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Interval Sprinting: Impact on Reading Fluency and Self-efficacy

Laura C. Duncan
Western Kentucky University, laura.duncan118@topper.wku.edu

INTERVAL SPRINTING: IMPACT ON READING FLUENCY AND SELF-EFFICACY

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INTERVAL SPRINTING: IMPACT ON READING FLUENCY AND SELF-EFFICACY

Date Recommended 5/16/18

Jenni Redifer, PhD., Director of Specialist Project

Carl Myers, PhD.

Ryan Farmer, PhD.

Dean, The Graduate School

5/16/18
Date

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Directed by: Jenni Redifer, Ph.D., Carl Myers, PhD., Ryan Farmer, PhD.

Department of Psychology Western Kentucky University

Reading fluency is the ability to decode connected text with accuracy and speed (Archer, Gleason, & Vachon, 2003; Daly, Neugebauer, Chafouleas, & Skinner, 2015), and is generally measured by how many words a student can read in a minute. Self-efficacy is the judgment people make about their own performance levels for specific abilities, which affects their motivation and behaviors concerning those abilities (Bandura, 1977). It is unknown if repeated reading or interval sprinting reading interventions have an effect on reading self-efficacy. Two third-grade students with low reading fluency participated in an alternate treatment design, using repeated reading and interval sprinting reading interventions. After each session, reading self-efficacy was assessed using the Children's Intervention Rating Profile (CIRP; Witt & Elliot, 1985). Results indicated that neither student's reading fluency increased as expected with single session dosage, but their reading self-efficacy did increase for both the repeated reading and interval sprinting interventions. Student 2 demonstrated an increase in reading fluency and reading self-efficacy following the repeated reading intervention when the intervention dosage was increased. Both students reported increases in reading self-efficacy, even when their reading fluency did not increase, suggesting these interventions may provide benefits beyond simply increasing the number of words a student can read in one minute.

Introduction

The National Reading Panel indicated that reading fluency instruction and intervention are important components of reading instruction, and reported that 44% of elementary aged students are low for reading fluency (National Institute of Child Health and Human Development, 2006). With the importance placed on reading fluency, it will be important for educators to maintain and encourage student motivation for reading. One approach is influencing a student's self-efficacy for reading (Bandura, 1977). However, at this time little is known about the impact of popular reading interventions on a student's reading self-efficacy.

Reading Fluency

Reading fluency is the ability to decode connected text with accuracy and speed (Archer, Gleason, & Vachon, 2003; Daly, Neugebauer, Chafouleas, & Skinner, 2015). Prosody, or the ability to read with a conversational tone and appropriate pace, is, conceptually, a component of reading fluency, but is not often measured (Rasinski, Rikli, & Johnston, 2009). Fluent readers are able to read faster because they have developed early literacy skills and have acquired automaticity in recognizing words (Kuhn & Stahl, 2003; LeBerge & Samuels, 1974).

Learning new skills occurs through progressing levels called the instructional hierarchy (Haring & Eaton, 1978). These levels begin with acquisition of a skill (being able to respond accurately), which leads to fluency development, generalization (being able to use this skill fluently in different contexts) and adaptation (being able to change the form of the skill appropriately). Reading acquisition begins when children first develop pre-reading (e.g., knowing how to hold a book, turn pages, and that words are

read right to left) and early literacy skills, which are foundational skills needed for reading success (Daly et al., 2015; Kuhn & Stahl, 2003). Early literacy skills generally develop for children in kindergarten through second grade, and include awareness of print (knowing what print is, understanding of the difference between print and pictures), graphic awareness (ability to identify letters by their unique features; LeBerge & Samuels, 1974; Manis, Doi, & Bhadha, 2000), phonological processing, understanding the relationship between speech and text, and single word reading (Daly et al., 2015; Lomax & McGee, 1987; Wagner & Torgesen, 1987). These skills are considered to be hierarchical in that, for most children, they develop sequentially, starting with awareness of print and moving through to single word reading. However, children do not become experts at one skill before learning the next, and may continue to develop early literacy skills through the practice of later skills (Lomax & McGee, 1987). In this way, once a child has begun to develop foundational skills, focusing on later reading skills, such as fluency, may be more beneficial than focusing on singular lower level skills (e.g., single letter or word drills), as the practice of reading connected text can lead to the mastery of those earlier skills.

