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An examination of video self-modeling as a reading fluency intervention

By

Shengtian Wu

A Dissertation
Submitted to the Faculty of
Mississippi State University
in Partial Fulfillment of the Requirements
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An examination of video self-modeling as a reading fluency intervention

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The purpose of the study was to examine the efficacy of video self-modeling as a reading fluency intervention for elementary school students. The participants were 10-year-old male students, and they were enrolled in 4th or 5th grade. All of the participants carry disabilities, including Autism Spectrum Disorder or Attention Deficit/Hyperactivity Disorder. 2 participants participated in the study in a clinic setting, and one participant participated in the study in a school setting. Before attending the intervention sessions, the participants attended pre-participation assessment sessions to evaluate if their current reading skills and behavioral repertoire met the purposes of the current study. Following the screening procedures, the participants participated in the baseline measurements, video developments, alternating treatments phase, confirmatory phase, and follow-up phase. The results indicated the stand-alone Video Self-Modeling was efficacious for 2 out of 3 participants, and the Video Self-Modeling as a supplemental intervention component showed its efficacy for 1 participant. The findings showed various practical implications. Limitations and future studies are also discussed.

DEDICATION

This dissertation is dedicated to my beloved mother, Yingji Jin, who sacrificed a significant portion of her life to support me. From the bottom of the sea, you held my hands and swam toward the surface using your positivity, perseverance, hope, and love. The bottom of the sea was not cold, dark, or lonely because you gave me unconditional love. My biggest achievement is my willingness, courage, and positivity, with which I can swim back to the bottom of the sea and save those in needs.

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Dissertation is a finale of this long journey. Numerous tough yet extremely valuable challenges knocked my door. I was able to overcome the challenges because of the supports from the precious people around me. I would love to acknowledge their supports and simply their presence in my life.

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CHAPTER I

INTRODUCTION

Learning to read is one of the most important skills for school-age children, as reading is an essential and foundational skill for being successful in society (Strickland, Boon, & Spencer, 2013). Reading is a basic skill needed for understanding and communicating with others. Engagement in a variety of reading activities facilitates functioning in society (e.g., reading a newspaper, test materials at school, descriptions of new electronic devices, friends' text messages). Moreover, reading is also related to other important school subjects. For example, if a student needs to solve a problem that presents a common everyday situation, such as, "How many total popsicles should Larry's mother buy if he eats two popsicles per day for 3 consecutive days?" In order to solve the problem, the student will need to understand the meaning of "total", "per day", and "consecutive." Thus, an understanding of the words in the context of mathematics is critical in solving math word problems accurately (Geary, 1994). Moreover, reading comprehension has a moderate to high correlation with text composition (Gartlehner, Hansen, Nissman, Lohr, & Carey, 2006) such that individuals with high reading comprehension skills tend to have better writing skills. Thus, reading is critical for academic success.

Despite the importance of reading and decades of efforts to improve students' reading, reading deficits have persisted (McCurdy, Daly, Gortmaker, Bonfiglio, & Persampieri, 2007). According to the most recent nation's Report Card provided by the National Center for

Education Statistics (2015), approximately 31% of fourth-grade and 24% of eighth-grade students' reading achievement levels were in the 'Below Average' range. Thus, educators must teach a large population of struggling students. Therefore, it is imperative that effective reading interventions are implemented to help struggling learners.

In response to the request to Congress for action to address wide-spread reading deficits, the U.S. government sponsored the National Reading Panel (NRP) in 2000, which was comprised of 14 members including leading researchers in the area of reading, reading teachers, representatives of colleges of education, educational administrators, and parents. The NRP aimed to create a report about the extant reading research in which various effective reading interventions were identified and disseminated, and future research was suggested. In its report (NRP, 2000), the panel reported that reading has five essential components: (a) phonics, (b) phonemic awareness, (c) reading fluency, (d) vocabulary, and (e) reading comprehension. Although most of these components have been explored extensively, historically reading fluency has been the single most neglected area of reading by researchers (Allington, 1983) such that only recently the most recent Individuals with Disabilities Education Improvement Act (IDEIA; 2004) added reading fluency as one of the eligibility categories of specific learning disabilities.

Reading Fluency

Reading fluency is defined by NRP (2000) as the capacity to read quickly and accurately with proper expression. Further, it is believed that reading fluency is necessary for reading comprehension (Bigozzi, Tarchi, Vagnoli, Valente, & Pinto, 2017). As a result of increased focus on reading and reading interventions, there have been a host of studies conducted to examine the efficacy and effectiveness (often distinguished separately in the literature) of reading interventions. Gartlehner et al. (2006) provided the following clarification: "Efficacy

trials (explanatory trials) determine whether an intervention produces the expected result under ideal circumstances. Effectiveness trials (pragmatic trials) measure the degree of beneficial effect under 'real world' clinical settings" (p. 1040).

The NRP (2000) report identified numerous effective reading fluency interventions with effective interventions continuing to emerge in the research literature. These interventions can be broadly divided into two categories labeled here as: (a) tutor-managed and (b) self-managed interventions. Tutor-managed interventions involve the presence of tutors (e.g., an adult or more advanced reader) and require a certain level of training to assist children in improving their reading skills. Self-managed interventions do not require the presence of tutors and rely on the reader's independence during intervention implementation. These two types of interventions will be briefly discussed below.

Reading Fluency Interventions

When it comes to reading fluency interventions, the literature shows evidence of well researched interventions in order to provide effective supports for the students with reading difficulties. As previously stated, tutor-managed interventions require the presence of a tutor and depend on assistance in direct application of the intervention. Tutor-managed interventions have been extensively reviewed in the literature which include an assortment of learners with a variety of reading difficulties and research finds such interventions to be very effective. On the other hand, the self-managed interventions do not require the immediate presence of tutors and, comparatively, rely more on learners themselves. Self-managed reading interventions have also been studied with very positive results. However, the continuing issue of high rates of students with reading difficulties shows more research is needed to identify effective, easy to administer reading interventions from which educators and those who seek to improve reading skills of

students can select. The following sections will discuss tutor- and self-managed reading

interventions.

Tutor-Managed Interventions

A large number of tutor-managed interventions have been developed such as paired

reading (Topping, 1987), listening passage preview (LPP; Daly & Martens, 1994), repeated

reading (RR; LaBerge & Samuels, 1974), phrase drill (Begeny, Daly, & Valleley, 2006), and

phonemic awareness interventions (Klubnik & Ardoin, 2010). For the purposes of this

introductory chapter, only LPP and RR will be discussed here; more in-depth coverage of

reading interventions is provided in Chapter 2.

LPP is a widely-used tutor-managed intervention, in which a teacher or an advanced

reader reads a passage, while the student silently follows along and then reads the passage

independently (Daly & Martens, 1994). Authors suggested LPP targets accuracy by modeling

accurate reading, stating LPP exposes readers to the text before an independent reading, thereby

also facilitating rapid reading. LPP is often included as one component of multi-component

reading interventions in many reading studies (e.g., Begeny & Sibler, 2006; Klubnik & Ardoin,

2010).

Another tutor-managed intervention is Repeated Reading (RR), a fluency-based reading

intervention that requires an individual to read a passage a prescribed number of times (LaBerge

& Samuels, 1974). For example, a tutor asks a student to read a passage four consecutive times.

Sometimes RR also refers to a process of reading the same passage until a satisfactory level of

reading fluency is attained (Samuels, 1979). For example, a tutor requires the student to read a

passage until he/she can read the passage at a rate of 85 words correct per minute (WCPM).

Chard, Vaughn, and Tyler (2002) found that RR is effective in improving reading quickness, but

is less effective in addressing deficits in word decoding or reading accuracy (e.g., accurate reading of sight words, phrases, and sentences). To address this issue, RR is combined with other interventions (e.g., corrective feedback, goal setting; Lee & Yoon, 2017; Therrien, 2004).

RR is the one of the most widely researched tutor-managed reading fluency interventions and has been found to be very effective. Consequently, a review and synthesis of NRP (2000) findings concluded that RR is the most recommended reading fluency intervention. For example, in a recent synthesis of 19 studies of various reading fluency intervention studies published from 2001-2014, Stevens, Walker, and Vaughn (2016) identified RR as the most effective reading fluency intervention, suggesting that repeatedly reading a passage with a variety of other intervention components (e.g., goal setting, error correction) might maximize students' improvement in reading fluency.

As further evidence of the effectiveness of RR, Lee and Yoon (2017) conducted a meta-analysis of 34 studies with K-12 children with or at-risk of reading difficulties from 1990 to 2014 in which RR was combined with other intervention components. The findings revealed five components were commonly added, either individually or in combination, to RR to increase reading fluency. The first component was *word list review*, in which a reader reviews key words in a passage before reading the words. Second, *LPP* was another added component, although the specific format of LPP varied slightly across studies. Third, an *error correction procedure* was a component added in order to decrease reading errors. Fourth, *performance feedback* was an added component and often included goal-setting, rewards for meeting goals, and self-evaluation to encourage higher performance. Finally, *peer-mediation* was an added component that involved a peer who delivered the intervention instead of researchers. The analysis revealed that RR that had the highest effect size when the intervention included LPP and RR, specifically

rereading a passage four times. Thus, this study (Lee & Yoon, 2017) and other meta-analyses (Chard et al., 2002; Therrien, 2004) identified repetition of passages four times is an optimal number for repeated reading of a passage. Additionally, as can be seen in this analysis and other studies, different component combinations and the number of repetitions are common variations within implementation of RR and show their effectiveness.

RR, however, is not without criticism. Even though there is abundant literature documenting its effectiveness, RR is a tutor-managed intervention and requires the presence of a tutor. Furthermore, from the perspective of the tutor, it is time consuming and, therefore, is considered a resource intensive intervention. Teachers, who have a busy schedule and multiple demands placed upon them in this age of accountability, might resist suggestions for the implementation of RR. Additionally, tutors (including teachers) typically require training; further, best practices suggest the need for measurement of integrity with the intervention procedures (Fiske, 2008). This adds to the demand on teacher/tutor skill and time. Furthermore, RR requires significant effort on the student's part (i.e., reading a challenging passage multiple times) in order to be implemented correctly. Therefore, students with low academic motivation and/or those with significant reading deficits may also be resistive to RR. Thus, although repeatedly reading a passage with a combination with other components is an effective intervention, it does have the potential to be intrusive and may be difficult to implement in the education setting.

In sum, to address reading deficits various tutor-managed reading fluency interventions (e.g., LPP, RR) have been developed and well researched across the past several decades. LPP is a common tutor-managed reading fluency intervention that is identified as effective; and RR is the most recommended reading fluency intervention by NRP (2000). Furthermore, at least one

meta-analysis (Lee & Yoon, 2017) shows that a combination of LPP and reading a passage four times was the most effective intervention to address reading deficits. However, despite its effectiveness, tutor-managed reading interventions, which are resource intensive, may be met with resistance in the educational setting.

Self-Managed Interventions

In the current study, self-managed interventions are defined as an intervention in which an individual manages his or her own behavior(s). However, others might be involved in the development of the interventions, the administration of the intervention is under the control of the individual. An example of a self-managed behavior intervention would be an intervention in which a student monitors completion of in-class seatwork. The student has a checklist of required behaviors and checks off each behavior on the list as it is completed and turns in the checklist to the teacher at the end of class. There may or may not be a reward provided by the teacher for completion of the in-class seatwork, dependent upon the specifics of the intervention. Thus, the student is the one who monitors the behavior, checks off each task, and is in control of turning in the checklist. Some of the advantages of a self-managed intervention include encouragement of responsibility for one's behavior, facilitation of independent learning, and time saving for the teachers.

Various self-managed reading fluency interventions have also been explored in the research literature. These include self-monitoring strategies which involve self-evaluation with components such as (a) goal setting (Lo, Cooke, & Starling, 2011); (b) contingent reward (Klubnik & Ardoin, 2009); and (c) electronic modeling (e.g., Morlock, Reynolds, Fisher, & Comer, 2015; Skinner et al., 1993; Skinner, Johnson, Larkin, Lessley, & Glowacki, 1995). In these interventions, technology is used to provide a model to the student (e.g., taped readings,

computer reader software, video modeling) and they have been well researched across the years. For example, in the Lo et al. (2011) study, the intervention had a self-managed component, specifically participants recorded their reading fluency during initial reading and were then asked to beat their last trial reading. The results indicate that three out of three participants obtained higher reading fluency in subsequent readings. In a study using audio-taped materials, Skinner et al. (1993) had participants listen to an audio-taped passage read at a fast and slow pace to determine which was most effective in improving reading performance. Readers listened to the previously recorded tape and then were asked to read the passage. This study allowed the interventionist to pre-record the passages, thereby reducing the amount of time spent directly with participants during the intervention. Results showed greater improvement when passage previewing was conducted at the slower rate. In a similar study, Skinner et al. (1995) found three individuals with behavior and academic skill deficits showed mixed results regarding which pace was more effective, with one student doing better under the fast pace and two doing better under the slow pace. These are examples of interventions which contain both tutor- and self-managed components. In order to further reduce the involvement of the interventionist and save teachers' time, the use of electronic modeling interventions has increased in recent times.

These electronic modeling interventions are relatively new and emerged with recent advancements in technology. Using computers, laptops, cellphones, and tablets as learning tool shows promise in teaching (Roschelle, Pea, Hoadley, Gordin, & Means, 2000). Fenty, MulCahy, and Washburn (2015) investigated the effectiveness of a computer-assisted instruction for 17 third-grade students. After training the students to use the computer program, the students independently logged in and used the reading program. The intervention included vocabulary review before reading, reading four times, reading comprehension questions, and corrective

feedback at the end of reading. The researchers used pre- and post-test methodology to measure the effectiveness of the intervention, and the results indicated the participants achieved a significant improvement in reading fluency. In another study conducted with children with Autism Spectrum Disorder, Morlock et al. (2015) evaluated the effect of video modeling on word identification of three high school students with Autism Spectrum Disorder by showing them videos that presented printed words accompanied by modeled pronunciation of the words. The study used a multiple baseline design across the participants with a follow-up phase 3 months after the final intervention session. The study found that all of participants achieved a significant improvement in word identification during the intervention and maintained improvement at follow-up phase.

Another widely implemented electronic modeling that is a self-managed intervention is video modeling, defined as a technique that teaches a behavior by showing a desirable behavior to the learner (Bellini & Akullian, 2007). Video modeling is rooted in Bandura's social learning theory, which suggests that individuals learn behaviors by observing a model without previously experiencing the behavior (Bandura, 1969). Common models are teachers, parents, and peers who are able to present a desired (or target) behavior accurately. Video self-modeling (VSM) is a type of video modeling which involves using the students themselves as the model for the intervention. VSM is one of the specific interventions explored in this study; thus, research using VSM will be reviewed more extensively below.

Video self-modeling. Over the past few years, technology has advanced rapidly in education resulting in a variety of new devices used in teaching and intervention (e.g., audience response systems, smart boards, iPads and other tablet products). As a product of technology advancement, VSM encourages a student to learn a behavior by watching a video of him or

herself performing a target behavior accurately (Dowrick, 1999). Schunk, Pintrich, and Mece (2007) implied that using someone who has similar characteristics (e.g., age, appearance, age, gender) increases the power of modeling as an intervention. Thus, the self as a model should be the most powerful type of modeling. In 1999, Dowrick argued that individuals tend to consider they 'own' the behaviors when it is their own modeling used within intervention and, thus, they are more likely engage in the modeled behaviors. Further, Dowrick (2012) indicated that watching a video of themselves reading fluently increases students' confidence in reading and, thus, leads to greater motivation for reading. The effect is VSM increases readers' self-efficacy and motivation in reading.

Since its introduction as an intervention, VSM has been used with individuals with various disabilities, age, and behaviors (Buggey & Ogle, 2012). In one historic study, Creer and Milklich (1970) first applied VSM in order to decrease immature and non-assertive behaviors of a 10-year old child with asthma in the residential setting. Two 5-minute video tapes were made in order to show appropriate and inappropriate behaviors acted by the participant and other two children. The participant watched both videos daily for 6 weeks. Results indicated that the child showed a significant decrease in immature and non-assertive behaviors and showed more age-appropriate behaviors for remaining 6 months in the residential setting after the intervention was completed. This study was a precursor to many studies to follow.

In a recent review of VSM, Buggey and Ogle (2012) reviewed 49 studies published from the early 1970s to 2010 that implemented VSM. The review revealed that typically developing children and those with attention difficulties, autism, cognitive disabilities, emotional disturbance, physical disabilities, speech language disorders, and traumatic head injury have participated in VSM studies. Furthermore, individuals in preschool (e.g., Buggey, 2005),

elementary school (e.g., Coyle & Cole, 2004), middle school (e.g., Hartley, Kehle, & Bray, 2002), and high school (e.g., Cihak & Schrader, 2008) have been shown to benefit from interventions using VSM.

Thus far, most studies using VSM have primarily focused on social skills, life skills, and functional skills (Buggey & Ogle, 2012). Of the studies examined by the authors, 46 out of 49 studies examined the effect of VSM on behavioral change; whereas, only three studies utilized VSM for improving academic skills (e.g., Delano, 2007; Hitchcock, Prater, & Dowrick, 2004; Schunk & Hansen, 1989). With the small number of studies regarding the application of VSM in academics, Buggey and Ogle (2012) admitted the slow expansion of VSM into academics.

When it comes to the application of VSM conducted as a reading fluency intervention, the effect of VSM has not been fully examined. Hitchcock et al. (2004) conducted one of the earliest VSM studies in improving reading fluency and a review of key journals reveals only five subsequent studies have been published. In two studies, Dowrick, Kim-Rupnow, and Power (2006) and Hitchcock et al. (2004) examined the supplemental effect of VSM by examining if adding VSM to a reading intervention package further improves minority elementary school students' reading fluency. Three more recent studies (e.g., Decker & Buggey, 2014; Montgomerie, Little, & Little, 2014; Robson, Blampied, & Walker, 2015) implemented VSM as a stand-alone reading fluency intervention for improving elementary school students in New Zealand. One study by Wu and Gadke (2017) examined both stand-alone and supplemental effect of VSM. In summary, the five published studies (i.e., Decker & Buggey, 2014; Dowrick et al., 2006; Hitchcock et al., 2004; Montgomerie et al., 2014; Robson et al., 2015) showed that VSM significantly improved reading fluency for most of the participants; whereas, Wu and

Gadke (2017) found VSM was not effective as either stand-alone or supplemental reading fluency intervention.

There are two forms of VSM that have addressed non-academic behaviors reviewed in the literature (i.e., Video Feedforward and Positive Self-Review; Prater, Carter, Hitchcock, & Dowrick, 2012). Video Feedforward teaches a skill that is not in a learner's repertoire (Prater et al., 2012); where as Positive Self-Review targets certain skills already in a learner's repertoire, yet rarely performed by individuals (Prater et al., 2012). An example of Video Feedforward is found in a study with a child who exhibited reading difficulties. In this study, Dowrick et al. (2006) videotaped the child while he practiced reading with an adult and then the video was edited (e.g., portions with reading errors were deleted) such that the child was depicted reading fluently in the video. In this study, reading fluency (a skill not previously exhibited) was targeted through a video showing reading fluency that was artificially created. Conversely, an example of Positive Self-Review is accomplished when a child's classroom behavior is recorded and all demonstration of low-incidence on-task behaviors are saved for later viewing (e.g., off-task behaviors and other parts of the video are edited out). It is important to note, all VSM studies designed to increase reading fluency have utilized the Video Feedforward procedure.

