice with the lower-level skills then allows them to progress onto a more complete comprehension, not hindered by the drain on cognitive resources that word decoding can be for readers struggling with fluency. In other words, repeated readings only help with lower-level skill deficits (LaBerge & Samuels, 1974). If a student lacks the higher-level skills, then repeated readings are not likely to impact their comprehension abilities.
Some studies on repeated readings have shown that comprehension gains can be attained (Dowhower, 1987; O’Shea et al., 1985, 1987; Sindelar et al., 1990). These studies provided reading material matched to grade level and ensured that students were working with material that presented some fluency issues for them. Fluency, in these cases, is improved and allows comprehension to take place. Suffice it to say that fluency is a necessary element but not sufficient alone to improve comprehension.

**Question Generation**

Teaching techniques designed to improve higher-order comprehension skills have also been empirically validated (National Institute, 2000). Question generation is one of these interventions and involves readers generating questions about the passage while they are reading it (National Institute of Child Health and Human Development, 2000). It has been shown to be effective for students without disabilities (Andre & Anderson, 1979; Billingsley & Wildman, 1988; Cohen, 1983; Davey & McBride, 1986a; Gilroy & Moore, 1988; Griffey et al., 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) and students with SLD (Billingsley & Wildman, 1988; Griffey et al., 1988; Wong & Jones, 1982; Wong et al., 1986).

While some data suggests that question generation does improve comprehension consistently, individual studies paint somewhat of a different picture. In the Rosenshine and colleagues (1996) meta-analysis of question generation, the reported effect sizes were anywhere from small to large. Also, five other individual studies failed to show any improvement in comprehension at all with question generation (Davey & McBride, 1986b; Dreher & Gambrell, 1985; MacGregor, 1988; Ritchie, 1985; Taylor & Frye, 1992). This failure might be due to the fact that techniques like question generation alone do not address lower-order skills. Without the solid base of basic reading skills, practice with the higher-order elements can not produce gains in comprehension. This may be a product of the amount of cognitive resources a student must commit to the more basic tasks such as decoding a word. With so much energy focused on the smaller scale details of reading, fewer resources can be devoted to higher-order comprehension.

This view is supported anecdotally by Nolte and Singer (1985) who found that question generation’s effects increased and decreased depending on readability levels of the passage. Support is also found in six studies showing that comprehension gains were attainable when the
reading material was at the appropriate readability level for the individual students involved (Billingsley & Wildman, 1988; Gilroy & Moore, 1988; Griffey et al., 1988; Lysynchuk et al., 1990; Palincsar & Brown, 1984; Short & Ryan, 1984).

Conclusions

It seems that repeated readings and question generation, while showing some effectiveness independently, cannot provide conclusive and consistent results for students with reading difficulties. Repeated readings do provide improvement in fluency, but this does not always lead to comprehension gains. Question generation can improve comprehension, but only seems to do so when the lower-order skills are already in place. Also, substantial gains in comprehension when using question generation alone were rare. Anecdotal evidence along with a review of the literature bases of both interventions suggest that both may not show conclusive results independently because they each fail to address both fluency and higher-order comprehension skills independently.

Reread-Adapt and Answer-Comprehend (RAAC) Intervention Development

The RAAC intervention is a program that combines aspects of both repeated reading and question generation. One meta-analysis of repeated reading found that the effectiveness of the intervention quadrupled when it was conducted by a competent adult, provided corrective feedback for errors, and utilized a criterion for reading performance such as the number of words read correctly in one minute (correct words per minute [CWPM]) to decide when to move on to a new passage (Therrien, 2004). All of these vital components are a part of the RAAC intervention.

