The Effect of Fluency Intervention on First Graders' Reading Fluency

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Submitted in Partial Fulfillment of the Requirements for the

Degree of Master of Education

May 2018

Goucher College

Graduate Programs in Education

Table of Contents

List of Tables

Abstract

The purpose of this study was to determine the effect of an additional fluency intervention on first graders' reading fluency. Fluency Folders, Reader's Theater and Ticket-to-Read were used in order to improve their fluency. The Fountas and Pinnell Benchmark Reading Assessment System was used to identify the instructional reading level of the students. The measurement tool used each week was a fluency passage based on the student's instructional reading level. The study involved the use of a posttest design to measure the data collected from the weekly readings including Words Correct Per Minute (WCPM), accuracy, and overall fluency score. Findings from the intervention indicated an overall increase in reading fluency scores for students who were initially below grade level or near grade level.

CHAPTER I

INTRODUCTION

The process in becoming a fluent reader is based on the mastery of five essential components of reading. These components include: phonemic awareness, phonics, fluency, vocabulary, and comprehension. The mastery of each component is developed over time and are interdependent on one another. These components contribute to the development of a fluent reader.

Fluency connects the individual words in text to their meaning. It has two essential components: automaticity and prosody. Automaticity refers to the ability to recognize words automatically or effortlessly. Prosody is the expressive phrasing and intonation readers use as they read a selected text. It completes the bridge by connecting to comprehension (Rasinski, 2012). Fluency builds upon phonics and phonemic awareness. In early childhood, students are taught letter-sound relationships and spelling patterns. Then, they learn to decode words and automatically recognize high frequency words in text. Once students are able to read with accuracy and appropriate pacing, their focus then falls on comprehension of text. This is the ultimate goal of reading. If fluency is not achieved, more of the student's attention and time is drawn to decoding words. This impacts their ability to comprehend the text and often frustrates the reader because of their inability to read smoothly and to remember what the text is about. Fluency plays an important role in becoming a successful reader.

There is a wide range of instructional reading strategies that can be implemented into daily reading instruction that reinforces and strengthens fluency. Instructional strategies include guided small group reading, repeated reading and Reader's Theater. The most pivotal

instructional strategy for teachers to utilize is modeling appropriate fluency (Cahill & Gregory, 2011). Students who are exposed to consistent practice with sight words or phrases will also be better supported with their fluency development.

Research on evidence-based practices in beginning reading concluded that beginning reading instruction should be composed of certain key instructional components with one of those components being fluency (Slee, 2008). In elementary schools especially, it is important for readers to be fluent since it impacts their comprehension. In the school where this researcher teaches, there is a high percentage of students who are falling behind in reading and have a difficult time teaching their targeted instructional reading level. Guided reading instruction is heavily enforced in all grade levels and peer observations are encouraged in order to gain insight into effective instructional strategies that can be used to help students become fluent readers. The range of reading needs vary in each classroom; however, fluency is the most common deficit.

In this study, students who are reading at least three reading levels below grade level will participate in daily guided reading instruction with added fluency intervention. During this time, they will receive phonics and sight word practice. Since guided reading rotations is a daily requirement in this researcher's school, the only difference will be the additional focus on repeated readings of sight word sentences found in student Fluency Folders, which have been strategically assembled, based on student reading level and fluency progress. These Fluency Folders contain phonics skill review, sight word phrases and sentences in addition to a progress monitoring sheet for students to track their fluency progress. Fluency will be modeled through the use of the Reader's Theater strategy and students will have their own passage to practice. This school has a license with the online reading program called Ticket-to-Read, a self-paced

program that focuses on foundational skills, fluency, vocabulary and comprehension. Students will be using this online program for 15 minutes daily following their guided reading group time.

Statement of Problem

What is the impact of implementing daily practice of Fluency Folders, Reader's Theater and Ticket-to-Read on reading fluency skills in struggling readers?

Hypothesis

The null hypothesis is that there will be no difference in the fluency progress across guided reading instructional conditions of the independent variable. With added support, there will be no change in performance.

Operational Definitions

Students who are reading below grade level by three or more reading levels will be included in the treatment group. Their reading levels are based on their performance on the Fountas and Pinnell Reading Benchmark Assessment. This assessment recommends a placement level for instruction, identifies students who need intervention and extra support, and monitors student progress across a school year.

The independent variable will be the guided reading instruction students are receiving. During the treatment, instruction will include the use of Fluency Folders focusing on phonics review, sight words and sentences to practice sight word identification, speed and accuracy. They will also be exposed to modeled fluency, the repeated reading strategy and Reader's Theater practice with various passages.

The dependent variable for the study will be the change in students' fluency performance on the reading assessment or specifically defined as the words per minute read correctly. This will measure fluency achievement. Reading fluency performance will be measured using the Fountas and Pinnell Reading Benchmark Assessment. The fluency performance will be defined as the comparison between the score of the first assessment with the score of the second assessment.

CHAPTER II

REVIEW OF LITERATURE

This literature review attempts to explore the impact of instructional strategies used in guided reading to improve fluency skills of struggling readers at the elementary level. Section one presents an overview of the role of fluency and its connection with other components of reading. The importance of reading fluency instruction is explained in section two. Section three examines the characteristics of poor reading fluency versus those of fluent readers. Section four discusses instructional reading strategies that can be used to improve fluency in the classroom.

Definition of Reading Fluency

Fluency in reading is defined as the ability to read words quickly, accurately, and with expression by automatically recognizing them. It provides a bridge between word recognition and comprehension (Nunez, 2009). The acquisition of sight words improves fluency and, consequently, reading proficiency and builds a reader's self-confidence as a developing fluent reader.

There are four phases that a reader goes through in the development of sight word recognition and automaticity, which are crucial for fluency. The first is the pre-alphabetic phase. In this phase, readers recall sight words by making connections between visual attributes of the words and either their pronunciation or meaning. In this phase, letter-sound relationships are not involved yet, because readers are looking at the words as pictures in order to remember what the words say, rather than sounding the words out. The next phase is partial alphabetic recognition. Readers make connections between some letters in words, typically concentrating on either the initial or final letters and their corresponding sounds. It focuses on the knowledge of letter names

and the reader's phonological awareness. As students learn how to read, they spend more time on coming to understand the alphabetic system. In the full alphabetic phase, readers recognize conventional spellings and are able to sound out other words with similar spellings. This allows readers to analyze the connections between graphemes and phonemes in words. They are able to decode unfamiliar words and store fully analyzed sight words in memory. The recognition of similar spellings allows readers to read new words by determining how to pronounce unfamiliar spellings. At this stage they are able to decode words, which later become sight words that they will eventually recognize automatically. The last phase, the consolidated alphabetic phase, is when readers consolidate their knowledge of blending letter sounds into larger units that recur in different words. These four phases contribute to the development of a fluent reader (Stahl & Yaden, 2004).

Fluency is one of the crucial pillars that contributes to successful reading. Along with fluency, other pillars of reading include: phonics, phonemic awareness, vocabulary, and comprehension. These serve as the foundation for a reader to be able to successfully decode, automatically recognize, and read words in order to understand the meaning of text. Learning to read is a complex process. As Stahl & Yaden (2004) stated,

> Research suggests that learning to decode involves phonological awareness, a concept of the form and function of writing, knowledge of the alphabet, and knowledge about sound-symbol and sound-spelling relations. Decoding is not complete, however, until the child can read words fluently and automatically so that written text is transparent and does not present a barrier to comprehension. (p. 149)

Reading fluency is made up of automaticity in word recognition and expression in oral reading so that what is read reflects the meaning of the text. It is the essential link between word recognition at one end of the reading spectrum and reading comprehension at the other (Rasinski, 2014). Automatic word recognition reduces the focus on sounding out words and allows readers to pay more attention to making connections and monitoring their comprehension while reading. "As students engage in guided and independent reading, their ability to recognize words improves, their vocabulary increases, their comprehension advances, and their reading fluency, both in terms of word recognition, automaticity and prosody, improves" (Kuhn, Rasinski, & Zimmerman, 2014, p. 72).