Although VSM has been shown to be effective as a supplemental and stand-alone reading fluency intervention, there are some limitations in the prior studies. First, the carry-over effect that could occur during the development of the video was not considered in the research design used by Dowrick et al. (2006) and Hitchcock et al. (2004). The supplemental effect of VSM was measured by comparing the effect of intervention package and the combination of the package and VSM. Even though the combined intervention further improved reading fluency, it is possible that the package resulted in a delayed effect in the combined phase, while the VSM did

not impact students' reading. Thus, a research design that minimizes the carry-over effect is needed. The recent study by Wu and Gadke (2017) also did not address the carry-over effect when evaluating the supplemental effect, as the comparison was made between RR implemented in one intervention phase and the combined intervention of RR and VSM implemented in next intervention phase.

Second, a limitation was found in the development of the combined intervention used in the study by Wu and Gadke (2017). Their RR required the students to read two times: (a) the first trial with an immediate error correction and (b) the second trial without an error correction. However, the VSM was inserted between the first and second trial of reading of RR, which might have negatively impacted the overall effect of the combined intervention. That is, the sequence of the combined intervention is the first trial of reading with the error correction, VSM, and the second trial of reading without the error correction. The researchers measured reading fluency during the second reading trial in order to measure the effect of the combined intervention. Wu and Gadke (2017) suggested that the addition of VSM might have interfered with participants' memory of the corrective feedback.

Third, interventions may have not optimized findings from previous research to inform the intervention design. For example, in their study using VSM and RR, Wu and Gadke (2017) had the participants read a passage only two times during RR and during the combined intervention condition. However, the RR meta-analysis studies (Lee & Yoon, 2017; Therrien, 2004) indicated that LPP and reading four times during RR led to the highest effect. Thus, there does not appear to a study comparing VSM and the most effective format of RR.

Finally, the overall development of the videos used in VSM has limitations. For example, during prior studies (e.g., Robson et al., 2015), students appear to have received

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unintended reading fluency interventions during the development of the videos for VSM. In order to develop the video, the researcher began by reading one or two sentences, then the students read after the researcher until the end of the passage. This video then served as the model for the student during the VSM intervention. This procedure is problematic for at least two reasons. It is probable that the researcher served as a model when reading the first two sentences and reading a passage served as a practice reading; therefore, students' reading improvement may have resulted from students' exposure to the researcher's modeling and/or practice reading during video development, instead of VSM itself. Removal of the modeling process during the video development would decrease potential confounding effects. Furthermore, in the process of designing videos used in their study, Robson et al. (2015) required participants to hold a blank paper and repeat researchers' sentences to simulate reading (i.e., instead of reading an actual passage, the participants repeated the sentences and held the paper as if they were reading). The premise of this procedures was to self-model good reading. However, it is clear that participants were aware that actual reading did not occur. If the researchers had recorded footage of participants' actual reading, the participants would have realized they were fluently reading. It is possible that participants might have become more confident in their reading ability when they observed themselves actually reading. Thus, attention is needed as to the most effective methods used to develop the videos in VSM.

In sum, VSM is one of the self-managed interventions used to teach social skills, life skills, and functional skills for children with and without disabilities. Two types of VSM include Video Feedforward and Positive Self-Review. Recent studies have begun to use VSM (i.e., Video Feedforward) to improve reading fluency. Two studies examined the supplemental effect; whereas, three studies used VSM as a stand-alone intervention to improve reading fluency for

minority and non-U.S. populations. However, the limitations in methodology includes potential carry-over effects and other confounding actions when examining the effect of VSM. Furthermore, in comparison less than ideal versions of other interventions have been used as the comparative intervention. These limitations in methodology used to evaluate VSM and compare it to other interventions need to be addressed.

Problem Statement

VSM has been used as an effective intervention to improve various non-academic behaviors (e.g., social, life, functional skills; Buggey & Ogle, 2012). However, only six studies using VSM as an intervention to improve reading fluency have been found in the literature. Two of these studies (i.e., Dowrick et al., 2006; Hitchcock et al., 2004) explored the effect of VSM as a supplemental intervention component and the three other studies (i.e., Decker et al., 2014; Montgomerie et al., 2014; Robson et al., 2015) evaluated the effect of VSM as a stand-alone intervention. Wu and Gadke (2017) examined both the stand-alone and supplemental effects of VSM. However, limitations in each of the studies lead to questions about the direct impact of VSM on reading fluency development.

Purpose of the Study

The first purpose of the current study is to compare the effect of RR (i.e., a combination of LPP and with four repetitions of passages, as suggested as ideal in the literature) and VSM on reading fluency development. The second purpose is to determine if a combination intervention of RR, as described above, and VSM is more effective than the two stand-alone interventions.

Significance of the Study

The current study will provide a more comprehensive examination of the effect three interventions to improve reading fluency using a rigorous, well-controlled single-subject design. Modifications to the intervention development and implementation and the research design will address identified limitations of previous studies. Specifically, the current study will be the first to use the Positive Self Review type of VSM in order to minimize the practice effect and other confounding variables during the video-making procedure. Additionally, the current study will adopt the format of RR recommended by the recent meta-analyses (Lee & Yoon, 2017) in which LPP followed by repeated reading of a passage four times. Further, during the combined intervention condition, VSM will be implemented before RR, so that the inclusion of VSM with RR does not interrupt the effect of RR. Finally, the research design will include an alternating treatments design to determine the most effective intervention for participants, followed by a confirmatory phase to further evaluate the effect of the intervention. A follow-up phase will also be used to evaluate the maintenance of reading fluency.

Research Questions

The following are six research questions are addressed in the proposed study:

1. Are the reading interventions (i.e., RR, VSM, and Combined Intervention) effective in increasing the reading fluency of the participants relative to the baseline phase?

2. Relative to the control condition in the alternative treatment design phase, are the reading interventions (i.e., RR, VSM, and Combined Intervention) effective in increasing the reading fluency of the participants?

3. Are there differences between RR and VSM with regard to effectiveness in increasing reading fluency?

4. Is the Combined Intervention (RR+VSM) more effective than either stand-alone

   intervention (i.e., RR or VSM) in increasing reading fluency of the participants?

5. Will the differences between the most and least effective intervention within the

   alternating treatment design phase continue in the confirmatory phase for each

   participant?

6. Will the effectiveness of the most effective intervention continue during the follow-

   up phase?

CHAPTER II

LITERATURE REVIEW

The purpose of this chapter is to present a comprehensive review of the literature regarding reading. The first section provides an overview of learning to read, including an introduction of five important pillars of reading skills followed by a section on the importance of reading fluency. The next section reviews selected reading fluency interventions divided into tutor-led reading fluency interventions and self-led reading fluency interventions. Finally, a summary section will be provided.

Learning to Read

In today's age of accountability, school systems are faced with ever-increasing demands. Public education personnel are required to decrease achievement gaps, utilize evidence-based interventions, meet adequate yearly progress goals, fulfill the needs of English language learners and children with disabilities, and adopt up-to-date pedagogical methods (United States Department of Education, 2005). Teaching reading is one of the most important tasks of an educator, as reading is closely related to functioning in daily lives and overall success in school and life (Strickland et al., 2013). Our lives would be heavily disrupted without knowledge of embedded messages found within product instructions, restaurant signboards, and newspapers. At school, most subjects rely on reading. For example, it is impossible to write a sentence or passage without knowing words. With rare exception, textbooks are required, and students must have functional reading skills to read and comprehend the materials.

Reading is a very complex skill that incorporates multiple sub-skills. In order to become an effective reader, NRP (2000) proposed that a reader needs to be proficient in five pillars of reading skills: (a) phonics, (b) phonemic awareness, (c) reading fluency, (d) vocabulary, and (e) reading comprehension. The Institute for the Development of Educational Achievement (2004) also referred to these five skills as 'the Big Five' and encouraged educators to purposefully incorporate these five skills into their reading instruction in order to effectively teach reading.

Phonics typically refers to alphabetic principles, which include letter-sound correspondence, and spelling patterns. This also includes utilizing these two skills in reading (NRP, 2000). Alphabetic principle includes the learning of individual letters. Moreover, the principle indicates the correspondence of a letter and its sound and the relationship between letter sounds (Griffin, 2009). In alphabetic principle instruction, the reader learns each letter that a word contains and the sounds of those letters to formulate the spoken word (Hsin, 2007). Readers must also learn to utilize the knowledge of letter-sound correspondence to read an unknown word (Metsala, 1999). *Phonemic awareness* refers to a reader's ability to segment and blend the smallest sound units of words (e.g., /p/, /a/, /th/; Ehri et al., 2001). Phonemic awareness skill is crucial and considered necessary for acquiring oral and written language (Asfendis, 2008). *Reading fluency* is defined as the ability to read fast and accurately with a proper prosody (rhythm and sound intonation; NRP, 2000). More definitions of reading fluency will be discussed in the next section to have a thorough review on how researchers review reading fluency. The correlation between reading fluency and reading comprehension was cited in multiple studies (e.g., Bigozzi et al., 2017; Klauda & Guthrie, 2008). That is, a fluent reader will likely use less cognitive load (see Sweller, Ayers, & Kalyuga, 2011) during reading, thereby enhancing the ability to focus on understanding the text (LaBerge & Samuels, 1974). *Vocabulary*

is intended to indicate an ability to understand words spoken by others and to use words to communicate with others (Hsin, 2007). Although there were limited studies that have explored the effect of vocabulary on reading ability, NRP (2000) found that a good vocabulary skill is positively related to reading comprehension. *Reading comprehension*, an ability to understand and obtain information from text, is the ultimate goal of reading (Elleman, Lindo, Morphy, & Compton, 2009).

Although reading is an essential part of life, learning to read has been a challenging task for a significant number of students. In 2005, 36% of fourth-grade students' and 27% of eighth-grade students' reading achievement were in the range of Below Basic. In 2015, 10 years later, although the percentage of struggling fourth- and eighth-grade students decreased to 31% and 24%, respectively, yet high percentage of struggling readers still indicate the need for effective reading interventions. Studies (e.g., Duke & Pearson, 2002) showed that good readers, who have better vocabulary, are able to ignore irrelevant information when reading, and can effectively read text that follows. Moreover, the studies found skills of good readers allow them to learn many subjects (e.g., math, science) more effectively. That is, a large number of students with reading difficulties might also experience difficulties in learning other subjects.

Furthermore, the negative impact of reading difficulties might be long lasting, as a failure of mastering foundational reading skills typically leads to a larger future discrepancy among readers. In a study, Biemiller (1977) found that reading fluency differences between poor and good readers can be as large as 40 words correct per minute (WCPM), and this discrepancy persists as they progress to higher grades. This may be in part due to the 'Matthew Effect' (Stanovich, 1986) in which a student with reading difficulties is less likely to engage in reading

and experiences decreased motivation to read, which then leads to less reading, causing the student to fall even further behind his or her peers.

In summary, today's school systems have experienced various challenges due to the evolution in educational mandates, policies, and procedures. Teaching the skill of reading is one of the most important tasks within schools, as reading skill significantly influences our daily lives and education. The NRP (2000) identified five key components of readings (i.e., phonics, phonemic awareness, reading fluency, vocabularies, reading comprehension), and the Institution for Development of Educational Achievement (2004) encouraged educators to incorporate these five pillars into their reading instruction. Despite the importance of reading and major efforts to address student inadequate reading performance, a large number of students are still experiencing reading difficulties. Moreover, those students with early reading difficulties may experience continuous and long-term difficulties in reading and other subjects.

Importance of Reading Fluency

Among the big five reading skills (or pillars of reading), reading fluency has not been educators' focal concern for decades (Allington, 1983), as indiated by very few reading fluency interventions. For example, the 'round robin' reading was one of the reading fluency interventions implemented at schools, in which students take a the turn reading each sentence until the passage is completed. Following this, NRP's reseach found the emergence of attention to reading fluency did not occur until NRP's large-scale research (2000) for exploring effective reading interventions published thus far, disseminating the conclusion of their research, and encouraging future research, based on the request of the U.S. Congress. While NRP (2000) found various meaningful results from their research into reading difficulties, one of the most important suggestions of NRP (2000) was that reading has five important pillars (as previously

mentioned), which included reading fluency for the first time as one of the key aspects of reading. While researchers defined reading fluency differently in the literature, the current study will adopt one of the definitions.

According to NRP (2000), reading fluency is defined as an ability to read fast and accurately with intonation or prosody. That is, a fluent reader should be able to orally read at a fast rate with accuracy, while reading with appropriate expression. There are two additional definitions of reading fluency in the literature. Daane, Cambell, Grigg, Goodman, and Oranje (2005) defined reading fluency as an ability to read passages quickly and accurately without consideration of the role of prosody (e.g., the ability to appropriately express the phrases that match their meanings). Conversely, Piklulski and Chard (2005) defined reading fluency as efficient and effective word identification that allows an individual to comprehend the meaning of text. These two alternative definitions considered the accuracy and speed of word recognition to be a crucial aspect of reading fluency. Notably, although there appears to be an inference of a relationship between fluency and comprehension, the third definition directly links the contribution of efficient and effective word recognition to reading comprehension. Overall, all of the definitions suggest that every reader has a limited attentional capacity, and fluent readers are able to distribute their attentional capacity to the meaning of texts because they can decode automatically with high accuracy (LaBerge & Samuels, 1974). Based on the scope of the current study, the second definition of reading fluency will be adopted, and only the speed and accuracy of reading will be measured. As for the relationship between reading fluency and reading comprehension, there are numerous empirical studies that suggest the high correlation between two reading skills of reading fluency and comprehension (e.g., Bigozzi et al., 2017; Fuchs & Fuchs, 1992; Kim, 2015; Klauda & Guthrie, 2008).

In summary, reading fluency has received minimal attention until NRP (2000) recognized reading fluency as a necessary component of learning to reading (i.e., one of the five pillars of reading). The current study will focus on reading fluency which, for the purposes of this study, is defined as the ability to read fast and accurately. It is recognized that a high level of reading fluency allows a reader to save attentional capacity and distribute attention to reading comprehension. Therefore, it is critical to assist students to improve their reading fluency.

Reading Fluency Interventions

Following the NRP (2000) report, a considerable amount of research has been conducted for developing effective reading fluency interventions (Chard et al., 2002; Fuchs, Fuchs, Hosp, & Jenkins, 2001). NRP (2000) identified multiple, well-researched reading fluency interventions (e.g., LPP, RP, RR) that may significantly improve students' reading skills. Another emerging reading fluency intervention is VSM.

To facilitate further exploration of the various reading fluency interventions, they will be divided into two categories: (a) tutor-managed interventions and (b) self-managed interventions. The purpose of this categorization is to better explain the advantages and disadvantages of two types of interventions. Thus, the following sections will describe the development of three tutor-assisted interventions (i.e., LPP, RP, RR) and one specific self-assisted intervention (VSM) with detail provided on important nuances of this emerging intervention.

Tutor-Managed Interventions

In this study, tutor-managed interventions refer to the interventions in which the learners highly rely on the tutors' assistance throughout the intervention. That is, the tutors are not only present during the interventions, but readers' improvement depend on how the tutors assist the

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readers. Various tutor-managed interventions will be described below. First, the development of

LPP will be described, followed by a description of the historical use of LPP in reading fluency

interventions. Then, RR, will be discussed; specifically, the original and current formats of RR

will be discussed with differentiation between RP and RR provided.

  LPP. LPP is designed to assist the reader in reading more accurately and quickly (Daly

& Martens, 1994). In LPP, before asking the reader to read a passage independently, a tutor

reads the passage aloud, while the student quietly follows along. Daly and Martens argued that

the effect of LPP could be explained by a behavior analytic model known as the Instructional

Hierarchy (Haring, Lovitt, Eaton, & Hansen, 1978). Instructional Hierarchy (Haring et al., 1978)

suggests that a learner moves through the following phases when learning a new skill: (a)

acquisition, (b) fluency, (c) generalization, and (d) adaptation. Specifically, a reader needs to

learn how to accurately read words (acquisition) before reading a passage quickly. When the

reader is able to read a passage with a high accuracy (e.g., 90%), the reader is ready to move to

building fluency, which involves reading with high accuracy and speed. Once the reader is able

to read fluently, the reading skill can then be generalized to allow the reader to read different

reading passages. Finally, readers can then adapt their reading skills to read different reading

materials (e.g., magazines, news, articles). LPP is often considered an acquisition intervention in

that it increases reading accuracy by teaching the reader how to read difficult words by listening

to the tutor before independently attempting the passage (thus avoiding errors the practice of a

new word). As the reader also reads and listens to the words that the reader already knows, LPP

facilitates an accurate responding of the acquired words. Next, the development and evolution of

LPP, including differences in components, settings, and combinations with other interventions

will be discussed.

Daly and Martens (1994) first implemented LPP to determine its effect on reading accuracy (i.e., total words read correct) and reading fluency (i.e., WCPM) with four male elementary school students with learning disabilities. The researchers used an alternating treatments design to compare the effect of three interventions, including LPP, after collecting seven baseline data points. During the baseline phase, each participant read a passage without any intervention and recorded WCPM, and the data collection occurred once per day for seven days. After the baseline, subject passage preview, taped words, and LPP were implemented in an alternating fashion. Subject passage preview, a reading fluency strategy, requires participants read the passage once before reading another time, during which their WCPMs were measured. Taped words required the participants to review the key words of the passage that they would then read aloud. As a modeling strategy, it targets reading accuracy by teaching words before the WCPMs were measured. The study results indicated that LPP led to the largest immediate improvement in reading fluency, although there were variations among the participants' performance. The effect size for each intervention was not reported in the study. Daly and Martens (1994) indicated that the accuracy and fluency component of LPP might have led to the relatively larger effects, because some participants reportedly had difficulty identifying words. For the participants, based upon the concepts of the Instructional Hierarchy (Haring et al., 1978), the accuracy strategy was believed to be necessary. Participants could not read fluently because they could not read the words correctly.

Skinner, Cooper, and Cole (1997) conducted a study to explore if different reading rates modeled by tutors during LPP impacted intervention effects. A multiple baseline design across participants was used for two 12-year old elementary school students with reading deficits. The researchers collected three baseline data points for one participant and four for the other

participant. During the baseline condition under which silent previewing was used, the participants silently previewed the passage once. After baseline, an alternating treatments design was implemented using silent previewing (as a control), slow presentation, and rapid presentation conditions. The only difference between the slow and rapid presentation conditions was that the rate of researchers' reading during LPP; participants were required to silently read the passage along with the researchers during both conditions. During the slow presentation condition, the researchers read the passage in the rate of the minimum mastery level of the participants' instructional reading level. For example, because the participants' instructional levels were the second and third grade, the researchers read in a rate of 50 WCPM, the minimum mastery level of second and third grade (see Shapiro, 1989). During the rapid presentation condition, the researchers read at their much faster natural rate. Each intervention condition was provided six to eight times and the control condition was conducted four to five times. Results show the slow presentation condition led to higher WCPMs for both participants compared to two other conditions and during baseline. The rapid presentation condition did not result in significantly higher WCPMs than did the baseline and control conditions for either participant (no effect size was not calculated for the effect of two formats of LPP). Thus, the researchers suggested using a reduced rate (i.e., the minimum mastery level of readers' instructional level) during LPP.

