

COMPARISION OF INCREASES IN READING ACCURACY

Comparison of Increases in Reading Accuracy through Repeated
Reading and Repeated Reading with the Quicktionary Reading Pen

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Abstract

Three students with reading difficulties learned to use the Quicktionary Reading Pen during the initial reading of passages. Their accuracy and fluency of the subsequent reading of the passages was compared to subsequent readings of passages with which the Reading Pen had not been used. The results indicated a consistently greater increase in reading accuracy after the initial use of the Reading Pen, than with repeated reading without the use of the pen.

Table of Contents

Abstract	2
Table of Contents	3
Introduction.....	4
Method	5
Participants.....	5
Setting.....	5
Materials	5
Dependent Variable	5
Observation and Recording Procedures	6
Data collection.....	6
Observer training	6
Interobserver agreement.....	6
Experimental Design and Conditions.....	6
Baseline.....	7
Repeated reading	7
Quicktionary reading pen.....	7
Errors Per Hundred Words.....	8
Difference in Errors Per Hundred Words.....	8
Reading Accuracy	8
Difference in Reading Accuracy	8
Discussion.....	9
Table 1: Mean Errors Per Hundred Words for Baseline and Intervention Conditions	10
Fig 1: % Reading Accuracy - Baseline and Intervention Conditions	10
Table 2: Difference in Errors per Hundred Words Between the Initial and Final Readings of the Interventions	11
Fig 2: Difference in Reading Accuracy Between the Initial and Final Readings of the Interventions	11
Table 3: Mean Reading Fluency (WPM) of Passages during Baseline and Intervention Conditions.....	12
References	13

Introduction

Reading involves many skills, which act as the foundation for much of future academic learning and opportunities beyond school. Unfortunately, many children have difficulty acquiring reading skills commensurate with their age and grade level. The federal government has recognized the growing deficiency in and importance of the development of adequate reading skills. This is evident in the request from the U.S. Departments of Education and Health and Human Services for the National Academy of Science to establish a committee to investigate the prevention of reading difficulties (Snow, Burns, & Griffin, 1998). Additionally, the America Reads Challenge Act of 1997 was passed to commit to the national goal of all children being able to read independently by the end of third grade (Wasik, 1998).

While the need for increased reading skills for many students has been identified; the question of how to increase these skills still remains. Isakson (1979) reported that students with the good reading comprehension make fewer errors during oral reading than students with poor reading comprehension. Repeated readings have been found to improve reading accuracy and fluency (Rasinski, 1990). According to Blum, Koskinen, Tennant, Parker, Straub, and Curry (1995), repeated reading is a very flexible reading strategy because it allows students with great variations in instructional levels to participate in the same activity.

Other studies (Blum et al., 1995; Gilbert, Williams, and McLaughlin, 1996; Holmes and McLaughlin, 1987; VanWagenen, Williams, and McLaughlin, 1994) have found that assisted reading, a variation of repeated reading utilizing audio-tapes of the readings, increases reading accuracy, fluency, and comprehension.

New reading technology is working its way into classrooms in the form of the Quicktionary Reading Pen. Though this tool is already in use in some classrooms, there is no existing research about the Reading Pen or its effective use. Research regarding the use of the Quicktionary Reading Pen during repeated reading, similar to the use of audiotaped books for assisted reading, might provide a means of effectively using this tool to increase the benefits of repeated reading.

The purpose of this study is to compare the effects of repeated reading and repeated reading with the Quicktionary Reading Pen on the error rate, reading accuracy, and fluency of students' subsequent readings of instructional level passages. The investigation will determine whether using the pen during repeated reading provides benefits beyond those of repeated reading.

Method

Participants

Three fifth grade students with reading difficulties, enrolled in a public school in Iowa, participated in this study. One Caucasian, male participant, age 12 years, 1 month, had an identified learning disability and received resource instruction in the area of reading. Both other participants had been discussed during the school's problem-solving process, but neither had been identified to receive special education services. These participants included an 11 year old, Caucasian male and an 11 year, 3 month old African American female. The instructional reading levels of the participants, as estimated by the administration of the QRI-II, were 4th grade, 5th grade, and 6th grade, respectively. Each of the participants was right-handed.

