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At Risk for Reading Disabilities

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Abstract

Ten first grade students who had responded poorly to a Tier 2 reading intervention in a response to intervention (RTI) model received an intervention of video self-modeling to improve decoding skills and sight word recognition. Students were video recorded blending and segmenting decodable words and reading sight words. Videos were edited and viewed a minimum of 4 times per week. Data were collected twice per week using curriculum-based measures. A single subject multiple baseline across participants design was used. Results indicated an increase in decoding skills and sight word recognition for all participants. A two-week post-test maintenance assessment showed retention or increases for 70% of participants. Results from the study offer promise for a specific intervention that may reach particular students who respond poorly to Tier 2 reading instruction.

The Effects of Video Self-Modeling on the Decoding Skills of Children

At Risk for Reading Disabilities

Students with reading disability (RD) may experience difficulty with decoding, fluency, and /or comprehension. It is common for students with RD to read slowly and deliberately, re-read lines and phrases, lose their place on a page, guess often, and omit or substitute words, letters, and phrases (McCray, Vaughn, & Neal, 2001; Swanson & Howard, 2005). In kindergarten and first grade, students at risk for RD often have deficits in phonological processing skills, including phonological awareness, rapid naming, and phonological recoding (O'Connor & Jenkins, 1999; Vellutino, Scanlon, Zhang, & Schatschneider, 2008). These deficits make it difficult for struggling readers to master decoding skills because the deficits limit the ability to read whole words and establish the automatic associations required for fluent reading (Ehri, Satlow, & Gaskins, 2009; LaBerge & Samuels, 1974; Simmons, Coyne, Kwok, McDonagh, Harn, & Kame'enui, 2008). When students are struggling to decode words, little focus remains for comprehension (Klingner, 2004; O'Connor, Swanson, & Geraghty, 2010).

Recently, school districts have turned to Response to Intervention (RTI) models to provide early intervention in phonemic segmenting, letter knowledge, and word reading with the hope of improving reading outcomes for children at risk for RD (Fuchs & Fuchs, 2007); however, RTI models can vary greatly in terms of instructional group size, types of tutors, standardization of instructional methods, number of sessions per week, duration of program, and fidelity of the treatment program (Wanzek & Vaughn, 2007, 2008). Many school districts use a three-level approach for designing their RTI system in which the first level, sometimes referred to as Tier 1, comprises the instruction general educators use with all students. Regardless of specific details, models of RTI use measures to identify students receiving Tier 1 instruction whose skills are below typical levels for the age and grade of the child. Students who score below these levels receive intervention that is more specific and intensive than their general education instruction, called Tier 2. The assumption is that intervention needs to be provided in a timely manner to circumvent severe, long-term academic difficulty. Typically Tier 2 occurs as small-group tutoring in which a program (or its components) meets criteria for effective, or evidence-based, intervention. Researchers who have implemented RTI approaches find that 20% to 30% of students fail to thrive in general classes, although the proportion varies depending on risk factors in the community and instructional features (D. Fuchs, Compton, Fuchs, Bryant, & Davis, 2008; O'Connor, Fulmer, Harty, & Bell, 2005; Simmons et al., 2008; Vellutino et al., 2008).

One way to offer support to reading intervention programs is to provide technology-based interventions. Children with learning disabilities and those at risk may feel less threatened by computers and other technologies than by instructional personnel and may respond positively to the multimedia and interactive presentation of learning materials (Edyburn, 2006; Hasselbring & Glaser, 2000). Although models of RTI have demonstrated improvements in reading trajectories and outcomes (O'Connor et al., 2005; Simmons et al., 2008; Vaughn, Wanzek, Murray, Scammacca, Linan-Thompson, & Woodruff, 2009), for students who do not respond well to Tier 2 in RTI models, few validated Tier 3 interventions are available (Denton, 2012). Such students may require something tailor-made to improve their responsiveness and reading growth.

In the current study, we examine the effects of such a tailor-made Tier 3 intervention--video self-modeling (VSM)--to improve the responsiveness of students with poor progress in Tier 2 interventions. Video self-modeling involves the video recording of a student performing a target behavior while either prompted or coached within a scripted or naturalistic setting. The target behavior is typically one that is desired and/or one that is slightly beyond the student's current ability. The video recording is edited to remove the prompting and coaching, leaving the student with a video of his or her own successful execution of the target behavior. It is a personalized intervention that has shown positive effects across a variety of skills and situations and is one of the fastest growing applications of modeling (Bellini & Akullian, 2007; Dowrick, 1999, 2006). When self-modeled videos are created at school, students typically work with an adult to storyboard (i.e.; sketch a series of panels and sequence them to depict the important segments of the action to be filmed), film, and view videos. VSM could intensify a tiered instructional model by creating images for children that they typically do not see because such images are not reflected in their daily environment – with respect to our study, these are visual and auditory images of their own successful reading, oral language, and learning (Dowrick, 2003; Edl, 2007). VSM in effect could function as a Tier 3 intervention.