Begeny, Krouse, Ross, and Mitchell (2009) compared LPP to two other interventions as small group reading interventions. The participants included 4 second-grade students in need of additional reading interventions based on their teachers' referral. As a group, the 4 participants received three interventions (i.e., LPP, RR, Listening Only) and were also exposed to a control condition using an alternating treatments design. Reading probes slightly above their reading

level were used in the study. During the LPP condition, the interventionist read the passage

twice at a rate slightly faster than the participants' fluency rate, while the participants silently

followed along. Begeny et al. (2009) also required the participants to point the text while

reading in order to ensure participants' attention to reading. To maintain their attention during

the LPP condition, the interventionist also stopped reading 4-5 times at unpredictable points and

asked one of the participants to read the next word. LPP was implemented two additional times

with two different passages at the same reading level, to obtain a median WCPM. During the

RR condition, a group leader was selected to read the passage out loud while the other

participants silently read along. If the leader made a mistake, immediate corrective feedback was

provided. Then, a second reading was conducted using the same procedure but with a new group

leader. The WCPMs were measured after the second reading, and two more RRs and reading

fluency measurements were conducted to calculate median WCPM as the procedure used during

the LPP condition. During the Listening Only condition, the participants listened twice to the

interventionist's reading without access to the passage. The same measurement procedure was

used during this condition. Results showed the RR condition led to higher levels of WCPM

across the participants; however, no effect size was calculated. Furthermore, although the study

attempted to add two components (i.e., pointing to text, reading the next words after stopping at a

random point) to LPP, which were intended to maintain the participants' attention, a component

analysis was not conducted to examine the effect of these added components. Overall, this study

implemented and compared the effect of LPP, RR, and Listen Only as small group interventions

for a group of 4 second-grade students. The results of the study indicated that RR led to the

highest improvement in reading fluency for the participants.

Various studies also have used LPP as part of a multi-component intervention. For example, Klubnik and Ardoin (2010) designed a multi-component reading intervention that included LPP, RR, contingent reward, and error correction and examined if the small group or individualized multi-component reading intervention was more effective with 6 second-grade students with reading difficulties grouped as triads. All participants were provided an individual and the small group intervention. The researchers used an alternating treatments design to compare the participants' WCPM during three conditions: (a) a control, (b) individual intervention, and (c) small group intervention.

During the small group intervention, interventionists reviewed three expected behaviors (i.e., "follow directions", "try your best", "pay attention") with the participants and told them that they could earn prizes based on the presence of the behaviors. Then, the interventionists provided LPP. Similar to the LPP procedure used by Begeny et al. (2009), the participants pointed to the text and read the next word when the interventionists stopped at a random point to make sure the participants paid attention to text. Next, they took turns reading one sentence, while two other students silently followed along the reader. Then, the participants engaged in the turn-take reading two more times (i.e., RR). The interventionists provided immediate corrective feedback. Moreover, the interventionists and the participants went over missed words two more times. The participants re-read missed words once. Then, the participants read the 2- to 3-word phrases that included the missed words twice. If the participants made the same error, they were asked to do syllable segmentation and blending. Then, each participant read the passage separately, and the interventionists recorded the WCPM. Last, a prize (e.g., candy) was provided contingent upon satisfactory performance of three expected behaviors throughout the session. During the individualized intervention condition, the procedure was the same, except

that the participant did not engage in take-turn reading. During the control condition, the

participants read the passage without any assistance. As a result, both individual and group

interventions resulted in significantly higher WCPM than did the control condition, with no

significant difference the small group and individual interventions across the participants.

In summary, LPP is an intervention that facilitates reading accuracy and improved

reading ability (i.e., WCPM), as LPP models the pronunciation of unknown words and requires

readers to repeat already acquired words. An early study found that a slower reading pace during

LPP resulted in higher WCPM than did rapid reading. LPP has also been shown to be effective

when used as a small-group intervention; although RR appeared to be more effective. Moreover,

LPP has been incorporated into multi-component reading interventions to improve students'

reading. However, it is important to note that while LPP has been shown to be an effective

intervention, it requires significant involvement from interventionists.

RR. RR is another well-researched reading intervention. As Chapter One of this

manuscript indicated, the format of RR has been gradually modified over time, especially in

recent RR literature. In addition to the influx of attention to RP, numerous studies have been

conducted to maximize the effect of RP by adding other intervention components to RP. For

example, Chard et al. (2002) suggested that adding other intervention components (e.g., error

correction, modeling) to RP would further improve reading fluency. Over time, these

modifications were commonly include in RP interventions such that a combination of RP and

other intervention components were eventually referred as RR in some of these studies (e.g.,

Ardoin, Williams, Klubnik, & McCall, 2009; Hawkins, Hale, Sheeley, & Ling, 2011; Kostewicz

& Kubina, 2010) and RR meta-analysis (e.g., Lee & Yoon, 2017; Therrien, 2004). Thus, most of

the RR studies, including RR meta-analysis studies (i.e., Lee & Yoon, 2017; Therrien, 2004),

refer to RR as a combination of RP with other types of interventions (e.g., LPP, corrective feedback). In order to clarify the format of RR, RP will indicate the original format of RR in which the individuals read a passage for several times, and RR will refer to the combination of RP with additional intervention components.

Both RR and RP have been described as an intervention in which a reader reads a passage repeatedly (i.e., multiple times as a practice exercise; LaBerge & Samuels, 1974). Based on the theory of automatic word processing and the Instructional Hierarchy, RP builds fluency, instead of accuracy, by exposing the reader to known words repeatedly. However, RR not only targets fluency, but increases reading accuracy by incorporating various evidence-based reading accuracy intervention components. The following paragraphs will discuss the development of RP. Moreover, different formats of RR and the populations that have benefited from RR will be discussed.

The concept of repeatedly reading a passage to improve reading fluency was explored as early as 1894 (Gerdes, 2000). In more current times, LaBerge and Samuels (1974) published a study regarding theoretical basis of RP. They suggested reading could be improved with RP, similar to the way people improved their skills in other subjects (e.g., music, dance, sports) by repeatedly practicing. The rationale of the RP was that poor readers spent most of the attention to decoding, and repeatedly reading passages would decrease cognitive load, so that they could read fluently and pay their attention to reading comprehension. According to Gerdes (2000), this study conducted in the mid-1970s was a pivotal study in the development of RP. For example, using RP as a foundation, Samuels (1979) conducted one of the most definitive studies using RP as a reading intervention. In the study, elementary school students with significant reading difficulties were required to repeatedly read five short passages (50-200 words) until they could

read at least 85 WCPM. As a result, participants' reading speed and accuracy increased as they repeatedly read the passages. Moreover, participants' fluency (i.e., WCPM) during subsequent readings was also increased, leading Samuels (1979) to conclude that the improvement achieved in the multiple readings in the first passage was generalized to the subsequent passages.

After the increased interest of RP among researchers, various studies had been conducted for further examining the effect of RP by comparing it with other evidence-based interventions. For example, Swain, Leader-Janssen, and Conley (2013) compared the effect of RP, LPP, and audio LPP for a fifth-grade male with reading difficulties. After collecting two baseline data points (i.e., WCPM) in two readings, the participant received each intervention once per week, separately, for 9 weeks. During the RP condition, the participant read three different fifth grade reading probes twice each. The participant only read for 1 minute during each reading. Then, the mean WCPM for the three readings (or trials) was graphed. During the LPP condition, the researcher first read aloud a passage twice, while the participant silently followed along. Then, the participant read the passage independently, and the WCPM was recorded. The only difference between the audio LPP and LPP condition was that the audio LPP used a computer to read the passage twice for the participant. All three interventions resulted in higher WCPMs than during the baseline performance, and the audio LPP led to greatest improvement in WCPM. However, during a 5-month follow up in which all three conditions were evaluated, the participant maintained previously attained reading fluency only during the RP and LPP conditions. Thus, the researchers suggested that the audio LPP might need to be implemented longer in order to maintain the intervention effect.

As for the add-on intervention components of RR, a recent RR meta-analysis study (Lee & Yoon, 2017) reviewed 34 journals and dissertations published from 1990 to 2014 in order to

explore the types of add-on interventions and the most effective format of RR. The participants

in the studies included students in K-12 identified as at risk of special education due to reading

difficulties. As a result of the analysis, the authors found five add-on intervention components:

word preview, LPP, error correction, performance feedback, and peer mediation. Moreover, the

authors found a variable, the number of re-reading during RR, appeared to contributed to the

effect of RR (see the presentation of various studies below).

In terms of the populations, RR has been shown to improve reading in various

populations: (a) typically developing children (e.g., Therrien & Kubina, 2007); (b) children with

specific learning disability (e.g., Yurick, Robinson, Cartledge, Lo, & Evans, 2006); (c)

intellectual disabilities (e.g., Valleley & Shriver, 2003); (d) speech impairments (e.g., Yurick et

al., 2006); (e) Bipolar Disorder (e.g., Staubitz, Cartledge, Yurick, & Lo, 2005); and (f) Attention

Deficit/Hyperactivity Disorder (e.g., Kostewicz & Kubina, 2010). Hawkins et al. (2011)

examined the effect of RR and a combination of RR and vocabulary previewing intervention for

6 high school students with a specific learning disability in reading. They adopted the alternating

treatments design to compare the WCPM of three conditions: RR, RR + Vocabulary Previewing,

and control condition. During the RR condition, the participants read an approximately 400-

word passage twice, while the researchers recorded the miscues. After the first reading, the

researchers wrote down the incorrect words in the index and asked the participants to read each

misread word. The error correction procedure continued until the participants read each word

correctly for three times. After the second reading, the researcher recorded reading fluency and

asked some comprehension questions. In the RR+Vocabulary Previewing condition, the

researchers provided index cards, in which there were key vocabularies from the reading

passages and their definitions. The participants read through them by themselves, and the

researchers asked the participants to read each word and define the word. This process continued until they could read and define each word three times accurately. Then, the same RR procedure was conducted. During the control condition, the participants read a 400-word passage without the word previewing and other interventions, while the researchers recorded their WCPM. Two intervention conditions were conducted five to six times, and the control condition was implemented three times. As a result, the participants resulted in higher reading fluency in both intervention conditions compared to the control condition. The RR+Vocabulary Previewing intervention appeared to be more effective for the participants, as the reading fluency was higher in the combined condition than the RR alone condition across 6 participants. Hence, the researchers suggested that adding the vocabulary previewing intervention to RR might lead to a further improvement for higher school students with the reading disability.

When it comes to LPP as one of the add-on intervention components, Begeny and Sibler (2006) compared the effect of four combined interventions for a group of 4 sixth-grade typically developing children with reading difficulties. There were three intervention components: (a) word list training, (b) LPP, and (c) RR. In the word list training, a school psychologist-in-training wrote down the 20 key words on a board and allowed the participants practiced the words before reading the passages that included the words. For example, the participants read each word as a group once modeled by the school psychologist-in-training, and the school psychologist-in-training called on random individual participants to read the words. LPP required the participants quietly followed along, while they were being read at a rate of 100 WCPM. The school psychologist-in-training stopped four to six times and asked the participants to read the next word in the passage. During the RR condition, 4 participants paired and took turn reading the passages. Each participant read the passage twice and silently followed along

twice. Using three intervention components, the researchers designed (a) word list training+LPP+RR, (b) word-list-training+LPP, (c) LPP+RR, and (d) word list training+RR. After collecting three baseline data points by recording WCPM of three readings without any intervention, the sequence of four combinations was randomized for each participant, and each intervention was provided for four times. As a result, four combinations resulted in higher WCPMs than the baseline condition across the participants. More specifically, the combination of all three components resulted in the highest improvement for the participants.

Ardoin et al., (2009) incorporated an error correction procedure into two different formats of RR and examined the effect of two RRs for 4 elementary school children. One of the participants had eligibility ruling on Specific Learning Disability and Language Impairment. The researchers adopted a rapid reversal single subject design to compare two RRs. That is, the only difference between two RRs was the number of re-reading. One required three re-readings, and another RR had six re-readings. Both RRs incorporated LPP, phrase drill, and phonemic awareness, and RP. After LPP, the participants read a passage for either three or six times. At the end of each reading, the researchers asked the participants to read the misread words with the error corrections and also read three to five-word phrases that included the misread words for three times. The syllable segmentation and blending were provided if the same mistake occurred more than once across different trials of readings. Based on the results, the RR with six re-readings resulted in higher reading fluency than the RR with three re-readings.

Performance feedback refers to goal setting, self-evaluation, and contingent reward (Lee & Yoon, 2017). Valleley and Shriver (2003) incorporated the goal setting and contingent reward to RR for 4 high school students with disabilities (i.e., Specific Learning Disability, Intellectual Disability). A multiple baseline design across the participants was used for their study. The RR

required the participants to read a fourth-grade passage for 1 minute for at least four times. That

is, the reading was continued until the participants read faster than their prior reading for three

consecutive times. If the criteria were not met, the participants read for 10 times at maximum.

After meeting the criteria or reading 10 times, the participants read a new passage. If they

finished reading the fourth-grade passages, fifth-grade passages were provided in the same

manner as the fourth grade. Moreover, a reward was provided if the participants followed the

directions and completed assigned work. The corrective feedback was not provided. As a result,

every participant achieved the improvement during the intervention phase compared to the

baseline performance.

When it comes to the add-on component of peer mediation, Yurick et al. (2006) included

more competent peers to RR in order to assist three groups of elementary school students with

(i.e., Specific Learning Disability, Speech Impairment) and without disabilities. The researchers

adopted the multiple baseline design across three groups. During the baseline phase, each

participant silently read a reading passage lower than their actual grade level for 10 minutes by

themselves without any assistance. Then, each student was pulled out and assessed in the same

passage, and the reading fluency was recorded. The first student in the multiple baseline design

had 8 to 11 baseline data points. Then, the intervention was implemented in a staggered manner.

Before the intervention, the student training was provided to the advanced peer mediators. Three

20 to 30-minute training include (a) description of the entire peer-mediation process and peer

mediators' roles, (b) description of the entire peer-mediation process and the struggling readers'

roles, and (c) the demonstration of the complete procedures, respectively. After the training, the

paired RR was provided. During the paired RR, each participant read a passage with the

assistance of peer mediator. Contingent upon the participants' miscue, the peer mediator

provided the immediate corrective feedback with three steps. First, the correct pronunciation of the misread word was read to the participant. Then, the participants were asked to read three-word phrases that included the misread word. Next, the participant was required to read the three-word phrases three times. After a 10-minute practice with the peer mediator, the researchers measured each participant's reading fluency in the passage that each participant just practiced. As a result, all of the participants increased their reading fluency compared to their reading fluency in the baseline phases.

In addition to five add-on components of RR, Lee and Yoon (2017) found the number of passage repetition in the studies were varied. For example, Hawkins et al. (2011) only repeated two times during RR. Valleley and Shriver (2003) required their participants to re-read four times. Ardoin et al. (2009) implemented three and six repetitions of RR in their study. Yurick et al. (2006) asked their participants to read as many times as possible during the 10-minute RR. The authors considered the variable, the number of re-reading, as an important characteristic of RR and analyzed the importance in their meta-analysis study. As results of the meta-analysis study, Lee and Yoon found that the most effective format of RR is a combination of LPP and RP with four re-readings.

In terms of the populations, RR improved reading fluency of typically developing children (e.g., Therrien & Kubina, 2007), children with Specific Learning Disability (e.g., Yurick et al., 2006), Intellectual Disability (e.g., Valleley & Shriver, 2003), Speech Impairment (e.g., Yurick et al., 2006), Bipolar Disorder (e.g., Staubitz et al., 2005), and Attention Deficit/Hyperactivity Disorder (e.g., Kostewicz & Kubina, 2010).

In summary, RR is a well-researched reading fluency intervention based on the theory of automatic processing. Although the development of RR started from the 1980s', LaBerge and

Samuels (1974) sparked the interest in RR research. After the definitive RR research (i.e., Samuels, 1979), significant attention was paid to explore the effect of RR. The effect of RR was documented with populations with and without disabilities. As for the early RR studies, the researchers tend to refer an intervention, where individuals re-read multiple times, as repeated reading. Gradually, a combination of multiple re-readings and other interventions was referred as RR. As for the add-on interventions, a recent meta-analysis (i.e., Lee & Yoon, 2017) found five add-on components (i.e., word previewing, LPP, error correction, performance feedback, peer mediation). Moreover, the number of re-readings was also a contributing factor of RR's effectiveness. As a result of the study, a combination of LPP and four re-readings was the most effective format of RR.

Two well-studied tutor-managed interventions, LPP and RR, were discussed in this section. The advantages of these two interventions included the abundant studies that support their effectiveness for various populations. However, a significant limitation of tutor-managed interventions is that they require the presence of a tutor, and the tutors might be resistant to the implementation of the interventions due to their heavy workload (Erchul & Martens, 2012; Kampwirth, 1999).

Self-managed Interventions

In comparison to tutor-managed interventions, self-managed interventions require a minimal level of tutor management. Self-managed interventions in the current study are defined as interventions, in which the individuals rely more on themselves when it comes to improving their behaviors, although the tutors might provide slight assistance. For example, a child with a behavioral concern of off-task behaviors (e.g., looking around, talking to others, making noise) during class may benefit from a behavior checklist, with which he or she could mark how many

times the off-task behaviors occurred in each class. Based upon the average occurrence of the

off-task behaviors, the child could realize how many times the off-task behaviors occurred in

prior classes. The child's efforts to decrease the number of marks on the checklist would lead to

the overall decrease of off-task behaviors in the classes. Other self-managed intervention such as

goal setting (Lo et al., 2011), contingent reward (e.g., Klubnik & Ardoin, 2009), and electronic

modeling (e.g., Skinner et al., 1993; Swain et al., 2013) had been used in the literature. As such,

self-managed interventions emphasize the individuals' independence in managing their

behaviors. Meanwhile, the tutors or others such as a teacher or interventionist do not need to

provide as much attention to the individual as is the case with tutor-managed interventions.

Hence, the tutors could distribute their time to another responsibility (e.g., assisting others). In

the current study, the researchers will focus on one of self-managed interventions (i.e., the

electronic modeling, VSM). In the following passages, the theoretical basis of VSM,

development of VSM across the years, and the development of VSM as a reading fluency

intervention will be discussed.

   The theoretical basis of VSM. VSM is a relatively new technique which has developed

as modern technology has advanced. In VSM, a learner learns a target behavior by watching an

edited video of him or herself performing a desired behavior (Dowrick & Dove, 1980). VSM is

based on Bandura's social learning theory (1969), which asserts that individuals can learn

behaviors by observation, without direct experience. Bandura (1997) suggested that well-

designed observation learning shows a learner how to perform a target behavior and gradually

helps the learner become confident in performing the behavior. VSM shows the target behaviors

using the self, who might further increase the power of the intervention (Schunk et al., 2007).

Schunk et al. suggested that a learner more likely attempted to learn a behavior presented by him

or herself, instead of others, as the learner tended to think that the behavior was already in his or her repertoire. In the case of VSM to improve reading fluency, the learner observes a video of him or herself reading fluently. Dowrick (2012) suggested that the observational learning of reading might allow the learner to become more confident and read more fluently.

Types of VSM. VSM was first implemented by Creer and Milklich (1970) in order to decrease immature behaviors and aggression of a 10-year old male with asthma in a residential facility. During baseline, the participant was observed during the 1-hour period between the participant's return to home and dinner in every weekday for 2 weeks. During intervention, the participant watched two videos every weekday for 8 weeks. The first video presented the inappropriate behaviors in four scenes: (a) the child's refusal to get up at the morning; (b) the child's temper tantrum when he was assaulted by other children; (c) his failure to participate in on-going games; and (d) his behavior that was too 'clingy' to adults. Another video presented replacement behaviors (i.e., appropriate behaviors) for each the four described inappropriate behaviors. Each video lasted approximately 5 minutes. As a result, the participant not only engaged in appropriate behaviors immediately after watching the videos, but the effect of the intervention was found during a 6-month follow up after the end of VSM intervention sessions.