Question generation has a much more flexible and diverse set of core elements. These elements are usually implemented or not depending on the skill level of the learner, but the goal remains the same: the reader must generate their own questions in order to strategically monitor their own comprehension of the passage. This becomes somewhat more difficult with beginning readers due to problems with getting them to focus on key narrative components. In this case, providing generic questions that the student can adapt and answer can help divert their attention to the right places (Rosenshine et al., 1996). Even though the questions are not generated by the students themselves, the process of adapting them to the story may be enough to preserve the effects of that aspect of the intervention. Research also suggests that the level of concreteness of the questions should vary depending on the skill level of the reader and the type of material.
being presented ranging from story structure questions to single word prompts (Therrien, Gormley, & Kubina, 2006). Story structure prompts are more appropriate of beginning readers, so these types of prompts were chosen for the RAAC’s narrative passages.

Study Purpose

One intent of this study was to further analyze the effects of the RAAC intervention on reading fluency and comprehension, building on the findings of previous studies showing that this intervention provides improvement in overall reading achievement for struggling readers (Therrien, Wickstrom, & Jones, 2006). The current investigation did not evaluate the total or combined effects of the RAAC on overall fluency and comprehension gains, but rather the purpose was to examine the relationship between lower-order skill increases (i.e., fluency) from repeated readings and higher-order skill enhancements (i.e., text comprehension) from question generation. The correlation between fluency and text comprehension gains during intervention sessions across repeated administrations was identified for eight children receiving the RAAC intervention.

Three hypotheses were directly investigated in this study:
1. There is a linear relationship between fluency and comprehension.
2. There is a fluency range that best predicts comprehension levels.
3. The relationship between fluency and comprehension is idiosyncratic.

Method

Participants and Setting

Participants were eight elementary-age students (3rd – 4th grade) who met screening criteria (described below). These students were selected from eligible students in the Talawanda School District in Oxford, Ohio. The setting was a summer reading program run by Miami University faculty and graduate students. Implementation of all procedures involved in this study for individual children was delivered by a graduate student in a 1:1 intervention setting.

Screening

Participants were selected among 3rd to 4th graders who were referred by the Reading First Coordinator in the district, and met the following criteria:

1. Oral reading fluency was below literature-based end of the year second grade benchmark of 70 correct words per minute (Fuchs & Deno, 1982), and
2. Maze performance was below literature-based benchmark of 60% accuracy (Howell & Nolet, 2000), and
3. Parental consent and child assent were obtained.

Materials

Assessment and intervention materials consisted of RAAC passage sets developed by Therrien (2004). Each passage set included a reading passage and eight comprehension questions (see Appendices A and B). Each passage set had a designated grade level that corresponded to its readability level, according to the Flesch-Kincaid Readability Index. At least 20 passage sets at each grade level (1st – 6th) were available.

Dependent Measures

The dependent variables were oral reading fluency, maze performance, and questioning. Administration, scoring, and literature-based benchmarks for each dependent variable are described in this section.

Oral reading fluency (ORF). ORF was the measure of the amount of correct words per minute (CWPM) that a student reads. ORF was assessed by an examiner following along as each student read the passages. Errors, omissions were marked by the examiner, and a total CWPM could then be calculated for the passage. ORF was assessed each time a child received intervention. The grade level of reading passages used was also recorded along with CWPM. ORF was assessed and plotted during each intervention session.

Maze. Maze passages were reading passages with every seventh word removed. In the place of each removed word was a blank with three choices. Of these choices, one word was semantically incorrect, one word was syntactically and semantically incorrect, and one word was semantically and syntactically correct. Students were instructed to read the passage and circle one word from the available choices to fill each blank. The maze administration was untimed, and student performance was recorded as the percentage of correct choices as well as the percentage of semantic and syntactic errors made by the student. Maze performance was assessed as a pre- and post-measure.

Questioning. Questioning consisted of asking the student to answer comprehension based questions after reading a passage. These questions were grouped into two categories: literal and inferential. Literal questions (i.e. “What was the main character’s name?”) had answers that were directly stated somewhere within the passage. Inferential questions did not have explicitly stated
answers within the passage, but instead, the answers had to be inferred by the reader. The students’ performances were recorded as the percentage of questions answered correctly, both overall, and also within each type of question. Comprehension was assessed through questioning and plotted during each intervention session.