Phonological processing can be considered a group of abilities. It is comprised of phonological awareness, knowing that letters sounds are combined, and understanding that combined letter sounds connect to make words (Wagner & Torgesen, 1987). Phonological awareness is a sensitivity to letter sounds and combined letter sounds in words, and includes the manipulation of those sounds and phonemes (Daly et al., 2015). Phonological awareness abilities occur at three levels: the word level (e.g., rhyming), the syllable level (e.g., counting syllables), and the phoneme level (e.g., blending sounds,

deleting sounds, or substituting sounds; Daly et al., 2015). Skills at the word level develop before those at the syllable or phoneme levels (Wagner & Torgesen, 1987). While phonological processing is occurring, the reader is determining the sounds that correspond to the decoded parts of words they are reading, holding these in memory and accessing other sounds to blend the sounds together to form the word (Daly et al., 2015, Wagner & Torgesen, 1987). Failure to develop these skills leads to impaired understanding of the relationship between speech and text, which leads to slower ability to read singular words (Lomax & McGee, 1987). If a child has not acquired the ability to read singular words accurately, they will not be able to develop fluency for connected text because this is at a higher level on the instructional hierarchy (Haring & Eaton, 1987).

Once readers become fluent, phonological processing becomes automatic and fewer attentional resources are needed to recognize letters and decode words (Kuhn & Stahl, 2003, LeBerge & Samuels, 1974). For automaticity, and therefore fluency, to be developed, readers must practice the skills required for reading (LeBerge & Samuels, 1974). When a reader is not fluent, they use more resources to determine what words are, often by attempting to use contextual clues, leaving fewer resources available to understand the meaning of the text as a whole (Stanovich, 1980). As the main goal of reading is comprehension of text (Daly et al., 2015), it is important for mastery of fluency to be achieved. Being able to comprehend text while using fewer attentional resources is important because it leads to less effort being used in comprehension of text (Daly et al., 2015).

It is beneficial for students to become fluent readers as early as possible. The age at which a reader becomes fluent has been found to account for 42% of the variance in reading comprehension scores (Hintze, Callahan, Matthews, Williams, & Tobin, 2002). The age at which fluency mastery occurs has an impact on later reading comprehension scores, with mastery by the beginning of second grade being most optimal (Park, Chaparro, Preciado, & Cummings, 2015). Measurement of reading fluency skills can serve as a strong indicator for reading skills at both higher and lower subcomponents of reading (Fuchs, Fuchs, Hosp, & Jenkins, 2001). Researchers have developed measures to compare students in the same age group to establish the point at which a student can be considered a fluent reader (Fuchs & Deno, 1991).

Measuring Reading Fluency

Oral reading fluency (ORF) can be measured using curriculum-based measurement (CBM), which is a simple tool that is inexpensive, both in terms of material and time required to complete assessment (Fuchs & Deno, 1991; Hosp, Hosp, & Howell, 2007), making it an efficient way to measure reading fluency. ORF can be scored as correct words per minute (CWPM). Using CBM, CWPM is defined at the number of words accurately read aloud in one minute from a connected text (Daly et al., 2015). One method of measuring CWPM requires a student to read three passages aloud while the administrator follows along. For each passage, the correct number of words read correctly by the student in one minute is counted. The median score of the three attempts is the student's CWPM score. The student does not receive points for words that are mispronounced, omitted, submitted (a word added in for the printed word), skipped, or

take longer than three seconds to read. Points are not deducted for reading a word twice or self-corrected errors (Hosp et al., 2007).

A student's CWPM score can be compared to national norms to determine how quickly and accurately the student is reading compared to other students in their grade (Hasbrouck & Tindal, 2006). Scoring instructions from Hosp, Hosp, & Howell (2007) indicate that CBM methods can be used to determine a student's instructional level, or the grade level at which the student is sufficiently performing. The performance levels are indicated as acquisition (below the 25th percentile of a normed sample), fluency building (between the 25th and 75th percentiles of a normed sample), or mastery level (about the 75th percentile of a normed sample; Hosp et al., 2007). CWPM scores can also be compared to students' previous CWPM scores in order to track changes in their reading fluency. To improve fluency for students who are not at the appropriate instructional grade level, interventions have been developed to increase reading fluency.

Repeated Reading

The Repeated Reading (RR) intervention has existed since the early 1970s in numerous forms with the intention of improving reading fluency (Samuels, 1979). The development of the intervention was informed by automaticity theory, and the finding that increased practice leads to less attentional resources needed for reading (LeBerge & Samuels, 1974; Samuels, 1979). During the intervention, students read a connected passage two times, followed by a third reading which is recorded as the measure of fluency. Generally, as the student reads the passage more times, their errors decrease, speed of reading a new passage increases (still with less errors than during the original passage), and it takes the reader less time to become fluent with a new passage (Samuels,

1979). RR has been found to improve fluency for individuals with and without learning disabilities (Chard, Vaughn, & Tyler, 2002; Therrien, 2004). Additionally, RR is the reading intervention used most often for reading fluency improvement (Chard et al., 2002).