Recently, Buggey and Ogle (2012) reviewed 49 studies regarding the implementation of VSM. Of these, 46 studies used VSM for targeting non-academic behaviors such as social initiation and temper tantrum (e.g., Buggey, 2005), language skills (e.g., Buggey, 1995); on-task behaviors (e.g., Clare, Jensen, Kehle, & Bray, 2000); social skills (e.g., Litras, Moore, & Anderson, 2010); appropriate verbal responses (e.g., Buggey, Toombs, Gardener, & Cervetii, 1999); cooking skills (e.g., McGraw-Hunter, Faw, & Davis, 2006); and spontaneous requesting (e.g., Wert & Neisworth, 2003).

Both forms of video-production procedures, Positive Self-Review and Video Feedforward, were adopted among the VSM studies that targeted various non-academic behaviors. For example, Buggey et al. (1999) used Positive Self-Review to facilitate the acquisition and maintenance of appropriate verbal responses of three elementary school students diagnosed with autism. In order to record the videos needed for Positive Self-Review, the researchers recorded the entire process used during baseline and then edited the video. The dependent variable of the study was the appropriate verbal response; thus, the researchers only included the participants' appropriate verbal responses in the resulted 3- to 5-minute videos. In an example of Video Feedforward, Buggey (2005) used this technique to teach social initiation to two elementary school students diagnosed with autism. Between the baseline and intervention phases, Buggey, the participants, and two other children engaged in role-playing, in which the vocalizations of each was predetermined. During the role-play, the social initiation was modeled before the scenes were recorded so that the participants could engage in the behavior. The videos where then edited to only include scenes where the participants successfully initiated conversation.

In addition to the management of various behaviors, VSM has also been implemented to assist a wide range of populations. The populations included preschool (e.g., Hepting & Goldstein, 1996); elementary school (Hartley et al., 2002), middle school (e.g., Delano, 2007); high school students (e.g., Rickards-Schlichting, Kehle, & Bray, 2004); and adults (e.g., Lasater & Brady, 1995). Furthermore, individuals with autism (e.g., Buggey, 2005); Aspergers. Syndrome (e.g., Delano, 2007); Developmental Delay (e.g., Lasater & Brady, 1995); Intellectual Disability (e.g., Dowrick & Ward, 1997); Spina Bifida (e.g., Dowrick & Dove, 1980); Oppositional Defiant Disorder (Clark et al., 1993); Specific Learning Disabilities (e.g., Dowrick

et al., 2006); Traumatic Brain Injury (e.g., McGraw-Hunter et al., 2006); and typically developing individuals (e.g., Zetou, Kourtesis, Getsiou, Michalopoulou, & Kioumourtzoglou, 2008). Thus, reportedly, VSM has resulted in positive effects in modifying and teaching various behaviors for a wide range of populations (Buggey & Ogle, 2012).

In summary, a self-managed intervention is a type of technique that requires a learner to become more independent in managing their own behaviors, although interventionist might provide minimal assist in the process of the interventions. This type of intervention not only encourage the child's independence, but saves the interventionist's time. There are two forms of VSM (i.e., Positive Self-Review and Video Feedforward), and these VSMs successfully managed various non-academic behaviors for diverse populations since its first application in the early 1970s. Although there have been multiple self-managed interventions introduced in prior studies, the current study focused on VSM, a technology-based intervention, to provide a reading fluency intervention. Research using VSM as an academic intervention is described below

VSM as a reading fluency intervention. Compared to the development of VSM as a behavioral intervention, the development of VSM as an academic intervention, especially reading fluency intervention, has been slow. Six VSM studies that implemented VSM as a reading fluency intervention are found in the literature. Two early studies (i.e., Dowrick et al., 2006; Hitchcock et al., 2004) examined the supplemental effect of VSM on reading fluency and three subsequent studies (i.e., Decker & Buggey, 2014; Montgomerie et al., 2014; Robson et al., 2015) evaluated the effect of stand-alone VSM as a reading fluency intervention. Finally, in a recent study (i.e., Wu & Gadke, 2017) examined the effect of both supplemental and stand-alone VSM to enhance reading fluency. The following passages will discuss the development of VSM as a reading fluency intervention.

Hitchcock et al. (2004) examined the supplemental effect of VSM by adding VSM to a

reading program for 4 Hawaiian children enrolled in first grade. Two participants were eligible

for Specific Learning Disability; one participant was eligible for Developmental Delay; the

fourth participant was typically developing child whose reading was considered as at-risk level.

The researchers adopted the multiple baseline design across the participants. During the

baseline, the participants were asked to read instructional-level reading probes twice per week.

The participants' reading fluency was calculated and graphed, resulting in 5 to 9 data points

within the baseline phase. After the baseline, a reading program, Accelerated Community

Empowerment (ACE; ACE reading, 2004), was implemented. The ACE program is a 20- to 30-

minute intervention with RR, phonics intervention, and sight word intervention as components.

The first intervention phase was stopped when the participants' reading fluency did not improve.

Then, VSM was added to the ACE program. VSM was created before the combined intervention

phase was implemented. During the video-production procedure, the participants were asked to

read the reading probes with the assistance of trained tutors to obtain examples of fluent reading.

Then, the researchers edited the videos so that the participants saw themselves engaging in fluent

reading. During the combined intervention, the participants watched the 2-minute resulting

videos first, and then the ACE program was implemented for four to seven sessions. Based on

the results, three of the four participants achieved improvement when VSM was added to the

ACE program compared to the ACE alone condition. The effect size of interventions was not

reported in the study.

Dowrick et al. (2006) used a very similar method to examine the supplemental effect of

VSM for 10 elementary school students from minority backgrounds (i.e., Samoan, Filipino,

Japanese, Hawaiian, and Mixed). Using a multiple baseline design, the researchers compared

participants' reading fluency during the ACE program and the combination of ACE program and VSM. The method of producing the less than 2-minute videos was the same as those created in Hitchcock et al. (2004), and the same procedure was conducted to measure the baseline performances. Participants had 5 to 11 baseline data points. Then, the ACE program was provided for three to nine sessions and the combined intervention was implemented for three to six sessions. As a result, 9 out of 10 participants achieved a significant improvement as determined by the effect size measurement, Reliable Change Indices (Jacobsen & Truax, 1991).

Researchers have implemented VSM as a stand-alone reading fluency intervention in more recent studies. Decker and Buggey (2014) used a multiple baseline design across participants for three of the six elementary school students diagnosed with Specific Learning Disorder. During the baseline phases, the participants read the instructional level reading probes with any intervention for 2 to 10 times. Before the intervention phase, the VSM videos were created. The researchers read a passage first, and then the participants tried to read as fast and accurate as did the researchers. The researchers edited the videos to delete participants' reading errors and the researchers' reading; thus, the edited videos only included the participant's fluent reading (the duration of resulting videos was not specified). During the intervention phase, each participant watched the videos once a day for 2 weeks. Participants' reading fluency was measured twice per week, resulting in four intervention data points for each participant. Then, a maintenance phase was conducted twice a week for 2 to 6 weeks, in which participants' reading fluency was measured without any intervention. As a result, three participants achieved improvement compared to their baseline performances. Moreover, three participants maintained their WCPM during the maintenance phases. Effect sizes were not calculated in the study.

One more study was published in 2014 to examine the stand-alone effect of VSM. Montgomerie et al. (2014) also used very similar research design as Decker and Buggey (2014). A multiple baseline design was used for four New Zealand elementary school students whose reading performance was behind that of their peers. The study reported data from baseline, VSM, and maintenance phases. The baseline condition was conducted across five to eight sessions. The VSM session was provided every weekday for 2 weeks with two measurements were conducted per week to monitor the progress. Although the passages that the participants read during video production were slightly more difficult than those they read during the baseline, intervention, and maintenance phases, other video-production procedures were the same as prior studies. The resulting video lasted around 2 minutes. The maintenance session was conducted 4 to 10 times across 2 to 5 weeks. Based on the results, two out of four participants achieved a significant improvement compared to their baseline performances, with Percentages of Non-overlapping Data (PND; Scruggs, Mastropieri, Cook, Escobar, 1986) of two participants above 90%. These two participants who benefited from VSM also obtained same or higher WCPMs during the maintenance phase.

Robson et al. (2015) used a pre- and post-test design to measure the effect of stand-alone VSM for 11 New Zealand elementary school students with reading difficulties. During the baseline phase, each participant engaged in multiple readings with the average of the reading serving as the baseline datum point. After the baseline, the videos were created for each participant using the same procedures as reported in prior studies. During the intervention phase, each participant watched 1- to 2-minute videos before being assessed for six sessions across 2 weeks. Based on the pre- and post-test using the Neale Analysis of Reading Ability (Neale,

1999), the 11 students achieved a significant improvement compared to the baseline, as Cohen's *d* indicated the difference had a large effect size.

In a recent study, Wu and Gadke (2017) evaluated the stand-alone and supplemental effect of VSM with three elementary school students with reading difficulties. The study included three phases in the research design: baseline, alternating treatments, and combined intervention phase. In the baseline phase, the participants read the instructional-level reading probes three times, and reading fluency was graphed. In the alternating treatments phase, each participant received RR and the stand-alone VSM in an alternating manner, each implemented five to six times. The alternating phase allowed a comparison between RR and VSM. Moreover, the effects of two interventions were measured by comparing their WCPM with those in the baseline phase. During the RR condition, the participants read a passage with an immediate error correction from the interventionist. Participants read a second time without any intervention, to assess reading fluency. The video-production procedure was the same as the one used in the Robson et al. (2015) and resulted in videos that lasted around 1 minute. During the VSM condition, each participant watched the video before being assessed with the instructional-level reading probes. After the alternating phase, the researchers combined RR and VSM in order to compare the effect of VSM with RR. The researchers' assumption was that there would be the additional improvement in the combined intervention compared to RR, with VSM boosting reading fluency relative to RR only. Each participant received four to five sessions of the combined intervention. RR resulted in a significant improvement compared to baseline, while the stand-alone VSM did not improve the participants' reading fluency. Furthermore, RR was more effective than VSM across all of the participants. Finally, results showed that VSM did not result in an additional improvement when added to RR in the study. Non-overlap of All

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Pairs (NAP; Parker & Vannest, 2009) was used as the effect size measurement in the comparison between baseline and two interventions, RR and VSM, and RR and the combined intervention.

In summary, there are six known studies that have evaluated the effect of VSM. Two earlier studies focused on the supplemental effect of VSM. Both studies added VSM to the ACE reading program, comparing the effect of ACE alone and the combination of ACE and VSM. Most of the participants improved reading fluency when VSM was added to ACE. The next three studies examined the effect of VSM, as a stand-alone reading fluency intervention. Two studies use a multiple baseline design across the participants, and one study used a pre- and post-test to measure the improvement of a group of students as a unit. Most of the participants achieved improvement when exposed to VSM. The latest study examined both supplemental and stand-alone effect of VSM. In this study, a comparison between RR and VSM showed RR was more effective for each participant and that adding VSM to RR did not further improve participants' reading fluency. For all of the studies, participants were all elementary school students, some with an educational eligibility of Specific Learning Disorder or Developmental Delay. The populations included African American, Caucasian, Hawaiian, Japanese, mixed, New Zealand, Filipino, and Somanian. Furthermore, on four out of six studies included an effect size measurement, such as PND, RCI, Cohen's *d*, and NAP.

Overall, this chapter discussed the importance of learning to read, the importance of reading fluency, and reading fluency interventions. Within the importance of learning to read, five key components of reading skills were discussed. The researchers also explained that reading fluency is crucial skill closely related to reading comprehension. Moreover, tutor- and self-managed interventions were discussed within the section of reading fluency interventions. For the purposes of the current study, the developments of LPP and RR were discussed as tutor-

managed interventions, while the development of VSM was discussed as a self-managed

intervention.

CHAPTER III

METHOD

The purpose of this chapter was to provide an overview of the methodology (i.e.,

participants, setting, materials, independent variables, dependent variables, procedures, treatment

integrity, inter-observer agreement, social validity, research design, analysis of data) of this

study. First, information regarding participant selection (i.e., the recruitment procedures,

specific background information about each participant including inclusionary and exclusionary

criteria) will be presented. Second, a description of the study setting will be presented, followed

by a description of all materials used in the study. Then, independent and dependent variables

will be described. Next will be a presentation of the procedures used in the study including

interventionist training, participant recruitment, video development, and data collection during

the various intervention phases and follow-up phase. A detailed description of the intervention

implementation procedures will then be described. A specific plan regarding evaluation of inter-

observer agreement, treatment integrity, and social validity will be discussed next. Finally, the

research design and data analysis will be described, including the rationale for choosing the

design. A brief summary will complete this chapter.

Participants

Three elementary school-age children (ages 9-12 years) identified as having reading

difficulties without significant concerning behaviors during reading practices were recruited for

the current study. The rationale of recruiting participants in this age range was most of the

participants in the recent meta-analysis were aged 9 to 12 years old (Lee & Yoon, 2017). Institutional Review Board (IRB) approval was obtained once the methodology and materials used in this proposed study were approved by the committee members (see Appendix A for IRB correspondence). The participants were considered to have reading difficulties if their instructional reading levels (determined by reading screening data compiled by the school district) were one or more grade levels lower than their current grade placement; however, the participants needed to have a minimal ability to read in order to benefit from the reading fluency interventions; thus, a screening procedure (i.e., administration of Nonsense Word Fluency [NWF]) was implemented to evaluate participants' reading skills to determine reading levels prior to implementing any intervention (see the Procedures section below for additional information). A description of each participant is provided, including age, grade, ethnicity, and reading instructional level.

Anderson

Anderson was a 10-year-old Caucasian male in fourth grade. He was eligible for a special education ruling of autism. Based on the demographic screener, Anderson had reading deficits and was receiving reading intervention at school. Parents reported Anderson did not present with any significant behavioral concerns in reading practices.

Bryan

Bryan was a 10-year old African American male in fifth grade. He received special education services under the rulings at school were autism and Other Health Impairment (Attention Deficit/Hyperactivity Disorder). Based on the screener, the parents indicated Bryan

had reading difficulties and did not receive reading interventions at school. The parents further indicated Bryan did not present significantly concerning behaviors during reading practices.

Carter

Carter was a 10-year old multi-racial male in fifth grade. He carries a ruling of Other Health Impairment (Attention Deficit/Hyperactivity Disorder) for special education services. The demographic screener indicates Carter's reading was delayed and did not participate reading intervention sessions at school. His parents reported he did not present with behavioral concerns.

Setting

This study was implemented in an interim alternative elementary school setting in the U.S. and in a clinic setting that located in a university as a part of practicum placement for school psychology students. The study was conducted in intervention rooms at the university-based clinic and at the participants' school, where there were chairs and desks available for the interventionist and participants. Distractions in the room were minimal. There were other individuals in the rooms other than the participants and researchers. Efforts were made to maximize participants' attention.

Materials

First, the materials used to train the interventionist will be described, including the treatment integrity sheet used to determine that intervention procedures followed correctly and the inter-observer agreement form used to evaluate the reliability of measurement of reading fluency and accuracy in all phases of the study will be described. Then, materials used to determine participants' eligibility for participation, which also includes materials used to evaluate the effectiveness of the intervention (e.g., AIMSweb™ probes), will be presented. Then,

materials used to create and edit videos needed for VSM (e.g., two video editing applications) will be described. A recording device will be used for editing the video. Finally, the social validity rating scale used to evaluate the intervention acceptability will be presented. Other materials used, but not described, include common tools for the intervention (e.g., pencils, clipboard, timer).

Interventionist Training Materials

Training materials for the current study can be divided into two categories. The first category includes the materials needed by the primary researcher. The primary researcher developed two training record sheets (Training Record Sheet for Assisting Researchers and The Training Record Sheet for Interventionists; see Appendix B) in order to record the training results of the assisting researchers and interventionists. The Training Record Sheet for Assisting Researchers has columns for recording each assisting researcher's performance with regard to inter-observation agreement and treatment integrity across three trials. The Training Record Sheet for Interventionists allows recording of the percentages of intervention steps followed correctly by the interventionists for three interventions. The second category includes the materials needed for assisting researchers (i.e., treatment integrity sheet for three interventions, inter-observer agreement form; Appendix C and D, respectively). For more details of treatment integrity of three interventions and inter-observer agreement form, please refer to the two following sections.

Treatment integrity sheet. Treatment integrity indicates that procedures (e.g., provision of interventions) were implemented as designed. In the current study, two different interventions and a combined intervention of the two interventions were implemented. Thus, the primary researcher created a checklist of steps for each of the three interventions (see Appendix C). The

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checklist includes the name of the individual who monitored the treatment integrity during the intervention session, the date, and specific steps of the interventions with check boxes beside each step. There is a space at the bottom of the page to report the percentage of intervention steps correctly followed by the interventionists who implemented the intervention.

Inter-observer agreement form. This form was created to evaluate the level of agreement of those who observe the performance of the assisting researchers. The form includes basic information, such as the initials of the participant and researcher, date, time, number of agreements and disagreements between an assisting researcher who observed the intervention and another assisting or primary researcher who implemented the intervention. There is a space at the bottom to record the agreement for each trial (see Appendix D).

AIMSweb™

AIMSweb™ is an assessment system that employs general outcome measures for universal screening and progress monitoring of various academic skills (Pearson, 2012). AIMSweb™ contains academic materials with well-accepted psychometric properties that have been developed to assess individual student's performance related to various academic subjects. For the current study, Nonsense Word Fluency and reading fluency probes were used and are described below.

Nonsense word fluency. As one of the criteria for inclusion (the ability to read), AIMSweb™ NWF probes were used to screen participants' ability to decode words. As a Curriculum-Based Measurement (CBM) of reading ability, NWF requires to readers to read multiple non-real words (e.g., mam, buj, kad) for 1 min in order to measure skills in letter-sound correspondence (Pearson, 2012). AIMSweb™ NWF probes include kindergarten and first-grade

level nonsense words. There are two probes at the kindergarten level and three probes at the first-grade level. Each probe has 75 nonsense words.

Reading passages. AIMSweb™ reading passages were used as a CBM tool. Passages are brief (approximately 300 words) and were individually administered. AIMSweb™ reading passages and procedures are considered to be a standardized measurement of oral reading fluency (Pearson, 2012). Passages are available for students enrolled in first to twelfth grade. There are 23 first grade level reading probes and 33 reading probes in each of the subsequent grades. Developed as a tool for universal screening of all children three times in a school year, these reading passages are well suited for determining functional (or instructional) reading level and can also be used as intervention reading passages. Moreover, the probes can be used to monitor the progress of students during intervention. The current study used AIMSweb™ passages to identify the reading fluency instructional level of participants, establish their baseline performance, and monitor their progress during baseline and all intervention phases.

Recording Device with Video Editing Software

Two separate video software programs were used in the current study (i.e., Video Joiner & Trimmer™, Perfect Video™). The first software is Video Joiner & Trimmer™ (Niu, 2016). After the recording each participant's reading, the researchers used the software to edit the video such that it only showed the participant successfully reading (e.g., scenes such as dysfluent reading and interventionist feedback were deleted). The software also allows cutting and merging of scenes, so that edited videos only show participants' fluent reading. This software is available on the iTunes™ website (https://itunes.apple.com/us/app/video-joiner-trimmer/id1076258083?mt=8).

The second software used for VSM was the Perfect Video™ (Tang, 2013). This software was used to insert pictures and music into the video. The video ended with music, a picture (e.g., a group of children cheering), and comments that were intended to encourage fluent reading in the future readings (i.e., "Good Job! Keep Reading Fast without Making Mistakes!"). This software is also available from iTunes™ (https://itunes.apple.com/us/app/perfect-video-movie-maker/id633335631?mt=8).