Setting

The study occurred in a 4th through 6th grade self-contained (with integrated special education) classroom. Typically, one special education teacher, two paraprofessionals, one pre-service teacher, and four to seven students were working in the classroom. The researcher and participants worked at their own table on one side of the room.

Materials

The reading passages used for this study were from the Macmillan/McGraw Hill basal reading series. The passages used were individualized so as to be at each student's instructional reading level, 90-97% accuracy, as estimated through the administration of the Qualitative Reading Inventory-II.

Passages at the students' instructional levels were used because this is the level at which students can read successfully while receiving the most benefit from instruction (Gillet & Temple, 2000).

An audiocassette recorder and audiocassettes were used daily to record all oral readings. A TI-82 graphing calculator was used to generate random numbers to create randomization of the interventions. The Quicktionary Reading Pen II and headphones were used for student training and the reading of certain, predetermined passages.

Dependent Variable

The effects of the interventions on the number of errors per hundred words were monitored and analyzed. Errors were defined as mispronunciations, substitutions, omissions, insertions, and reversals. The guidelines for identifying errors are based on those used by Leslie and Caldwell (1995). Self-corrections and repetitions were recorded, but not counted as errors.

Though all of the passages for the individual students were approximately the same reading level, other factors such as student prior knowledge, interest, and motivation might have impacted the difficulty level for individual students (Leslie & Caldwell, 1995). In order to account for differences between passages during the initial reading, the difference of errors per hundred words between the first and final reading was calculated. Reading accuracy was also calculated and examined. To calculate accuracy, the errors were subtracted from the total number of words in the passage, then divided by the total number of words in the passage and multiplied by 100.

The difference in reading accuracy between the first and final readings was examined to reduce the effect of unavoidable variability among passages. This difference was calculated by subtracting the initial accuracy percentage from the final accuracy percentage.

The effects of the interventions on reading fluency were also examined. Fluency was defined as words read per minute.

Observation and Recording Procedures

Data collection.

During the passage readings, running records were used to determine evaluate errors per hundred words and reading accuracy. As each child read the passages, the observer, with a copy of the student passage, recorded any aberrations from the written text. Differences from the text were categorized as mispronunciations, substitutions, omissions, insertions, reversals, self-corrections, and repetitions.

Mispronunciations and substitutions were recorded by writing the word the student said above the word in text in the passage. Omissions were recorded by circling the word, which the student did not read. Marking "^" and writing the word the student included that was not present in the text indicated an insertion. Reversals were recorded by the proofreading symbol for reversed words. Self-corrections were recorded above the word in text by writing the student's error, followed by "SC" for self-correction. Repetitions were recorded by underlining the word or words that the student read more than once. Self-corrections and repetitions were not counted as errors. Mispronunciations, substitutions, omissions, insertions, and reversals were considered errors.

Reading fluency data were collected by timing the audiotaped readings. A stopwatch was started at the beginning of the reading and stopped upon the completion of the reading. The words per minute, WPM, were calculated using the formula provided by Leslie and Caldwell (1995): number of words in the passage x 60, divided by time in seconds.

Observer training

The primary observer and the observer used to establish the agreement data received their training during an hour-long training session. The first ten minutes of the session consisted of instruction regarding the types of reading deviations from the written text and their respective recording procedures. This training was provided modeling a running record from an audiocassette. The second part of the session provided the observers two running record practice opportunities completed from an audiocassette of a fifth grade student reading two passages. Discussion of the running records and specific feedback for the observers was provided. The observers utilized the remainder of the training session to meet the training criterion of recording two consecutive running records with agreement of 98% or better. They met this criterion on the third and fourth running records with agreement of 98% and 100%.

Interobserver agreement.

In order to ensure the accuracy of the collected data, interobserver agreement was established for 10% of the data. For each participant random sampling of the audiocassettes provided 3.33% of the agreement data. Agreement was established with the interobserver agreement formula provided by Martella, Nelson, and Marchand-Martella (1999): agreements divided by the sum of disagreements and agreements, multiplied by 100.

The agreement data was high for all participants, ranging from 96% to 100%. The mean reliability percentages for the first, second, and third participants for errors per hundred words and accuracy were 98%, 96%, and 100%, respectively. The mean of all agreement data was 98%. These percentages represented high accuracy of recording across each of the participants.