Due to its simple nature, RR interventions have been implemented in different ways, using different components. A meta-analysis determined that the most effective components of RR are to have students read the passage aloud, to give corrective feedback if the student makes mistakes, and to have the student read the passage until a performance criterion is met, instead of a predetermined number of times (Therrien, 2004). Two types of errors are recorded and corrected: errors of commissions are words that are mispronounced, whereas errors of omission include skipped words and words that the student takes more than three seconds to read (Kubina & Starlin, 2003). No corrections are given for inserted words, repeated words, self-corrected words, or words that are sounded out in less than three seconds. When using RR, the reader should be reading from passages on their instructional level (at what grade level the student scored within the 25th through 75th percentile, pre-determined using CWPM scores), not necessarily on their grade level, as fluency gains are greater when the reader is working with passages on their instructional level (O'Connor et al., 2002). Additionally, it is important to show the reader their progress as their fluency improves, as it helps to reinforce the reading behavior of the student (Samuels, 1979). When progress is being monitored, it is easier for the student to determine if they are meeting goals.

Goal setting is an important component of RR (Kostewicz, 2012). Goal setting for fluency increases motivation for improvement. Ideally, a more challenging goal should

be used for practice (for example, 200 words per minute), while a more conservative goal should be used for assessment of fluency on a new passage (Kostewicz, 2012; Kubina & Starlin, 2003). This is because distal goals increase the number of words a student must read in practice, whereas proximal goals are more likely to be met during assessment. Additionally, because the student is rereading the same passage in practice during the RR intervention and a new passage during ORF assessment, one would expect them to read the passage they have seen before at a quicker rate, leading to the need for different goals during practice and assessment (Kostewicz, 2012). Increasing the amount of practice students have reading additional words is the purpose of the RR intervention. Consequently, changes were made to the procedure of the intervention to provide increased practice which increased the amount of words the student was expected to read in short bursts in the same amount of time, leading to the development of Interval Sprinting (IS; Kostewicz & Kubina, 2010).

Interval Sprinting

The IS intervention is quite similar to RR. Instead of allowing the student to read the entire passage, the student reads and rereads sections of passages for 10-15 second intervals (Kostewicz & Kubina, 2010). For the short intervals, the student reads from a passage that has been broken down into equal parts. The student rereads each part two times during each interval, eventually reading the entire passage. The student receives error correction and performance feedback at the end of each section, as opposed to receiving error correction throughout the RR intervention. With this change from RR, Kostewicz and Kubina hoped to increase endurance for reading. Endurance for reading is described as maintained accuracy and rate, even when distractions are present. IS allows

for shorter reading periods to help build endurance, as the student would have less time to become distracted from their reading passage. Additionally, Kostewicz and Kubina explained that IS improves on the traditional RR approach because by giving error correction at the end of each section, instead of interrupting the student while they were reading throughout the passage, the interventionist is allowing for more words to be read.

In an alternating treatment design with RR, IS was found to have equal effects on reading fluency, with both interventions showing improvements (Kostewicz & Kubina, 2010). When the students were using the IS intervention, they practiced reading 23 additional words per minute on average. This suggests that there is potential for students to read many more words when this intervention is used over a long period of time, which should further increase their practice and therefore lead to increased automaticity for reading (LeBerge & Samuels, 1974). Kostewicz and Kubina's findings were promising, however, this intervention has only been used in one published study to date, and so more evidence is needed to support these findings.

In summary, reading fluency is an important skill to be mastered by early elementary-aged students. Researchers and educators can accurately measure the level at which a student can fluently read using CWPM (Hosp et al., 2007). Interventions have been developed to increase practice with reading, and therefore reading fluency (Samuels, 1979). However, it is unclear whether students know that they are improving as it is happening during the use of reading interventions such as RR or IS. Self-efficacy, or the perceived judgment one makes about their ability to be successful at a task (Bandura, 1977), has a substantial impact on reading success (Schunk, 2003), and therefore, is an important topic to investigate in the context of reading interventions. If

students know they are reading faster as they are improving, their reading self-efficacy should improve as well.

Self-Efficacy

Self-efficacy is the judgment people make about their own performance levels for specific abilities, which affects their motivation and behaviors concerning those abilities (Bandura, 1977). When a person has high self-efficacy for a specific task, they believe that they can do that task well, and that their ability to do the task well generalizes to different forms of the same task. For example, a person with high self-efficacy for driving a truck should also believe they could drive a car, or other types of four wheeled motorized vehicles. Self-efficacy generally develops through performance and observation. For academic skills, self-efficacy develops when students compare their performance to other students' work, or when they receive feedback from adults about their own performance (Schunk, 2003).

