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Improving the On-Task Behavior of Students with Emotional and Behavioral Disorders Using an iPad-Created Video Self-Modeling Intervention

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IMPROVING THE ON-TASK BEHAVIOR OF STUDENTS WITH EMOTIONAL AND BEHAVIORAL DISORDERS USING AN IPAD-CREATED VIDEO SELF-MODELING INTERVENTION

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A DISSERTATION

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An Abstract of the Dissertation Presented
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Developing effective and efficient methods to increase the on-task behavior of students with emotional and behavioral disorders (EBD) is an important step in improving the academic performance and outcomes of this population. This study evaluated the effectiveness of a video self-modeling intervention to improve the on-task behavior of two school-age students with EBD. To demonstrate the feasibility of using emerging technology to carry out an evidence-based intervention, this study utilized an Apple iPad to capture, edit, and display self-modeling videos promoting on-task behavior during independent math work. A multiple baseline across subjects design was employed in order to evaluate the effects of the intervention. For one participant, direct observation

data revealed increases in on-task behavior from 13% of intervals during baseline to 79% during the VSM intervention phase. Since a more modest increase in on-task behavior was observed for the second subject, a reinforcement condition was added to VSM, which resulted in a greater increase in on-task behavior. Data collected regarding the percentage of math problems completed and response accuracy showed similar trends. Data also were collected during the development of self-modeling videos on the iPad, and showed a mean time devoted to the intervention to be about 47 minutes on average, which included collecting and editing video footage.

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Introduction and Literature Review

It has been well-established that students with emotional or behavioral disorders[1] (EBD) commonly display significant academic deficits (Reid, Gonzalez, Nordness, Trout, & Epstein, 2004; Nelson, Benner, & Lane, 2004; Montague, Enders, & Castro, 2005). Specifically, students with EBD tend to score lower than their peers on standardized tests in reading, math, and written expression (Nelson, Benner, & Lane, 2004; Lane, Barton-Arwood, Nelson, & Wehby, 2008), receive lower grades (Bradley, Henderson, & Monfore, 2004) and are more likely to be retained (Wagner & Cameto, 2004). Students with EBD are often unresponsive to traditional interventions, making little progress from year to year, even when placed in more restrictive settings (Siperstein, Wiley, & Forness, 2011; Lane, Wehby, Little, & Cooley, 2005). As a result, students with EBD often fall farther and farther behind their peers over time (Montague et al., 2005; Nelson et al., 2004). Given the poor academic outcomes of students with EBD, further research has been recommended in order to identify more effective interventions that can be implemented in public school settings (Bradley et al., 2004).

A factor believed to be related to these poor outcomes is academic engagement (Nelson et al., 2004). Students with EBD frequently lack the self-control skills to stay on task, especially during instructional periods that require independence (Rock & Thead, 2009; Hayling, Cook, Gresham, State, & Kern, 2008). Compared to their peers, students with EBD respond half as often to oral questions and are more likely to be distracted

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[1] For the purposes of this study, the following definition of EBD is utilized:
"The term 'emotional or behavioral disorder' means a disability that is characterized by behavioral or emotional responses in school programs so different from appropriate age, cultural, or ethnic norms that the responses adversely affect educational performance, including academic, social, vocational or personal skills; more than a temporary, expected response to stressful events in the environment; consistently exhibited in two different settings, at least one of which is school-related; and unresponsive to direct intervention applied in general education, or the condition of a child is such that general education interventions would be insufficient" (Forness & Kavale, 2000, p. 264).

during instruction (Wagner et al., 2006). Lack of engagement and distractibility are believed to contribute to problems with academic skill acquisition since these factors directly impact the time devoted to instructional activities and decrease opportunities to learn (Carr, Taylor, & Robinson, 1991). Thus, developing methods to increase on-task behavior are likely an important factor in addressing the academic weaknesses of students with EBD (Lane et al., 2008).