Experimental Design and Conditions

Since the purpose of this study was to compare the effects of two interventions, an alternating treatment design was employed. This design allowed for the examination of the effects of repeated reading and repeated reading with the initial use of the reading pen on the dependent variables. The design also demonstrates the effects of the stronger treatment by applying that treatment alone for several sessions after the intervention comparison was completed. Randomization, as recommended by Martella et al. (1999), was utilized to control for_ the susceptibility of this design to sequential confounding. A random number generation program on the TI-82 graphing calculator was used to identify the intervention to be implemented with all of the students for the session. Any even number generated indicated the implementation of repeated reading, while the generation of an odd number signaled the implementation of repeated reading with the use of the Quicktionary Reading Pen for the initial reading of the passage. Neither intervention was implemented for more than two consecutive days.

Carryover effects were minimized by the implementation of the guidelines of Barlow and Hersen (1984):

COMPARISON OF INCREASES IN READING ACCURACY

counterbalancing the treatments, providing discrimination between treatments, and providing a time delay between treatment sessions. The procedures for randomization provided counterbalancing of treatments. Directions provided to the student and the use or absence of the reading pen provided the participants two methods of discriminating between the two treatments. A time delay was provided between treatment sessions, as only one intervention was applied in each of the daily sessions.

Baseline

Prior to collecting baseline data, the students met with the observer daily for one week. During this week the students began reading passages and being audio-recorded to identify their instructional reading levels and reduce the novelty effects inherent in beginning a new routine. Next, baseline data were collected using the passages at each student's instructional level.

Repeated reading.

The students met with the observer at individually designated times each day. At the beginning of the session, the student was provided an oral advanced organizer of the session. On the days the repeated reading intervention was applied, the audiocassette recorder began recording, and the students were instructed to read the passage out loud without any help. With regard to unknown words, the students were instructed to, "Try your best. If you still don't know it, move on." The cue to begin reading was, "Begin when you're ready."

During the entire session, the observer sat so the student was unable to observe the recorder taking the running record. The observer always sat on the left side of the student at the table. The observer made smooth, unobtrusive movements throughout the readings, so the student would not notice the recording procedures occurring. The observer's eyes remained on the running record, so as to discourage the solicitation from the student for help. Upon the completion of the reading the observer provided positive reinforcement by saying, "Thank you for your careful reading."

After the completion of the initial reading, the student was instructed to reread the passage silently and look up when finished. When the student had completed the silent reading the observer said, "Thank you for your hard work." The student was dismissed back to class.

During the consecutive session, the student was informed that he or she had read the passage on the previous day. The oral reading procedures were then employed for the final rereading of the passage.

Quicktionary reading pen

The students were trained to use the Quicktionary Pen during three 5-minute sessions of direct instruction. After the student training with the Quicktionary Pens, the students were assessed regarding their accuracy in pen usage. The students received a passage with five bold-print words, which they were asked to scan. Scanning the word correctly within two attempts and correctly repeating the word was considered an accurate scan. Failing to scan the word correctly within two attempts or not correctly repeating the word was considered an inaccurate scan. An accuracy percentage was calculated for each student upon the completion of the assessment. The students needed to meet an 80% accuracy criterion before they proceeded to the passage reading with the pen.

The students then received direct instruction training for using the pen independently during passage reading. This training was completed in one 5-minute session. After the students received training to use the pen for their own unknown words during passage reading, the students received a practice passage. Again, an accuracy criterion of 80% had to be met before proceeding. This criterion percentage was determined using the unknown words from the passage that the student chose to scan.

The procedures for the intervention of repeated reading with the use of the pen matched the procedures for the other intervention except for the initial reading. On the days the intervention with the pen was applied, the audiocassette recorder began recording and the students were instructed to read the passage out loud without any help, using the pen when necessary. The remainder of the session utilized the same procedures as the other intervention.

During the consecutive session, the student was informed that he or she had read the passage on the previous day

COMPARISON OF INCREASES IN READING ACCURACY

using the pen. The oral reading procedures were then employed for the third and final rereading of the passage without the use of the pen.