Self-efficacy for reading is important, because higher self-efficacy for reading can create a reciprocal loop for increasing both self-efficacy for the skill and improvement of the skill itself. Children who have higher self-efficacy for reading have higher motivation to work through difficulties they experience while reading (Schunk, 2003; Zimmerman, 2000). These children feel that they will be more likely to overcome these difficulties, and therefore will be willing to expend effort and attentional resources for this task, because they view themselves as capable (Bandura, 1982). When children do not need to use as much effort to read fluently, they are more likely to choose to read in the future. This is because the likelihood of reinforcement for reading will be higher, as they are more likely to find the act of reading rewarding (Daly et al., 2015). When students can

read a passage quickly and understand its meaning, they are more likely to enjoy texts that they chose to read. This can lead to better understanding of topics, better grades, and positive adult or peer attention, all of which can increase their self-efficacy for reading (Schunk, 2003). This increase in motivation can lead to more reading, which in turn can lead to increased fluency due to the increased practice of reading.

There is an established relationship between higher academic self-efficacy and reading achievement. In high school social studies classes, perceived self-efficacy for academic achievement positively correlated with students' goals for their grades, as well as with their actual final grade (Zimmerman, Bandura, & Martinez-Pons, 1992). When examined together, self-efficacy for academic achievement and student-set goals accounted for 31% of the variance in final grades. Self-efficacy for reading scores were predictive of reading achievement scores in single word reading and reading comprehension (Lee & Jonson-Reid, 2016). In a study of fifth grade students, reading motivation scores positively predicted performance on a reading comprehension task, when controlling for word reading ability, listening comprehension, and nonverbal ability (Solheim, 2011). A similar relationship has been found in college-aged students (Shell, Murphy, & Bruning, 1989). These relationships establish the importance of improving students' self-efficacy for reading.

For students who do not have high self-efficacy, some practices are known to improve their perception of their skills. Mastery experiences, goal setting and modeling can be used to increase self-efficacy for a task (Bandura, 1982; Schunk, 2003; Usher & Pajares, 2008; Zimmerman, 2000). A mastery experience, or an experience where a student does not encounter failure, is considered the most powerful way to change self-

efficacy for a task (Bandura, 1977; Usher & Pajares, 2008). Mastery experiences require substantial effort on the part of the student. Past research illustrates the payoff of this effort. Previous mastery experiences are positively correlated with self-efficacy, and this relationship is stronger than the relationship between self-efficacy and vicarious experiences, social feedback, or physiological state (see Usher & Pajares, 2008 for a review). Both RR and IS offer mastery experiences to students. However, by increasing the amount of times a student receives performance feedback (Kostewicz & Kubina, 2010), IS provides more chances for the student to experience a mastery experience. Having more mastery experiences should lead to higher self-efficacy, due to the established relationship between mastery and self-efficacy.

By setting proximal goals, which are goals that are not substantially higher than the current level of performance, self-efficacy for the task can be increased, as the person can use these goals as progressive markers to a larger goal (Bandura, 1982; Schunk, 2003). Thus, using a lower word per minute goal, progressively increasing over time to the grade level word per minute goal, should increase self-efficacy for reading fluency. It is important for the student to receive feedback on how close they are to meeting a goal, especially if it is difficult to determine the rate or accuracy of one's own performance (Schunk, 2003). IS provides more opportunities for goal feedback than RR, because there are more intervals for which a student could get feedback (Kostewicz & Kubina, 2010). This may lead to students who receive IS as an intervention to develop higher self-efficacy than those who receive RR.

Interventions that aim to improve self-efficacy for a task often include modeling. Modeling, i.e., observing a similar peer perform the task accurately, can also improve

self-efficacy because it shows the student that someone like them is capable of doing the task and they may be able to do it as well (Schunk, 2003). Modeling also allows the person to see the task performed correctly, which can help them improve their own performance. However, increases in self-efficacy for reading have not been found for students who have been diagnosed with reading disabilities using interventions that include modeling. When using teacher paired reading with proximal goal setting (setting reading fluency goals slightly higher than the level the student is currently reading), ORF scores increased for a sixth-grade student, but self-efficacy, as measured by the Reader Self-Perception Scale (RSPS), stayed consistent throughout the study (Nes Ferrara, 2005). Modeling works best when the model is similar to the student (Bandura, 1977; Usher & Pajares, 2008), which may be why Nes Ferrara found no change in self-efficacy. IS and RR do not involve modeling components. It is important to know if these interventions that do not include a modeling component affect self-efficacy, because it may be difficult to find models in classrooms that are similar to students experiencing reading difficulties.

Few studies have examined self-efficacy using non-modeling strategies. However, Nelson and Manset-Williamson (2006) attempted to use explicit strategy instruction to increase self-efficacy for students previously diagnosed with learning disabilities in reading, while also improving reading comprehension. Students were expected to gain self-efficacy for reading due to increased control in understanding connected text as the result of direct comprehension strategy instruction. The explicit instruction group was taught goal setting, how to activate prior knowledge about the text, to predict what would happen, name main ideas, summarize, and self-monitor their strategy use. This group also

received feedback about their strategy use. The non-explicit instruction group was only taught how to use prediction, summarization, and generate questions about the text after reading. Although both groups showed gains for reading comprehension, neither demonstrated significant increases in self-efficacy. Students in each group rated themselves high in self-efficacy for reading at the pretest, indicating that individuals with learning disabilities may not be good at judging their own abilities. The authors questioned whether higher self-efficacy should always be the goal of intervention, when it may be more beneficial to strive for more accurate self-efficacy perceptions. As students see how complex a task such as reading is, they understand how much of it they are not able to do and therefore may have a more accurate understanding of their own self-efficacy after intervention. Self-efficacy is generally measured using self-reported questionnaires. For academics, self-efficacy can be measured generally, as an academic self-efficacy construct, or as separate constructs according to subject matter.