Importance of Reading Fluency Instruction

Fluency is an essential element of proficient and meaningful reading. Reading fluency instruction allows educators to work with students on a more intensive and purposeful level in order to target the specific areas that prevent them from reading fluently and understanding the meaning of text. According to Miller and Schwanenflugel (2008) "research has suggested that children who do not develop fluency early on in the schooling process are likely to experience difficulty learning and comprehending important material from texts introduced in later grades" (p. 336).

When students spend more time decoding words and read at rates that are too slow, they can often lose track of words in sentences and fail to understand the overall meaning of what is read. By helping them increase their fluency stamina, fluency instruction can help them read more fluidly and at an appropriate pace. "Despite solid basic reading instruction, a significant

number of students will still struggle in their fluency development. For these students a more direct and intensive form of fluency instruction may be appropriate" (Kuhn, et al., 2014, p. 72).

"Fluency is a transitional stage that allows the reader to utilize higher order thinking skills necessary for more complex demands of comprehension, it is necessary for them to transition from simple word decoding in texts to fluent word recognition that allows them to construct meaning" (Rasinski, Rupley, Pagie, & Nichols, 2016, p. 164).

Characteristics of Poor Reading Fluency versus Fluent Readers

Rasinski (2014) describes Stanovich's interactive compensatory model of reading fluency, stating that "Stanovich (1980) argued that the automaticity component of fluency is a distinguishing factor between good and struggling readers" (p. 5). He also notes that **"**Readers who lack sufficient practice in reading are unlikely to develop automaticity in word recognition" (p. 164). Struggling readers who are unable to demonstrate this automaticity in word recognition read at a far slower rate than fluent readers. Their time spent reading words takes away from their ability to comprehend the text and thus impacts their motivation to read. Reading becomes more frustrating for them because most of their time is spent working on identifying the sounds of letters to blend together to make words (Rasinski, et al., 2016). They read words in isolation and have limited sight word vocabulary. When a reader lacks word recognition accuracy and automaticity and is unable to read fluently, it prevents them from progressing to the next level: reading for meaning and learning.

Determining why a reader is not fluent can help determine what to do to help the student. "Reading fluency may be poor due to a combination of decoding problems and language limitations. These students often have difficulty meeting both foundational and comprehension-

related standards from the Common Core" (Spear-Swerling, 2016, p. 518). Distinguishing between fluent and disfluent readers can help teachers recognize when and how to intervene to improve students' fluency. Following is a brief summary of traits of fluent readers.

A fluent reader can be described as one who is accurate in word decoding, demonstrates automaticity in word recognition and appropriate use of prosodic features such as stress, pitch, and suitable phrasing. Fluent readers also read with adequate speed and their oral reading mirrors spoken language (Rasinski, et al., 2016). These readers have developed the automatic word recognition skills necessary to spend more of their focus on their comprehension of text. They are able to utilize a variety of word recognition strategies that make reading almost effortless because they are able to apply those strategies to decode or fix errors while reading. Fluent readers are more receptive to reading practice and feedback, thus being able to adjust their intonation, expression, or reading pace as needed.

Instructional Reading Strategies to Improve Fluency

There are various instructional reading strategies that can be implemented in the classroom to improve fluency.

Repeated reading is a strategy used to help develop the reading rate of readers. It focuses on re-reading the same text repeatedly until an appropriate level of fluency is reached. Repeated oral reading, followed by feedback and effective instruction, promotes improvements in reading for students at all levels (Swain, Leader-Janssen, & Conley, 2017, p. 106). Rasinski, et al. (2016) state that studies have found that repeated readings lead to improved student word recognition accuracy, reading rate, expressive and meaningful reading, reading comprehension, and confidence in reading, not only on the passages which the students have practiced but also on

unfamiliar texts. Repeated readings allow students to practice speed and expression rather than decoding when they are reading text on their independent reading level. When students engage in repeated readings, they improve their ability to read the text practiced and demonstrate improvement in overall reading achievement (Cahill & Gregory, 2011). It is important to note that with this strategy, students should be reading text that is on their independent or instructional level. If the text is at their frustration level, it will be too difficult for them to successfully decode words and understand the content of the text. This instructional strategy gives readers the chance to practice reading a variety of texts until they become able to read texts independently without errors, thus attaining a sense of mastery and confidence.

Reader's Theater is an engaging way for students to perform repeated readings for an audience. It is often referred to as the oral performance that is a natural goal of repeated reading (Chase & Rasinski, 2009). The text selections that are chosen for Reader's Theater often contain topics of interest for students. This motivates them to want to read more and become the expert who shares about the topic aloud. Various types of text used in Reader's Theater include speeches, songs, scripts, poetry, and plays. When these texts are read aloud, it encourages and reinforces prosodic reading. Prosodic reading entails expressive reading with emphasis on phrasing and intonation. This instructional strategy is an enjoyable experience for readers in which they take on the role of another character and showcase their personality and comprehension through their performance. Through Reader's Theater, readers can use their voices to communicate meaning and develop their fluency through practice and their expression of the meaning of the text they are trying to convey (Rasinski, et al., 2016).

Modeling fluency has also been shown to be an effective way for students to learn how a fluent reader's voice should sound and helps them to better understand the text. By reading aloud daily to students, they are exposed to appropriate rate, intonation and expression while reading. It is important that teachers take time to explicitly discuss with students how expression and appropriate speed is used while reading. By modeling and practicing reading fluently, it gives students the opportunity to discuss the quality of fluency they heard and examine unfamiliar vocabulary and concepts in the passage (Cahill & Gregory, 2011). When specific feedback is given to students, they are able to practice on those certain aspects of fluency as they read. These strategies are effective and engaging in helping the progression of fluency skills for struggling readers.

Summary

Fluency is a key pillar in the development of a competent reader. The ability to automatically identify words as one reads at an appropriate pace contributes to his or her ultimate comprehension of text. If fluency is not mastered, then comprehension, in addition to confidence and enjoyment of reading, is impacted. If a reader is unable to comprehend what they are reading, he or she will not be able to understand the author's purpose or be able to learn new information. Fluent readers spend less time decoding words and instead focus their attention on what texts mean. Specific instructional strategies should be implemented to help readers develop fluency. Repeated Reading, Reader's Theater, and Modeling Fluency have been shown to be effective instructional strategies that can be used to expose students to and facilitate their development of fluent reading practice and skills. Their implications for the fluency of particular groups of students warrants further study.

CHAPTER III

METHODS

The purpose of this study is to determine the impact of implementing daily practice of Fluency Folders, Reader's Theater and Ticket-to-Read on improving reading fluency skills in struggling readers.

DESIGN

This study is based on the quasi-experimental design. Students were first assessed using the Fountas and Pinnell assessment to determine their instructional reading level. The fluency pre- and post-assessments were obtained from the McGraw-Hill Wonders Reading Program. Student fluency scores were analyzed. This included the Words Correct Per Minute (WCPM), accuracy, and overall fluency score. WCPM is measured by the number of words read minus the errors in one minute. The accuracy is calculated by WCPM divided by Words Read. The fluency score is determined based on phrasing, expressive interpretation, pausing, attention to author's meaning or punctuation, appropriate stress and rate. The score is based on a numeric scale of 0, 1, 2, or 3 - with 3 being fluency.

Students who were reading at least two reading levels below grade level were selected to partake in group one. This group consisted of thirteen students. These thirteen students struggled with sight word identification, decoding, and fluency. Their fluency impacted their comprehension of various texts. These thirteen students participated in daily intervention strategies to improve their fluency scores. The second group consisted of nine students. These students did not receive intervention strategies. They demonstrated characteristics of fluent

readers, read on grade level or above, and their comprehension was not impacted by their fluency while reading. Groups were selected to determine if students' fluency skills could be improved through solely guided reading instruction.