Reliability. (IOA) was assessed for 33% of all sessions by audio taping the sessions, and having an independent observer score each DV at a later time. For ORF, IOA was determined by dividing the lower estimate by the higher estimate. For maze, IOA was calculated as the percentage of maze items that were scored as correct or incorrect by both observers. For questioning, IOA was calculated as the percentage of answers (out of 8) that were scored as correct or incorrect by both observers.

An analysis of total reliability, across all children, revealed the following. For ORF, mean IOA was 95.33 (range, 90 to 100). For the maze, IOA was 100.00 (range, 100 to 100). Finally, IOA for the questioning assessment was 89.93 (range, 75 to 100). These data indicate that the measurement systems were consistent across examiners, and free from bias.

Experimental Conditions

Each child was exposed to the RAAC treatment during 5-7 consecutive days. During each treatment session, the RAAC intervention was delivered to one or two passages, depending on the time available and the child’s individual reading pace. The RAAC strategy included all essential instructional components of repeated readings and question generation, and followed six instructional steps recommended by Therrien, Gormley, and Kubina (2006):

1. Teacher cued the student with the following statement:
“Read this story the best you can and as quickly as you can. Pay attention to what you are reading as you will need to answer these questions (teacher points to the cue card questions).”

2. A cue card containing the generic story structure questions was presented, and the teacher prompted the student to read the questions aloud. (See Appendix C for cue card questions.)

3. The child reread the passage aloud until he/she reached a pre-established CWPM. Regardless of CWPM achieved, each passage was read a minimum of two times and a maximum of four times. The criterion of CWPM was based on norms reported by Hasbrouck and Tindal (1992) for students reading at the 50th percentile at the student’s instructional reading level.
4. The teacher provided 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 rereading the passage. Error correction in both cases entailed pointing at each word error and asking the student to repeat the correct word.

5. After the passage was read four times or the criterion fluency rate was achieved, the teacher prompted the student to adapt and answer the cue card questions orally. Scaffolded assistance was provided to the student. For each incorrect (or non-) response, a prompt to look for the information in the passage was given. If the student answered the question incorrectly or provided no answer for a second time, the teacher pointed to the sentence where the answer could have been found or inferred. If the student still was unable to answer the question, the answer was provided and the researcher explicitly pointed out where the answer could have been found or inferred.

6. The teacher adjusted the difficulty of the reading material for use in the subsequent session using the following guidelines. If the student was unable to reach the pre-established CWPM required for their instructional reading level for three consecutive sessions, the reading material to be used in subsequent sessions was lowered by one grade level (e.g., from third to second grade). If, for three sessions in a row, the student was able to reach the pre-established CWPM required for their instructional reading level during the initial or first reading, the reading material to be used in subsequent sessions was raised by one grade level (e.g., from second to third grade).

Treatment Integrity

A treatment integrity checklist was completed for each RAAC passage (see Appendix D). The checklist included the six steps, as well as blanks to allow the teacher to record fluency data after each reading, and the number and percentage of comprehension questions answered correctly.

Experimental Design and Procedures

A “treatment-only” accountability design (Hayes, 1992) was used to examine the effects of the RAAC on CWPM and comprehension. No baseline phase was implemented. For each child, seven days of treatment were delivered. During each daily session, 1-2 RAAC passages were administered and, for each passage, two data points were plotted. First, oral reading fluency
was recorded as CWPM obtained on the final reading (i.e., the second, third, or fourth reading, depending on when the criterion CWPM was met). Second, a questioning score was recorded as the percentage of comprehension questions answered correctly. Thus, the comprehension score represented the child’s independent level of text comprehension.

Because a “treatment only” design was used, changes in comprehension were not attributed to the RAAC intervention. The purpose of this study, on the other hand, was to identify the relationship between fluency and comprehension. For each participant, the correlation between fluency and text comprehension levels, within each intervention session, was examined.