VSM evolved from the work of Albert Bandura and Lev Vygotsky. In the 1960s, Bandura conducted several studies that showed that children who were presented with a model of aggressive toy playing behavior imitated the behavior and the language patterns (Bandura & Huston, 1961; Bandura, Ross, & Ross, 1961). In 1970, Creer and Miklich introduced VSM as a means to reduce children's inappropriate behavior. In the mid 1970s, Peter Dowrick used VSM across a variety of learning environments with students with disabilities (Dowrick, 2006; Hitchcock, Dowrisk, & Pater, 2003). Currently there are close to 300 applications of VSM described in print (Bellini & Akulian, 2007; Dowrick et al., 2006).

Bandura demonstrated that children can learn many skills through modeling with and without reinforcement, and that self-efficacy can be influenced through the use of video modeling by observation of one's own success (Bandura, 2001). The use of video modeling to acquire a skill just beyond current ability is also supported by Vygotsky (1978), who theorized that learning is most efficient in the zone of proximal development (ZPD); that is, when information to be learned is just beyond current knowledge but closely related to it. By definition, the ZPD covers experiences between a child's unaided performance and the performance that is possible with the help of a teacher or peer (Hausfather, 1996). Dowrick (1999) has labeled the method of video recording a person's potential future performance as Feed Forward. The notion of Feed Forward is that providing an image of the future performance rather than reflecting on past performance may have greater impact on learning than feedback.

Consider the experience of a student successfully achieving a target skill after watching a self-modeled video, while also experiencing the struggle of achieving the skill during the recording phases. In the initial creation of a self-modeled video, a student receives verbal support from others regarding his / her achievement. Positive reinforcement, especially from teachers and parents, has been documented as important to and linked to the development of self-efficacy (Chen & Looi, 2011; Holmes, 2011).

Researchers have used VSM to teach new behaviors such as spontaneous requesting, on-task behavior, and question answering (Charlop & Milstein, 1989; Wert & Neisworth, 2003), to decrease problem behaviors such as tantrums and other disruptive behaviors (Buggey, 2005; Clare et al., 2000) and to increase task fluency (Lasater & Brady, 1995). Recently, researchers have turned their attention to uses of VSM to improve reading skills. Greenburg, Buggy, and Bond (2002) created videos for three 3rd grade participants who were at least one year below grade level. These students viewed themselves fluently reading passages that were above their current reading levels. To produce the video, students received prompts as needed, which were then edited from the final videotape. The students watched their VSM tapes once a day; two of the participants increased their oral reading rate a full grade level and the third participant increased from the 25th to the 75th percentile of his current grade level. Likewise Hitchcock et al. (2004) used VSM combined with tutoring to increase reading fluency and comprehension skills of four 1st graders with reading difficulties.

Dowrick et al. (2006) also demonstrated that VSM could increase reading fluency. Participants included ten 1^{st}-grade students selected by their classroom teacher as having difficulty reading. On average, students increased reading rate from 7.2 words per minute to 21.2 words per minute. The students were tutored in passage reading, comprehension, vocabulary, sight words, and phonics. Videos were created with participants reading difficult passages and sight word flashcards. The videos were edited to show students a fluent self-model of themselves reading. Dowrick calculated a reliable change index (RCI) for each student, in which Z scores outside the range +/- 1.96 were considered to be significant. All participants reached criterion in one to three months, scoring between +2.70 and +8.34.

These studies have shown positive gains utilizing VSM to increase reading fluency and comprehension (Dowrick, 2006; Greenberg et al., 2002; Hitchock et al., 2003); nevertheless, no evidence to date has shown whether VSM can improve decoding skills. Decoding skills and recognition of sight words are the foundation of reading fluency and comprehension, and are common instructional targets in Tier 2 interventions for 1st graders (Fuchs et al., 2008; O’Connor, Bocian, & Beebe-Frankenberger, 2010). In this study we used video self-modeling with second semester 1st grade students who were receiving RTI Tier 2 reading instruction, but demonstrating minimal progress in reading words.

Ten 1st grade students who had responded poorly to 15 weeks of Tier 2 RTI instruction (38% of the Tier 2 participants) received an intervention of video self modeling to investigate whether this instructional tool would affect their decoding and sight word recognition. A single subject, multiple baseline AB design was used across participants to answer the following questions: (1) Does video self-modeling improve decoding skills of children at risk for reading disabilities? (2) Does video self-modeling improve sight word recognition of children at risk for reading disabilities?

Method

Setting and Participants

The participating school was a Title 1, low socio-economic-status (SES) elementary school in southern California. The ethnic composition included 68% Hispanic, 16% White, 9% African American, and 7% Other. Thirty percent were English learners, predominately Spanish speaking. Eighty percent received free/reduced lunch and 51% were female.

Twenty-six students received Tier 2 intervention during first grade. All of these students had attended the school since the start of kindergarten and demonstrated deficits in decoding skills and phonemic awareness throughout kindergarten and the first half of 1st grade. Participants in the VSM intervention included ten of these students, and scores on the Basic Phonics Skills Test (BPST; Shefelbine, 2006) administered at the beginning of the school year showed a non-passing score for each student participant. The students are described for age, gender, and ethnicity in Table 1. All but one spoke English as their first language.