One intervention that holds promise for increasing on-task behavior for students with EBD is video self-modeling (VSM). VSM is an evidence-based procedure that has a well-established record of promoting positive behavior change for a variety of school-aged students (Dowrick, 2012). VSM involves using video images of an individual engaged in an adaptive behavior that has been targeted for improvement (Dowrick, 1999). In most cases, the student is first involved in the creation of a video showing him or herself engaged in a target behavior. The target behavior is generally one that the student has not yet mastered or is yet to demonstrate independently. Through video editing, prompts are removed and shorter clips are combined to create a depiction of the child performing the desired behavior fluently. This video is then shown to the student, which serves as a model of the desired behavior. VSM has been described as a strength-based intervention because it focuses on desired and attainable behaviors, rather than on individual weaknesses (Bellini & McConnell, 2010).

In a recent review, Buggey and Ogle (2012) identified 49 studies of VSM involving 422 participants who demonstrated positive effects on a wide range of student challenges, including social skills, disruptive behavior, speech and language impairments, motor skills, academic, and functional skills. Buggey and Ogle concluded that this body of research not only demonstrates the effectiveness of VSM in the acquisition of skills, but also shows that generalization and maintenance of newly taught skills were achieved without additional direct intervention.

Past research has demonstrated additional advantages of VSM over other behavioral interventions. For instance, VSM is considered to be less restrictive, unobtrusive, and more efficient than traditional interventions (Kehle, Clark, Jenson, & Wampold, 1986) and has documented social validity (Hitchcock, Dowrick, & Prater, 2003). VSM has also been described as a "culturally indifferent" intervention in that the events and activities portrayed in the video originate from the individual's natural surroundings (Dowrick, 2012). Lastly, VSM has repeatedly been shown to produce immediate, dramatic, and generalizable effects for a wide range of behaviors with a variety of populations and ages (Hitchcock et al., 2003).

Despite these many advantages, VSM has remained a relatively uncommon intervention in most school settings (Buggey & Ogle, 2012). A possible barrier to wider implementation of VSM is the perception that creating edited video footage of students is overly complicated, requiring extensive time and training (Hitchcock et al., 2003). In addition, educators may assume that VSM interventions require costly technical equipment that is unavailable in schools (Bellini & McConnell, 2010). While these factors may have been a reality in the early years of VSM, new advances in technology and the increasing availability of easy-to-use and inexpensive digital devices in schools will likely create new opportunities to expand the use of self-modeling interventions (Collier-Meek, Fallon, Johnson, Sanetti, & Delcampo, 2012). Indeed, the need for more research on the application of this emerging technology in developing evidenced-based interventions for students with disabilities has been suggested (Haydon, Hawkins, & Denune, 2012). This is highlighted by the fact that despite the widespread use of digital technologies in schools, there has been a lack of empirical research regarding the effects of these devices in classroom settings (Haydon et al., 2012). Furthermore, relative to other high incidence disability populations, technological advances in general have been slow to develop for students with EBD (Fitzpatrick & Knowlton, 2009).

While much of the recent research on the effectiveness of VSM has been conducted with students with autism spectrum disorders (Gul & Vuran, 2010), a recent review by Baker, Lang, & O'Reilly (2009) summarized sixteen studies in which VSM was used successfully with students with EBD. Among these were two studies showing the effectiveness of VSM as an intervention to improve the students' on-task behavior. Clare, Jenson, Kehle, and Bray (2000) assessed the effects of VSM on the classroom behavior of three students between the ages of 9 and 11. Using a multiple baseline design across three students, the results showed immediate and durable improvements in on-task behavior, as well as generalization across academic settings. Walther & Beare (1991) assessed the effects of VSM on the on-task behavior of a fourth grade boy enrolled in a special education classroom for students with EBD. An ABAB single subject experimental design demonstrated a functional relationship between the intervention and the student's rate of on-task behavior during independent seatwork.

The purpose of the current study was to further evaluate the effectiveness of VSM in increasing the on-task behavior of students with EBD during independent seat-work. Additionally, this study assessed the feasibility of using an iPad, a device commonly found in today's schools, to develop and deliver this intervention. Utilizing recent technological advances may be a solution to make VSM a more commonly used intervention in school. The following research questions were addressed in this study:

1. Will increases in on-task behavior of students with EBD be observed after exposure to a VSM intervention developed and delivered on the iPad?
2. Will this intervention also increase work production and accuracy?
3. How much time will be necessary, on average, to develop this intervention on the iPad?