Analyses

The purpose of this study was to further analyze the effects of the RAAC intervention on reading fluency and comprehension. Rather than a treatment evaluation of the RAAC, however, this study was primarily concerned with identifying the relationship between fluency and comprehension. This is an important area of study because fluency is necessary but not sufficient for active text comprehension (Therrien, Wickstrom, & Jones, 2006). Thus, a linear relationship is not expected. Rather, it has been hypothesized that a minimum level of fluency is needed, above which there will be no additional comprehension benefit to the child. Further, it has been hypothesized that this ideal range is idiosyncratic and will vary from child to child. The following analyses were conducted to test these hypotheses:

**Hypothesis 1:** There is a linear relationship between fluency and comprehension.

To test this hypothesis, Pearson correlation coefficients between oral reading fluency scores and comprehension scores across all administered RAAC passages was calculated. Coefficients were obtained between the first reading of a passage (i.e., before intervention), the final reading (i.e., following intervention), and the child’s comprehension score.

**Hypothesis 2:** There is a fluency range that best predicts comprehension levels.

To test this hypothesis, the entire population of oral reading fluency scores were classified as “below benchmark,” or “at or above benchmark,” according to Hasbrouck and Tindal’s (1992) oral reading fluency norms (see Table 1). Next, the entire population of comprehension scores was classified into groups: “below benchmark” or “at or above benchmark,” according to Howell and Nolet’s recommendations for scoring questioning
strategies (see Table 2). Classification agreement between fluency and comprehension, across children, was determined using Kappa (Cohen, 1988), which is a coefficient of nominal agreement that controls for chance.

**Hypothesis 3:** The relationship between fluency and comprehension is idiosyncratic.

Due to the low number of treatment sessions, which ranged between 9 – 12 per participant, correlational or classification analyses were relatively weak and potentially unstable for individual participants. However, as a preliminary investigation, the same analyses conducted on the aggregated data were also performed at the individual level. Relative differences in correlations and classification accuracy between the children were used as a preliminary test of this hypothesis.

**Results**

The following section describes the results of the RAAC intervention. First, each child’s individual response to intervention is presented. Next, results of three analyses used to test the relationship between fluency and comprehension are presented.

**Response to Intervention**

Subject 1: Results for this participant are displayed in Figure 1 (top panel). This participant’s mean oral reading fluency during the final reading was 100 CWPM, with a range from 75 to 132. For 8 of 9 (89%) passages, Subject 1 required the maximum 4 readings before achieving the fluency goal. The mean comprehension level was 97%, with a range of 88% to 100%.

Subject 2: Results for this participant are displayed in Figure 1 (bottom panel). This participant’s mean oral reading fluency during the final reading was 53 CWPM, with a range from 46 to 61. For 9 of 9 (100%) passages, Subject 2 required the maximum 4 readings before achieving the fluency goal. The mean comprehension level was 84%, with a range of 63% to 100%.

Subject 3: Results for this participant are displayed in Figure 2 (top panel). This participant’s mean oral reading fluency during the final reading was 70 CWPM, with a range from 50 to 88. For 9 of 9 (100%) passages, Subject 3 required the maximum 4 readings before achieving the fluency goal. The mean comprehension level was 90%, with a range of 75% to 100%).
Subject 4: Results for this participant are displayed in Figure 2 (bottom panel). This participant’s mean oral reading fluency during the final reading was 78 CWPM, with a range from 60 to 102. For 6 of 9 (67%) passages, Subject 4 required the maximum 4 readings before achieving the fluency goal. The mean comprehension level was 90%, with a range of 75% to 100%.

Subject 5: Results for this participant are displayed in Figure 3 (top panel). This participant’s mean oral reading fluency during the final reading was 108 CWPM, with a range from 95 to 131. For 9 of 9 (100%) passages, Subject 5 required the maximum 4 readings before achieving the fluency goal. The mean comprehension level was 93%, with a range of 75% to 100%.

Subject 6: Results for this participant are displayed in Figure 3 (bottom panel). This participant’s mean oral reading fluency during the final reading was 80 CWPM, with a range from 63 to 104. For 4 of 9 (44%) passages, Subject 6 required the maximum 4 readings before achieving the fluency goal. The mean comprehension level was 99%, with a range of 88% to 100%.