The video-making procedure using these software programs is similar that used by Robson et al. (2015). Each video was approximately 1 min in length. One video was made for each participant and was used throughout the study.

Social Validity

Social validity involves the evaluation of the acceptability of an intervention. Teachers' ratings of social validity of interventions were the first to be reported in the literature, as the teachers often implemented interventions (Elliott, Witt, Galvin, & Peterson, 1984). However, social validity should also be considered from the child's perspective when receiving intervention. Turco and Elliot (1986) developed the Children's Intervention Rating Profile (CIRP) which was modified by the researcher for use in this study to obtain participants' ratings regarding the acceptability of the three interventions. The rating form uses a Likert scale from 1 (i.e., Strongly Agree) to 7 (i.e., Strongly Disagree). The modified CIRP has seven questions that asked participants if the reading interventions were fair, harsh, recommendable to peers, favorable, and helpful.

Independent Variables

The independent variables for this study are three intervention conditions: VSM, RR, and combined (VSM+RR). These are described in detail in the procedures section of this chapter. However, to briefly clarify the independent variables: (a) the VSM condition requires the participant to watch a video and read a new passage, (b) the RR condition requires the participant to listen to the reading of the interventionists or primary researcher before the participant to engages in independent reading four times; and (c) the combined condition requires the participant to watch the video first and then also engage in RR as described above.

Dependent Variables

There were two dependent variables in the current study. The first was reading fluency measured as WCPM and calculated by dividing the total words read correctly by the time to read the passage (e.g., 1 min). The other dependent variable was reading accuracy measured as errors per minute (EPM) calculated by dividing the number of reading errors by the time used for reading (e.g., 1 min).

Procedures

The following procedures were implemented and are described in detail in sections to follow: (a) training of interventionists to implement all procedures for the current study (i.e., screening for eligibility, intervention implementation during baseline phase, the three conditions within the intervention phase, the confirmatory phase, the follow-up phase); (b) recruitment of potential participants followed by administration of AIMSweb™ reading probes to determine eligibility for the study; (c) assembly of materials needed for interventions, including reading passages (i.e., AIMSweb™ reading passages); (c) development of individual videos for each

participant using the recording device's video-editing applications. The following intervention

procedures were implemented: (a) baseline phase, (b) intervention phase, (c) confirmatory phase,

and (d) follow-up phase (all described in sections to follow).

Training of Interventionists and Assisting Researchers

Interventions, inter-observer agreement, and treatment integrity checks were conducted

by interventionists (e.g., school psychology graduate students with the knowledge and previous

experience of administering academic interventions) trained by the primary researcher.

Interventionists, assisting researchers, and the primary researcher met and training was provided

for baseline and the three interventions used in this study. Interventionists worked in dyads and

practiced each intervention while the primary researcher provided corrective feedback to each, as

necessary. Moreover, the primary researcher taught the assisting researchers to measure inter-

observer agreement and treatment integrity, with corrective feedback provided as necessary.

To determine that interventionists are prepared to correctly administer interventions

during all conditions and that the assisting research could accurately measure treatment integrity

and inter-observer agreement, the primary researcher observed the interventionists and assisting

researchers during role-play, using the Treatment Integrity Sheets (see Appendix B) to evaluate

readiness to provide interventions, measure treatment integrity, and determine inter-observer

agreement. An accuracy criterion of 90% indicated readiness to implement procedures. Those

individuals who did not meet criterion were provided additional training until criterion was met.

That is, the researcher provided feedback on any needed areas and re-evaluated readiness. The

same remediation plan was provided until the interventionists and assisting researchers met all

criteria. Any condition with below 90% accuracy during any phase, meant the primary

researcher provided feedback and training (i.e., modeling and role-play) regarding the missed steps.

Recruitment of Participants

This section provides information on the recruitment of participants. Potential participants were identified by sending out a flyer (see Appendix F) and getting referrals from the school staff (e.g., teachers, administrators, special education directors). Parent consent was obtained for those identified as potential participations. Then, eligibility for inclusion in the study was determined. To be eligible for the study all participants must have meet inclusionary criteria while not meeting any exclusionary criteria using the following procedures.

First, potential participants were provided the NWF probe of AIMSweb™ (Pearson, 2012) to determine reading ability. Criterion was mastery level with first grade materials. Then, the participants' reading fluency instructional level was determined. The instructional levels should be at least one grade below the participant's actual grade. In the current study, the instructional level was determined if the participant's reading fluency is within the range of 25th to 75th percentile (Shapiro, 2011). Only those who meet all inclusionary and exclusionary criteria were included in the study.

Video Development

Once participants were identified and determined to be eligible for this study, an individualized video was developed for the VSM conditions. Prior to the development of the videos for VSM, various factors were considered: (a) length of the video, (b) reading passages that the participant read during the development of the videos, (c) frequency of viewing videos,

(d) number of videos designed for each participant, and (e) types of comments and music that were included in the videos.

Before implementing VSM, the researcher met with participants and created videos. The first step of the video design was to select reading probes from AIMSweb™ at the participant's mastery level and ask the participant to read the passage as fast as he or she could without making mistakes. The participant read one mastery probe at a time. No corrective feedback was provided for reading in this process. However, the researcher provided a lower-level reading probe if the participant could read the mastery-level reading probes fluently. After recording the participant's reading, the primary researcher edited out unnecessary parts of the video using Video Joiner & Trimmer™ (Niu, 2016). This process created a video that only included the child's fluent reading and excluded the scenes that had the researcher's voice and appearances. Next, the primary researcher used Perfect Video™ to add pictures, comments, and music to create a final version of the video. The procedure was implemented individually for each participant such that a unique and individualized video was developed for each participant.

In the current study, the videos were designed for the Positive Self Review type of VSM, instead of the Feedforward type as was used in prior studies. In Positive Self Review (PSR; Dowrick, 1999), the participants observe the behavior that they are already able to perform, but do not perform after they have learned the skills. In the current study, the target behavior is fluent reading with instructional material, considered a low-frequency behavior due to reading deficits. However, because the videos are made with reading probes at mastery level, participants are shown to read fluently within the video. Thus, the current study examined if observing a video of their own fluent reading using mastery-level reading probes would improve

participants' reading fluency with instructional-level reading probes. Specifics on the video development are described below.

 First, the participants sat in front of a desk, and the reading probe was placed on the desk. The participant read three novel mastery-level reading probes with the researcher providing error correction. The participant only read the first 150 words of each probe, as the video used for PSR lasted around 1 min. In order to record the footage of reading, a recording device was used. After recording three readings, the reading in which the participant performed the highest WCPM was selected as the video to edit. It was assumed that participants would make minimal mistakes, as they read mastery-level reading probes; however, if a participant could not read the mastery-level probe, the researcher provided three reading probes one grade level lower.

Then, the videos were edited with Video Joiner & Trimmer™ and Perfect Video™. Eventually, each participant had one individualized 1-min video used in the VSM and VSM+RR conditions throughout the study.

Intervention Implementation and Follow Up

Based on each participant's estimated reading level that was determined during the recruitment process, instructional reading level and baseline data were obtained. Then, interventions were implemented. The intervention phases were followed by a confirmatory phase using the intervention condition judged to be most effective. Finally, a follow-up phase was implemented. Each of these is describe below.

Determining instructional level and baseline phase. Prior to the baseline phase, the primary researcher determined the instructional reading level of each participant using AIMSweb™ reading passages. The primary researcher utilized the AIMSweb™ procedure of

determining the instructional reading level of each participant. First, the researcher administered

three AIMSweb™ benchmark reading probes from the participant's actual grade level. Each

participant read each passage for 1 min and any word read incorrectly (i.e., errors) was recorded.

After each administration, the researcher calculated WCPM (i.e., the number of words read

minus the number of errors during the 1-min). The primary researcher then calculated the

median WCPM of the three readings. This median WCPM was compared with the AIMSweb™

grade-level national norms. Notably, there are three seasons available in each grade's national

norm: (a) fall; (b) winter; (c) spring. Based on the season (i.e., fall, winter, spring) when the

administration was conducted, the researcher chose that season's national norm with which to

compare with the median WCPM. For example, if a third-grade student's reading fluency was

measured in the spring of the year 2018, median WCPM of the student was compared to spring

norms for third graders. Within each grade's national norms, 10, 25, 50, 75, and 90th percentiles

are provided. Using the student's performance data, a median WCPM in the range of equal to or

below 25th percentile, 25 to 75th percentile, and above 75th percentile would be considered as

frustrational, instructional, and mastery level, respectively (Shapiro, 2011). If the median

WCPM is in the range of frustrational level, the participant then read three benchmark reading

probes at a lower grade level. Then, the new WCPM was compared with the lower grade

national norm. The researcher continued to drop back a grade-level for the probes until the

participant's obtained median WCPM was in the range of 25th to 75th percentile for the

corresponding grade-level probes.

The baseline phase was included in the study to compare participants' baseline reading

fluency (i.e., WCPM) and accuracy (i.e., EPM) with the three intervention conditions within the

alternating treatment phase. The participants read at least three 1-min instructional-level

AIMSweb™ reading probes during the baseline phase. While each participant read the probes, the total time used for reading and the total errors and words read correctly were measured. If a participant's reading fluency was variable or showed an increasing trend during baseline, the participant was asked to read new reading probes until his or her reading fluency (i.e., WCPM) was stable (i.e., not showing an increasing trend) or did not show a decreasing trend. The variability and trend were monitored using visual analysis of graphs of the baseline performance. The baseline phase was completed across 1-2 weeks.

Alternating treatment phase. After baseline has been established, in the current study three interventions (i.e., VSM, RR, VSM+RR) were provided using an alternating treatment design to address research design limitations identified in prior studies. Specifically, design issues related to the specific aspects of intervention(s) used in previous research were addressed in the current study.

For example, Dowrick et al. (2006) and Hitchcock et al. (2003) compared the reading fluency of participants when comparing receiving a combined intervention of ACE™ combined with VSM. Even though the participants improved their reading fluency during the combined intervention, it was difficult to conclude that the improvement resulted from the addition of VSM to the ACE™ program. Another design limitation can be found in the Wu and Gadke (2017) study that used an alternating treatment design to examine the supplemental and stand-alone effect of VSM. In their study, the combined intervention was not included in the alternating treatment phase. Further, Wu and Gadke (2017) inserted VSM between the first and second reading trials during RR to examine the combined intervention. The participants received immediate error correction and then read a second time without the error correction while the researchers calculated participants' WCPM of the second reading. Wu and Gadke (2017)

suspected that the inclusion of VSM right before the assessment of reading fluency might have compromised the participants' memories of prior corrective feedback. Furthermore, Wu and Gadke (2017) suggested that a more effective format of RR (i.e., repeated reading four times instead of two times) might have created a clearer contrast between RR and VSM. Additionally, the sequence of RR and VSM in the alternating treatment phase was not randomized. It is possible that RR was more effective because VSM was implemented first for all participants. Although Wu and Gadke (2017) did not find VSM as a stand-alone intervention to be effective, three studies (Decker & Buggey, 2014; Montgomerie et al., 2014; Robson et al., 2015) found that it was effective for most of their participants. Prior studies share the same methodological limitation in that participants practiced reading during the modeling by the researchers. However, the researchers did not realize that participants also engaged in RR during the development of the videos. Thus, it is possible that improvement during the VSM condition might have resulted from the unacknowledged extra reading practice that occurred during the video development. Finally, Robson et al. (2015) asked the participants to repeat what the researchers read while holding a blank notecard during the development of the videos. Although the videos appear to show the participants engage in reading, the participants were actually pretending that they were reading passages.

With these design limitations in mind and in order to further develop the literature, the current study adopted an alternating treatment design and compared the effect of three interventions (i.e., RR, VSM, RR+VSM). Moreover, the VSM was provided before implementing RR during the Combined Intervention (RR+VSM) condition. During RR, the current study used recommendations resulting from the meta-analysis conducted by Lee and Yoon (2017); instead of using Feedforward, the current study implemented PSR in order to

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decrease the practice effect during the video-making procedures. Also, to control the carry-over effect of the interventions, the sequencing of the interventions during the alternating treatment phase was randomized using a number randomizer (www.random.org). More specifically, each of three interventions was assigned a number from 1 to 3, and the number randomizer was used to decide the sequence of interventions. In the following sections, each intervention procedure is described.

VSM. During the VSM condition, the participant sat in front of the desk and watched his or her previously developed video. The interventionist sat beside the participant to ensure attention was paid to the video. After watching the video, the participant read a novel instructional-level 150-word passage; the interventionist recorded errors and calculated the participant's reading fluency (WCPM) and accuracy (errors per minute). Each VSM session lasted 3-5 minutes and was provided two to three times per week for approximately 3 weeks.

RR. Based on the meta-analysis (Lee & Yoon, 2017; Therrien, 2004), RR with three or four repetitions of a passage has been found more effective than RR with two repetitions. However, the meta-analysis found there was very few differences between RR with three and four receptions. Moreover, most of the studies implemented RR with three repetitions. Thus, the current study used the format of RR with three repetitions. The participants read a new passage three times without error correction. At the end of the third trial of reading, the interventionist recorded reading errors and the duration of reading. Then, the reading fluency and accuracy were calculated. The duration of RR was approximately 7-15 min. This RR procedure was provided once or twice per week for approximately 3 weeks.

VSM+RR (combined intervention). VSM+RR (i.e., the combined intervention condition) was also administered to compare its effectiveness to that of the RR and VSM

conditions. The sequence of the combined intervention was the same as those of prior studies (Dowrick et al., 2006; Hitchcock et al., 2004) that examined the supplemental effect of VSM to RR. During this condition, first participants engaged in VSM by watching their individualized video. Then, RR was provided in the same manner as described above during the RR condition. Reading fluency and accuracy were calculated based on the participants' performance on their third reading trial. The combined intervention lasted around 8-16 min on average and was provided two to three times per week for approximately 3 weeks.

  Confirmatory phase. After the alternating treatment phase, a confirmation phase was implemented to verify the effect of the intervention considered to be the most effective for each participant. The most and least effective condition were decided by visual analysis of the level, trend, and variability of reading fluency (i.e., WCPM) during the alternating treatment condition. That is, if a specific intervention resulted in the highest reading fluency, the most stable performance, and/or had an increasing trend in performance, the intervention was chosen for the confirmation phase. In the case where an obvious difference is not evident, intervention that produced the fewest errors was used during the confirmatory phase. The least effective condition was also identified during the alternating treatments phase using the approach described above. The procedure for the confirmatory phase for each individual participant was the same as the procedure described in the alternating treatment phase for the selected conditions. The selected conditions were provided five times each across approximately 1 to 2 weeks.

  Follow-up phase. This phase is designed to assist in determining if participants maintained the improvement resulting from the intervention implemented during the confirmation phase. In this phase, 1 week following the completion of the confirmatory phase

the interventionists provided the most and least effective condition once with a goal to further confirm the discrepancy between reading fluency during the two conditions.

Treatment Integrity

Treatment integrity was measured to determine that each intervention was provided as designed. The primary researcher developed a checklist for each intervention and provided the checklist to each assisting researcher (see Appendix C). Treatment integrity was calculated for each intervention by dividing the number of steps of the intervention followed accurately by the total number of intervention steps and multiplying the resulting dividend by 100. For Anderson and Bryan, the researcher was present in the intervention room with the assisting researchers. The assisting researcher calculated Carter's treatment integrity by listening to the audios of the intervention sessions. The treatment integrity was measured for at least 33% of each intervention condition.

Inter-observer Agreement

Inter-observer agreement (IOA) was measured to ensure the reliability of measurement during all of the conditions. IOA was measured using total number of agreements between the researcher and the interventionist on the reading of the passage (i.e., agreements divided by agreements + disagreements times 100 to obtain a percent agreement). For Anderson and Bryan, a trained researcher was present in the intervention room with the interventionist and participant during implementation the intervention and measurement of the participant's reading fluency. For Carter, the trained assisting researchers listened to the audio recordings of the sessions and calculated his reading fluency. The assisting researchers checked on the treatment integrity sheets if they heard the intervention components were implemented in the audios. Based on the

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criteria of Kratochwill et al. (2010), IOA was conducted for at least 20% of the sessions for each phase (i.e., baseline, alternating treatment, confirmation, and follow-up phase). In the alternating treatment phase, the IOA was conducted for 20% session of each intervention condition.

Social Validity

Social validity is measured to evaluate a participant's acceptance of an intervention. Acceptability is important because an acceptable intervention might facilitate cooperation with an intervention and may allow a participant to actively engage in an intervention. The modified was administered after the last time each intervention is conducted during the alternating treatment phase. For example, the social validity of RR was measured immediately after the last session of RR during the alternating treatment phase. This procedure was followed for each of the other two interventions. This timing of the social validity measurement allowed participants to experience each intervention five times to facilitate a clear understanding of the procedures of the intervention. Moreover, the participants might be able to compare one intervention with other interventions if the social validity measurement will be conducted at the last session of each intervention.

Research Design

The current study utilized the alternating treatment single-subject design with a confirmation and follow-up phase across the participants. The justification for using this design is to minimize the potential carry-over effect found in prior studies (Dowrick et al., 2006; Hitchcock et al., 2004). Also, alternating treatments design has a high internal validity and are well suited for comparing the efficacy of two or more interventions, especially skill building interventions (Riley-Tillman & Burns, 2009). Studies cited in the literature review utilized

A/B/B+C design, where B was a reading intervention package and C was VSM. Using this design, it is difficult to conclude that improvement in reading fluency during B+C condition compared to the B condition resulted from the addition of C (i.e., VSM) to B (i.e., reading intervention package). For example, B might have improved reading fluency during the B+C condition, while C did not contribute or minimally contributed to the improvement. Additionally, in previous studies the B phase always preceded the B+C phase, which also makes it difficult to determine the specific effect of B+C without any influence of B. An alternating treatment single-subject design allows a rapid alternation of interventions to examine any potential carry-over effect of other interventions. Thus, the current study's design addresses one of the limitations of prior studies. Furthermore, the alternating treatment design also allows a direct comparison among the VSM, RR, and combined intervention conditions. Based on the standard previously established for the number of times a condition should be administered (Kratochwill et al., 2010), each intervention was conducted five times within the alternating treatment design. The confirmatory phase had five more sessions of the conditions that appears to be the most and least effective in the alternating treatment phase to allow evaluation to determine if the most effective condition relative to the least effective condition during the alternating treatment phase continued to be effective when more sessions were conducted. Finally, the follow-up phase evaluated if the most effective condition maintained its effect relative to the least effective condition. Each participant read one instructional level reading probe during the most effective condition and read another reading probe during the least effective condition.

Analysis of Data

The data were analyzed using two methods. First, the level, variability, and trend of each condition in three graphs were evaluated using visual analysis. Level indicates the mean reading fluency, rapidity, or accuracy during each condition (or intervention). Variability indicates how variable the participants' performances are during the three conditions. Trend indicates if performance during any of the three conditions tends to improve.

The second method of data analysis determines the effect size of each intervention. There are multiple ways of measuring the effectiveness of interventions, the Percentage of Non-overlapping Data (PND; Scruggs & Casto, 1987) and Percent of Data Points Exceeding the Median (PEM; Ma, 2006) are two of the commonly used methods. PND examines the percentage of data points in the intervention phase that exceed the highest datum in the baseline (Scruggs & Casto, 1987). PEM indicates the percentage of intervention data points that exceed the median datum point of the baseline phase (Ma, 2006). PND is the most widely used method among single-subject designs and is easy to visualize and calculate, but is susceptible to the outlier (i.e., a single highest outlier) of the baseline phase (Parker, Hagan-Burke, & Vannest, 2007). Parker et al. (2007) suggested that PEM minimizes the impact of the outlier, but it does not consider other data points in the baseline other than the median score. Non-overlap of All Pairs (NAP; Parker & Vannest, 2009) was developed in order to overcome the limitations of prior effect size methods (Parker & Vannest, 2009), such as PND and PEM, and is described below.