Results

Errors Per Hundred Words

The mean errors per hundred words for the baseline and intervention conditions of each participant are displayed in Table 1. The errors per hundred words for the first participant's final repeated reading ranged from 9.97 to 14.29 with a mean of 11.145), while the errors per hundred words for the final repeated reading with the initial use of the reading pen ranged from 3.46 to 5.74 with a mean of 4.82. For Participant 2 the range for repeated reading was 5.71 to 8.78 with a mean 7.22, while the range for repeated reading with the pen was 5.25 to 6.67 with a mean of 5.94. The range errors per hundred words for repeated reading for Participant 3 was 2.62 to 8.74 with a mean of 5.01, while the range and mean for repeated reading with the pen were 1.16 to 2.52 and 11.67, respectively. The data for each of the participants indicated that repeated reading with the pen was more successful in reducing the errors per hundred words than repeated reading.

Difference in Errors Per Hundred Words

Table 2 shows the difference in errors per hundred words from the initial to the final readings for each participant for both interventions' passages. During the repeated reading intervention, all of the participants experienced at least one increase in errors per hundred words, with the greatest decrease being 1.69. During the repeated reading with the pen, all students demonstrated decreases in errors per hundred words. The smallest decrease was 1.28 and the greatest decrease was 4.83. The data for all participants show a consistently greater decrease in errors per hundred words during the repeated reading with the pen.

Reading Accuracy

The reading accuracy of each participant for baseline and the final readings for both intervention conditions is depicted in Figure 1. The baselines for Participants 1 and 2 were stable at about 91 %, while the baseline for Participant 3 was stable at 96%. The first participant's accuracy for final repeated readings was at or below the baseline accuracy. This participant's final reading accuracy for repeated reading with the pen was clearly greater, ranging from 95% to 97%. For Participant 2, the repeated reading accuracy ranged from 91% to 94%, and repeated reading with the pen ranged from 93% to 95%. The repeated reading of Participant 3 ranged from 91 % to 97%, while the range of the repeated reading with the pen was 97% to 99%. Since differences in the accuracy during the initial readings likely influenced the differences in the final readings, an examination of the difference between the initial and final readings for both interventions provided a more clear illustration of the effects on reading accuracy.

Difference in Reading Accuracy

Figure 2 illustrates the difference in percent accuracy between the initial and final readings for the intervention conditions for each participant. The reading accuracy of the first participant remained the same, then decreased by 4% during the repeated reading intervention. This participant's reading accuracy increased by 3% to 5% during the intervention using the pen. The second participant's reading accuracy remained the same for two passages, increased by 2% for one passage, and decreased by 1 % for another passage during repeated reading. The reading accuracy of this participant increased by a range of 1 % to 4% during the intervention utilizing the pen. The third participant's reading accuracy remained the same, decreased by 6%, and decreased by 1 % during repeated reading. During the intervention with the reading pen, this participant's reading accuracy remained the same, increased by 4%, increased by 3%, and increased by 3%. Repeated reading with the reading pen resulted in consistently greater increases in reading accuracy for each participant than did repeated reading alone.

Table 3 depicts the mean reading fluency for the baseline and intervention conditions for each participant. The mean fluency of Participant 1 during the final repeated readings was 89.27 words per minute, while 105.79 words per minute for the final repeated reading with the pen. For Participant 2 the mean fluency during the final repeated readings was 115.36 words per minute and 103.16 during final repeated readings with the pen. The mean fluency for

COMPARISON OF INCREASES IN READING ACCURACY

Participant 3 during the final repeated readings was 151.95 words per minute and 144.99 during the final readings with the pen. Neither intervention demonstrated consistently greater effects on the participants' reading fluency.

Discussion

The results of this study demonstrated that repeated reading with the initial use of the Quicktionary Reading Pen is more effective in reducing the errors per hundred words and increasing reading accuracy in subsequent readings than repeated reading alone. The errors per hundred words of three participants decreased in subsequent readings of instructional level passages, when the reading pen was used during the initial reading. Participant reading errors decreased by as much as 4.83 errors per hundred words with the use of the pen, while the greatest decrease in errors per hundred words during repeated reading was 1.69. This reduction of reading errors was reflected in greater increases in reading accuracy with the use of the Quicktionary Reading Pen during repeated reading. Though the effects of the interventions were consistent for reading errors and accuracy, neither intervention consistently increased reading fluency.