Subject 7: Results for this participant are displayed in Figure 4 (top panel). This participant’s mean oral reading fluency during the final reading was 87 CWPM, with a range from 59 to 102. For 5 of 9 (56%) passages, Subject 7 required the maximum 4 readings before achieving the fluency goal. The mean comprehension level was 99%, with a range of 88% to 100%.

Subject 8: Results for this participant are displayed in Figure 4 (bottom panel). This participant’s mean oral reading fluency during the final reading was 86 CWPM, with a range from 65 to 96. For 4 of 12 (33%) passages, Subject 8 required the maximum 4 readings before achieving the fluency goal. The mean comprehension level was 91%, with a range of 75% to 100%.

*Three Hypotheses Regarding the Relationship between Fluency and Comprehension*

Hypothesis 1: There is a linear relationship between fluency and comprehension.

The mean ORF for initial readings, mean ORF for final readings, and percent correct for comprehension questions for each participant are depicted in Table 3. While this table displays means, it should be emphasized that initial reading ORF, final reading ORF, and percent correct
comprehension were recorded for each passage for which the RAAC intervention was implemented.

The overall correlation among initial fluency, final fluency, and comprehension across all participants is displayed in Table 4. These data indicate that the correlation between oral reading fluency and comprehension was significant for both the first and final (i.e. following treatment in the passage) CWPM. This analysis suggests that a linear relationship exists between oral reading fluency and comprehension.

Hypothesis 2: There is a fluency range that best predicts comprehension levels.

Classification agreement is displayed in Table 5 and 6. These tables illustrate the degree to which levels of proficiency in fluency agree with levels of proficiency in comprehension. In other words, if a child “meets” proficiency standard for CWPM, what is the likelihood of achieving proficiency in comprehension? Proficiency, in both cases, was defined in terms of the most commonly used literature-based benchmarks (Hasbrouck & Tindal, 1992; Fuchs & Deno, 1982). The total accuracy of the initial reading was 26%, which was associated with a kappa coefficient of .02 (p = .630). The total accuracy of the final reading was 76%, which was associated with a kappa coefficient of .27 (p < .05). This analysis suggests that there is a positive relationship between oral reading fluency and comprehension: classification agreement of proficiency levels, following intervention, was significant beyond chance levels.

Hypothesis 3: The relationship between fluency and comprehension is idiosyncratic.

The third hypothesis was examined by comparing final CWPM levels associated with comprehension scores for the total group, as well as individual children. Table 7 displays the mean CWPM associated with each percentage accuracy score obtained for comprehension. As a group, there was a linear increase in CWPM for each additional question answered correctly. Patterns of scores for individual children reveal that this relationship is idiosyncratic. Only four of the eight participants display systematic increases at each level of comprehension. Among the other four children, there was no increase from 88% to 100% comprehension.

This analysis indicates, once again, that a strong, linear relationship between oral reading fluency and comprehension exists. Generally speaking, greater fluency is associated with higher comprehension scores. At the individual level, however, this relationship may not be linear. There appears to be a criterion level of fluency, at which no further gains in comprehension are achieved.
Discussion

Overall, results of this study indicate that (a) there is a linear relationship between fluency and comprehension, (b) there is a fluency range that best predicts comprehension levels, and (c) the relationship between fluency and comprehension is idiosyncratic. The correlations between participants’ ORF and comprehension of passages were significant. This suggests a linear relationship between the two measures. Furthermore, when examining the classification agreement (Tables 5 & 6), it becomes clear that certain reading fluency ranges correspond with certain reading comprehension ranges. However, an examination of individual participant’s fluency and comprehension levels reveals that not every participant exhibited the same linear relationship between gains in the two areas. Rather, it seems that reading fluency being at a sufficient level may be necessary, but not the sole prerequisite for reading comprehension gains.