Method

Participants and Setting

Participants for this study were two students attending a regional special education school for students with EBD and other disabilities who engage in severely disruptive behaviors. "Walter[2]," a six year-old first grade boy, was diagnosed with Attention-Deficit Hyperactivity Disorder, Combined Type (ADHD-CT) when he was four years old. Walter has a history of physical aggression directed at teachers and peers, as well as problems with noncompliance and tantrums. He also has a history of work refusal and significant difficulty initiating and sustaining focus with school-related tasks. He had been enrolled in the school about two months prior to the beginning of the study.

"Jesse" was a seven year-old second grade male student. He was diagnosed in the past year with ADHD-CT and Mood Disorder, Not Otherwise Specified. In addition to well-documented problems with distractibility and impulse control, Jesse has a history of engaging in interfering behaviors including noncompliance, work refusal, verbal disruption, and verbal threats. He was admitted to the school approximately one year

[2] Participant names are pseudonyms

prior to the study with primary concerns related to physical aggression directed towards peers and teachers, and property destruction.

Participants were selected out of a pool of students who were nominated by their teachers as displaying low levels of on-task behavior during classroom activities. Direct observation by the researcher during instructional periods verified low levels (i.e., less than 50 percent) of on-task behavior for four of the students. Participants were also required to meet the following inclusion criteria: (a) enrollment in the program for at least two months; (b) an attendance rate of at least 90% for the previous one month; (c) identified as eligible to receive special education under the category of emotional disturbance, and/or diagnosed with a behavior disorder, such as ADHD or Oppositional Defiant Disorder (ODD); and d) parental consent and participant assent. The following discontinuation criteria were also applied to the pool of prospective participants: (a) the participant and/or his or her parent or guardian expressed a desire to discontinue participation in the study; (b) the participant was absent for five or more days during the treatment phase of the study; and (c) the participant engaged in dangerous behavior during activities directly related to the study. The study was approved by a University institutional review board (IRB).

While four students met all of the above criteria for inclusion, only two students completed the study. One student voluntarily withdrew from the study after two treatment sessions. A second student was discharged from the program due to disruptive behaviors during baseline. The remaining two students who participated in the study were enrolled in the same classroom.

The study was conducted in the elementary wing of the school. The school, which is located in a rural community in the Northeast, serves about 40 students (kindergarten through grade twelve) from a number of surrounding communities. There are two elementary classrooms in the school: one serving students in kindergarten through grade two, and the other serving students in grades three and four. Assigned to each classroom are one special education teacher and three to four paraprofessionals. The number of students enrolled in the classrooms during the course of the study ranged from five to six.

Data collection and implementation of the intervention were carried out in one of two rooms adjacent to the classroom. One room was an empty classroom that contained two desks and two chairs located on opposite sides of the classroom. The desks were placed against opposite walls, so that the participants would not be facing each other. The other room was the school library, where a number of small tables were arranged with two to three chairs each. When in this room, the participants were seated in opposite ends of the space, again facing away from each other.

Procedure

Prior to baseline, two video footage segments of each participant during independent seatwork were collected in the classroom by the researcher using the iPad. During these periods, the participant was prompted to display his “best behavior” and told that the footage would be used for a “good behavior” video. This video footage was edited to create two separate segments of approximately two minutes in duration. Video footage was also edited to remove any disruptive or off-task behavior. Thus, the video segments depicted the participants engaged productively and independently during math seatwork. In addition, to reduce potential confounds to the treatment effects, teacher praise or other rewards were deleted from the footage so that subjects would not view themselves receiving reinforcement. A recorded narration and captions were added to the videos in order to highlight the positive behaviors displayed (e.g., "Here, you are doing a great job working on those math problems"). Background music packaged with the video editing application was also incorporated into the videos.

Edited videos were shown to each participant once per session during the treatment condition. The two video clips for each participant were alternated so that the same video was never shown across consecutive sessions. Participants watched the videos in the presence of the researcher in a private room adjacent to the classroom. A short explanation of the video was provided, along with instructions to watch the video. If a participant became distracted during any part of the playback, the researcher reminded the participant to watch the video. Videos were shown immediately before each instructional session.