PARTICIPANTS

In this study, the participants were twenty-two first grade students. The school used in this research is located in a suburban area in Anne Arundel County. There are 758 students within grades Pre-Kindergarten through 5th grade. Nine percent of the student population have Language Education Plans, 53% receives Free and Reduced Meals, and 7% are Students with Disabilities. There is a high referral rate for disruption, defiance, and contact within the classroom. The student population is diverse and comes from lower- to middle-class families. Parent involvement and support with academic progress is divided between involved and inconsistent families participating in school events and continuing academic practice at home. This school is a targeted Title I, International Baccalaureate Primary Years Program School (IBPYP). Through Title I and IBPYP funding, the school receives monetary and resource support to plan for and purchase instructional materials and have the capacity to hire additional adult support within the classrooms.

INSTRUMENT

For this study, Fountas and Pinnell reading levels were used to determine student grouping. Student performance on the fluency assessment provided by the Wonders Reading Program were used to measure achievement in fluency. The researcher used this reading

assessment for both the pre-test, weekly progress monitoring, and post-test data. Points of data include WCPM, accuracy, and overall fluency score.

PROCEDURE

Students' Fountas and Pinnell instructional reading level scores were analyzed and used to determine who would participate in this action research project. Twenty-two students were selected. Thirteen of the Twenty-two students read at least two levels below grade level. Their overall fluency scores were 2 or below. They received additional support with various intervention strategies to help improve their fluency scores. The remaining nine students, in group two, scored at least a 2 in fluency and read on grade level or above.

After the groups were determined, the researcher then assessed student fluency further by assessing WCPM, accuracy, and overall reading fluency score based on their instructional reading level. The researcher then immediately implemented intervention strategies with Group One. The intervention strategies implemented were Fluency Folders, Reader's Theater with weekly stories, and the Ticket-to-Read computer program. The Fluency Folders included phonics review, sight words and sentences to practice sight word identification, speed and accuracy. Each week, guided reading books are selected based on instructional reading level, and through the duration of this action research, books were strategically used with a story that could be read with a Reader's Theater application. Lastly, Ticket-to-Read is a computer program that adapts to the progress of student's mastery of phonics, sight word, and fluency skills. The program tracks timing of student responses to tasks and accuracy, then provides them with either remedial lessons to practice a skill until its mastered or moves them forward to the next skill. Students

spend fifteen minutes in this center four days a week during guided reading rotations. Group Two did not receive any of these intervention strategies over the course of this study.

The duration of this action research project lasted approximately 6 weeks. The researcher closely monitored all twenty-two students through progress monitoring data and informal observations during guided reading group time. The post-test was administered using the Wonders Reading Program assessment to analyze progress with WCPM, accuracy and overall fluency score.

CHAPTER IV

RESULTS

The purpose of this study was to determine whether first grade students receiving an additional fluency intervention during daily guided reading instruction over a 5 week time frame would make significant improvement in their reading fluency scores. The study was based on the quasi-experimental design and measured the reading fluency scores, specifically words read correctly per minute (WCPM), accuracy, and an overall fluency score each week. The fluency passages used to track progress each week was chosen based on the students' instructional reading level. These were determined based on their reading performance on the Fountas and Pinnell benchmark reading assessment that was given prior to the start of the intervention period. The number of words correctly read in one minute, accuracy and overall fluency score measured the reading fluency of the students.

Overall, the WCPM, accuracy, and fluency scores increased from week-to-week for both the low and high groups. The low group was composed of students who were reading below grade level by 3 or more reading levels. The high group consisted of students who were reading on or below grade level by 1-2 reading levels. Eight out of 12 times, the low group demonstrated statistically significant weekly improvement for the totality of WCPM, accuracy, and fluency. They showed week-to-week increases all 4 times for WCPM. The high group demonstrated statistically significant weekly increases 7 out of 12 times. They outperformed the low group with significantly higher scores than the low group 10 out of 15 times for the totality of WCPM, accuracy, and fluency as well as each week for WCPM. Tables 1, 2 and 3 summarize the results

of the students' fluency mean scores and the results of the tests of the null hypotheses. Detailed tables of the paired t-tests (week-to-week gains) and the 2-group t-tests (low v. high for each week) are presented in Appendix A.

Table 1.
Means Scores by Group (Low v. High)

Outcome	Group	Week1	Week2	Week3	Week4	Week5
WCPM	Low	22.3	26.8	33.9	38.6	49.4
WCPM	High	36.6	46.3	51.3	59.6	79.3
Accuracy	Low	76.8	79.8	85.5	89.1	92.3
Accuracy	High	85.6	91.2	91.8	93.6	94.7
Fluency	Low	1.15	1.23	1.54	2.08	2.38
Fluency	High	1.44	1.89	2.22	2.44	2.89

Low group had 13 students; high group had 9 students

Table 2.
Week-to-Week Statistically Significant Mean Changes, Paired t-tests, $p<.05$

Outcome	Group	Weeks 1-2	Weeks 2-3	Weeks 3-4	Weeks 4-5
WCPM	Low	Significant	Significant	Significant	Significant
WCPM	High	Significant	Not Signif.	Significant	Significant
Accuracy	Low	Not Signif.	Significant	Not Signif.	Significant
Accuracy	High	Significant	Not Signif.	Significant	Not Signif.
Fluency	Low	Not Signif.	Not Signif.	Significant	Significant
Fluency	High	Significant	Not Signif.	Not Signif.	Significant

Low group had 13 students; high group had 9 students

Table 3.
Statistically Significant Mean Differences Low v. High, 2-sample t-test, p<.05

Outcome	Week 1	Week 2	Week 3	Week 4	Week 5
WCPM	Low<High	Low<High	Low<High	Low<High	Low<High
Accuracy	Not Signif.	Low<High	Not Signif.	Low<High	Not Signif.
Fluency	Not Signif.	Low<High	Low<High	Not Signif.	Low<High

The original null hypothesis stating that there will be no difference in fluency progress across guided reading instructional conditions of the independent variable was rejected. The results and implications will be discussed in the next chapter.

CHAPTER V

DISCUSSION

The purpose of this study was to determine the effect of an additional fluency intervention on first graders' reading fluency. The null hypothesis stating that there will be no difference in fluency progress from week-to-week with added support was rejected for 15 out of 24 tests of significance. Data from the study was analyzed in Chapter IV and generally indicated statistically significant results.

Implications of the Results

The results indicated that if the study took place over a longer time frame, the results might have been more significant. Although there were positive gains in data collected, most of the students were not able to finish the reading passage in one minute. The high group outperformed the low group despite the additional fluency strategies implemented with the low group.

However, the findings indicated that reading fluency scores showed an overall increase in performance. All students made progress week-to-week in WCPM, accuracy and an overall fluency score. The students were motivated to want to do better each week and were happy to see that they were getting further in the passage each time they read. They acknowledged the progress they were making and their increased confidence and motivation became more apparent each week. However, it is important to consider the threats to validity of the study, discussed in the next section.

Theoretical Consequences

Based on recent research, *repeated reading* improves student word recognition accuracy, reading rate, expressive and meaningful reading, reading comprehension, and confidence in reading (Rasinski, 2016). Using fluency folders that were made specific to the students reading needs proved effective. These folders included a variety of foundational literacy-based readings such as sight words, sound blending cards, and sight word sentences and passages. These changed weekly depending on the progress of student performance. It was noted by the researcher that the self-motivation and confidence of students in every group increased and they were more engaged than the week prior. Students were more inclined to independently apply the fluency strategies that were modeled in their own reading. It was apparent that as their self-confidence grew, they wanted to read more like 'scoop readers', reading 2-3 words in chunks at a time, rather than 'robot readers', reading words in monotonous isolation. Repeated reading became familiar for the students each week and the repetitive practice helped them feel like they were the experts of word recognition and accuracy.

Reader's Theater was an engaging strategy used in this study, and one that the students truly enjoyed. They looked forward to reading each week and were curious to know what their parts were in the beginning of the week and looked forward to perform at the end. It encouraged them to take their parts seriously and to practice so they could properly deliver their role in the story. According to Rasinski, 2016, Reader's Theater allows readers to use their voices to communicate meaning and develop their expression of the meaning they are trying to convey. This is important in developing fluent readers because it focuses on phrasing and expressive

reading. It also contributes to developing a fluent reader's comprehension of understanding various topics and types of text.