This investigation has shown the potential benefits of using the Quicktionary Reading Pen to supplement repeated reading. The flexibility of repeated reading remained present in repeated reading with the use of the Reading Pen, after the students had been trained with the pen. The use of the pen with repeated reading does not require constant teacher monitoring, making this an activity that could benefit students when the teacher is not available to provide direct instruction or monitoring.

While this study achieved its purpose, there were several limitations with the investigation. Though procedures to control carryover effects were followed, these effects could have been a factor due to the similar content and vocabulary of some of the reading passages. As stated by Barlow and Hersen (1984) these effects are not likely to reverse the comparison of the effects of the interventions as long as the procedures for controlling them were implemented. The possibility of carryover effects did create doubt as to the effectiveness of the stronger treatment when applied alone, not alternated with the other intervention. By completing the alternating treatment design with the pen intervention alone, this doubt would have eliminated. Unfortunately, the study was ended due to time constraints, before this occurred.

Another possible limitation involved student attitude toward the reading. As the study progressed, one student seemed to grow tired of the daily reading required for this investigation. This could have affected the student's reading accuracy and fluency. This could have also impacted the reading of the other students, though they did not seem to tire of the reading.

While the repeated reading with the use of the reading pen showed positive effects on reading accuracy, these effects could be related to the excitement and motivation of using new technology, instead of the assistance the technology provided. If the effects were caused by this motivation, the effects would likely diminish with time. If the pen's pronunciation of unknown words caused the effects seen in this study, the effects are more likely to remain consistent over time.

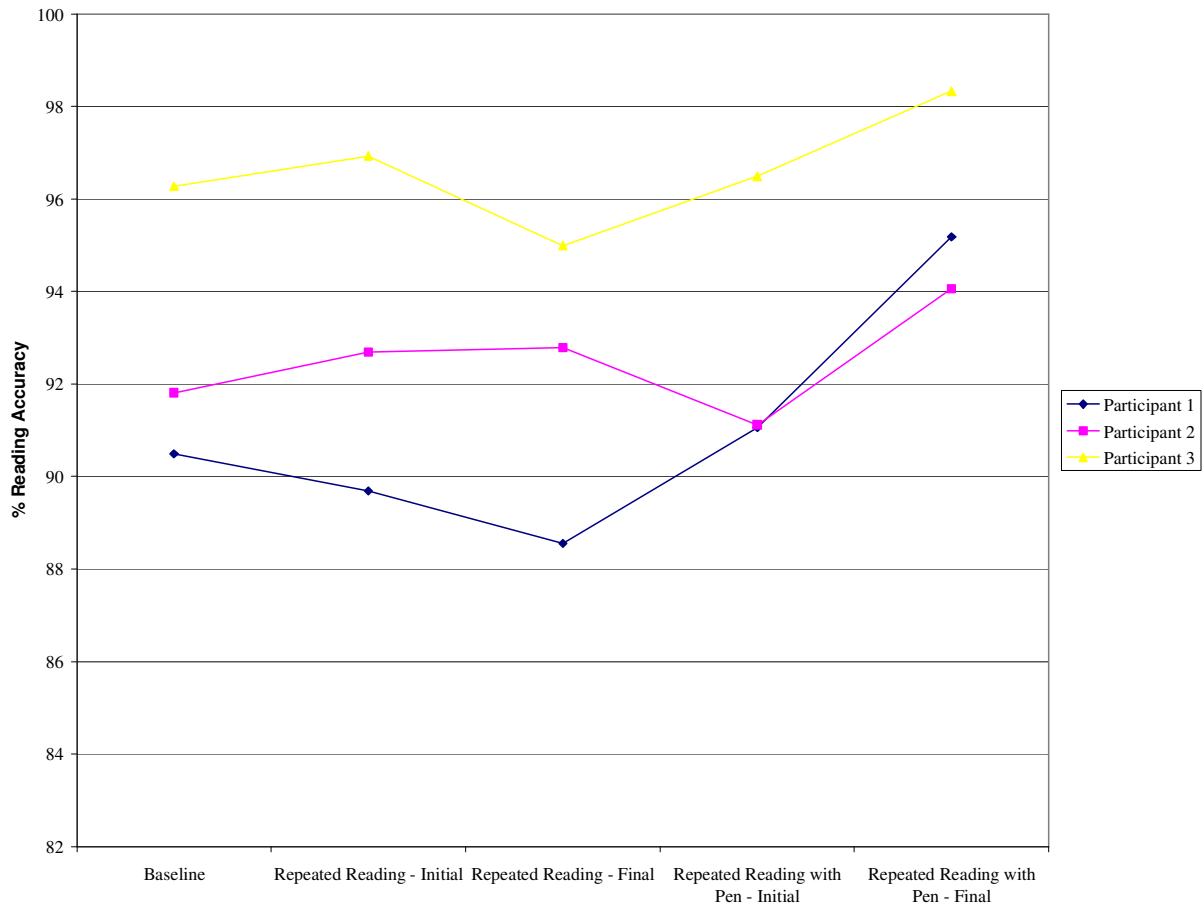
Continued research regarding the effectiveness of the Quicktionary Reading Pen is necessary. Replications of this study across different participants are required. Further investigation of the effects of the pen on self-correction rates, correct words per minute, and comprehension are needed. Additional research could evaluate the effects of pen usage on frustration level readings and the student's independent pen use in the classroom. More research is required before the best uses of the Quicktionary Reading can be determined.