Although not the same construct as self-efficacy, social validity can tell us how much a student likes a particular intervention and if they think the intervention was fair. Social validity is a concept which includes determinants of importance of goals, the appropriateness of the procedures used, and the importance of the effects of the intervention (Wolf, 1978). When determining the importance of the effects to the individual, the researcher is asking the participant if they perceived the intervention as helpful to them. In the case of reading fluency interventions, by asking if an intervention was helpful, the researcher is asking the participant if they perceived their reading fluency skill to have improved through the intervention.

The Present Study

Although the impact of RR on reading fluency has been established, whether it increases self-efficacy for reading quickly and accurately is still unknown. RR is a commonly used reading fluency intervention, however, there is no evidence of its effect on self-efficacy. IS is a newer and less used reading fluency intervention. There is evidence that it is as effective as RR at increasing a student's reading fluency, but like RR, no evidence of its impact on self-efficacy. Components of IS (e.g., more chances for mastery experiences, increased feedback) make it more likely to improve reading self-efficacy than RR. The present study seeks to determine whether RR and IS are equally effective at improving reading fluency, as well as whether IS is more effective than RR at increasing student self-efficacy for reading.

Research Questions

1. Will the RR and IS interventions be equally effective in increasing reading fluency?
2. Will IS increase self-efficacy for reading more than RR?

Hypotheses

1. RR and IS will be equally effective at improving student reading fluency.
2. IS will increase the student's self-efficacy for reading more than RR.

Method

The methods used for RR and IS interventions were adapted from those used by Kostewicz and Kubina (2010), with updated IS procedures (Kostewicz, 2012). Institutional Review Board approval was obtained through Western Kentucky University for this study prior to recruiting participants.

Participants

Participants were two third grade students from a local school district who were reported by teachers as having low reading fluency (as identified by district progress monitoring tools), but the ability to read grade level words. To ensure that these teacher-referred students were reading grade level words, existing data (a grade level Fry word list) was evaluated. Student 1 was a nine-year-old female and read 99% of the words on the Fry word list. Student 2 was a nine-year-old male, and also read 99% of the words on the Fry word list. Neither student was identified as having an educational disability. Parent consent for participation and audio recording, and student assent for participation were obtained. A third participant was also recruited, but was removed due to excessive school absences on treatment days.

Materials

All reading passages were gathered from AIMSweb Progress Monitoring and Improvement Systems (Pearson, 2012; Pearson Education, 2008). This site presents grade-based reading passages that can be used to assess reading fluency. At least two copies of a passage were used for each session. The researcher had one copy containing word counts at the end of each line or section, which was used to track errors during reading (for repeated reading, the researcher had three copies of the numbered passages

to track errors); the student's copy did not include word counts. Additionally, a timer was used to indicate when to instruct the student to stop reading and an audio recorder was used to record each session.

Dependent Variables

Oral reading fluency was assessed using CBM methods (Hosp et al., 2007). This score is referred to as correct word per minute (CWPM). The student read three different passages, and the median CWPM score was recorded. Reading errors were recorded following the Hosp, et al. method. Self-corrected errors were not recorded. If a student skipped a line of text this was not counted as a skipped words error, instead the student was instructed to read the line, or words from that line were omitted from the final word count. Total number of words read per reading interval, minus errors, was graphed to allow for comparison of each student's change in CWPM scores.

Self-efficacy was measured at the end of each session using an adapted version of the Children's Intervention Rating Profile (CIRP; Witt & Elliot, 1985) with the use of a visual analog scale (Bijur, Silver, & Gallagher, 2001). The student chose a place on a slider to represent their answer (possible score of 0-100). The measure assesses student self-efficacy for reading, intervention preference, and whether the student thought the intervention was fair. Three items pertaining to self-efficacy were assessed during the baseline phase. Due to a data collection error, self-efficacy was not assessed at session one. The full nine items were rated by the student during the multi-element phase, and during the final two phases where dosage was increased. The survey was administered electronically using Qualtrics, via a laptop. Each item was read aloud to the student during every session. The three items pertaining to self-efficacy were totaled for all

sessions and are graphed for each student (possible scores of 0-300, collectively). The researcher was blind to the outcomes of the self-efficacy measure until all data collection was complete.