These findings help to illuminate another dimension in the understanding of the reading process. While a linear relationship between reading fluency and reading comprehension does exist, it may not simply be enough to target reading fluency for improvement when striving to impact comprehension. Reading fluency presents itself in this study as a vital, yet not sole support for reading comprehension. The implications of this finding are far-reaching, with the potential to impact intervention design for students struggling to comprehend written text.

The findings of this study support previous research which has indicated that there may be a fluency range that would best predict comprehension level (Dowhower, 1987; O’Shea et al., 1985, 1987; Sindelar et al., 1990). These findings also support the myriad of past studies indicating a linear relationship between reading fluency and reading comprehension.

Limitations

The most serious limitation of the current study is that “within-session” relationships between oral reading fluency and comprehension were examined, rather than transfer of skills to novel or unfamiliar passages. This introduces the possibility that comprehension gains may have been completely or partially attributable to repeated presentation of information rather than fluency gains.

Another limitation is that the isolated impact of RR was not examined. Comprehension questions were asked after a certain fluency level was reached, but between the repeated readings and the comprehension questions, the RAAC also included the question generation procedure. In all cases, the comprehension questions were independent of the cue card questions. It is not
possible, however, to isolate the relative impact of the repeated readings versus the cue card questions.

The cue card procedures, however, were constant across all RAAC sessions, so that the correlation between ORF and comprehension questions is still an indication of the relative impact of repeated readings on comprehension, within the context of the RAAC strategy. What is not know, however, is whether the correlation observed between repeated reading and comprehension in this study can be generalized to cases in which the entire RAAC strategy is not employed.

A third limitation is that the study did not examine the impact of passage structure (expository versus narrative versus persuasive), which could impact fluency, comprehension, and the relationship between the two (some types require background information, for example).

One final limitation is that the RAAC strategy employs a comprehension measure which takes the form of eight questions. While questioning has been shown to be a valid measure of reading comprehension, providing only eight questions severely limits this measure’s sensitivity. Future studies should strive to include a more sensitive measure.

*Future Directions*

While the relationship between reading fluency and reading comprehension has been widely examined by numerous studies, the idea that fluency may be only necessary and not independently sufficient for reading comprehension has received much less attention. This warrants future research on this topic which could go one of several directions.

Given that there appears to be a criterion level of fluency at which participants’ comprehension benefit decreases, future research is needed to examine what this criterion might be as well as if and how much it varies from individual to individual. This would require a more extensive study in which participants’ reading fluency and comprehension would be monitored using separate passages of similar readability levels. Changes in comprehension could be observed and examined on an individual basis. If such a study found that comprehension on passages of similar difficulty does indeed improve until a certain level of fluency is reached, at which point the improvement decreases or levels off, this would support both hypotheses that reading fluency is necessary but not sufficient for comprehension growth and that there is a criterion level of fluency at which comprehension growth diminishes.
Additional research could expand on these findings and work toward the development of a brief experimental analysis to identify the requisite level of fluency for individual children. Several brief experimental analyses could be designed and tested by administering them to participants who would then undergo procedures similar to those of the present study to determine the accuracy of the analyses. A criterion level of fluency would be first derived from the brief experimental analysis and again by actually increasing the participant’s fluency levels while monitoring comprehension growth on similar passages. The resulting brief experimental analysis, should one be found accurate, would be a critical assessment procedure, and, at this point, a missing step, when designing interventions for struggling readers.
References


Table 1.
Hasbrouck and Tindal’s (1992) *Oral Reading Placement Criteria*

<table>
<thead>
<tr>
<th>Grade</th>
<th>Level</th>
<th>CWPM</th>
</tr>
</thead>
<tbody>
<tr>
<td>3*</td>
<td>Below Benchmark</td>
<td>&lt;70</td>
</tr>
<tr>
<td></td>
<td>At Benchmark</td>
<td>70 to 89</td>
</tr>
<tr>
<td></td>
<td>Above Benchmark</td>
<td>&gt;89</td>
</tr>
<tr>
<td>4*</td>
<td>Below Benchmark</td>
<td>&lt;80</td>
</tr>
<tr>
<td></td>
<td>At Benchmark</td>
<td>80 to 109</td>
</tr>
<tr>
<td></td>
<td>Above Benchmark</td>
<td>&gt;109</td>
</tr>
</tbody>
</table>

*Note.* * = Criteria correspond with end of the year, previous grade level norms
Table 2.