Threats to Validity

There were several threats to validity that emerged during this study. The intervention took place over the course of only five weeks, in which a teacher had to practice phonics skills and sight words, utilize Ticket-to-Read and teach Reader's Theater in order to collect data for the study. The time for the intervention was a short period and might have limited the effectiveness of the intervention. It would have been more beneficial if there were more time to narrow the achievement gap between the struggling readers and those reading on grade level. There were several days that were lost due to weather conditions closing school early or having no school at all. One day was impacted due to an unanticipated lockdown. This caused some lessons to be combined and readjusted in order to meet the lessons planned each week. As a result, students were not able to practice to its entirety for as many days that were planned. There were a few days that Chromebooks were taken to use for testing in intermediate grade level classrooms. This lessened the access to technology from five devices to two, which limited the number of students who could access Ticket-to-Read.

An additional threat to validity was the lack of diversity in the groups. There are two English Language Learners (ELL) in the treatment group who receive additional support from an ELL teacher. These students struggle with reading fluency because English is not the primary language at home and they are not reading a language that is familiar to them. Their pronunciation, grammar, and phonetic sounds sometimes impacted the way they read and interpreted sounds and decoding words. All but one of the students in the treatment group

qualified for free or reduced meals, where as the majority of the control group did not qualify for free or reduced meals. Students raised in low socioeconomic families are often at a higher risk of developing reading difficulties and not typically consistently supported or exposed to a language or print-rich environment due to a lack of resources and experience at home.

A third threat to validity that may have affected the posttest scores was that three students in the treatment group also received Leveled Literacy Intervention three days per week from a reading specialist. Although these students were concerns for attendance and tardiness from school, they still received extra reading support in foundational literacy skills in addition to the guided reading intervention. A solution to this problem would have been to exclude the data for these students in order to eliminate this threat to validity.

Despite the truncations, curtailments, and real-world interruptions, students generally improved their fluency scores from week-to-week, whether they were low or high level at the beginning of the study.

Connections to Existing Literature and Other Research

"Fluency matters simply because it is an essential element of proficient and meaningful reading" (Rasinski, 2014, p. 5). The ability to read fluently allows readers to build on their confidence of being able to read expressively and develop their comprehension of a variety of texts. It is also important that in order for students to be fluent, they should be proficient in decoding words. If students have a weak foundation of phonics skills and struggles to blend unfamiliar words, their fluency is significantly impacted. "The combination of seeing the words

while hearing them pronounced leads developing readers to improved and more expressive recognition of the words in text" (Cahill & Gregory, 2011, p. 128).

Results from another study conducted by Clark, Morrison and Wilcox indicated that findings showed inconsistent accuracy scores among the participants, however motivation and confidence increased through the use of Reader's Theater (2009). Two of the three participants showed significant improvement in their WCPM and accuracy scores by the end of the 8th week intervention. The participants developed the ability to include expression and volume in oral reading, while reading at a smooth and consistent pace. The study supported the importance of reading prosody, or the phrasing, pacing, and smoothness, all of which contribute to developing fluency. The noticeable observation of increase in student engagement, motivation and confidence is a similarity discovered between this study and the study conducted by the researcher.

Implications for Future Research

Additional research and data collection from previous studies and student progress would provide insight into different methods for teaching phonics and fluency strategies. The duration of this study could be lengthened to longer than 5 weeks to provide more insight and time in the development of fluency skills. A longer study is more valuable in analyzing the overall development of fluency and would provide important data for each student as they progress throughout their elementary school years.

Another implication for future research is to involve parents earlier in the education of their child. It is important that teachers work collaboratively with parents to better support them with resources that can be used at home to continue their child's reading development and progress. When parents and guardians are exposed to and well-informed of strategies to use with their child, they are more inclined to be more supportive and involved with their child's academic achievement.

The last variable that could be considered for future research is the amount of time students work in guided reading groups. The amount of time spent in group lasted about 15 minutes daily. It would be beneficial to conduct further research to determine if students, who worked in groups for more or less than 15 minutes daily, impacted their fluency development. It would be interesting to also analyze whether their motivation was affected by the increased or decreased time of practice. The intervention could also be applied to multiple classrooms in schools that differed demographically.

Conclusion

This study was completed to determine the impact of implementing daily practice of Fluency Folders, Reader's Theater and Ticket-to-Read on reading fluency skills in struggling readers. The results showed that the high group outperformed the low group despite the additional practice of fluency folders, Reader's Theater and use of Ticket-to-Read. However, most of the gains from week-to-week were statistically significant for both low and high students even with small samples. WCPM, accuracy, and fluency scores increased across the five weeks with both groups.

REFERENCES

Cahill, M. A., & Gregory, A. E. (2011). Putting the fun back into fluency instruction. The Reading Teacher, 65(2), 127. Retrieved from https://goucher.idm.oclc.org/login?url=http://search.proquest.com.goucher.idm.oclc.org/docview/1032779770?accountid=11164

Chase, Y., & Rasinski, T. (2009). Implementing Readers Theatre as an Approach to Classroom Fluency Instruction. Reading Teacher, 63(1), 4-13.

Clark, R., Morrison, T. G., & Wilcox, B. (2009). Readers' Theater: A Process of Developing Fourth-Graders' Reading Fluency. Reading Psychology, 30(4), 359-385. doi: 10.1080/02702710802411620

Kuhn, M., Rasinski, T., & Zimmerman, B. (2014). Integrated fluency instruction: Three approaches for working with struggling readers. International Electronic Journal of Elementary Education, 7(1), 71-82. Retrieved from https://goucher.idm.oclc.org/login?url=http://search.ebscohost.com.goucher.idm.oclc.org/login.aspx?direct=true&db=eric&AN=EJ1053592&site=ehost-live&scope=site

Miller, J., & Schwanenflugel, P. J. (2008). A Longitudinal Study of the Development of Reading Prosody as a Dimension of Oral Reading Fluency in Early Elementary School Children. Reading Research Quarterly, 43(4), 336-354.

Nunez, L. D. (2009). An analysis of the relationship of reading fluency, comprehension, and word recognition to student achievement (Order No. 3358170). Available from Education Database. (305142648). Retrieved from 20 https://goucher.idm.oclc.org/login?url=http://search.proquest.com.goucher.idm.oclc.org/docview/305142648?accountid=11164

Rasinski, T. V. (2012). Why reading fluency should be hot! The Reading Teacher, 65(8), 516. Retrieved from https://goucher.idm.oclc.org/login?url=http://search.proquest.com.goucher.idm.oclc.org/docview/1032776531?accountid=11164

Rasinski, T. (2014). Fluency matters. International Electronic Journal of Elementary Education, 7(1), 3-12. Retrieved from https://goucher.idm.oclc.org/login?url=http://search.ebscohost.com.goucher.idm.oclc.org/login.aspx?direct=true&db=eric&AN=EJ1053609&site=ehost-live&scope=site

Rasinski, T. V., Rupley, W. H., Pagie, D. D., & Nichols, W. D. (2016). Alternative text types to improve reading fluency for competent to struggling readers. International Journal of Instruction, 9(1), 163-178. Retrieved from https://goucher.idm.oclc.org/login?url=http://search.ebscohost.com.goucher.idm.oclc.org/login.aspx?direct=true&db=eric&AN=EJ1086966&site=ehost-live&scope=site

Slee, J. M. (2008). Effects of adding fluency instruction to accuracy instruction on the reading achievement of kindergarteners at risk for failure (Order No. 3320938). Available from Education Database. (304350878). Retrieved from https://goucher.idm.oclc.org/login?url=http://search.proquest.com.goucher.idm.oclc.org/docview/304350878?accountid=11164

Spear-Swerling, L. (2016). Common Types of Reading Problems and How to Help Children Who Have Them. Reading Teacher, 69(5), 513-522. doi: 10.1002/trtr.1410