Independent Variable Conditions

Two intervention conditions were used for this study, IS and RR. Both conditions were used with each participant. All sessions were audio recorded for scoring purposes. Checklists were used at each session to ensure treatment integrity.

Repeated reading. For the RR intervention, each student first read a passage to the end, twice. Each student received the non-numbered copy of the passage. The researcher told each participant to read as quickly as possible until they reached the end of the passage, telling each student to begin with the first word of the passage when the researcher said "go." The timer was set and the researcher noted both errors and number of words read at the end of 60 seconds. Each student received error correction for any errors that occur during the reading at the end of each reading of each passage. Each student then received performance feedback on how many words they read during the first 60 seconds following each reading of the passage. These procedures occurred again for a second reading of the passage. The number of words read in one minute was recorded after a third reading of the passage for progress monitoring.

Interval sprinting. For the IS condition, the reading passage was separated into six equal parts. Each student was instructed to begin reading from the first word of the first interval, and to read as far as they could in ten seconds. The researcher noted any errors and how many words that student read in the interval. Each student received performance feedback on words read and error correction after each section. Each section

was read twice, with the student receiving performance feedback and error correction after each reading (Kostewicz, 2012). After each section of the text had been read two times, each student reread the text for one minute and oral reading fluency was then recorded.

Study Design

This study used an alternating treatments design. At each session, the student received either RR or IR, which were counterbalanced in order to reduce interactions between the two conditions. During each session, a new passage was used (i.e., the student did not read the same passage for more than one session). The design had four phases, with Phase 1 consisting of baseline and Phase 2 consisting of the multi-element comparison across two conditions. Phases 3 and 4 were designed to increase treatment dosage, and consisted of three sessions in one day, for each intervention. In the last two phases, only one self-efficacy score was obtained, after all sessions had been completed.

Results

Scores for CWPM and the self-efficacy measure were graphed for each session, and are shown in Figures 1 and 2, respectively. Each graph displays the CWPM read by each student, and their self-reported self-efficacy score. Filled markers represent CWPM, and markers with no fill represent the self-efficacy score. Circles represent baseline data, triangles represent data for IS sessions, and squares represent data for RR sessions.

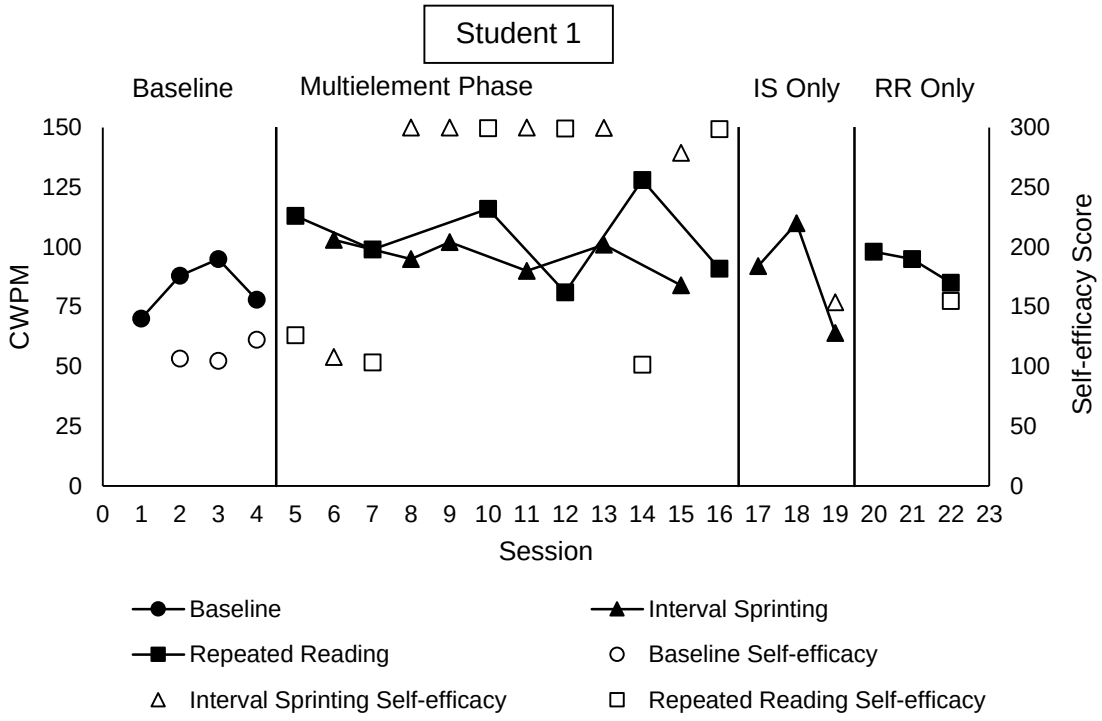

Figure 1. Scores for self-efficacy and CWPM for Student 1.