*Howell and Nolet’s (2000) Comprehension Score Cutoffs*

<table>
<thead>
<tr>
<th>Measure</th>
<th>Level</th>
<th>Cutoff</th>
</tr>
</thead>
<tbody>
<tr>
<td>QUESTIONING</td>
<td>Below Benchmark*</td>
<td>&lt;80% correct</td>
</tr>
<tr>
<td></td>
<td>At Benchmark*</td>
<td>80% to 90% correct</td>
</tr>
<tr>
<td></td>
<td>Above Benchmark*</td>
<td>&gt;90% correct</td>
</tr>
</tbody>
</table>
Table 3.

**Oral Reading Fluency and Questioning Accuracy Means**

<table>
<thead>
<tr>
<th>Participant</th>
<th># of RAAC Passages</th>
<th>Mean First Reading ORF</th>
<th>Mean Final Reading ORF</th>
<th>Mean % Comprehension</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>9</td>
<td>64</td>
<td>100</td>
<td>97</td>
</tr>
<tr>
<td>2</td>
<td>9</td>
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<td>9</td>
<td>41</td>
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<td>4</td>
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<td>5</td>
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<td>7</td>
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</tr>
<tr>
<td>8</td>
<td>12</td>
<td>55</td>
<td>86</td>
<td>91</td>
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Table 4.

*Correlation Matrix Between Initial and Finals Readings*

<table>
<thead>
<tr>
<th>Initial ORF</th>
<th>Final ORF</th>
<th>% Comprehension</th>
</tr>
</thead>
<tbody>
<tr>
<td>Initial ORF</td>
<td>1</td>
<td>.782**</td>
</tr>
<tr>
<td>Final ORF</td>
<td>1</td>
<td></td>
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*Note.* ** = sign. < .01
### Table 5.

*Classification Relationships Between Initial ORF and Comprehension*

<table>
<thead>
<tr>
<th>INITIAL ORF</th>
<th>% COMPREHENSION (Questioning)</th>
<th>Below Benchmark</th>
<th>At Benchmark</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Below Benchmark</td>
<td>9</td>
<td>53</td>
<td>62</td>
<td></td>
</tr>
<tr>
<td>At Benchmark</td>
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<td>10</td>
<td>11</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>10</td>
<td>63</td>
<td>73</td>
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</table>
Table 6.

*Classification Relationships Between Final ORF and Comprehension*

<table>
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<tr>
<th>FINAL ORF</th>
<th>% COMPREHENSION (Questioning)</th>
<th>Below Benchmark</th>
<th>At Benchmark</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Below Benchmark</td>
<td></td>
<td>6</td>
<td>14</td>
<td>20</td>
</tr>
<tr>
<td>At Benchmark</td>
<td></td>
<td>4</td>
<td>50</td>
<td>54</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>10</td>
<td>64</td>
<td>74</td>
</tr>
</tbody>
</table>


Table 7.

*Mean CWPM Associated with Comprehension Levels*

<table>
<thead>
<tr>
<th>Comprehension</th>
<th>Total</th>
<th>S1</th>
<th>S2</th>
<th>S3</th>
<th>S4</th>
<th>S5</th>
<th>S6</th>
<th>S7</th>
<th>S8</th>
</tr>
</thead>
<tbody>
<tr>
<td>63%</td>
<td>53</td>
<td>53</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>75%</td>
<td>66</td>
<td>49</td>
<td>67</td>
<td>68</td>
<td>96</td>
<td>80</td>
<td></td>
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<td></td>
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<tr>
<td>88%</td>
<td>84</td>
<td>94</td>
<td>56</td>
<td>69</td>
<td>90</td>
<td>107</td>
<td>67</td>
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<tr>
<td>100%</td>
<td>87</td>
<td>102</td>
<td>55</td>
<td>72</td>
<td>74</td>
<td>111</td>
<td>82</td>
<td>89</td>
<td>85</td>
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Figure 1: Graphs depicting initial and final reading CWPM for subjects 1 (top panel) and 2 (bottom panel)