COMPARISON OF INCREASES IN READING ACCURACY

Table 1: Mean Errors Per Hundred Words for Baseline and Intervention Conditions

	Baseline	Repeated Reading		Repeated Reading with Pen	
		Initial	Final	Initial	Final
Participant 1	9.51	10.31	11.45	8.94	4.82
Participant 2	8.19	7.31	7.22	8.88	5.94
Participant 3	3.73	3.07	5.01	3.51	1.67

Fig 1: % Reading Accuracy - Baseline and Intervention Conditions

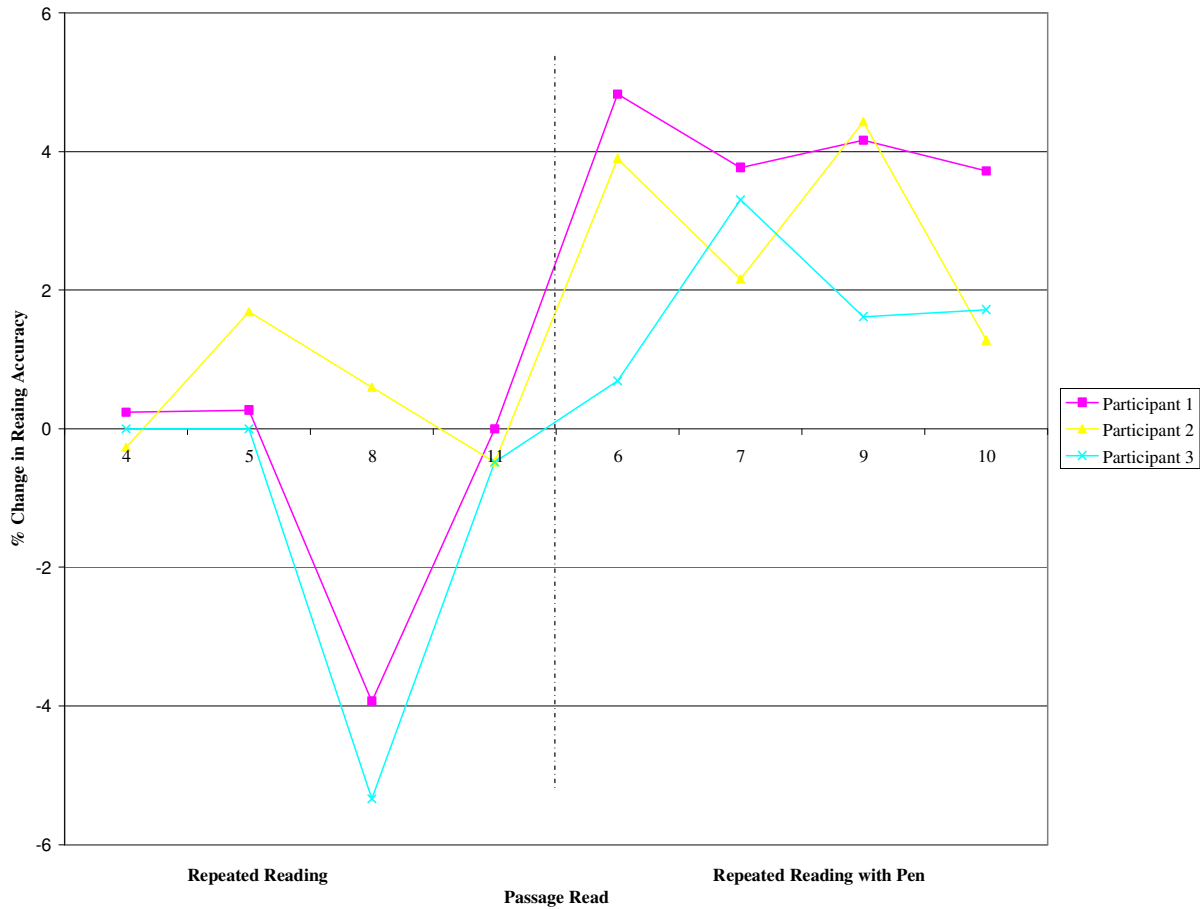


COMPARISON OF INCREASES IN READING ACCURACY

Table 2: Difference in Errors per Hundred Words Between the Initial and Final Readings of the Interventions

Passage	Repeated Reading				Repeated Reading with Pen			
	4	5	8	11	6	7	9	10
Participant 1	-.24	-.27	3.93		-4.83	-3.77	-4.16	-3.72
Participant 2	.27	-1.69	-.60	.48	-3.90	-2.16	-4.43	-1.28
Participant 3		0	5.34	.48	-.69	-3.30	-1.62	-1.72

Fig 2: Difference in Reading Accuracy Between the Initial and Final Readings of the Interventions



COMPARISON OF INCREASES IN READING ACCURACY

Table 3: Mean Reading Fluency (WPM) of Passages during Baseline and Intervention Conditions

	Baseline	Repeated Reading		Repeated Reading with Pen	
		Initial	Final	Initial	Final
Participant 1	94.26	84.58	89.27	73.81	105.79
Participant 2	100.51	103.18	115.36	73.31	103.16
Participant 3	126.07	136.41	151.95	92.90	144.99

References

- Barlow, D. H. (1984). *Single Case Experimental Designs: Strategies for studying behavior change* (2nd ed.). Elmsford, NY: Pergamon Press.
- Blum, L. H., Koskinen, P. S., Tennant, N., Parker, E. M., Straub, M., & Curry, C. (1995). Using audiotaped books to extend classroom literacy instruction into the homes of second-language learners. *Journal of Reading Behavior*, 27(4), 535-563.