Stahl, S., & Yaden, Jr., D. (2004). The Development of Literacy in Preschool and Primary Grades: Work by the Center for the Improvement of Early Reading Achievement. The Elementary School Journal, 105(2), 141-165. doi:10.1086/428862

Swain, K. D., Leader-Janssen, E., & Conley, P. (2017). Effects of repeated reading and listening passage preview on oral reading fluency. Reading Improvement, 54(3), 105-111. Retrieved from https://goucher.idm.oclc.org/login?url=http://search.ebscohost.com.goucher.idm.oclc.org/login.aspx?direct=true&db=a9h&AN=125088711&site=ehost-live&scope=site

APPENDIX A

Tables of paired t-tests for week-to-week score changes

-> group = Low

Paired t test

Variable	Obs	Mean	Std. Err.	Std. Dev.	[95% Conf.	Interval]
wcpm2	13	26.76923	3.681474	13.27375	18.74799	34.79047
wcpm1	13	22.30769	3.451838	12.44578	14.78678	29.8286
diff	13	4.461538	1.579579	5.695252	1.019932	7.903145

mean(diff) = mean(wcpm2 - wcpm1) t = 2.8245

Ho: mean(diff) = 0 degrees of freedom = 12

Ha: mean(diff) < 0 Pr(T < t) = 0.9923

Ha: mean(diff) != 0 Pr(|T| > |t|) = 0.0153

Ha: mean(diff) > 0 Pr(T > t) = 0.0077

-> group = Low

Paired t test

Variable	Obs	Mean	Std. Err.	Std. Dev.	[95% Conf.	Interval]
wcpm4	13	38.61538	4.092737	14.75657	29.69808	47.53269
wcpm3	13	33.92308	4.084777	14.72787	25.02311	42.82304
diff	13	4.692308	.9895908	3.56802	2.536175	6.848441

mean(diff) = mean(wcpm4 - wcpm3) t = 4.7417
Ho: mean(diff) = 0 degrees of freedom = 12

Ha: mean(diff) < 0 Ha: mean(diff) != 0 Ha: mean(diff) > 0
Pr(T < t) = 0.9998 Pr(|T| > |t|) = 0.0005 Pr(T > t) = 0.0002

-> group = High

Paired t test

Variable	Obs	Mean	Std. Err.	Std. Dev.	[95% Conf.	Interval]
wcpm4	9	59.55556	6.813204	20.43961	43.84428	75.26683
wcpm3	9	51.33333	6.463573	19.39072	36.42831	66.23836
diff	9	8.222222	2.515385	7.546154	2.421735	14.02271

mean(diff) = mean(wcpm4 - wcpm3) t = 3.2688
Ho: mean(diff) = 0 degrees of freedom = 8

Ha: mean(diff) < 0 Ha: mean(diff) != 0 Ha: mean(diff) > 0
Pr(T < t) = 0.9943 Pr(|T| > |t|) = 0.0114 Pr(T > t) = 0.0057

-> group = Low

Paired t test

Variable	Obs	Mean	Std. Err.	Std. Dev.	[95% Conf.	Interval]
wcpm5	13	49.38462	5.097182	18.37815	38.27881	60.49042
wcpm4	13	38.61538	4.092737	14.75657	29.69808	47.53269
diff	13	10.76923	2.250794	8.115354	5.865171	15.67329

mean(diff) = mean(wcpm5 - wcpm4) t = 4.7846
Ho: mean(diff) = 0 degrees of freedom = 12

Ha: mean(diff) < 0 Ha: mean(diff) != 0 Ha: mean(diff) > 0
Pr(T < t) = 0.9998 Pr(|T| > |t|) = 0.0004 Pr(T > t) = 0.0002

-> group = High

Paired t test

Variable	Obs	Mean	Std. Err.	Std. Dev.	[95% Conf.	Interval]
wcpm5	9	79.33333	6.827233	20.4817	63.58971	95.07696
wcpm4	9	59.55556	6.813204	20.43961	43.84428	75.26683
diff	9	19.77778	3.094699	9.284096	12.64139	26.91417

mean(diff) = mean(wcpm5 - wcpm4) t = 6.3909
Ho: mean(diff) = 0 degrees of freedom = 8

Ha: mean(diff) < 0 Ha: mean(diff) != 0 Ha: mean(diff) > 0
Pr(T < t) = 0.9999 Pr(|T| > |t|) = 0.0002 Pr(T > t) = 0.0001

-> group = Low

Paired t test

Variable	Obs	Mean	Std. Err.	Std. Dev.	[95% Conf.	Interval]
accura~2	13	79.76923	3.479157	12.54428	72.1888	87.34966
accura~1	13	76.76923	4.233798	15.26518	67.54458	85.99389
diff	13	3	2.423179	8.736895	-2.279653	8.279653

mean(diff) = mean(accuracy2 - accuracy1) t = 1.2380
Ho: mean(diff) = 0 degrees of freedom = 12

Ha: mean(diff) < 0 Ha: mean(diff) != 0 Ha: mean(diff) > 0
Pr(T < t) = 0.8803 Pr(|T| > |t|) = 0.2394 Pr(T > t) = 0.1197

-> group = High

Paired t test

Variable	Obs	Mean	Std. Err.	Std. Dev.	[95% Conf.	Interval]
accura~2	9	91.22222	1.839216	5.517648	86.98098	95.46346
accura~1	9	85.55556	2.828973	8.486918	79.03193	92.07918
diff	9	5.666667	1.724013	5.17204	1.691085	9.642249

mean(diff) = mean(accuracy2 - accuracy1) t = 3.2869
Ho: mean(diff) = 0 degrees of freedom = 8

Ha: mean(diff) < 0 Ha: mean(diff) != 0 Ha: mean(diff) > 0
Pr(T < t) = 0.9945 Pr(|T| > |t|) = 0.0111 Pr(T > t) = 0.0055

-> group = Low

Paired t test

Variable	Obs	Mean	Std. Err.	Std. Dev.	[95% Conf.	Interval]
accura~3	13	85.53846	2.947436	10.62713	79.11655	91.96037
accura~2	13	79.76923	3.479157	12.54428	72.1888	87.34966
diff	13	5.769231	2.154762	7.769104	1.074408	10.46405

mean(diff) = mean(accuracy3 - accuracy2) t = 2.6774
Ho: mean(diff) = 0 degrees of freedom = 12

Ha: mean(diff) < 0 Ha: mean(diff) != 0 Ha: mean(diff) > 0
Pr(T < t) = 0.9899 Pr(|T| > |t|) = 0.0201 Pr(T > t) = 0.0101

-> group = High

Paired t test

Variable	Obs	Mean	Std. Err.	Std. Dev.	[95% Conf.	Interval]
accura~3	9	91.77778	1.351725	4.055175	88.66069	94.89486
accura~2	9	91.22222	1.839216	5.517648	86.98098	95.46346
diff	9	.5555556	1.454028	4.362084	-2.797439	3.90855

mean(diff) = mean(accuracy3 - accuracy2) t = 0.3821
Ho: mean(diff) = 0 degrees of freedom = 8

Ha: mean(diff) < 0 Ha: mean(diff) != 0 Ha: mean(diff) > 0
Pr(T < t) = 0.6438 Pr(|T| > |t|) = 0.7124 Pr(T > t) = 0.3562

-> group = Low

Paired t test

Variable	Obs	Mean	Std. Err.	Std. Dev.	[95% Conf.	Interval]
accura~4	13	89.07692	1.416304	5.106557	85.99106	92.16278
accura~3	13	85.53846	2.947436	10.62713	79.11655	91.96037
diff	13	3.538462	2.159105	7.784765	-1.165825	8.242748

mean(diff) = mean(accuracy4 - accuracy3) t = 1.6389
Ho: mean(diff) = 0 degrees of freedom = 12

Ha: mean(diff) < 0 Ha: mean(diff) != 0 Ha: mean(diff) > 0
Pr(T < t) = 0.9364 Pr(|T| > |t|) = 0.1272 Pr(T > t) = 0.0636