The adult participants included the school's reading specialist and special education teacher, both of whom held master's degrees and at least 10 years of experience in this school, and the first author. Also involved were two special education teaching assistants. All of the adults were female and over the age of 40; three were bilingual Hispanic and two were Caucasian. The reading specialist was responsible for administering the RTI Tier II program with the help of one teaching assistant. The first author and special education teacher, with the help of one teaching assistant, administered the VSM intervention and were responsible for data collection and intervention fidelity.

Background Reading Instruction

All of the participants received 90 minutes of daily Tier 1 and 25 minutes of Tier 2 instruction 4 days per week. The Tier 2 program was Systematic Instruction in Phoneme Awareness, Phonics, and Sight Words (SIPPS; Shefelbine, 2006). SIPPS is a systematic phonics program developed by John Shefelbine that focuses on phonemic awareness, single syllable decoding, short vowels, consonants, complex vowels, consonant digraphs, polysyllabic strategies, and high-frequency sight words. SIPPS includes an assessment tool that determines placement and the (K-1) beginning level is for children who are considered nonreaders. The SIPPS first grade instruction consists of oral blending, segmenting of syllables and consonant–vowel–consonant (CVC) words, and sight word recognition. The reading specialist and teaching assistant implemented the Tier 2 program and followed a paired set of scripted administration directions; however, no formal fidelity procedures on background Tier 1 or 2 were undertaken in the current study. SIPPS was evaluated in a comparison across schools in California, for which the author reported significant improvements in reading levels after two schools were provided the SIPPS program for grades 1-3. Two other schools using other phonics programs served as comparison schools. Students using the SIPPS program showed significant gains over the comparison schools in decoding on a normed assessment test (Shefelbine, 2006).

All students receiving Tier 2 RTI instruction began with SIPPS lesson 1 at the beginning of 1st grade. The program is designed to introduce new consonants, vowels, and sight words every ten lessons, and students must master the earlier set before advancing to the next set, which occurs at lesson 11, 21, 31, and onward. Students considered responsive to the RTI program reach at lesson 41 or higher by the month of January, which is a level commensurate with first grade performance. Three of the ten poor responders selected for this study tested at lesson 11 in January and the other seven tested between lessons 21 and 31. Lessons 1 - 20 included the phonemes: /s/, /n/, /t/, /a/, /r/, /i/, /f/ and sight words: I, see, the, you, can, me, and, we, on, is, yes, are, and no. Lessons 21 – 40 include phonemes: /h/, /u/, /d/, /c/, /k/, /ck/, /o/, /b/, /y/, /p/, /g/, /l/, /e/, /w/ and 33 additional sight words. Students who successfully complete lesson 41 are able to segment and orally blend and manipulate all previously learned sounds. Students reached only lesson 31 (or lower) by January were considered to be “not thriving in Tier 2” and were selected for this Tier 3 intervention.

Measures

Program reading measure. The Basic Phonics Skills Test (BPST; Shefelbine, 2006) was first administered in September by the school and was re-administered in January and April for pre- and posttest scores for the current study (See Table 2 for January and April scores on the BPST). The 100 items on the BPST include letter sounds, vowels, digraphs, and word reading. The test is aligned with the California English Language Arts Content Standards for kindergarten and first grade. All 10 students were able to name some letters but unable to produce the sounds for all letters. Placement levels in SIPPS are also shown in Table 2.

Three measures were used to collect baseline and progress data. The first was the Nonsense Word Fluency (NWF) probe from the Dynamic Indicators of Basic Early Literacy

Skills (DIBELS, Good et al., 2004). Students were shown a page of two-to-four-letter nonsense words and asked to read the word. Scores for NWF were calculated in the optional format of counting words recoded correctly (WRC) rather than individual sounds decoded correctly, which tests letter-sound knowledge rather than decoding. The score is the number of correctly pronounced words in one minute. Reports on NWF have indicated interrater reliability around .90 and concurrent validity with standardized achievement measures and teacher ratings from .60 to .70 (Elliot, Lee, & Tollefson, 2001). In addition to graphed scores, pre- and posttest scores are shown in Table 2.

The second and third measures were curriculum-based measures (CBM) comprised of decodable and sight word card sets (Shefelbine, 2006) from the SIPPS reading instruction program, lessons 11 through 41. Appendix A shows these lists. Interobserver reliability on the BPST and NWF are reported in the results.

Progress monitoring. Twice per week, after students had viewed their videos and participated in their Tier 2 SIPPS reading instruction, students were monitored with the NWF and two sets of index cards (one set decodable and the other sight words) to assess the number of correctly decoded words and sight words recognized. The selected words were from lessons 1-40, which covered the range of lessons students had completed through those to be introduced within the study time frame. Each student was shown the cards in flip card fashion and asked to read the word. For the sight words they were allotted one minute to read as many words as they could from the set. For the decodable words they were given the entire set each session and allotted up to 5 seconds to read the word aloud. The cards were shuffled and presented in random order each time, and were administered by a reading assistant, the special education teacher, or the first author. The number of correct words was recorded on score sheets and plotted as graphs for visual analysis.