- Flood, J., et al. (2003). *Reading*. New York: Macmillan McGraw-Hill.
- Gilbert, L. M., Williams, R.L., & McLaughlin, T. F. (1996). Use of assisted reading to increase correct reading rates and decrease error rates of students with learning disabilities. *Journal of Applied Behavior Analysis*, 29(2), 255-257.
- Gillet, J. W., & Temple, C. (2000). *Understanding Reading Problems: Assessment and instruction* (5th ed.). New York: Addison Wesley Longman.
- Holmes, I. K., McLaughlin, T. F. (1987). Assisted Reading with Fourth-Grade Readers: A multiple baseline analysis. *B. C. Journal of Special Education*, 11(4), 335-341.
- Isakson, R. (1979). Interdependency between comprehension and decoding in oral reading. *Reading Improvement*, 16, 230-234.
- Leslie, L., & Caldwell, J. (1995). *Qualitative Reading Inventory-II*. New York: Addison Wesley Longman.
- Martella, R. C., Nelson, R., & Marchand-Martella, N. E. (1999). *Research Methods: Learning to become a critical research consumer*. Boston: Allyn and Bacon.
- Rasinski, T. V. (1990). Effects of repeated reading and listening-while-reading on reading fluency. *Journal of Educational Research*, 83, 147-150.
- Snow, C. E., Burns, M.S., & Griffin, P. (1998). *Preventing reading difficulties in young children*. Washington, DC: National Academy Press.
- Van Wagenen, M. A., Williams, R.L., & McLaughlin, T.F. (1994). Use of assisted reading to improve reading rate, word accuracy, and comprehension with ESL Spanish-speaking students. *Perceptual and Motor Skills*, 79, 227-230.
- Wasik, B. A., (1998). Volunteer tutoring programs in reading: A review. *Reading Research Quarterly*, 33, 266-291.