As a relatively new method, NAP is reported to be a more advanced effect size method than prior methods used for evaluating the effect of interventions by calculating the degree of non-overlap between two conditions (e.g., baseline and intervention). According to the

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definition of NAP, the researcher/interventionist calculates the number of non-overlap pairs between each baseline datum point and each intervention datum point and divides the total number of non-overlapping pairs with the total pairs between the baseline and intervention data points. Parker and Vannest (2009) reported that, relative to other calculations of effect size, NAP has high discriminability in identifying low, medium, and high effect size; has a higher correlation with R^2; and has a narrower confidence interval for the effect size. The NAP effect size is defined by Parker and Vannest (2009) as small (0 to .65), medium (.66 to .92), or large (.93 to 1.00).

NAP, as a measure of effectiveness, was used by Bryant et al. (2015) in study using an alternating treatment design where a comparison of two interventions (e.g., intervention A and B) using NAPs was calculated two ways. First, the NAP (i.e., NAP-1) was calculated as if Intervention A was the intervention and Intervention B was the baseline. Then, another NAP (i.e., NAP-2) was calculated as if Intervention B was the intervention and the Intervention A was the baseline. It was determined that if NAP-1 and NAP-2 were in the same effect size range, then the two interventions had the same effect size. If NAP-1 obtained a larger effect size than NAP-2, then Intervention A would be considered more effective than Intervention B. The current study adopted this method of calculating effect size to determine which intervention was most effective in the alternating treatment phase.

Tau-U is another relatively advanced effect size measurement. Tau-U combines Kendall's and Mann-Whitney U method to calculate the non-overlap between phases and control the trend in baseline and intervention phases (Parker, Vannest, Davis, & Sauber, 2011). The advantages of Tau-U include (a) more statistical power; (b) consistency between effect size and visual analysis; (c) being applicable to any single case design research; (d) contribution to meta-

analysis study; (e) addressing ceiling effect; (f) applicability to both regression and non-overlapping measurements; (g) flexibility in calculating non-overlap, trend, or both. The research used the online calculator (Vannest, Parker, & Gonen, 2011) to calculate the effect size of each intervention in the alternating treatments phase relative to the baseline across the participants. The interpretation criteria (Vannest & Ninci, 2015) indicates there are small (Tau-U<0.20), moderate (0.20-0.60), large (0.60-0.80), and very large effect size (0.80<Tau-U).

In summary, this chapter has described the overall methodology of the current study. The chapter described participant selection and the study setting. Then, various materials to be used in the current study were described. Next, the researcher introduced the independent and dependent variables. The procedure section includes detailed information regarding the overall steps that the researcher will follow. In order to ensure the validity, reliability, and acceptability of the interventions, the researcher justified and explained the types of measures provided to measure these three important aspects of the study. Last, the design and data analysis methods were described.

CHAPTER IV

RESULTS

The purpose of the study was to examine the efficacy of VSM as a reading fluency intervention for three elementary school students. In order to examine the efficacy of VSM, the study examined the efficacy of stand-alone VSM relative to baseline, control, the most recommended reading fluency intervention (i.e., RR; NRP, 2000), and the combined intervention (VSM+RR). The researchers implemented the confirmatory and follow-up phase to further identify the most efficacious intervention for each participant. The following sections include a discussion of (a) pre-participation assessments; (b) a comparison of VSM, RR, and the combined intervention; (c) treatment integrity and IOA; and (d) social validity.

Pre-Participation Assessments

The inclusionary criteria of the study included: (a) participants aged 9 to 12 years old; (b) an ability to decode words based on the results of curriculum-based measurement (CBM) using AIMSweb[TM] NWF measurements (Pearson, 2012); and (c) at least one grade behind relative to the participants' actual grade, evidenced by the results of CBM measurement using AIMSweb[TM] reading fluency measurements. The exclusionary criteria included exhibiting significant behavioral concerns confirmed by the parents' reports in the demographic screener designed by the primary researcher. The result of pre-participation assessments can be found in table 1.

Anderson

Based on the NWF assessment, the median NWF in the first NWF probes was 73 letter sounds correct per minute, above 75th percentile of the first-grade NWF national norm. Anderson also read three AIMSweb™ benchmark reading probes in fourth and third grade. The median reading fluency in fourth-grade benchmark reading probes was 77 WCPM, below 25th percentile of the first-grade reading fluency national norm. Anderson's median reading fluency in third-grade benchmark reading probes was 85 WCPM, between 25th and 50th percentile of the third-grade reading fluency national norm. In addition, his median reading accuracy in three fourth-grade benchmark reading probes was 3 EPM. The result indicates his current reading level met the criteria. According to the parent's report in the demographic screener, Anderson did not present any significantly concerning behaviors during reading practices. Therefore, Anderson met the current study's inclusionary and exclusionary criteria.

Bryan

According to the NWF assessment, Bryan obtained a median NWF of 35 letter sounds correct per minute, above 50th percentile of the first-grade NWF national norm in the first-grade NWF benchmark probes. Bryan also read fifth to first-grade AIMSweb™ benchmark reading probes. The median reading fluency in fifth, fourth, third, and second-grade benchmark reading probes were 20 WCPM, 21 WCPM, 22 WCPM, and 23 WCPM, respectively, below 25th percentile in the national norm of AIMSweb™. As for the first-grade benchmark reading probes, Bryan's median reading fluency was 26 WCPM, between 50th and 75th percentile of the first-grade national norm. His median reading accuracy in three fourth-grade benchmark reading probes was 12 EPM. Thus, his instructional level was the first grade, and his current reading fluency level met the criteria of the study. The demographic screener indicated that Bryan did

not present any significantly concerning behaviors during reading practices. Thus, both inclusionary and exclusionary criteria were met.

Carter

The NWF assessment that Carter's median NWF was 191 letter sounds correct per minute, above 90th percentile of the first-grade level NWF national norm. Carter started the AIMSweb[TM] CBM by reading fifth-grade level reading probes. His median WCPM in the fifth-grade readings was 101 WCPM, below 25th percentile of the fifth-grade national norm. The median reading fluency of fourth-grade readings was 117 WCPM, which is between 25th and 50th percentile. His median reading accuracy in three fourth-grade benchmark reading probes was 4 EPM. Therefore, Carter's instructional reading level was fourth grade, a grade below his actual grade. Based on the demographic screener, the Carter experienced reading difficulties while showing minimum concerns about disruptive behaviors during reading practices. Thus, his inclusionary and exclusionary criteria were met.

<p align="center">A Comparison of VSM, RR, and the Combined Intervention</p>

Following the pre-participation assessment, each participant's baseline reading fluency and reading accuracy were measured. Then, each participant's VSM video was developed. In the alternating treatments phase, participants engaged in four conditions: (a) VSM; (b) RR; (c) the combined intervention; and (d) control condition. In the confirmatory phase, the most and least efficacious condition were implemented five sessions to further evaluate the discrepancy between the two conditions. In the follow-up phase, the participants received one session of the most and least efficacious condition implemented in the confirmatory phase. The results indicated that VSM showed efficacy for two participants; RR and the combined intervention

were efficacious for all of the participants; RR was more efficacious than VSM for two out of three participants; the combined intervention was more efficacious than RR for only one participant and was more efficacious than VSM for two out of three participants; the efficacy difference between the least and most efficacious interventions was maintained during the confirmatory phase but not maintained during the follow-up phase consistently. Detailed results of each participant were described in the following sections.

Anderson

In the baseline phase, Anderson read five different third-grade progress monitoring reading probes of AIMSweb^{TM} without any assistance. The sequence of reading probes across the phases and conditions was randomized using an online sequence randomizer (www.random.org). The average WCPM was 74.13 (range = 66.82 WCPM – 89.11 WCPM). The average EPM was 1.78 (range = 0.86 EPM – 3.23 EPM). Table 2 and 4 include information regarding three participants' average WCPM and EPM, respectively. The data in Anderson's baseline were formed a decreasing trend with a minimum variability (see Figure 1).

Following baseline, Anderson read three second-grade level reading probes (i.e., one grade lower than the instructional reading level) in order to develop a video used for VSM and combined intervention conditions. The researcher developed the video in which Anderson read the most fluently and merged fluent parts of his readings in the video, so that the overall fluency in the video is slightly fluent than his highest reading fluency in the baseline phase. The duration of the video was approximately 1 minute. The reading fluency in the video was 89 WCPM.

Prior to implementing four conditions (i.e., VSM, RR, Combined Intervention, Control condition) in the alternating treatments phase, the sequence of conditions was randomized by the primary researcher using an online sequence randomizer (www.random.org). The sequence of

conditions was randomized without replication of more than two of the same condition in a row. During the control condition, the average WCPM and EPM were 78.05 (range = 71.68 WCPM – 84.29 WCPM) and 1.74 (range = 1.01 EPM – 2.93 EPM), respectively. In comparison to the baseline performance, there was a similar level of WCPM, and the WCPM in the control condition was characterized by a flat and stable data. As for the overlap between the baseline and the control condition, the Tau-U of 0.8 indicates a large effect size. Table 6 includes three participants' Tau-U values between baseline phase and four conditions during alternating treatments phase.

During the VSM condition, the average WCPM and EPM were 79.02 (range = 75.95 WCPM – 83.24 WCPM) and 2.28 (range = 1.35 EPM – 3.53 EPM), respectively. The average WCPM during the VSM condition was only 4.89 higher than the baseline average WCPM. There was a slight increase in WCPM in the first VSM condition. However, the data showed a stable flat trend, and there were multiple overlaps between the baseline and VSM condition. A Tau-U value of 0.92 between the baseline and VSM condition also indicates a very large effect size relative to the baseline phase.

During the RR condition, the average WCPM and EPM were 98.79 (range = 88.42 WCPM – 120 WCPM) and 1.91 (range = 0.95 EPM – 3.89 EPM), respectively. The average WCPM during the RR condition was 24.66 higher than the baseline average WCPM. There was an immediate increase in WCPM during the first RR condition compared to the baseline phase. The WCPMs during the RR condition formed a slight decreasing trend and variability. There were a couple of overlaps between the data in the baseline phase and RR condition. However, a Tau-U value of 1.2 indicates a very large effect of RR relative to the baseline phase for Anderson.

During the combined intervention condition, Anderson's average reading fluency and reading errors were 89.37 WCPM (range = 70.98 WCPM – 99.88 WCPM) and 2.54 EPM (range = 0.83 EPM – 5.62 EPM), respectively. Compared to the baseline average WCPM (i.e., 74.13 WCPM), the average WCPM during the combined intervention condition increased 15.24 WCPM. The WCPM increased immediately during the combined intervention condition. In the third combined intervention session, there was a significant decrease in WCPM, and the WCPM gradually increased in the following two sessions. The data during the combined intervention session were quite variable and formed a decreasing trend. There were multiple overlaps between the data in the baseline and the combined intervention condition. The Tau-U value between baseline and combined intervention condition was 1.00, indicating a very large effect size.

NAP was used to compare the effect of three interventions and control condition. Table 7 includes three participants' NAP values between control and three intervention conditions, and Table 8 includes three participants' NAP values between three intervention conditions. In comparison between the control and three interventions, the NAP values indicate that there was a small effect size (i.e., *NAP* = 0.56) between the control and VSM condition, a medium effect size (i.e., *NAP* = 0.76) between the control and combined intervention condition, and a large effect size (i.e., *NAP* = 1.00) between the control and RR condition. The relative efficacy of three interventions was also evaluated using NAP. The NAP value of 0.78 between VSM and combined intervention condition indicates a medium effect size. There was a large effect size (i.e., *NAP* = 1.00) in comparison between VSM and RR condition. As for the comparison between combined and RR condition, the NAP value of 0.64, indicating a small effect size.

In the confirmatory phase, RR was selected as the most efficacious condition. Although there was no significant difference between WCPM during the RR and combined intervention condition in the alternating treatments phase, the RR condition had a slightly higher effect size (i.e., *Tau-U* = 1.20) than the combined intervention condition (i.e., *Tau-U* = 1.00) when comparing to the baseline phase. Moreover, RR is a relatively shorter intervention than the combined intervention. Based on the effect size measurement among four conditions in the alternating treatments phase, the control condition was the chosen as the least efficacious condition. The average WCPM and EPM of the control condition were 79.8 (range = 66.25 WCPM – 93 WCPM) and 3.14 (range = 0.93 EPM – 6.46 EPM), respectively. Compared to the control condition in the alternating treatments phase, there was a similar variability and level yet an increasing trend during the control condition of the confirmatory phase. Table 3 and 5 include three participants' average WCPM and EPM, respectively, during confirmatory and follow-up phase.

The average WCPM and EPM during the RR condition of the confirmatory phase were 98.89 (range = 87.55 WCPM – 114.29 WCPM) and 1.96 (range = 0.73 EPM – 3.41 EPM), respectively. In comparison with the RR condition of the confirmatory phase, the data consistently showed a similar level and variability yet an increasing trend during the RR condition of the confirmatory phase. As for the comparison between control and RR condition, there was a divergence between the graphs of two conditions. A NAP value of 0.78 between control and RR condition indicates a medium effect size. That is, RR is still somewhat efficacious than the control condition. Table 9 includes information regarding three participants' NAP values between two conditions during confirmatory phase.

The follow-up phase was implemented after a week the confirmatory phase ended. The sequence of the conditions was also randomized using the online randomizer (www.random.org). The WCPM and EPM during the RR condition were 114 and 1.54, respectively. During the control condition, Anderson's WCPM and EPM were 82 and 1.09, respectively. The follow-up phase also indicates Anderson has a higher reading fluency in the RR condition than the control condition.

In summary, the RR and combined intervention conditions in the confirmatory phase led to significantly higher WCPMs compared to the baseline phase, while WCPMs during the control and VSM conditions were not significantly different than the baseline phase. Based on the visual analysis and effect size measurements, the RR condition led to the highest mean WCPM, while the control condition had the lowest mean WCPM. The confirmatory and follow-up phase further indicated that the RR condition led to higher WCPMs, while Anderson had relatively lower WCPMs in the control condition.
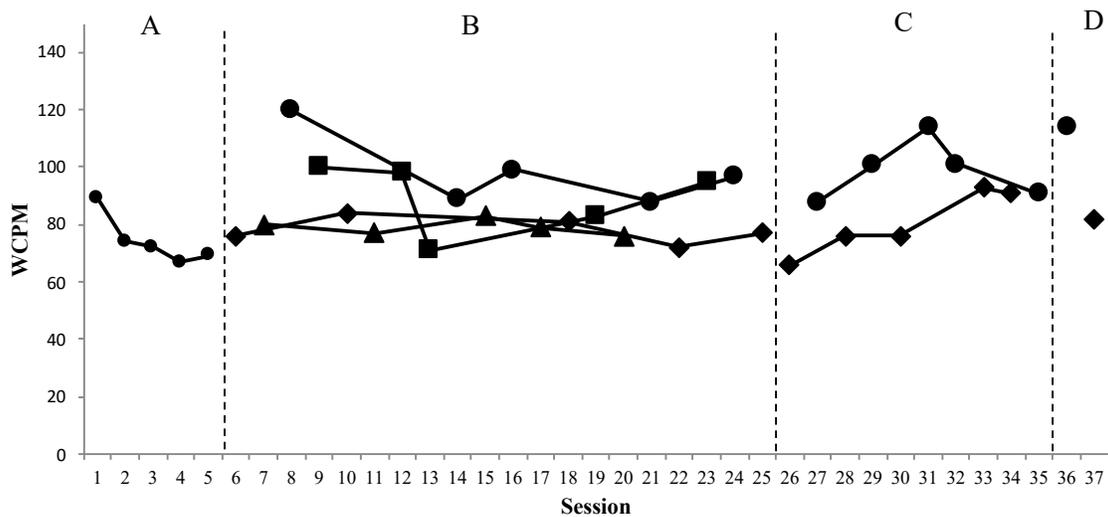
Figure 1. Anderson's WCPM across four phases.

Note: Circle: RR condition; Triangle: VSM condition; Square: Combined Intervention condition; Diamond: Control condition.

Bryan

Bryan read five first-grade progress monitoring reading probes before receiving interventions in the following phases. The average WCPM and EPM in the baseline phase were 23.65 (range = 19.10 WCPM – 27.9 WCPM) and 11.93 (range = 10.31 EPM – 14.32 EPM), respectively. The baseline data were characterized by a decreasing trend with a slight variability (see Figure 2).

Bryan read three kindergarten-level reading probes (i.e., one grade below his instructional reading level) to design the video for VSM and combined intervention conditions. The reading in which Bryan read the most fluently was selected, and the fluent sections of the video were merged together to create the video. The duration of the video was approximately 1 minute. The reading fluency in the video was 62 WCPM.

After randomizing the conditions using the same method used for Anderson, the primary researcher started the alternating treatments phase. During the control condition, Bryan's average WCPM and EPM were 25.11 (range = 19.91 WCPM – 31.44 WCPM) and 20.12 (range = 15.95 EPM – 26.81 EPM), respectively. On average, reading fluency increased 1.46 WCPM in the control condition relative to the baseline phase. Compared to the baseline phase, there was no immediate increase in WCPM in the first session of control condition. The data showed an increasing trend with a variability. Various data in the baseline phase and control condition were overlapped. A Tau-U value of 0.48 between the baseline phase and control condition indicates a medium effect size.

During the VSM condition, the average WCPM and EPM were 32.94 (range = 21.08 WCPM – 43.69 WCPM) and 18.74 (range = 14.33 EPM – 22.42 EPM), respectively. The average WCPM increased 9.29 in the VSM condition relative to the baseline phase. Although there was no immediate increase in the mean WCPM during the VSM condition, the data showed an increasing trend with variability. Data in two phases have few overlaps, but the Tau-U value of 0.88 indicates a very large effect size.

The RR condition's average WCPM and EPM were 28.89 (range = 24.23 WCPM – 38.36 WCPM) and 17.66 (range = 14.64 EPM – 20.14 EPM), respectively. WCPM increased 5.24 on average relative to the baseline phase. WCPM did not increase immediately in the first RR session, but the data formed an increasing trend with a slight variability. The baseline phase and RR condition have overlaps. The effect size measurement (*Tau-U* = 0.88) indicates a very large effect size.

During the combined intervention condition, the average WCPM and EPM were 27.64 (range = 20.54 WCPM – 32.77 WCPM) and 20.92 (range = 17.63 EPM – 23.11 EPM),

respectively. The mean WCPM in the combined condition was 3.99 higher than the mean WCPM in the baseline phase. The WCPM during the combined intervention condition did not increase immediately compared to the baseline phase. The data were characterized by an increasing trend with a slight variability. Visual analysis indicates overlaps between the baseline and the combined intervention condition. The Tau-U value of 0.76 indicates a large effect size of the combined intervention relative to the baseline phase.

The primary researcher used NAP to compare the efficacy of the conditions in the alternating treatments phase. When comparing to the control condition, the VSM ($NAP = 0.48$), RR ($NAP = 0.28$), and combined intervention condition ($NAP = 0.28$) had small effect sizes. That is, three intervention conditions did not result in significantly higher WCPM compared to the control condition. The efficacy comparison among three intervention conditions indicates a small effect size between the RR and VSM condition ($NAP = 0.08$), between the combined intervention and VSM conditions ($NAP = 0.12$), and RR and combined intervention conditions ($NAP = 0.24$). Based on the comparison, the VSM condition resulted in a relatively higher efficacy compared to other intervention conditions, even though the difference is not significant based on the NAP measurements. Moreover, VSM requires less instructional time compared to other interventions. The control condition had the smallest effect size relative to the baseline phase. Thus, VSM was selected as the most efficacious intervention condition, and the control condition as chosen as the least efficacious condition.