Intervention log. Throughout the study, the first author kept a log of teacher and student comments, along with observations of student performance. On days when no direct quotations or progress monitors were recorded, student performance was summarized. These comments are reported in the results.

Interviews of teachers and students. Following the close of intervention, all participating adults and students were interviewed. It was important to interview the teachers to understand their perspective on student reading improvement outside of the intervention setting, and their views regarding expanding the VSM work if it were to prove successful. The interviews were informal and not coded for the study. Questions asked of teachers included: Have you noticed changes in decoding skills during classroom activities? Have you noticed changes in participation during reading activities? What do the students say in class to others about their reading progress? Does VSM seem feasible as a Tier 3 intervention?

Some of the questions asked of students included: Did you like making videos? What did you like about making reading videos? Did you watch them with your family? How did you feel when you saw yourself reading words? Do you think the videos helped you to become a better reader? Teacher interviews lasted approximately 10 minutes, and student interviews approximately 5 minutes.

Procedures

The timeline for the study was as follows: students were identified in early January. Testing began in the second week of January. Baseline data were collected for the last two weeks of January. The VSM intervention began in the first week of February and continued for 8 weeks thru March. One Spring break week off from school interrupted the middle of the study. Maintenance data were collected in the second week of April. The Tier 3 intervention using VSM occurred 4 days per week in the reading specialist's classroom. The classroom was divided into sections conducive to small group instruction with a mix of horseshoe and rectangular tables and room dividers. Along the back wall were computer stations equipped with headphones and divider carousels where this study's students watched their videos. During the intervention no other students were in the classroom.

The first week of the study comprised assessment solely, with the BPST, SIPPS Assessment, and DIBELS NWF administered individually to each student. The first author, the reading specialist, and the special education teacher administered the assessments. The BPST and SIPPS were tests already being administered by the school teachers and so the only training required was for the DIBELS assessment, which occurred prior to the first session by the first author. In total the BPST was administered once at the beginning of the school year and then two more times, once in January and once in April. The January and April scores were used as pre and post-tests for the study. The second week was the start of baseline data collection for students, who continued to participate in their Tier 2 instruction throughout this study. Once a stable baseline had been established for each of the students video recording was initiated for the VSM phase. Individual videos were recorded during the first week of the VSM intervention.

The first author managed all of the video recording and editing. For the personalized video, each student was video recorded participating in a reading intervention session that included oral blending of letter sounds, segmenting, and sight word recognition slightly beyond the present ability of the student to utilize the feed forward technique (Dowrick, 1999). The student worked with one adult tutor and video recording took place in a private classroom to eliminate noise and interruption. Students were filmed decoding and reading words in a manner that mirrored their daily Tier 2 sessions. A simple Flip Video Camera on a tripod was used, placed away from the student at the best angle to capture the student's face and the materials.

The student was coached to work on the specific activity. For example, the student was asked to blend a consonant vowel consonant (cvc) word such as /s/ /a/ /t/. The tutor asked the student to identify the sounds. If the student was unsure, the tutor modeled the sounds and how to blend them. When the video was edited, the tutor modeling was removed and the student was seen responding with perfect blending of the sounds. The same process took place for segmenting sounds and for reading sight words. When a student needed prompting, coaching or modeling, it was provided. When the video was edited, prompting, coaching, and modeling were removed. What remained was 2 minutes of the student correctly decoding words or recognizing sight words. Editing was done with Apple's iMovie program on a standard Mac G5 computer, which enabled the addition of still photos, graphics, titles, and sound as necessary. For this study 3 to 4 videos for each student were made. Each of the videos was recorded in the same way every time to ensure fidelity of the recording.

The VSM intervention was staggered across a multiple baseline phase beginning with the first set of 3 students, based on their schedule of RTI sessions. Once criteria for change were met for at least two students, a video was introduced to the next set of students. Criteria for change included two data points above baseline, or alternatively, the passage of four intervention sessions. This continued until all students were viewing videos prior to their Tier 2 instruction.

Each video included five decodable words and five sight words. The recording process took less than 5 minutes for each video. The student segmented the decodable words and blended each back together one at a time, with an adult assisting as needed (later edited out). The student then read each of the five sight words. The first 3 students recorded one video during the first week of baseline. After the VSM intervention began for these students and we observed an increase in decoding skills by two data points, the second set of students recorded their first video and the first set of students recorded their second video. The next change in data brought in the third set of students to record their first video, while the second group recorded their second video and group one recorded their third video. The recording process continued this way throughout the remainder of the study.

The purpose of the study was explained to the students in this way: “We are going to make videos of you learning your sounds to help you learn to read. You will make your very own video and watch your own video. The sounds and words you will work on will come from your reading group lessons. You will come here every morning before reading group and watch your video. After you watch yourself doing a good job of learning your sounds and words, you will go back to your reading group. We are trying to help you become better readers.”