-> group = High

Paired t test

Variable	Obs	Mean	Std. Err.	Std. Dev.	[95% Conf.	Interval]
accura~4	9	93.55556	1.365356	4.096069	90.40704	96.70407
accura~3	9	91.77778	1.351725	4.055175	88.66069	94.89486
diff	9	1.777778	.4937886	1.481366	.6390993	2.916456

mean(diff) = mean(accuracy4 - accuracy3) t = 3.6003
Ho: mean(diff) = 0 degrees of freedom = 8

Ha: mean(diff) < 0 Ha: mean(diff) != 0 Ha: mean(diff) > 0
Pr(T < t) = 0.9965 Pr(|T| > |t|) = 0.0070 Pr(T > t) = 0.0035

-> group = Low

Paired t test

Variable	Obs	Mean	Std. Err.	Std. Dev.	[95% Conf.	Interval]
accura~5	13	92.38462	.8882312	3.202563	90.44933	94.3199
accura~4	13	89.07692	1.416304	5.106557	85.99106	92.16278
diff	13	3.307692	.7284037	2.626297	1.720637	4.894748

mean(diff) = mean(accuracy5 - accuracy4) t = 4.5410
Ho: mean(diff) = 0 degrees of freedom = 12

Ha: mean(diff) < 0 Ha: mean(diff) != 0 Ha: mean(diff) > 0
Pr(T < t) = 0.9997 Pr(|T| > |t|) = 0.0007 Pr(T > t) = 0.0003

-> group = High

Paired t test

Variable	Obs	Mean	Std. Err.	Std. Dev.	[95% Conf.	Interval]
accura~5	9	94.66667	1.178511	3.535534	91.94901	97.38432
accura~4	9	93.55556	1.365356	4.096069	90.40704	96.70407
diff	9	1.111111	.5121969	1.536591	-.0700171	2.292239

mean(diff) = mean(accuracy5 - accuracy4) t = 2.1693
Ho: mean(diff) = 0 degrees of freedom = 8

Ha: mean(diff) < 0 Ha: mean(diff) != 0 Ha: mean(diff) > 0
Pr(T < t) = 0.9691 Pr(|T| > |t|) = 0.0619 Pr(T > t) = 0.0309

-> group = Low

Paired t test

Variable	Obs	Mean	Std. Err.	Std. Dev.	[95% Conf.	Interval]
fluency2	13	1.230769	.2010819	.7250111	.7926494	1.668889
fluency1	13	1.153846	.1538462	.5547002	.8186442	1.489048
diff	13	.0769231	.1368856	.4935481	-.2213251	.3751712

mean(diff) = mean(fluency2 - fluency1) t = 0.5620
Ho: mean(diff) = 0 degrees of freedom = 12

Ha: mean(diff) < 0 Ha: mean(diff) != 0 Ha: mean(diff) > 0
Pr(T < t) = 0.7078 Pr(|T| > |t|) = 0.5845 Pr(T > t) = 0.2922

-> group = High

Paired t test

Variable	Obs	Mean	Std. Err.	Std. Dev.	[95% Conf.	Interval]
fluency2	9	1.888889	.2003084	.6009252	1.426977	2.350801
fluency1	9	1.444444	.1756821	.5270463	1.039321	1.849568
diff	9	.4444444	.1756821	.5270463	.0393208	.8495681

mean(diff) = mean(fluency2 - fluency1) t = 2.5298
Ho: mean(diff) = 0 degrees of freedom = 8

Ha: mean(diff) < 0 Ha: mean(diff) != 0 Ha: mean(diff) > 0
Pr(T < t) = 0.9824 Pr(|T| > |t|) = 0.0353 Pr(T > t) = 0.0176

-> group = Low

Paired t test

Variable	Obs	Mean	Std. Err.	Std. Dev.	[95% Conf.	Interval]
fluency3	13	1.538462	.1439099	.5188745	1.224909	1.852014
fluency2	13	1.230769	.2010819	.7250111	.7926494	1.668889
diff	13	.3076923	.1748485	.6304252	-.0732698	.6886544

mean(diff) = mean(fluency3 - fluency2) t = 1.7598
Ho: mean(diff) = 0 degrees of freedom = 12

Ha: mean(diff) < 0 Ha: mean(diff) != 0 Ha: mean(diff) > 0
Pr(T < t) = 0.9481 Pr(|T| > |t|) = 0.1039 Pr(T > t) = 0.0519

-> group = High

Paired t test

Variable	Obs	Mean	Std. Err.	Std. Dev.	[95% Conf.	Interval]
fluency3	9	2.222222	.2222222	.6666667	1.709777	2.734668
fluency2	9	1.888889	.2003084	.6009252	1.426977	2.350801
diff	9	.3333333	.1666667	.5	-.0510007	.7176674

mean(diff) = mean(fluency3 - fluency2) t = 2.0000
Ho: mean(diff) = 0 degrees of freedom = 8

Ha: mean(diff) < 0 Ha: mean(diff) != 0 Ha: mean(diff) > 0
Pr(T < t) = 0.9597 Pr(|T| > |t|) = 0.0805 Pr(T > t) = 0.0403

-> group = Low

Paired t test

Variable	Obs	Mean	Std. Err.	Std. Dev.	[95% Conf.	Interval]
fluency4	13	2.076923	.1368856	.4935481	1.778675	2.375171
fluency3	13	1.538462	.1439099	.5188745	1.224909	1.852014
diff	13	.5384615	.1439099	.5188745	.2249088	.8520143

mean(diff) = mean(fluency4 - fluency3) t = 3.7417
Ho: mean(diff) = 0 degrees of freedom = 12

Ha: mean(diff) < 0 Ha: mean(diff) != 0 Ha: mean(diff) > 0
Pr(T < t) = 0.9986 Pr(|T| > |t|) = 0.0028 Pr(T > t) = 0.0014

-> group = High

Paired t test

Variable	Obs	Mean	Std. Err.	Std. Dev.	[95% Conf.	Interval]
fluency4	9	2.444444	.1756821	.5270463	2.039321	2.849568
fluency3	9	2.222222	.2222222	.6666667	1.709777	2.734668
diff	9	.2222222	.1469862	.4409586	-.1167285	.561173

mean(diff) = mean(fluency4 - fluency3) t = 1.5119
Ho: mean(diff) = 0 degrees of freedom = 8

Ha: mean(diff) < 0 Ha: mean(diff) != 0 Ha: mean(diff) > 0
Pr(T < t) = 0.9155 Pr(|T| > |t|) = 0.1690 Pr(T > t) = 0.0845

-> group = Low

Paired t test

Variable	Obs	Mean	Std. Err.	Std. Dev.	[95% Conf.	Interval]
fluency5	13	2.384615	.1404417	.5063697	2.078619	2.690612
fluency4	13	2.076923	.1368856	.4935481	1.778675	2.375171
diff	13	.3076923	.1332347	.4803845	.0173989	.5979857

mean(diff) = mean(fluency5 - fluency4) t = 2.3094
Ho: mean(diff) = 0 degrees of freedom = 12

Ha: mean(diff) < 0 Ha: mean(diff) != 0 Ha: mean(diff) > 0
Pr(T < t) = 0.9802 Pr(|T| > |t|) = 0.0395 Pr(T > t) = 0.0198

-> group = High

Paired t test

Variable	Obs	Mean	Std. Err.	Std. Dev.	[95% Conf.	Interval]
fluency5	9	2.888889	.1111111	.3333333	2.632666	3.145112
fluency4	9	2.444444	.1756821	.5270463	2.039321	2.849568
diff	9	.4444444	.1756821	.5270463	.0393208	.8495681

mean(diff) = mean(fluency5 - fluency4) t = 2.5298
Ho: mean(diff) = 0 degrees of freedom = 8

Ha: mean(diff) < 0 Ha: mean(diff) != 0 Ha: mean(diff) > 0
Pr(T < t) = 0.9824 Pr(|T| > |t|) = 0.0353 Pr(T > t) = 0.0176