In the confirmatory phase, the average WCPM and EPM during the control condition were 31.56 (range = 28.71 WCPM – 35.82 WCPM) and 21.33 (range = 18.02 EPM – 22.97 EPM), respectively. Compared to the control condition of alternating treatments phase, the average WCPM during the control condition in the confirmatory phase increased 7.91. The data

still showed an increasing trend with a variability. During the VSM condition, the average

WCPM and EPM were 34.2 (range = 28.71 WCPM – 39.57 WCPM) and 19.18 (range = 14.61

EPM – 24.86 EPM), respectively. The average WCPM increased 1.26 compared to the previous

VSM condition. The data maintained an increasing trend, but the variability slightly decreased.

Based on NAP measurement, the overall WCPM in the VSM condition was higher than the

control condition with a medium effect size ($NAP = 0.70$).

Following the confirmatory phase, a follow-up phase was conducted. The sequence of

the condition was randomized using the online randomizer. The WCPM and EPM during the

control condition were 35.1 and 16.11, respectively. During the VSM condition, the WCPM and

EPM were 34.42 and 10.96, respectively. The follow-up phase indicated a similar discrepancy in

WCPM between two conditions.

In summary, the VSM and RR condition led to a very large effect, while the control and

combined intervention condition had a small and medium effect size, respectively, relative to the

baseline phase. The VSM condition arguably led to higher reading fluency with a less time-

consuming procedure, while the control condition led to a relatively smaller reading fluency. In

the confirmatory phase, the VSM condition was more efficacious than the control condition with

a medium effect size. In the follow-up phase, there was no significant difference in WCPM

during two conditions.
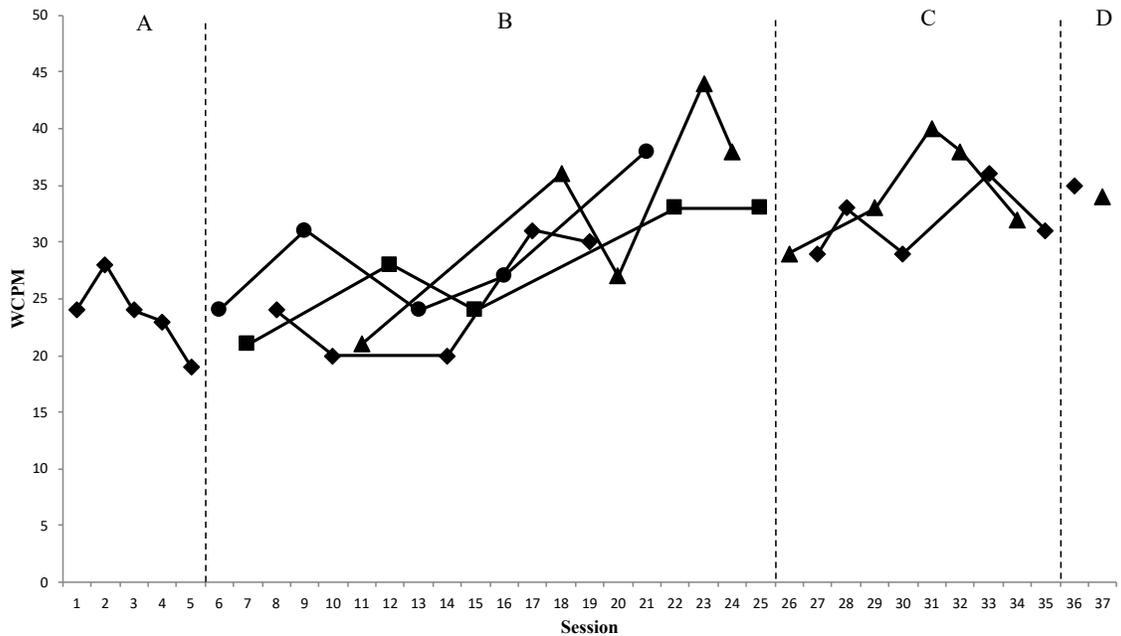
Figure 2.   Bryan's WCPM across four phases.

Carter

The baseline measurement was conducted by recording Carter's readings on five fourth-grade level AIMSweb™ reading probes. The average WCPM and EPM in the baseline was 115.04 (range = 97.9 WCPM – 141.7 WCPM) and approximately 3.46 (range = 1.28 EPM – 6.22 EPM), respectively. The baseline data formed a decreasing trend with a slight variability (see Figure 3).

Following the baseline phase, Carter read three third-grade level reading probes in order to design the VSM for the intervention phases. The researcher edited Carter's reading, in which his WCPM was the highest among the three third-grade level reading probes. His WCPM in the edited video was 145.

Carter read fourth-grade level AIMSweb™ reading probes in a randomized manner without replacement in the alternating treatments phase. During the control condition, Carter's

average WCPM and EPM were 113.61 (range = 99.8 WCPM – 127.88 WCPM) and 2.75 (range = 1.13 EPM – 3.75 EPM), respectively. The average WCPM was decreased approximately 1.43 relative to the average WCPM in the baseline condition. The data showed a decreasing trend with a slight variability. The pattern of trend and variability was similar with the baseline phase. Relative to the baseline phase, WCPM did not increase immediately. There were multiple overlaps between the data in the baseline phase and the control condition. The Tau-U measurement (*Tau-U* = 0.20) also indicates that the WCPM in the control condition did not improve relative to WCPM in the baseline phase.

During the VSM condition, Carter's average WCPM and EPM were 120.02 (range = 102 WCPM – 141.37 WCPM) and 2.29 (range = 1.23 EPM – 3.03 EPM), respectively. Relative to the baseline average WCPM, the average WCPM increased approximately 5.16. There was no immediate improvement in WCPM. The data during the VSM condition formed a decreasing trend with a slight variability. The data between the baseline phase and the VSM condition had multiple overlaps. The Tau-U measurement (*Tau-U* = 0.36) indicate a negligible improvement on WCPM during the VSM condition.

During the RR condition, the average WCPM and EPM were 146.7 (range = 108.77 WCPM – 171.07 WCPM) and 1.78 (range = 0 EPM – 3.38 EPM), respectively. The WCPM did not increase immediately during the first RR session, but the WCPM increased significantly since the second RR session. The average WCPM increased 31.66 during the RR condition relative to the baseline phase. The overall data had an increasing trend with a slight variability. One datum during the RR condition overlapped with the data in the baseline phase. A Tau-U value of 0.88 indicates a very large improvement on WCPM from the baseline phase to the RR condition.

Carter's average WCPM and EPM during the combined intervention condition were 164.54 (range = 156.92 WCPM – 179.46 WCPM) and 3.42 (range = 2.4 EPM – 5.29 EPM), respectively. The average WCPM increased 49.5 relative to the baseline condition. The WCPM increased immediately during the combined intervention condition relative to the baseline phase. The data formed a slight increasing trend with an obvious variability. No overlaps were observed between the baseline phase and combined intervention condition. There was a very large effect size based on a Tau-U value of 1.16.

Based on the effect size measurements using NAP in the alternating treatments phase, the control condition was the least efficacious condition. In comparison between the control and VSM condition, a NAP value of 0.72 indicates a medium size improvement from the control to the VSM condition. When comparing to the RR condition, the NAP value was 0.88, indicating a medium-size improvement. The NAP value between the control and combined intervention condition was 1.00, suggesting a significantly larger WCPMs during the combined intervention condition. Both RR and combined intervention condition resulted in significantly higher WCPMs relative to VSM condition. The NAP value between VSM and RR was 0.88, indicating Carter had somewhat higher WCPMs during RR condition compared to the WCPMs during VSM condition. When comparing to the combined intervention condition, the NAP was 1.00, indicating significantly higher WCPMs during the combined intervention condition. The NAP value between the RR and combined intervention condition was 0.72, indicating that the WCPMs during the combined intervention condition were somewhat higher than the WCPMs during the RR condition. The overall effect size measurements informed that the most efficacious condition for Carter was the combined intervention condition. Thus, the control and the combined intervention condition were implemented in the confirmatory phase.

In the confirmatory phase, Carter read five passages during the control and combined intervention conditions. During the control condition, his average WCPM and EPM were 145.56 (range = 130.32 WCPM – 171.72 WCPM) and 3.21 (range = 2.29 EPM – 4.14 EPM), respectively. Compared to the control condition in the alternating treatments phase, the WCPM had an immediate improvement on WCPM during the control condition in the confirmatory phase. The average WCPM was also higher in the confirmatory phase (i.e., 145.56 WCPM) relative to the alternating treatments phase (i.e., 113.61 WCPM). While the control condition's data in the alternating treatments design showed a decreasing trend, the control condition formed an increasing trend of data in the confirmatory phase. The data had more variability in the confirmatory phase relative to the alternating treatments phase. No overlap was observed between two control conditions. The combined intervention did not have an immediate increase in WCPM, but the average WCPM increased in the confirmatory phase (i.e., 188.16 WCPM) compared to the alternating treatments phase (i.e., 164.53 WCPM). The combined intervention conditions in both phases formed increasing trends with a slight variability. Multiple data were overlapped between two conditions. There was one overlap between the data during the two conditions. The NAP value of 0.96 indicates significantly larger WCPMs during the combined intervention phase. The large WCPM difference between two conditions is consistent with the comparison of two conditions in the alternating treatments phase.

In the follow-up phase, Carter participated the control and combined intervention once, and the sequence of the condition was randomized using the online randomizer. The WCPM and EPM during the control condition were 202.14 and 3.5, respectively. Carter's WCPM and EPM during the combined intervention condition were 194.44 and 3.33, respectively. The result was inconsistent with the alternating treatments and confirmatory phase.

In summary, RR and combined intervention resulted in significantly higher WCPMs relative to the baseline WCPMs, and control and VSM condition did not lead to significant improvements in WCPMs in the alternating treatments phase. Based on the effect size measurements using NAP, the combined intervention resulted in the highest WCPMs for Carter, and the WCPMs were the lowest during the control condition in the alternating treatments phase. In the confirmatory phase, the combined intervention condition had higher efficacy than the control condition. The WCPM was slightly higher during the combined intervention condition relative to the control condition of the follow-up phase.
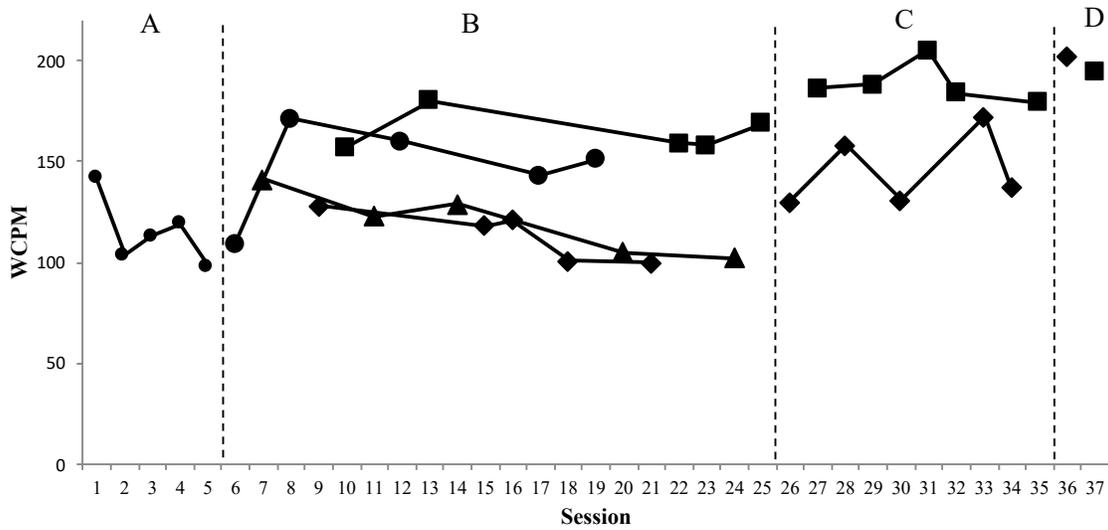
Figure 3.   Carter's WCPM across four phases.

Table 1

Preassessment Data for Three Participants

Participant	NWF	Reading Level	Median Reading Fluency	Median Reading Accuracy
Anderson	73 (>75th percentile)	Fourth Grade	85 (25-50th percentile)	3
Bryan	35 (50-75th percentile)	First Grade	26 (50-75th percentile)	12
Carter	191 (>90th percentile)	Fourth Grade	117 (25-50th percentile)	4

Note. NWF indicates number of letters read correctly per minute. Reading fluency indicates words correct per minute. Reading accuracy indicates errors per minute. The number inside the parenthesis indicates the range of NWF or reading fluency in their reading levels.

Table 2

Participants' Mean WCPM in the Baseline and Alternating Treatments Phase

| | BL | Alternating Treatments Phase | | | |
		CL	VSM	RR	CI
Anderson	74.13	78.05	79.02	98.79	89.37
Bryan	23.65	25.11	32.94	28.89	27.64
Carter	115.04	113.61	120.02	146.7	164.53

Note. BL indicates baseline phase. CL indicates control condition. CI indicates combined intervention condition.

Table 3

Participants' Mean WCPM in the Confirmatory Phase and the Follow-up Phase

| | Confirmatory Phase | | | | Follow-up Phase | | | |
	CL	VSM	RR	CI	CL	VSM	RR	CI
Anderson	79.8	-	99.09	-	81.52	-	113.84	-
Bryan	31.56	34.20	-	-	35.10	34.42	-	-
Carter	145.56	-	-	188.16	202.14	-	-	194.44

Table 4

Participants' Mean EPM in the Baseline and Alternating Treatments Phase

	BL	Alternating Treatments Phase			
		CL	VSM	RR	CI
Anderson	1.78	1.74	2.28	1.91	2.54
Bryan	11.93	20.12	18.74	17.67	20.92
Carter	3.47	2.75	2.29	1.78	3.42

Table 5

Participants' Mean EPM in the Confirmatory Phase and WCPM in the Follow-up Phase

	Confirmatory Phase				Follow-up Phase			
	CL	VSM	RR	CI	CL	VSM	RR	CI
Anderson	3.14	-	1.96	-	1.09	-	1.54	-
Bryan	21.33	19.17	-	-	16.11	10.96	-	-
Carter	3.21	-	-	1.83	3.50	-	-	3.33

Table 6

Tau-U Values between Baseline Phase and Four Conditions

	BL-CL	BL-VSM	BL-RR	BL-CI
Anderson	0.8	0.92	1.2	1
Bryan	0.48	0.88	0.88	0.76
Carter	0.2	0.36	0.92	1.16

Table 7

NAP Values between Control and Three Intervention Conditions

	CL-VSM	CL-RR	CL-CI
Anderson	0.56	1	0.76
Bryan	0.8	0.7	0.7
Carter	0.72	0.88	1

Table 8

NAP Values between Three Intervention Conditions

	VSM-RR	VSM-CI	RR-CI
Anderson	1	0.78	0.36
Bryan	0.36	0.3	0.48
Carter	0.88	1	0.72

Table 9

NAP Values between Two Conditions in the Confirmatory Phase for Each Participant

	CL-RR(Anderson)	CL-VSM (Bryan)	CL-CI (Carter)
NAP	0.78	0.70	1

Treatment Integrity

Procedural Integrity

Procedural integrity was measure during the alternating treatments, confirmatory, and follow-up phase. It was measured by assisting researchers, a school psychologist-in-training of a School Psychology program. All of the assisting researchers took graduate courses regarding academic assessment and intervention and engaged in training in school and clinic settings for at least 2 years. Furthermore, the primary researcher provided the assisting researchers a 1-hour group training and decided their participation based on meeting the criteria of the training. The

training results indicate seven assisting researchers passed the criteria of training. During measuring the procedural integrity, the assisting researchers sat beside the interventionists and used the treatment integrity sheets (see Appendix C) to mark the procedurals of the interventions that the interventionists followed correctly.

For Anderson, the procedural integrity was measured in 40% of the alternating treatments phase, 40% of the confirmatory phase, and 100% of the follow up phase sessions. The procedural integrity in three phrases were 100%. For Bryan, the procedural integrity was measured in 40% of the alternating treatments phase, 80% of the confirmatory phase, and 100 % of the follow-up phase sessions. The integrity was 100% across the sessions in three phases for Bryan. Carter's procedural integrity was measured in 44% of the alternating treatments phase, 50% of the confirmatory phase, and 100% of the follow-up phase sessions. The integrity was 100% in the alternating treatments, confirmatory, and follow-up phase.

Inter-observer Agreement

IOA was measured for at least 20% of the trial across each phase based on the suggestion of Kratochwill and colleagues (2010). The assisting researchers who assisted with the procedural integrity also measured IOA. Each assisting researcher received a 1-hour training from the primary researcher and was required to pass the training criteria prior to participating in the IOA measurement. Seven assisting researchers passed the criteria. The assisting researchers measured the reading fluency with the primary researcher in the sessions. For Carter, the assisting researchers listened to the audios in which the sessions were recorded and measured IOA. The IOA was measured by dividing the number of the agreements between the interventionists and the assisting researchers with the total number of words in the passage and multiplying 100 (i.e., multiplying 100 to the agreements divided by disagreements). IOA was

measured 40 to 100% of the sessions during each phase across participants. IOA was ranged from 91.46% to 100% across three participants.

Social Validity

The participants filled the modified CIRP (Turco & Elliot, 1986) to indicate the acceptability of three interventions at the last session of each intervention in the alternating treatments phase. Thus, a participant finished three CIRPs for three interventions in the alternating treatments phase. In CIRP, "1" indicates a strong agreement, and "6" indicates a strong disagreement. The overall score (possible range = 6 - 42) indicates the acceptability toward an intervention. A higher score indicates a higher acceptability.

Based on the survey, Anderson had scores of 37, 39, 40 as acceptability toward VSM, RR, and the combined intervention, respectively. Bryan's acceptability scores were 27, 30, and 33 for VSM, RR, and the combined intervention, respectively. Carter had acceptability scores of 40, 37, and 37 for VSM, RR, and combined intervention, respectively. Thus, Anderson and Bryan preferred the combined intervention, and Carter preferred VSM.

CHAPTER V

DISCUSSION

Reading is a crucial skill that impacts a wide range of our lives (Strickland et al., 2013). Reading not only is an important subject among school-age children, but relates to other academic subjects, such as mathematics (Geary, 1994) and writing skills (Gartlehner et al., 2006). NRP (2000) proposed five core reading skills needed for a successful reader: (a) phonics; (b) phonemic awareness; (c) reading fluency; (d) vocabulary; and (e) reading comprehension. Reading fluency, an ability to read quickly with minimum reading errors, has a strong correlation with reading comprehension (Bigozzi et al., 2017). An increased awareness of the importance of reading fluency and decades of effort to develop effective reading fluency interventions still did not stop students from experiencing reading difficulties (McCurdy et al., 2007).

In the extant research literature, reading fluency interventions were divided into tutor-managed and self-managed interventions. Researchers have been developing and implementing the tutor-managed interventions for decades. Common tutor-managed interventions include RR (LaBerge & Samuels, 1974) and LPP (Daly & Martens, 1994). Compared to the tutor-managed interventions, very few self-managed interventions have been developed. Self-managed interventions can decrease tutors' workload and increase readers' independence in working on academic tasks. Among various self-managed interventions, the current study focused on VSM, in which readers improve their reading fluency by watching videos of their fluent readings (Dowrick & Dove, 1980).