Students viewed their own video four times per week at a computer before beginning their routine small group Tier 2 instruction. Viewing a video took 2 minutes per video for each student. The same students came each day in small groups to watch videos just before their scheduled reading groups. Each of the three adults watched particular students viewing their videos. Throughout the study, students were given copies of their videos to view during other free time upon request. They also took copies of videos back to class to share with their teacher and took home copies to share with a parent or guardian. Data were collected on the number of additional times a student viewed his or her video outside of the study parameters for social validity.

Videos were viewed in the order in which they were created. During the first week, Jordan, Skyler, and Trevor only had one video to watch, but in the second week they had two videos to choose between, or they could watch both. Over time, and after having recorded two to three videos, the students were given the option to choose any or all of their videos to watch. The videos were nearly identical with the exception of focusing on different words. Data were collected on Tuesdays and Fridays for each of the students, establishing observable patterns with least 20 data points per student over the course of twelve weeks. Eventually VSM was introduced to all 10 students, staggered in groups of 2 and 3, based on their Tier 2 intervention schedule. By the end of the 11th session all students were watching videos prior to reading instruction. After watching their videos, students continued to participate in Tier 2 reading groups of 4-6 students for 25 minutes, 4 days per week. The VSM recording sessions lasted 10-to-15 minutes in small groups of 3 students, just slightly smaller than their Tier 2 groups. Viewing videos was independent although the students sat near each other in private carousel desks with headphones. They viewed videos a minimum 4 days per week for 5 minutes each session.

Data Analysis

The most common method of data analysis for single case design (SCD) is visual analysis (Horner et al., 2005; Riley-Tillman & Burns, 2009), which involves examining data to compare baseline with the intervention phase, seeking patterns or changes in order to determine effectiveness of an intervention. Data are plotted and graphed exactly as they are collected, allowing the researcher to examine levels, immediacy, variability, and overlapping data (Parker & Brossart, 2003). Riley-Tillman and Burns (2009) explain that levels of data lines can show differences between baseline and intervention, and immediate changes strengthen internal validity. Variability is defined as checking for the amount of variation in the range of data points. If data points overlap with the baseline, it is assumed that the intervention is not creating change in the dependent variable (Hinkle, Wiersma, & Jurs, 2003).

If there are visible changes in trend, variability, immediacy, or levels in the results of a study, it may be reasonable to suppose that the intervention is working. One method that can be used to make decisions regarding collected data is establishing the percentage of non-overlapping data (PND). We calculated the PND for each student by taking the number of data points above each student's highest individual baseline score during the intervention phase and dividing that by the total number of data points. For example, if a student's highest baseline score was 5, and the student had a total of 10 recorded data points during the intervention with 8 of these greater than 5, we divided 8 by 10 for a PND score of 80%, indicating that 80% of the time, the student performed greater in the intervention phase than during the baseline phase.

Validity and reliability. One of the limitations of SCD is the difficulty drawing generalization due to the small number of participants used in each study. Replicating the findings across participants or other measures of the dependent variable enhances external validity. Utilizing a multiple baseline can address threats to internal validity (Horner et al, 2005). This study used 10 participants to replicate findings and multiple measures of reading across participants to enhance confidence that changes in behavior were the result of the intervention.

Results

Interobserver Agreement and Fidelity of Implementation

Interobserver agreement was collected each Friday on measures of NWF and the two sets of SIPPS word cards. Mean agreement on scores between the two observers ranged from 98% to 100%, with no disagreement larger than one score point. On Fridays, the students rotated through two test administrators in order to assess inter-observer reliability for the study. After assessing one student, an administrator observed another administrator assessing a student and both recorded scores. This took place for all three sessions on Fridays covering all ten students. The data collection and inter-observer reliability on Fridays covered approximately 50% of the graphed measures including the baseline and intervention phases. Data were collected 20 times over the ten week study. Of those 20, ten included assessment of inter-observer reliability, which came out greater than 95%.

We assessed treatment integrity across two dimensions. . First, we verified the appropriateness of the choices of words used in each video. The first author selected the video content (specific words to be read) from within the individual range of lessons that students might complete over the next subsequent two weeks (i.e., the Feed Forward process). This content was verified by each student's Tier 2 teacher, who found no instances of inappropriate word choices for the videos. Fidelity at this level was 100%.

Secondly, teachers and tutors also monitored (1) whether students viewed their videos prior to Tier 2 instruction, and (2) the number of instances students shared their videos during school hours. Although the morning viewing prior to instruction occurred at 100%, additional viewings varied across students and the reports were likely estimates with a lower level of integrity than the viewing required with implementation of VSM. Most of these reports came from a single source (e.g., the child's classroom teacher or the child) and often they could not be verified.

Intervention Effects

A visual analysis of the data was performed to determine whether the VSM intervention was successful. Because data were collected and graphed twice weekly, each set of two consecutive points reflects one instructional week. Figure 1 shows student progress across the baseline, intervention, and maintenance phases for each measure of progress and each student. Intervention effectiveness was judged with the Percentage of Non Overlapping Data (PND) for each measure, which ranged from 70-90% across students, with 70-80% considered effective and 90% considered very effective (Scruggs & Mastropieri, 1998) (See Figure 2).