During instructional periods, students in this classroom typically rotated through three to four "centers," which were located at tables in different areas of the classroom and sometimes were located in a vacant classroom or in the school library. The centers were supervised by a teacher or paraprofessional who delivered instruction. The centers included a variety of instructional activities, which tended to be interactive in nature and generally required minimal independence. Students worked either in pairs or individually and rotated every 10 minutes, which was signaled by an electronic timer.

For the purpose of this study, an additional center was developed during the math period for the participants. This center included student-specific math worksheets for the participants to complete independently. In order to control for task difficulty, the math worksheets were matched to each participants' instructional level based on the AIMSweb Math Computation or Early Numeracy probes. The first subject, Walter, was given single digit addition problems with sums from 3 to 8, which also included graphic objects (e.g., kites, balloon, puppies) below each addend to facilitate addition. Jesse, who was performing above grade-level, was given a worksheet of 64 vertical subtraction problems with minuends ranging from 0 to 18 and subtrahends ranging from 0 to 9. Subtraction problems were chosen for Jesse because observation data revealed that this type of task was most frequently associated with his off-task behavior in his classroom. The staff person assigned to this center was instructed to direct participants to work on the math problems independently and prompt the participants to stay in their seats until the 10-minute signal sounded. The participants attended the worksheet center either in the vacant classroom, or in the school library, depending on space availability.

The worksheet center was stocked with at least 4 pencils and at least one duplicate worksheet for each participant. The staff person assigned to this center was instructed to begin the session by following a script explaining the rules for this center. The rules included: (a) sit in your seat; (b) solve the problems on the worksheet; and (c) raise your hand if you have a question. If the participant left his seat, he was prompted by the staff member to stay at the center until the 10-minute signal sounded. If the participant completed the assigned work before the 10-minute signal, data collection was discontinued and the participant was instructed to wait quietly for the end of the center time. Each staff member assigned to this center attended a 20-minute training led by the researcher. This training included a verbal overview of each aspect of the instructional session, as well as demonstration and role-play.

In the event that on-task behavior was not significantly affected by the VSM intervention alone, an additional treatment condition was planned for the participants. This phase combined positive reinforcement with VSM. The positive reinforcer used was a gift certificate that could be exchanged for a low-cost item from the school store. The researcher explained to the participant that the gift certificate could be earned for completing a specific number of items, which would be circled on the worksheet. During this phase, the criterion for reinforcement was initially equal to the participant's best performance during the VSM phase.

This study also included a plan to ensure the safety of all participants. This plan required that the researchers follow the school's guidelines, which were consistent with state regulations regarding the use of physical restraint and seclusion in schools.

Experimental Design and Data Analysis

In order to assess the effects of the VSM intervention, a multiple baseline across participants design was employed. This study included one phase of baseline (A), followed by VSM intervention phase (B) for each participant. An additional intervention phase was added for one subject, Jesse, who did not respond to the VSM intervention phase. The VSM intervention phase was staggered so that no two participants began receiving treatment at the same time. Follow-up probes were attempted four and six weeks after the conclusion of the intervention phase. Visual analysis was the primary method for interpreting the results of the study, although mean values and ranges for dependent measures were also reported. To calculate effect size, the percentage of non-overlapping data points was calculated for on-task behavior, and task completion.

The data from one treatment session were excluded from the analysis since the participants engaged in a verbal altercation. This disagreement continued throughout the session and treatment conditions were suspended. Similarly, during a post-treatment follow-up session, behavior recordings were suspended when the participant left the classroom following a disruption by another student nearby.

Treatment Integrity

To demonstrate treatment integrity, a treatment protocol checklist was employed to ensure that each aspect of the intervention was implemented as designed. This protocol encompassed the following aspects of the treatment: (a) the duration of the video clip is approximately 2 minutes and depicts the participant demonstrating continuous on-task behavior; (b) the participant is present for the entire duration of the video; (c) video clips for each participant are alternated during each day of the treatment phase; (d) the interventionist provided instruction to watch the video and reminders to attend to the video if the participant's attention wanders; (e) the participant is escorted to the classroom after viewing and attends the worksheet center; and (f) the rules of the worksheet center are reviewed with each participant at the start of the center using the script. The treatment protocol checklist was completed by the researcher during all treatment sessions. Inspection of the checklists revealed that all elements of the intervention were implemented with 100% accuracy.