Baseline (Phase 1)

For both students, four sessions were used to establish a baseline. For each student, this was done due to researcher error in failing to obtain a self-efficacy measurement at session 1. For Student 1, this was also necessary to obtain a steady baseline. See Table 1 for all means and standard deviations for CWPM scores, and Table 2 for all means and standard deviations for self-efficacy scores for all phases.

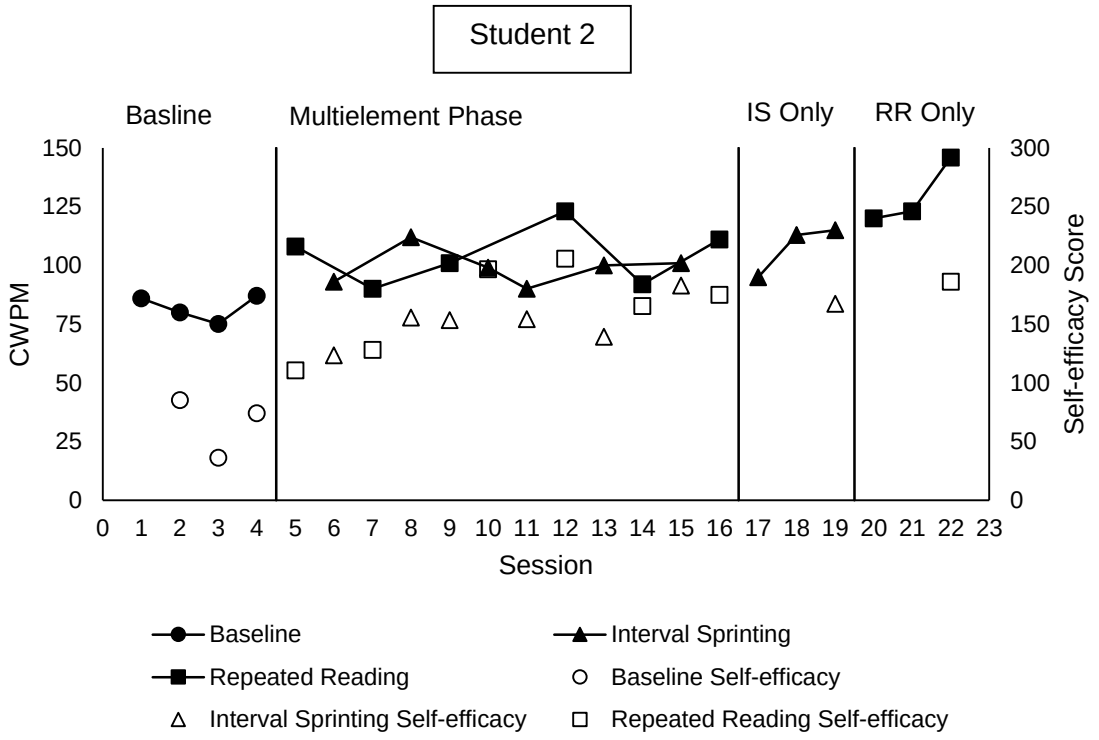

Figure 2. Scores for self-efficacy and CWPM for Student 2.

Table 1

Means and Standard Deviations of CWPM By Phase

	Student 1		Student 2	
Phase	Mean	SD	Mean	SD
Baseline	82.75	11.00	82.00	5.60
Multi-element: IS	95.83	7.63	99.17	7.63
Multi-element: RR	104.67	17.44	104.17	12.45
IS Only	88.67	23.18	107.67	11.02
RR Only	96.67	6.81	129.67	14.22

Table 2

Means and Standard Deviations of Self-efficacy Scores By Phase

	Student 1		Student 2	
Phase	Mean	SD	Mean	SD
Baseline	111.19	9.81	65.12	25.76
Multi-element: IS	264.41	77.16	151.54	19.74
Multi-element: RR	204.73	103.81	163.60	37.65
IS Only	153.65	--	167.41	--
RR Only	154.77	--	186.09	--

Multi-element Treatment Phase (Phase 2)

During the multi-element treatment phase, each student received each intervention six times, for a total of 12 sessions each. On average, Student 1 read at a slightly increased rate of CWPM during IS sessions over baseline. Her rate of CWPM during the RR sessions also increased over the baseline rate. During both the IS and RR sessions, Student 1 reported an increase in their mean self-efficacy score.

During the multi-element treatment phase, Student 2 read a slightly increased mean CWPM rate during IS and RR sessions over baseline. He reported a higher mean self-efficacy score after IS and RR sessions than he had reported during the baseline phase.