Baseline. A baseline was established for each of the participants. Baseline measures for Jordan, Skyler and Trevor showed a stable pattern for a minimum of three data points across the three domains (decoding, sight words and NWF). Jason and Sheryl had relatively steady baselines with a slight increase for decoding for Sheryl prior to intervention. We attributed this decoding increase to the practice decoding words in preparation for making their first video, with a similar pattern for Drew and Gavin. Danise demonstrated a drop in her baseline scores in the weeks prior to beginning VSM. Jake and Latoya displayed steady decoding baselines; however, Jake's NWF increased during the baseline phase and increased at the same rate following the intervention.

Decoding. The first three intervention students--Jordan, Trevor, and Skyler--demonstrated improvement in their decodable word scores within four to five measurement points following the VSM intervention, which was typical of most students in this study. Jason, Drew, Danise, Sheryl, and Latoya showed a clearly improving trend within three measurements of decodable words; however, Jake's trend was not clear until the 8th measure (i.e., four weeks of VSM intervention).

Progress in decoding nonsense words (i.e., pronouncing words on the NWF as whole words) followed a pattern similar to reading real decodable words for most students. The exceptions were Jordan, Trevor, Sheryl, and Latoya, who showed a flatter trend in NWF than for real words, possibly due to the time constraints for NWF.

Sight words. Although Gavin, Danise, and Jake improved their rate of sight word reading within two measurement points, most students took three to four data points to show clear improvement. Jordan and Latoya did not show sight word improvement until six to nine points, representing three or more weeks of VSM implementation. For some of these students (i.e., Jordan, Skyler, Sheryl, and Latoya), increases in decoding were paired with slow or decreasing progress in sight word reading as they attempted to decode sight words (i.e., are, your, would) for which decoding is ineffective. Comments in the observation log documented Skyler's attempt to decode the sight words as he developed decoding confidence.

Pre- and post-test scores on the Basic Phonics Skills Test indicated that all ten students showed improved letter sound, digraph, and vowel recognition and earned passing scores above 80, the average score for mid-year first graders (See Table 2). Pre- and post-test scores on the NWF and the SIPPS placement tests are also shown in Table 2. Results of the SIPPS Tier 2 placement test showed that all students advanced one or more instructional levels, each representing mastery of 10 lessons.

Initially, several of the students demonstrated deficits in letter sound recall, for example Jordan tested at Lesson 11 on the SIPPS placement assessment the week before his Tier 3 VSM intervention began. After 10 weeks receiving the VSM intervention, Jordan placed at Lesson 31. His decoding PND was 83%. However, during a two-week follow up maintenance check, Jordan's scores dropped and he showed the lowest maintenance scores of all ten students.

After 10 weeks of the VSM intervention, Skyler demonstrated the greatest gain in SIPPS assessment scores of all ten students, which placed him within the first grade range (Lesson 41). Skyler missed the follow-up maintenance check, due to his family moving away.

Trevor, Jason and Sheryl each moved up two SIPPS levels with the VSM intervention. The SIPPS level of 41 was the highest level achieved by students during the 10-weeks of this study.. As Trevor's decoding skills improved, he gradually demonstrated improvement in nonsense word reading as well, with a decoding PND of 87 % and a NWF PND of 88%. He maintained gains in all three areas. Jason was able to decode his highest number of words during his two week maintenance follow up, indicating that he continued to grow in skills after the VSM ended, with a PND of 98% on decoding skills. Sheryl, our only second language learner, brought her BPST within average range for first grade by the end of the study, and her NWF PND score was 94%.

Drew, Danise, and Jake demonstrated immediate changes in decoding at the start of their VSM intervention. Drew's two-week post assessment indicated stability and growth, with a PND greater than 95% of decodable words. Danise showed rapid increases in decoding, sight words, and NWF once the intervention began, and her PND was 73%. VSM appeared to help Jake generalize letter sound knowledge, as evidenced by his NWF PND score of 90%.

Gavin was one year older than the others because he had been retained in the first grade. After his first session of the VSM intervention, he dropped in decoding; however, during this time he showed an increase in sight word recognition. He soon began to recover his decoding skill and showed a steady progressive trend along with an increase in NWF, with a PND of greater than 95%. Latoya demonstrated immediate increases in decoding and recognizing sight words with a PND of greater than 95%. The maintenance score of 54 in decoding is double her baseline performance with only five weeks of VSM.

Social Validity

In addition to comments recorded in the instructional log, students and their teachers were interviewed by the first author at the close of the study. All of the students reported that they enjoyed watching themselves on video. They especially liked showing the videos at home to family. Several students said that their families invited relatives and friends to come watch the reading videos. One student mentioned that he could not watch them at home because he did not have a DVD player or computer, but we invited his mother to watch them at school. Each student stated that the videos helped him or her to read. It was often observed in the instructional log that project students would race across the schoolyard to ask when they were going to make reading videos again. One student said she remembered more words when she watched herself reading them. She said she liked watching the other students read words as well during the video recording process. Most of the students expressed disappointment when the study was over and they would not be making more videos.