Dependent Variables and Data Collection

The primary dependent variable was on-task behavior. Similar to Clare, et al. (2000), on-task behavior was defined as the student being oriented toward the teacher or the assigned task and performing the assigned activity. Also in concert with Clare et al. (2000), on-task behavior for each participant was recorded using a 10-s momentary time sampling method, a method that has been shown to closely resemble continuous data recording (Meany-Daboul, Roscoe, Bourret, & Ahearn, 2007). Data were collected by the researcher via paper and pencil at 10-s intervals, cued by an electronic timer with a vibrating signal. At the end of each interval, the observer indicated on a data sheet whether the participant's behavior was on-task at the time of the signal. The percentage of intervals in which the participant was on-task was calculated at the end of each observation session.

Direct observations were conducted during the scheduled math period. Data collection began at the start of the independent seatwork center and continued until the task was completed or until the 10 minute timer sounded, whichever occurred first. Data also were collected on two collateral variables: percent of task completed and task accuracy. These data were obtained through examination of the completed worksheets for each participant. The number of problems completed, divided by the number of problems assigned, resulted in a percentage score for task completion. To determine a task accuracy score, the number of problems completed correctly was divided by the number of problems completed. During sessions when no problems were completed, an accuracy score could not be determined.

To assess the feasibility of implementing this intervention, data were collected on the amount of time required to collect and edit the video clips for each participant. The total number of minutes devoted to these tasks was divided by the number of participants, providing the mean number of minutes.

Follow Up

As noted, follow-up probes were planned at four and six weeks after the intervention was discontinued. It was planned that participants would attend the worksheet centers but no self-modeling videos would be shown to the participants and no reinforcement would be delivered. However, the end of treatment phases coincided with the end of the school's summer program. When follow-up sessions were attempted in the fall of the following school year, the participants refused to engage in the sessions in all but one instance.

Interobserver Agreement

Two research staff independently observed and recorded the participants' on-task behaviors. Prior to the beginning of data collection, the observers were trained to employ the observation method using video footage of the subjects. Using the agreed-upon definition of on-task behavior, each observer coded the data independently. Any discrepancies were discussed until agreement was reached. This process was repeated until 100% agreement was reached.

Interobserver reliability checks were completed during 43% of all sessions. This was achieved by the presence of the two observers, using the same methods and synchronized electronic timers. Interval-by-interval data were collected for each of these sessions. Interobserver agreement (IOA) scores were computed by dividing the number of agreements by the number of agreements plus disagreements, multiplied by 100. The mean IOA score was 94% (range 87%-100%) for Walter's sessions and 95% (range 88%-100%) for Jesse's sessions.

Instrumentation

One Apple 16G iPad 2 (Model A1395) was used to record, edit, and display videos of each participant engaging in continuous on-task behavior during math. iMovie

(Version 1.4.1), a low cost ($4.99) iPad application, was used to edit video footage.