Increased Dosage Phases (Phases 3 and 4)

Phases 3 and 4 allowed for an increase in the intervention dosage. Three sessions occurred on one day, with each session containing the same intervention. Student 1 read at a mean CWPM rate closer to her baseline score than her mean CWPM rate during the multi-element phase during Phase 3, which consisted of only the IS condition. This student reported an increased self-efficacy score at the conclusion of this session compared to their baseline score, but lower than the score they reported during the multi-element phase. Student 1 read at a slightly increased mean CWPM score during Phase 4, which consisted of only the RR condition. The student reported a self-efficacy score at the conclusion of Phase 4 higher than their baseline score, but lower than their reported score in the multi-element phase.

Student 2 read at increased CWPM rate during Phase 3, which consisted of only the IS condition, compared to their baseline score. This student reported an increase for

their self-efficacy score at the conclusion of this session over their baseline score. Student 2 read at an increased CWPM rate over baseline scores during Phase 4, which consisted of only the RR condition. The student reported a higher self-efficacy score at the conclusion of Phase 4 compared to their mean baseline or multi-element phase scores.

Discussion

The present study used a multi-element treatment design to compare IS and RR in terms of each intervention's effect on CWPM and self-efficacy. It was hypothesized that both IS and RR would be effective for increasing a student's CWPM reading rate. Additionally, IS was expected to raise the student reported self-efficacy. Results related to these hypotheses were mixed.

Reading fluency, as measured by CWPM reading rate, did not increase as expected during the multi-element phase for either student. Some variability in reading rate was observed, however, each student's rate of reading stayed relatively flat across time and interventions. This is a surprising finding, especially because these interventions have been shown to be successful at improving reading fluency in the past (Chard et al., 2002; Kostewicz & Kubina, 2010). Due to the lack of reading rate growth, Phases 3 and 4 were used to increase the dosage of the interventions. For Student 1, this approach did not appear to be effective, as neither additional phase resulted in a substantial increase of CWPM. For Student 2, increasing the dosage of the intervention was most effective for RR, resulting in a 47.67 CWPM increase in the mean reading rate from baseline.

Although reading fluency scores remained flat, there was a substantial increase in self-efficacy scores for both students across time. Measures of self-efficacy obtained after sessions using IS and RR indicated higher self-efficacy scores than baseline for both interventions. These results indicate that IS and RR may have benefits beyond their ability to increase reading fluency rates. Increased reading self-efficacy is known to lead children to be willing to expend more effort for reading (Schunk, 2003), and to be more motivated to read in the future, as they will be more likely to find reading as a rewarding

activity (Daly et al., 2015). It is notable that although Student 1 did not experience the increase in reading fluency rate, this student still reported self-efficacy at a notably higher rate than during baseline. If the student's current level of self-efficacy for reading continues after the intervention, it could have additional benefits in the future.

The present study has high ecological validity. The interventions took place in a public school during times previously established by school administration for reading intervention. Although the students knew they were part of the study, the interventions were activities similar to those their classmates were completing. The interventions were completed by a professional familiar with the school and students, reducing possible confounds (e.g., if a researcher unfamiliar with the school had administered the study tasks).

Despite the high level of ecological validity, some aspects of the study related to ecological validity may be considered limitations. The study was subject to non-scheduled interruptions (e.g., snow days, student illnesses), and could not always be implemented every two days as originally planned. Originally, the study included three participants, however, one student had to be dropped from the study due to missing multiple days of school when treatment was occurring. This led to only students from the same grade participating in the study. The students were familiar with the interventionist, and this relationship may have had unknown impacts on the self-efficacy of the students.

An additional limitation of this study was the use of a three-item measure for self-efficacy. Although the CIRP was developed for use with children, the three self-efficacy items used for this study are part of a larger questionnaire, asking children about their perceived self-efficacy, how fair they felt the intervention was, and their preference for

the intervention (Witt & Elliot, 1985). Future researchers may wish to find or develop a separate measure specifically measuring reading self-efficacy that has also been developed for use with young children. Such a measure may be more sensitive to changes across time.

In the present study, an increase in self-efficacy for both students was found after participation in RR and IS interventions. Neither IS nor RR were effective in increasing reading fluency during the multi-element phase, but RR was effective for one student when treatment dosage was increased. IS and RR should be further studied using practices that lead to high ecological validity. This will contribute to the existing body of knowledge regarding whether IS and RR are effective interventions for reading fluency and self-efficacy. Researchers studying other interventions may also wish to consider including self-efficacy measures in their studies, to continue to investigate the relationship between academic interventions and change in self-efficacy.

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APPENDIX

Children's Intervention Rating Profile (Adapted)

1. This activity to improve my reading skills was fair.
2. Ms. Laura gave me enough time to practice reading.
3. This activity is good one to use with other students.
4. I like this activity for my reading skills.
5. This activity helps me do better in school.
6. I am good at reading.
7. I am as smart as my classmates.*
8. I can read quickly.*
9. I can figure out the answers almost always.*

*These are questions also asked during the baseline phase.