Teachers reported changes in decoding skills and reading self-efficacy. One teacher reported a noticeable stabilization of previous reading inconsistency, such that gains were maintained from one day to the next. All of the teachers reported that the students liked to watch their videos in the classroom during down time. They also mentioned that their other students were envious and wanted to make videos of their reading as well. One teacher reported that a student participant was reading more calmly. Another stated that she observed one student trying to read independently with a classmate during a non-scheduled reading time, which was a new behavior. Two teachers requested to learn how to record and edit VSM reading videos.

Discussion

Video self-modeling is a personalized intervention that has shown positive effects across a variety of skills and situations (Bellini & Akullian, 2007; Dowrick, 1999, 2006). This study expanded the literature base of VSM and reading improvement by including decoding as a dependent variable that had not yet been considered. We explored the potential impact that VSM might have as a Tier 3 intervention within RTI for students in first grade. In this study, students who responded poorly to Tier 2 decoding instruction improved their decoding and sight word reading ability following implementation of VSM. First grade children who respond poorly to Tier 2 instruction are likely to be stuck in decoding, in recognizing sight words, or both. By measuring decoding of real and nonsense words and sight words, we were able to reveal such patterns in baseline scores and in response to this unique intervention.

Applying Bandura's (1997) theory to learning to read, children with disabilities who experience high self-efficacy may persevere in the face of difficulties, initiate more opportunities to practice reading, and become better readers than other children with the same level of cognitive ability. Unfortunately, children who do not feel they are good readers rarely pick up a book (Henk & Melnick, 1995; Margolis & McCabe, 2003). Some children will tell others they are good readers even though they know they do not read as well as their peers (Klassen, 2002). Situations such as these may be perfect opportunities for the use of VSM due to the potentially positive effects of the visual images of being a good reader (Dowrick, 2006).

Typical RTI instruction outside the classroom setting involves 15- to 30- minute sessions with a trained community, school, or professional tutor several times per week. Our study suggests that technology could offer additional support at other times of day including at home, during or after school, and on weekends. The use of a video camera enables self-modeling opportunities, which allow students to observe themselves as successful readers and to practice the reading skills that have been recorded and made portable on an iPad, DVD, flash drive, iPod, computer or webpage. Today's students are often native digital learners and motivated by technology, and although we did not measure motivation in this study, it is possible that motivation may have contributed to the success of our technology-based instruction.

This study found positive effects for VSM on improving decoding skills and sight word recognition for children at risk for, or already identified with disabilities. All ten students improved their pre-test scores and most of them maintained or improved their highest score two weeks after the intervention ceased. The multiple baseline design enabled a clear picture of how assessment scores improved in relation to the timing of the VSM implementation. However, prior to watching their own videos, students were tested with the CBM word cards and recorded their videos in preparation for watching them. Both of these activities are part of the VSM experience but force consideration as to the exact reason for improved reading performance. It is possible that improved scores could be attributed to the repeated reading and memorization from the practice and testing, which occur as part of the process of making and watching videos and are not independent of the VSM intervention

Longitudinal data on these students leads us to reject that explanation. First, students had been receiving Tier 2 intervention for five months, which involved repetition and sight word memorization, yet had shown a very slow rate of learning. The process of filming each video took less than 5 minutes, and we made no more than four videos for each child (some as few as two), which is minimal practice as a result of VSM creation. Scores improved rapidly with VSM intervention, even when the VSM phase was as brief as four to five weeks (our last three students). Despite months of scant progress, several students showed effects within just a few sessions of video viewing. Unfortunately, we lack observations and ratings of instructional quality in Tiers 1 and 2, as would be collected in a fully integrated model of RtI.

It is also possible that the previous slow rate of reading improvement during intervention without VSM was due to inattention during intervention. It may also be that in typical Tier 2 intervention the model is a teacher, who is older, perhaps a different ethnicity or gender, and is not the "self." This is where VSM could intensify tiers by offering a unique contribution to learners with particular deficits. Video self-modeling in this study provided an individualized, multi-faceted approach for improving decoding skills. The process of making the videos required students to observe, follow directions, repeatedly practice, recognize or rehearse letter sounds, sequence and blend, and memorize. The finished product may improve student's motivation to learn the skills necessary to create the videos. It may also help students to see that they can improve their skills through practice.

When students are struggling with decoding individual sounds to make words, they may be unable to see the bigger picture. When they watch a video, they can focus less on individual sounds and see and understand the process of decoding words. Video viewing creates an imprinted memory through visualization, auditory memory, and sequence. When two or more students make videos during the same session, each watches the other make a video. As one student watches the other filming, they are receiving repeated lessons on skills related to their own learning, much like preteaching or reteaching.

During the intervention, the students on occasion watched parts of other student's videos. It was observed that they did not display the same enthusiasm as when watching their own, which was also noted by Sherer et al. (2001). The self-modeling may have been effective because students were distinctly drawn to watching themselves on screen. In interviews, each research teacher noted this attention and focus. Students watching themselves demonstrate a skill that is difficult may be more intrigued than watching someone with little or even some resemblance to them perform the same skill with ease (Sherer et al.).