**Subject 1 ORF**

**Subject 2 ORF**
Figure 2: Graphs depicting initial and final reading CWPM for subjects 3 (top panel) and 4 (bottom panel)

Subject 3 ORF

Subject 4 ORF
Figure 3: Graphs depicting initial and final reading CWPM for subjects 5 (top panel) and 6 (bottom panel)

Subject 5 ORF

Subject 6 ORF
Figure 4: Graphs depicting initial and final reading CWPM for subjects 7 (top panel) and 8 (bottom panel)

Subject 7 ORF

Subject 8 ORF
Appendix A

Tess was a very shy girl. She didn’t have many friends in her neighborhood. Here mom told her to be brave and meet new friends, but she was just too shy. Tess was scared that kids would make fun of her. She had freckles all over her body. Tess hated her freckles. Her mom thought they were cute. Tess didn’t.

One day a new girl moved onto Tess’s block. When Tess saw her, she couldn’t believe it. Her name was Sara. Sara had even more freckles than Tess. Tess said hi to Sara. They became friends right away. As they played, Tess realized that freckles weren’t so bad. They actually looked cute on Sara. Tess slowly learned to like her own freckles, too.
Appendix B

Questions

Write down student’s responses and place an X on questions answered incorrectly

(*If students say they do not know an answer to a question ask them the following: Based on what the story said, what do you think the answer might be?)

1. (F) At the beginning of the story, did Tess have a lot of friends? (no)

2. (F) What did Tess have all over her body? (freckles)

3. (F) Who liked Tess’s freckles in the beginning of the story? (her mom)

4. (I) Why did it say Tess “couldn’t believe it” when she saw Sara? (because Sara had more freckles than Tess; Tess probably hadn’t seen someone with more freckles than herself)

5. (I) Was Tess very shy around Sara? (no)

6. (I) Why not? (Tess felt more comfortable around someone that looked like herself)

7. (F) Did Tess think Sara’s freckles were ugly? (no, she thought they looked cute on her)
8. (I) Do you think Tess gained confidence by becoming friends with Sara? (yes, she learned to like herself more – probably wasn’t as shy with the other kids anymore)

Number correct: ____________
Appendix C

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?
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?
Appendix D

Treatment Integrity Checklist - RAAC

Session # ___________
Passage: ____________  # words in passage: ________

☐ Read instructions aloud

☐ Have student read cue card questions aloud

☐ Have student read and re-read passage (w/ appropriate immediate error correction)

Reading 1: 
Time: ______  Prosody: ______
CWPM: ______

Reading 2: 
Time: ______  Prosody: ______
CWPM: ______

Reading 3 (optional): 
Time: ______  Prosody: ______
CWPM: ______

Reading 4 (optional): 
Time: ______  Prosody: ______
CWPM: ______

☐ Provide feedback (speed, accuracy, and prosody)

☐ Have student adapt and answer cue card questions, providing error correction (up to 3x)

☐ Have student answer comprehension questions. Percentage correct _______

☐ Adjust reading passage level for next session. Level: ________________
Reading 1:          Reading 2:
Time: _______  Prosody: _______  Time: _______  Prosody: _______
CWPM: ______  CWPM: ______

Reading 3 (optional):          Reading 4 (optional):
Time: _______  Prosody: _______  Time: _______  Prosody: _______
CWPM: ______  CWPM: ______

☐ Provide feedback (speed, accuracy, and prosody)

☐ Have student adapt and answer cue card questions, providing error correction (up to 3x)

☐ Have student answer comprehension questions. Percentage correct _______

☐ Adjust reading passage level for next session. Level: __________________