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While there is extensive research regarding VSM as a behavioral intervention, very few studies explored the efficacy of VSM as a reading fluency intervention. Dowrick and colleagues (2006) and Hitchcock et al. (2004) evaluated the efficacy of VSM when it was incorporated to a reading program. Although both studies found the addition of VSM significantly increased most of their participants' reading fluency, the limitations of their research methodologies warrant a further analysis of VSM's efficacy as a reading fluency intervention. The primary concern having to do with carry-over effects, as it is difficult to separate the efficacy of the reading program and VSM in the combined intervention effect. Thus, an improvement in WCPM when VSM was added to the reading program could not indicate that VSM was efficacious for the participants.

Moreover, the efficacy of stand-alone VSM was not fully evaluated. Three studies (i.e., Decker & Buggey, 2014; Montgomerie et al., 2014; Robson et al., 2015) indicated the stand-alone VSM was efficacious, while Wu and Gadke (2017) found VSM was not efficacious neither as stand-alone intervention nor supplemental intervention component. Multiple limitations were found in the prior studies. First, Wu and Gadke (2017) only asked their participants to repeat twice during RR conditions when comparing the efficacy of RR and VSM, while RR tends to show the largest effect size when a reader repeats a passage three or more times (Therrien, 2004). Implementing the suggested format of RR might have evaluated a more accurate efficacy of VSM. In addition, all of studies that examined the efficacy of VSM as a reading fluency intervention only adopted one type of VSM: Video Feedforward. Designing a video using Video Feedforward raises a concern of improving reading skills prior to the intervention sessions because the participants practice reading repeatedly with the interventionists' modelling. Thus,

the participants' improvement might be partly explained by the reading practices during video developments procedures.

The purposes of the current study were to evaluate the efficacy of the reading interventions (i.e., RR, VSM and the combined intervention) relative to the baseline reading fluency and compare the efficacy of the reading interventions. This study employed a single-subject design across three elementary school students. The design had four phases: (a) baseline phase, (b) alternating treatments phase, (c) confirmatory phase, and (d) follow-up phase. Following the baseline, each participant participated in developing the videos needed for VSM (i.e., PSR) and the combined intervention. The study also employed RR with three repetitions instead of two repetitions. Moreover, VSM was implemented prior to RR during the combined intervention conditions to address Wu and Gadke's concern (2017) regarding the disruption of VSM on the efficacy of RR. The efficacy of RR, VSM, combined intervention, and control conditions were compared using the alternating treatments design in the alternating treatments. The confirmatory and follow-up phases were incorporated to confirm the most efficacious intervention condition for each participant. This chapter discusses the findings regarding the research questions. Following the findings, implications, limitations, and future studies are discussed.

Overview of Findings

Efficacy of Stand-alone VSM

Based on prior studies (Decker & Buggey, 2014; Montgomerie et al., 2014; Robson et al., 2015), most of the participants benefited from the stand-alone VSM intervention. The current study showed similar results. During the stand-alone VSM condition, Bryan and Carter performed higher WCPMs on average relative to the WCPMs during the control condition. For

Bryan, the efficacy of VSM was further confirmed by the confirmatory phase, in which the VSM condition consistently resulted in higher WCPMs on average relative to the WCPMs during control condition. Since Bryan had a high frequency of reading errors, it was possible that Bryan had experienced fatigue during the RR and combined intervention condition where he had to read a passage three times at each session. That is, watching a video of himself reading fluently and reading a passage once might have been doable tasks compared to reading a passage three times with a large amount of reading errors. Social validity might be an indicator that impacts their performance during the VSM or combined intervention condition. Social validity measurement indicated Carter enjoyed engaging in VSM, which might have contributed to the improvement on WCPM during the VSM condition. VSM was acceptable for Anderson, but he reported preference toward other interventions.

When comparing VSM with RR, the most recommended tutor-managed reading fluency intervention, Anderson and Carter's overall WCPM were higher during the RR condition in the alternating treatments phase. This result was consistent with the outcome of Wu and Gadke (2017). The high number of reading errors and potential fatigue effects might explain the minimum difference between the efficacy of VSM and RR condition for Bryan.

Efficacy of VSM as a Supplemental Intervention

Most of the participants in prior studies (i.e., Dowrick et al., 2006; Hitchcock et al., 2004) benefited from adding VSM to the reading program, while Wu and Gadke (2017) did not observe the efficacy of VSM as a supplemental intervention component. In the current study, one out of three participants (i.e., Carter) performed higher WCPM when VSM was combined to RR based on the medium effect size measured by NAP. Based on the social validity measurement using CIRP, Carter's willingness to attend the VSM condition might have

contributed to the efficacy of VSM as a supplemental intervention component. The results of the current study were aligned with prior studies that VSM could be an efficacious intervention component.

In comparison between the efficacy of the combined intervention and VSM, the combined intervention condition had medium to high effect size relative to the VSM condition for Anderson and Carter. However, there was negligible difference in Bryan's reading fluency between the combined intervention and VSM condition. A possible explanation is fatigue might have occurred when Bryan showed difficulty decoding words during reading the passage repeatedly without any error correction assistances.

Efficacy of RR

In order to maximize the efficacy of RR, the current study included three re-readings in RR without any error correction, which reportedly had high effect sizes compared to two re-readings and had very similar effect sizes relative to four re-readings (Therrien, 2004; Lee & Yoon, 2017). The results of the study indicated that three participants consistently had higher WCPMs during the RR condition not only relative to the baseline condition, but the control condition in the alternating treatments phase. The effect size of RR relative to the baseline and control condition was ranged from medium to large. Thus, consistent with prior studies (e.g., NRP, 2000; Therrien, 2004; Lee & Yoon, 2017), the current study also supports that RR is a very efficacious reading fluency intervention.

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Implications

</div>

The current study examined the efficacy of three reading fluency interventions for three elementary school students. The results have several important implications. First, while there

are very few self-managed reading fluency interventions, VSM appears to be a viable intervention for children who have difficulties with reading fluency. Although the stand-alone RR increased reading fluency more effectively relative to the stand-alone VSM for two out of three participants, the stand-alone VSM still showed efficacy in improving the reading fluency of two participants. Considering teachers' busy schedules and a large need from students, the stand-alone VSM might be still a viable option. For example, when a teacher is only available to work with five out of eight students, then the teacher could implement the stand-alone RR for the five students and implement the stand-alone VSM for the students who could not work directly with the teacher.

The current study found only one participant benefited from adding VSM to RR (i.e., combined intervention). It is still possible some individuals might improve reading fluency when incorporating VSM to reading intervention(s) (e.g., RR). The practitioners might be able to examine the efficacy of VSM as a supplemental intervention component by alternating the implementation of a reading program and the combination of the reading program and VSM to evaluate if the readers have higher WCPMs during the combined intervention condition (Wu, Stratton, & Gadke, 2018). Social validity might impact the efficacy of VSM, as VSM had different efficacy for the three participants in the current study. The practitioners could use the modified CIRP (Turco & Elliot, 1986) to evaluate the readers' acceptability after few trials of VSM.

The current study also informed of the procedures of designing the PSR type of VSM. This procedure saves times because the practitioners could record the readers' reading without practicing until they reach higher reading fluency as prior researchers did when designing the Video Feedforward type of VSM. Due to the easy process of the video developments, the

practitioners could design more videos based on readers' improvement in order to show the performance similar with the readers' current reading skills in the videos across the time. If the readers improve reading fluency after multiple VSM sessions, it is possible that the readers' current reading fluency is higher than their reading fluency in videos of VSM.

Limitations

Despites the study's contributions to the literature of VSM as a reading fluency intervention, there are noticeable limitations. First, the improvements during the intervention conditions indicated immediate practice effects, instead of generalization effects. The observed improvement during the intervention effects could not guarantee the participants could read new passages fluently without any interventions.

Bryan still showed difficulties decoding when reading the instructional-level reading passages, even though he passed the minimum criteria of decoding in the study. According to the Instructional Hierarchy (Haring et al., 1978), reading fluency interventions would not be efficacious for the individuals who had decoding difficulties.

Bryan had difficulties comprehending the social validity items, even though the researcher attempted to verbally explain each item to him. In order to report an accurate social validity, the participants need to understand each item. In addition, the study could have a higher internal validity if the participants' disability and age were controlled. Given the assumption that practitioners will develop and assist with the implementation of VSM, the current study did not include the evaluation of the practitioners' social validity.

Furthermore, while there are few studies that examined the efficacy of Feedforward type of VSM as a reading fluency intervention, this is one of the first studies that examined the PSR

type of VSM as a reading fluency intervention. Thus, there are limited number of studies that indicated the efficacy of PSR.

Future Studies

The future studies could further explore the generalization effect of the stand-alone VSM and VSM as a supplemental intervention component. The traditional methodology of measuring generalization effect requires researchers or practitioners to create new passages that have 80% or higher words overlaps with the practiced passages (Ardoin, Carfolite, Klubik, & McCall, 2009; Daly, Martens, Hamler, Dool, & Eckert, 1999). The practiced passages were used for the intervention sessions, and the new passages were used to measure the generalization effect by having the readers to read the new passages without any interventions. Klubnik and Ardoin (2010) suggested an easier yet valid approach. They proposed a reading passage can be divided into two approximately same parts. The first half of the passages can be used for the intervention sessions, and the researchers can monitor the progress of the generalization effect by measuring students' reading fluency in the second half without implementing any interventions. Klubnik and Ardoin (2010) stated the range of words overlaps between the first and second half of the passage is 40-60%. They also indicated the level of words overlaps did not necessarily lead to an improvement in the second half to the passage when a reader reads the first part with interventions. This methodology is not only relatively simple compared to the traditional methodology, but also provides a valid measurement of generalization effect.

In order to ensure a proficient decoding skill of the participants, the future study could include the participants whose decoding skill is above 75th percentile of the first-grade students. When it comes to screening of reading comprehension, a reading comprehension subtest of achievement test (e.g., Kaufman Test of Educational Achievement, Third Edition; Kaufman &

Kaufman, 2014) can inform the current reading comprehension skills of the participants. Including a reading comprehension skills screening in addition to decoding and reading fluency screening would more likely identify the participants who can comprehend the questions in the social validity measurements. As for the social validity of practitioners who may implement VSM, future studies can measure social validity by providing the Intervention Rating Profile (Turco & Elliot, 1986) after having them experience design and implement VSM.

In addition, more studies regarding the efficacy of PSR type of VSM are needed, since this is one of the first studies that implemented and measured its efficacy. While the current study's participants only include elementary school students, the future studies can explore the efficacy of VSM with children with different age ranges (e.g., middle school, high school). In addition to Autism Spectrum Disorder and Attention Deficit/Hyperactivity Disorder, implementing VSM for children with other disabilities and typically developing children would also expand the current literature.

The efficacy of PSR as a supplemental intervention can be measured in the group reading fluency intervention context as well. Wu and colleagues (2018) measured the efficacy of VSM component by using the alternating treatments design to compare the participants' WCPMs during a group reading fluency intervention condition and a combined group intervention condition (VSM + the group reading fluency intervention). This methodology allows to examine if an addition of VSM to the group intervention resulted in an additional improvement in WCPMs. Future studies can use this methodology to evaluate the efficacy of PSR as a reading fluency intervention.

Summary

The purpose of the study was to examine the efficacy of PSR as a stand-alone and supplementary reading fluency intervention for three elementary school children. As one of the first studies that implemented PSR as a reading fluency intervention, the current study provided preliminary findings regarding its efficacy. The results indicated the stand-alone VSM was efficacious for two out of three participants, and the VSM as a supplemental intervention component was efficacious for one participant.

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APPENDIX A

INSTITUTIONAL REVIEW BOARD APPROVAL

MISSISSIPPI STATE
U N I V E R S I T Y™

NOTICE OF DETERMINATION FROM THE HUMAN RESEARCH PROTECTION PROGRAM

DATE: May 08, 2018

TO: Carlen Henington, Counseling Ed Psyc & Foundations, Cheryl Justice;Daniel Gadke;Tawny McCleon

PROTOCOL TITLE: An Examination of Video Self-Modeling as a Reading Fluency Intervention

PROTOCOL NUMBER: IRB-18-116

Approval Date: May 08, 2018   Expiration Date: May 07, 2023

EXEMPTION DETERMINATION

The review of your research study referenced above has been completed. The HRPP had made an Exemption Determination as defined by 45 CFR 46.101(b)1. Based on this determination, and in accordance with Federal Regulations, your research does not require further oversight by the HRPP.

Employing best practices for Exempt studies are strongly encouraged such as adherence to the ethical principles articulated in the Belmont Report, found at www.hhs.gov/ohrp/regulations-and-policy/belmont-report/# as well as the MSU HRPP Operations Manual, found at www.orc.msstate.edu/humansubjects. Additionally, to protect the confidentiality of research participants, we encourage you to destroy private information which can be linked to the identities of individuals as soon as it is reasonable to do so.

Based on this determination, this study has been inactivated in our system. This means that recruitment, enrollment, data collection, and/or data analysis **CAN** continue, yet personnel and procedural amendments to this study are no longer required. **If at any point, however, the risk to participants increases, you must contact the HRPP immediately. If you are unsure if your proposed change would increase the risk, please call the HRPP office and they can guide you.**

If this research is for a thesis or dissertation, this notification is your official documentation that the HRPP has made this determination.

If you have any questions relating to the protection of human research participants, please contact the HRPP Office at irb@research.msstate.edu. We wish you success in carrying out your research project.

Review Type: EXEMPT

IRB Number: IORG0000467

APPENDIX B

TRAINING MATERIALS

Training Record Sheet for Assisting Researchers

Date: _____   Researcher:_____

	Trial 1		Trial 2		Trial 3	
	IOA	TI	IOA	TI	IOA	TI
Assisting Researcher 1						
Assisting Researcher 2						
Assisting Researcher 3						

*Note***:** The assisting researchers will pass the training session if both their IOA and treatment integrity (TI) accuracy are above 90% for 3 consecutive trials.

Training Record Sheet for Interventionists

Date: _____   Researcher: _____

	Trial 1			Trial 2			Trial 3		
	RR	VSM	CI	RR	VSM	CI	RR	VSM	CI
Interventionist 1									
Interventionist 2									
Interventionist 3									

*Note***:** The interventionists will pass the training session if the treatment integrity accuracy of Repeated Reading (RR), Video Self-Modeling (VSM), and Combined Intervention (CI) are above 90% for 3 consecutive trials.

APPENDIX C

TREATMENT INTEGRITY

Treatment Integrity: Video Self-Modeling

Date: _____   Time: _____

Participant's Initials: _____   Interventionist: _____

Phase: __ATD/Confirmation/Follow-up Phase__   Passage Number: _____

Intervention Steps

☐   1. Place the cellphone in front of the participant and say, "**You will watch a video of yourself reading a passage. Please pay attention to the video.**" Then, start playing the video.

☐   2. Monitor the participant's behaviors and encourages the participant to pay attention if distracted.

☐   3. Place the participant's copy of the passage in front of the participant.

☐   4. Say, **"You will read the passage. Try to read as fast as you can without making mistakes. If you come to a word you don't know, skip the word and keep reading the rest of the passage. Do you have any question? Ready? Begin."**

☐   5. When the participant says the first word, start the stopwatch for reading time. Record the total reading time, number of reading errors, and total words read correct. This is will be the scores that will be used for tracking the participant's reading performance for that intervention session.

☐   6. Do not correct participant's mistakes during reading, but say the word aloud if the participant hesitates for 3 seconds.

Percent of Integrity _____

123

Treatment Integrity: Repeated Reading

Date: _____   Time: _____

Participant's Initials: _____   Interventionist: _____

Phase: __ATD/Confirmation/Follow-up Phase__   Passage Number: _____

Intervention Steps

☐   1. Place the participant's copy of the passage in front of the participant.

☐   2. Say, **"You will read the passage for three times. Try to read as fast as you can without making mistakes. Do you have any question? Ready? Begin."**

☐   3. During the readings, if participant hesitates for 3 seconds, say the word aloud for and instruct the participant to continue reading. Do not correct misread words

☐   4. When the participant says the first word, start the stopwatch for reading time. Record the total time needed for reading, reading errors, and total words read correctly for each trial. The reading fluency and accuracy in the third reading will be the scores will be used for tracking the participant's reading performance for that intervention session.

Percent of Integrity _____

Treatment Integrity: Combined Intervention (RR+VSM)

Date: _____   Time: _____

Participant's Initials: _____   Interventionist: _____

Phase: __ATD/Confirmation/Follow-up Phase__   Passage Number: _____

Intervention Steps

☐ 1. Place the cellphone in front of the participant and say, "**You will watch a video of yourself reading a passage. Please pay attention to the video.**" Then, start playing the video.

☐ 2. Encourage the participant to pay attention if the participant becomes distracted.

☐ 3. After watching the video, place the participant's copy of the passage in front of the participant.

☐ 4. Say, **"You will read the passage for three times. Try to read as fast as you can without making mistakes. Do you have any question? Ready? Begin."**

☐ 5. During the readings, if participant hesitates for 3 seconds, say the word aloud for and instruct the participant to continue reading. Do not correct misread words

☐ 6. When the participant says the first word, start the stopwatch for reading time. Record the total time needed for reading, reading errors, and total words read correctly for each trial. The reading fluency and accuracy in the third reading will be the scores will be used for tracking the participant's reading performance for that intervention session.

Percent of Integrity _____

APPENDIX D

INTER-OBSERVER AGREEMENT SHEET

Inter-observer Agreement Sheet

Date: _____   Time:_____

Interventionist: _____   Participant's Initials:_____

Trial	Date	#Agreement	#Disagreement	IOA
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				

APPENDIX E

DEMOGRAPHIC SCREENER

<div align="center">**Demographic Screener**</div>

Demographic Information

Parent's Name: Child's Name:

Gender: DOB:

Grade: Age:

School: Race/Ethnicity:

Primary Language: Eligibility Ruling:

Behaviors

Question 1: Does the child have reading concern?

Question 2: Is the child receiving reading interventions at school?

Question 3: Indicate if the child displays any of the following behaviors:

[   ] Aggression   [   ] Non-compliant behaviors   [   ] Extremely nervous

[   ] Self-injurious behaviors [   ] Too easily get frustrated   [   ] Disruptive behaviors

[   ] Destructive behaviors   [   ] No behavioral concerns

APPENDIX F

RECRUITMENT FLYER

Opportunity to Improve Your Child's Reading Skills!!!

Hi, parents!

We are currently recruiting **three to five** students to provide reading interventions for **free** for the purpose of a dissertation study.

This study will examine and compare the effect of three evidence-based reading interventions. Your child will receive each intervention 5-11 times. Each session will last 1 hour, and each intervention might last approximately 5 minutes. The length of the entire study depends on the availability of the participants, but the researcher expects the duration of the study will be 2-3 weeks.

The **benefits** of the participation include (1) increasing the participants' reading skills, (2) knowing the current reading level of the participants, (3) knowing strengths and weaknesses of the participants' reading skills, and (4) understanding how to implement the interventions used in the study.

More specific **criteria** of participants include: (1) children are enrolled in 4th or 5th grade, (2) children have reading difficulties, and (3) children do not have behavioral concerns. We will only recruit three to five participants for the purpose of the study. More specific details will be discussed once the parents contact the researchers.

Please contact the primary researcher (Shengtian Wu) via email sw1757@msstate.edu, if you are interested in helping your child improve his/her reading skills.

Thank you for your participation!