-> group = Low

Paired t test

Variable	Obs	Mean	Std. Err.	Std. Dev.	[95% Conf.	Interval]
wcpm4	13	38.61538	4.092737	14.75657	29.69808	47.53269
wcpm3	13	33.92308	4.084777	14.72787	25.02311	42.82304
diff	13	4.692308	.9895908	3.56802	2.536175	6.848441

mean(diff) = mean(wcpm4 - wcpm3) t = 4.7417
Ho: mean(diff) = 0 degrees of freedom = 12

Ha: mean(diff) < 0 Ha: mean(diff) != 0 Ha: mean(diff) > 0
Pr(T < t) = 0.9998 Pr(|T| > |t|) = 0.0005 Pr(T > t) = 0.0002

-> group = High

Paired t test

Variable	Obs	Mean	Std. Err.	Std. Dev.	[95% Conf.	Interval]
wcpm4	9	59.55556	6.813204	20.43961	43.84428	75.26683
wcpm3	9	51.33333	6.463573	19.39072	36.42831	66.23836
diff	9	8.222222	2.515385	7.546154	2.421735	14.02271

mean(diff) = mean(wcpm4 - wcpm3) t = 3.2688
Ho: mean(diff) = 0 degrees of freedom = 8

Ha: mean(diff) < 0 Ha: mean(diff) != 0 Ha: mean(diff) > 0
Pr(T < t) = 0.9943 Pr(|T| > |t|) = 0.0114 Pr(T > t) = 0.0057

-> group = Low

Paired t test

Variable	Obs	Mean	Std. Err.	Std. Dev.	[95% Conf.	Interval]
wcpm5	13	49.38462	5.097182	18.37815	38.27881	60.49042
wcpm4	13	38.61538	4.092737	14.75657	29.69808	47.53269
diff	13	10.76923	2.250794	8.115354	5.865171	15.67329

mean(diff) = mean(wcpm5 - wcpm4) t = 4.7846
Ho: mean(diff) = 0 degrees of freedom = 12

Ha: mean(diff) < 0 Ha: mean(diff) != 0 Ha: mean(diff) > 0
Pr(T < t) = 0.9998 Pr(|T| > |t|) = 0.0004 Pr(T > t) = 0.0002

Tables of Mean Differences Between Low and High Groups by Week

```
. ttest wcpm1, by(group)

Two-sample t test with equal variances
```

Group	Obs	Mean	Std. Err.	Std. Dev.	[95% Conf.	Interval]
Low	13	22.30769	3.451838	12.44578	14.78678	29.8286
High	9	36.55556	5.188425	15.56527	24.59103	48.52008
combined	22	28.13636	3.248906	15.23872	21.37989	34.89283
diff		-14.24786	5.974798		-26.71107	-1.784653

```
    diff = mean(Low) - mean(High)                                 t =  -2.3847
Ho: diff = 0                                     degrees of freedom =       20

    Ha: diff < 0                 Ha: diff != 0                 Ha: diff > 0
 Pr(T < t) = 0.0136         Pr(|T| > |t|) = 0.0271          Pr(T > t) = 0.9864
```

```
. ttest wcpm2, by(group)

Two-sample t test with equal variances
```