Conclusion

The results of this study are promising because they add to the body of literature on the effective use of video as an assistive academic tool for learning, as well as a potential avenue for developing Tier 3 interventions. Video takes the flat printed letters and brings them to life in a way that can engage the senses and the self. But the use of VSM does more. Showing videos to family, teachers, and peers could improve a student's self-esteem and help everyone see the student as a reader. Students were motivated to make good videos. They understood the end product was a movie of them being successful and they worked hard to create that product. The students were not intimidated because the movies showed students' best performance. VSM allowed students to play an active role in what and how they were learning. VSM may also play a role in improving reading self-efficacy because students had something tangible to feel proud of, which may be crucial to the motivation of students at risk.

Limitations

Single subject designs by nature have certain limitations. Lack of generalization to a larger population should be considered even though ten replications make a reasonably strong case in multiple baseline design studies. Another limitation was the short duration of the study (i.e., The baseline and intervention phase of this study lasted only ten weeks). A longer period of time might have made a stronger case for the effect of VSM on reading growth; conversely, with longer implementation it is possible that students could lose interest.

In addition, we only had control over the VSM portion of teaching decoding to these students prior to the Tier 2 intervention that was implemented by teachers in the school. The reading specialists and administration assured us that the RTI program was being implemented with the highest caliber instruction; however, we recognize the lack of formal data on Tiers 1 and 2 as a limitation in this study. Without formal data regarding the fidelity of the delivery of the previous Tiers we are unable to determine why these particular students did not thrive in their RTI program. We were also limited in our technical data for the SIPPS program. Although this program has published data within a school setting of second language learners, it is limited in regard to our elementary population.

Lastly, although a team of people worked on VSM viewing and testing, only the first author edited the videos. The number of videos required for ten students each rotating through two-to-four videotapes across the ten weeks was challenging.

Future Research Directions

Researchers should continue to investigate the use of VSM as a Tier 3 approach to an RTI reading model. Replicating a study on the effects of VSM and decoding would be a start. Continuing studies on using VSM to improve other aspects of reading would also add to the growing body of literature in Tier 3 reading instruction, as well as in VSM. Other questions for consideration may include determining who might benefit most from VSM, and whether VSM would be effective in improving reading skills of second language learners and students already diagnosed with learning disabilities.

Researchers could consider individual components of creating self-modeled videos in terms of which are most effective. There are no current standards or rules controlling setting, lighting, materials, environment, using tutors in the video, audio, graphics, or text. Issues of dosage are also important. Our student participants watched their videos prior to their routine instruction; however, many students also watched them at other times of the day. Although we collected anecdotal information on these viewings, dosage was not systematically altered.

We observed instances of transfer (e.g., from blending sounds in real words to nonsense words) and overgeneralization (e.g., attempting to use newfound decoding skills on sight words that were not regularly spelled). Likewise, students like Gavin who made a quick leap in sight word reading through VSM dropped commensurately in decoding as he appeared to overgeneralize instant recognition of words to those that are best read through sound blending. Future studies could create direct assessments of transfer and overgeneralization to explore the extent of these possibilities and how to correct them.

Beyond improvement in word reading could be other important effects that our study failed to assess directly. As examples, students appeared to demonstrate increased confidence in themselves and their reading ability, despite months of prior struggle. In our log we noted that shy students, who would previously not speak up, imitated their videos and showed them to one another with natural behavior and a face of pride. Struggling readers stopped the project teachers on the playground to ask about making new reading videos. VSM appeared to create engaged learners, and a study that captured potential changes in motivation and reading self-efficacy could help to explain why VSM may be effective in Tier 3 environments. There might be added value to including a measure for attention or motivation in this regard.

One last idea would be to test whether VSM might have diminishing returns. It is possible that students might tire of the process and intervention. A study of longer duration could test whether VSM would be effective with the same group of participants a second time around with the next collection of new sounds and sight words.

Final Thoughts

VSM is a reasonable tool for use in schools because video cameras are simple to use and inexpensive. Many are in phones or small pocket digital cameras. People are familiar with using video due to the popularity of media-based websites such as Youtube, which maintains an average of two million viewers daily. Most computers come with basic video-editing software, and there are many video-editing Apps for tablets such as the iPad that are free or affordable. Videos can be made and edited quickly, emailed home, viewed on iPod/iPad or other handheld devices, shared on the school server, burned to a disc, stored in Cloud technology, or watched on any computer or TV in classrooms or homes. Videos enable portable learning.

Although we used a hand-held video camera, there are other techniques for developing videos if the classroom computer or tablet has a built-in camera. Students can read into the built-in computer camera for teachers to edit when time avails. Peer tutors or buddy readers from upper grades might be able to assist with recording or editing videos for students participating in tiered reading models or students in lower grades. iPad tablets have several Apps with built in video templates that enable quick construction of VSM videos. This study demonstrated how VSM benefitted struggling readers and how teachers might use VSM to create alternative methods in Tier 3 that increase the intensity and individualization of instruction.