Group	Obs	Mean	Std. Err.	Std. Dev.	[95% Conf.	Interval]
Low	13	26.76923	3.681474	13.27375	18.74799	34.79047
High	9	46.33333	4.901814	14.70544	35.02973	57.63694
combined	22	34.77273	3.567489	16.73301	27.35373	42.19173
diff		-19.5641	6.01191		-32.10473	-7.023478

```
    diff = mean(Low) - mean(High)                                 t =  -3.2542
Ho: diff = 0                                     degrees of freedom =       20

    Ha: diff < 0                 Ha: diff != 0                 Ha: diff > 0
 Pr(T < t) = 0.0020         Pr(|T| > |t|) = 0.0040          Pr(T > t) = 0.9980
```

```
. ttest wcpm3, by(group)

Two-sample t test with equal variances

   Group |     Obs        Mean    Std. Err.   Std. Dev.   [95% Conf. Interval]
---------+--------------------------------------------------------------------
     Low |      13    33.92308    4.084777    14.72787    25.02311    42.82304
    High |       9    51.33333    6.463573    19.39072    36.42831    66.23836
---------+--------------------------------------------------------------------
combined |      22    41.04545    3.953998    18.54589    32.82267    49.26824
---------+--------------------------------------------------------------------
    diff |           -17.41026    7.263076               -32.56077   -2.259746
------------------------------------------------------------------------------
    diff = mean(Low) - mean(High)                                 t =  -2.3971
Ho: diff = 0                                     degrees of freedom =       20

    Ha: diff < 0                 Ha: diff != 0                 Ha: diff > 0
 Pr(T < t) = 0.0132         Pr(|T| > |t|) = 0.0264          Pr(T > t) = 0.9868

. ttest wcpm4, by(group)

Two-sample t test with equal variances

   Group |     Obs        Mean    Std. Err.   Std. Dev.   [95% Conf. Interval]
---------+--------------------------------------------------------------------
     Low |      13    38.61538    4.092737    14.75657    29.69808    47.53269
    High |       9    59.55556    6.813204    20.43961    43.84428    75.26683
---------+--------------------------------------------------------------------
combined |      22    47.18182    4.235306    19.86535    38.37402    55.98962
---------+--------------------------------------------------------------------
    diff |           -20.94017    7.482646               -36.5487   -5.331645
------------------------------------------------------------------------------
    diff = mean(Low) - mean(High)                                 t =  -2.7985
Ho: diff = 0                                     degrees of freedom =       20

    Ha: diff < 0                 Ha: diff != 0                 Ha: diff > 0
 Pr(T < t) = 0.0055         Pr(|T| > |t|) = 0.0111          Pr(T > t) = 0.9945

. ttest wcpm5, by(group)

Two-sample t test with equal variances

   Group |     Obs        Mean    Std. Err.   Std. Dev.   [95% Conf. Interval]
---------+--------------------------------------------------------------------
     Low |      13    49.38462    5.097182    18.37815    38.27881    60.49042
    High |       9    79.33333    6.827233     20.4817    63.58971    95.07696
---------+--------------------------------------------------------------------
combined |      22    61.63636    5.134362    24.08229    50.95887    72.31385
---------+--------------------------------------------------------------------
    diff |           -29.94872    8.346136               -47.35845   -12.53898
------------------------------------------------------------------------------
    diff = mean(Low) - mean(High)                                 t =  -3.5883
Ho: diff = 0                                     degrees of freedom =       20

    Ha: diff < 0                 Ha: diff != 0                 Ha: diff > 0
 Pr(T < t) = 0.0009         Pr(|T| > |t|) = 0.0018          Pr(T > t) = 0.9991
```

```
. ttest accuracy1, by(group)

Two-sample t test with equal variances

   Group |     Obs        Mean    Std. Err.   Std. Dev.   [95% Conf. Interval]
---------+--------------------------------------------------------------------
     Low |      13    76.76923    4.233798    15.26518    67.54458    85.99389
    High |       9    85.55556    2.828973    8.486918    79.03193    92.07918
---------+--------------------------------------------------------------------
combined |      22    80.36364    2.861557    13.42189     74.4127    86.31457
---------+--------------------------------------------------------------------
    diff |           -8.786325    5.630945               -20.53227    2.959622
------------------------------------------------------------------------------
    diff = mean(Low) - mean(High)                                 t =  -1.5604
Ho: diff = 0                                     degrees of freedom =       20

    Ha: diff < 0                 Ha: diff != 0                 Ha: diff > 0
 Pr(T < t) = 0.0672         Pr(|T| > |t|) = 0.1344          Pr(T > t) = 0.9328

. ttest accuracy2, by(group)

Two-sample t test with equal variances

   Group |     Obs        Mean    Std. Err.   Std. Dev.   [95% Conf. Interval]
---------+--------------------------------------------------------------------
     Low |      13    79.76923    3.479157    12.54428     72.1888    87.34966
    High |       9    91.22222    1.839216    5.517648    86.98098    95.46346
---------+--------------------------------------------------------------------
combined |      22    84.45455    2.474745    11.60758    79.30803    89.60106
---------+--------------------------------------------------------------------
    diff |           -11.45299    4.476959               -20.79176   -2.114219
------------------------------------------------------------------------------
    diff = mean(Low) - mean(High)                                 t =  -2.5582
Ho: diff = 0                                     degrees of freedom =       20

    Ha: diff < 0                 Ha: diff != 0                 Ha: diff > 0
 Pr(T < t) = 0.0094         Pr(|T| > |t|) = 0.0187          Pr(T > t) = 0.9906

. ttest accuracy3, by(group)

Two-sample t test with equal variances

   Group |     Obs        Mean    Std. Err.   Std. Dev.   [95% Conf. Interval]
---------+--------------------------------------------------------------------
     Low |      13    85.53846    2.947436    10.62713    79.11655    91.96037
    High |       9    91.77778    1.351725    4.055175    88.66069    94.89486
---------+--------------------------------------------------------------------
combined |      22    88.09091    1.914751     8.98098    84.10897    92.07285
---------+--------------------------------------------------------------------
    diff |           -6.239316    3.738761               -14.03823    1.559602
------------------------------------------------------------------------------
    diff = mean(Low) - mean(High)                                 t =  -1.6688
Ho: diff = 0                                     degrees of freedom =       20

    Ha: diff < 0                 Ha: diff != 0                 Ha: diff > 0
 Pr(T < t) = 0.0554         Pr(|T| > |t|) = 0.1107          Pr(T > t) = 0.9446
```

```
. ttest accuracy4, by(group)

Two-sample t test with equal variances

   Group |     Obs        Mean    Std. Err.   Std. Dev.   [95% Conf. Interval]
---------+--------------------------------------------------------------------
     Low |      13    89.07692    1.416304    5.106557    85.99106    92.16278
    High |       9    93.55556    1.365356    4.096069    90.40704    96.70407
---------+--------------------------------------------------------------------
combined |      22    90.90909     1.09487    5.135396    88.63218      93.186
---------+--------------------------------------------------------------------
    diff |           -4.478632    2.050349               -8.755585   -.2016798
------------------------------------------------------------------------------
    diff = mean(Low) - mean(High)                                 t =  -2.1843
Ho: diff = 0                                     degrees of freedom =       20

    Ha: diff < 0                 Ha: diff != 0                 Ha: diff > 0
 Pr(T < t) = 0.0205         Pr(|T| > |t|) = 0.0410          Pr(T > t) = 0.9795

. ttest accuracy5, by(group)

Two-sample t test with equal variances

   Group |     Obs        Mean    Std. Err.   Std. Dev.   [95% Conf. Interval]
---------+--------------------------------------------------------------------
     Low |      13    92.38462    .8882312    3.202563    90.44933    94.3199
    High |       9    94.66667    1.178511    3.535534    91.94901    97.38432
---------+--------------------------------------------------------------------
combined |      22    93.31818    .7367483    3.455656    91.78603    94.85033
---------+--------------------------------------------------------------------
    diff |           -2.282051    1.448207               -5.302959    .7388562
------------------------------------------------------------------------------
    diff = mean(Low) - mean(High)                                 t =  -1.5758
Ho: diff = 0                                     degrees of freedom =       20

    Ha: diff < 0                 Ha: diff != 0                 Ha: diff > 0
 Pr(T < t) = 0.0654         Pr(|T| > |t|) = 0.1308          Pr(T > t) = 0.9346

. ttest fluency1, by(group)

Two-sample t test with equal variances

   Group |     Obs        Mean    Std. Err.   Std. Dev.   [95% Conf. Interval]
---------+--------------------------------------------------------------------
     Low |      13    1.153846    .1538462    .5547002    .8186442    1.489048
    High |       9    1.444444    .1756821    .5270463    1.039321    1.849568
---------+--------------------------------------------------------------------
combined |      22    1.272727    .1173631    .5504819    1.028657    1.516797
---------+--------------------------------------------------------------------
    diff |           -.2905983    .2358107               -.7824908    .2012942
------------------------------------------------------------------------------
    diff = mean(Low) - mean(High)                                 t =  -1.2323
Ho: diff = 0                                     degrees of freedom =       20

    Ha: diff < 0                 Ha: diff != 0                 Ha: diff > 0
 Pr(T < t) = 0.1161         Pr(|T| > |t|) = 0.2321          Pr(T > t) = 0.8839
```

```
. ttest fluency2, by(group)

Two-sample t test with equal variances

   Group |     Obs        Mean    Std. Err.   Std. Dev.   [95% Conf. Interval]
---------+--------------------------------------------------------------------
     Low |      13    1.230769    .2010819    .7250111    .7926494    1.668889
    High |       9    1.888889    .2003084    .6009252    1.426977    2.350801
---------+--------------------------------------------------------------------
combined |      22         1.5    .1577713    .7400129    1.171897    1.828103
---------+--------------------------------------------------------------------
    diff |           -.6581197    .2940469               -1.271491   -.0447486
------------------------------------------------------------------------------
    diff = mean(Low) - mean(High)                                 t =  -2.2381
Ho: diff = 0                                     degrees of freedom =       20

    Ha: diff < 0                 Ha: diff != 0                 Ha: diff > 0
 Pr(T < t) = 0.0184         Pr(|T| > |t|) = 0.0367          Pr(T > t) = 0.9816

. ttest fluency3, by(group)

Two-sample t test with equal variances

   Group |     Obs        Mean    Std. Err.   Std. Dev.   [95% Conf. Interval]
---------+--------------------------------------------------------------------
     Low |      13    1.538462    .1439099    .5188745    1.224909    1.852014
    High |       9    2.222222    .2222222    .6666667    1.709777    2.734668
---------+--------------------------------------------------------------------
combined |      22    1.818182    .1416716    .6644986     1.52356    2.112804
---------+--------------------------------------------------------------------
    diff |           -.6837607    .2525927               -1.21066   -.1568616
------------------------------------------------------------------------------
    diff = mean(Low) - mean(High)                                 t =  -2.7070
Ho: diff = 0                                     degrees of freedom =       20

    Ha: diff < 0                 Ha: diff != 0                 Ha: diff > 0
 Pr(T < t) = 0.0068         Pr(|T| > |t|) = 0.0136          Pr(T > t) = 0.9932

. ttest fluency4, by(group)

Two-sample t test with equal variances

   Group |     Obs        Mean    Std. Err.   Std. Dev.   [95% Conf. Interval]
---------+--------------------------------------------------------------------
     Low |      13    2.076923    .1368856    .4935481    1.778675    2.375171
    High |       9    2.444444    .1756821    .5270463    2.039321    2.849568
---------+--------------------------------------------------------------------
combined |      22    2.227273    .1126581    .5284135    1.992987    2.461558
---------+--------------------------------------------------------------------
    diff |           -.3675214    .2199423               -.8263129    .0912702
------------------------------------------------------------------------------
    diff = mean(Low) - mean(High)                                 t =  -1.6710
Ho: diff = 0                                     degrees of freedom =       20

    Ha: diff < 0                 Ha: diff != 0                 Ha: diff > 0
 Pr(T < t) = 0.0551         Pr(|T| > |t|) = 0.1103          Pr(T > t) = 0.9449
```

```
. ttest fluency5, by(group)

Two-sample t test with equal variances
```

Group	Obs	Mean	Std. Err.	Std. Dev.	[95% Conf.	Interval]
Low	13	2.384615	.1404417	.5063697	2.078619	2.690612
High	9	2.888889	.1111111	.3333333	2.632666	3.145112
combined	22	2.590909	.1072903	.5032363	2.367787	2.814032
diff		-.5042735	.1930943		-.9070612	-.1014858

```
    diff = mean(Low) - mean(High)                                 t =  -2.6115
Ho: diff = 0                                     degrees of freedom =       20

    Ha: diff < 0                 Ha: diff != 0                 Ha: diff > 0
 Pr(T < t) = 0.0084         Pr(|T| > |t|) = 0.0167          Pr(T > t) = 0.9916
```