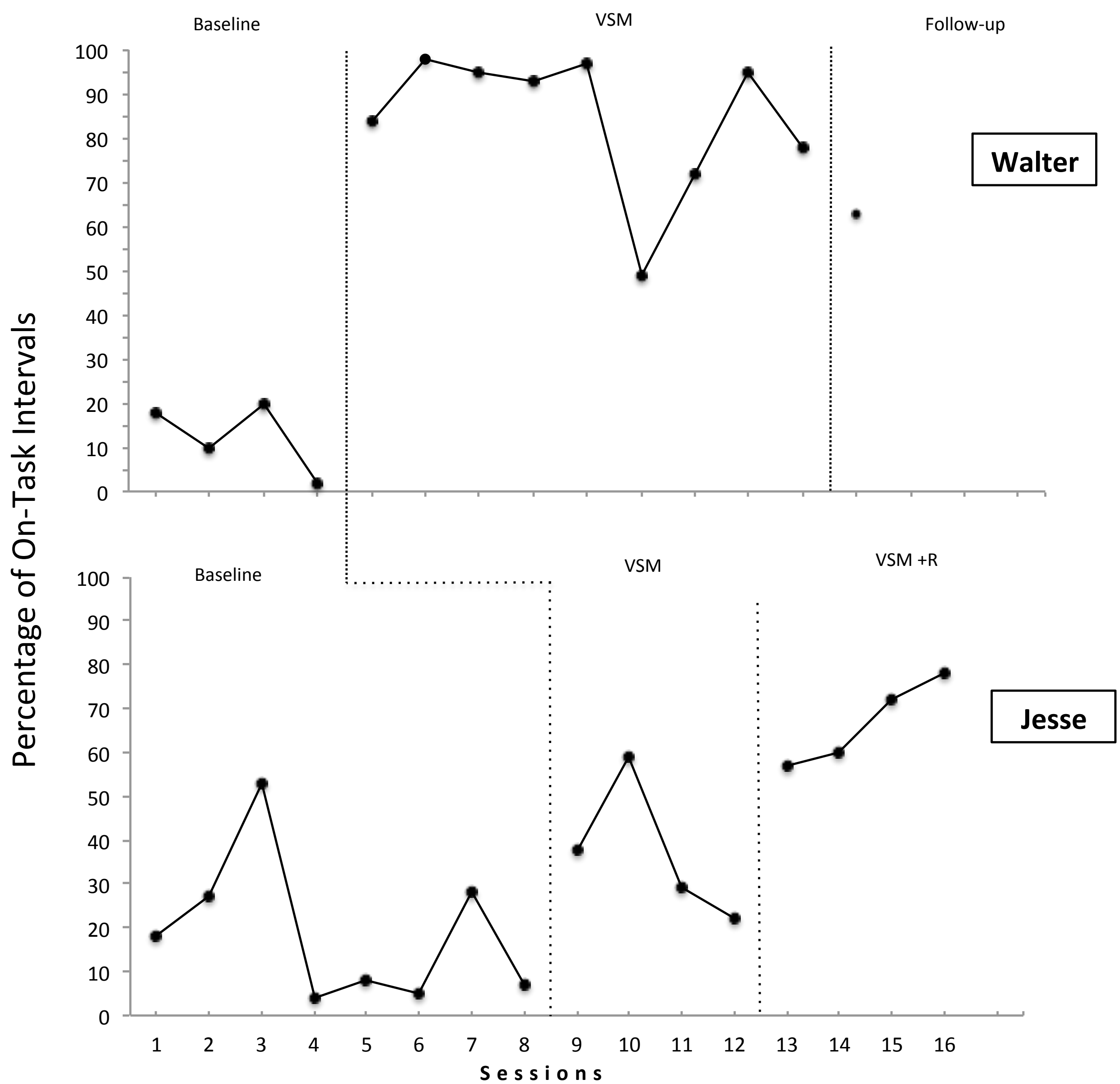
Results

Figure 1 depicts the percentage of on-task behavior during sessions for each participant. For Walter, data collected during four baseline sessions revealed that on-task behavior did not increase over the course of four sessions. The mean percentage of on-task behavior intervals was 12.5 (range = 2-20%). When the VSM intervention was delivered beginning with session five, an immediate increase in on-task behavior was observed, which continued above baseline levels for the 10 remaining sessions. During the VSM phase, the mean percentage for on-task behavior intervals was 84.5 (range = 49-98%). Four weeks after the conclusion of the intervention phase, a follow-up phase was conducted, during which time Walter became agitated while another student had a behavioral outburst outside the classroom door. Due to the distraction, Walter left the session after two minutes; data from this session were prorated. The prorated data revealed on-task behavior for 63% of intervals.

Baseline data for Jesse were collected over the course of eight sessions, during which time his rate of on-task behavior did not increase. During baseline, the mean percentage of on-task behavior intervals was 18.75 (range = 4-53%). During the VSM intervention phase, the mean percentage of on-task behavior was 37 (range = 22-59%). Since a significant response to the VSM intervention was not observed after four sessions, an additional intervention phase was instituted, which consisted of VSM plus positive reinforcement. During the VSM plus positive reinforcement phase, the mean percentage of on-task behavior was 66.75 (range = 57-78%). Four and six weeks after the conclusion of the intervention phase, a follow-up phase was attempted. However,

Figure 1.

Percentage of on-task intervals for Walter and Jesse across baseline, treatment, and post treatment sessions

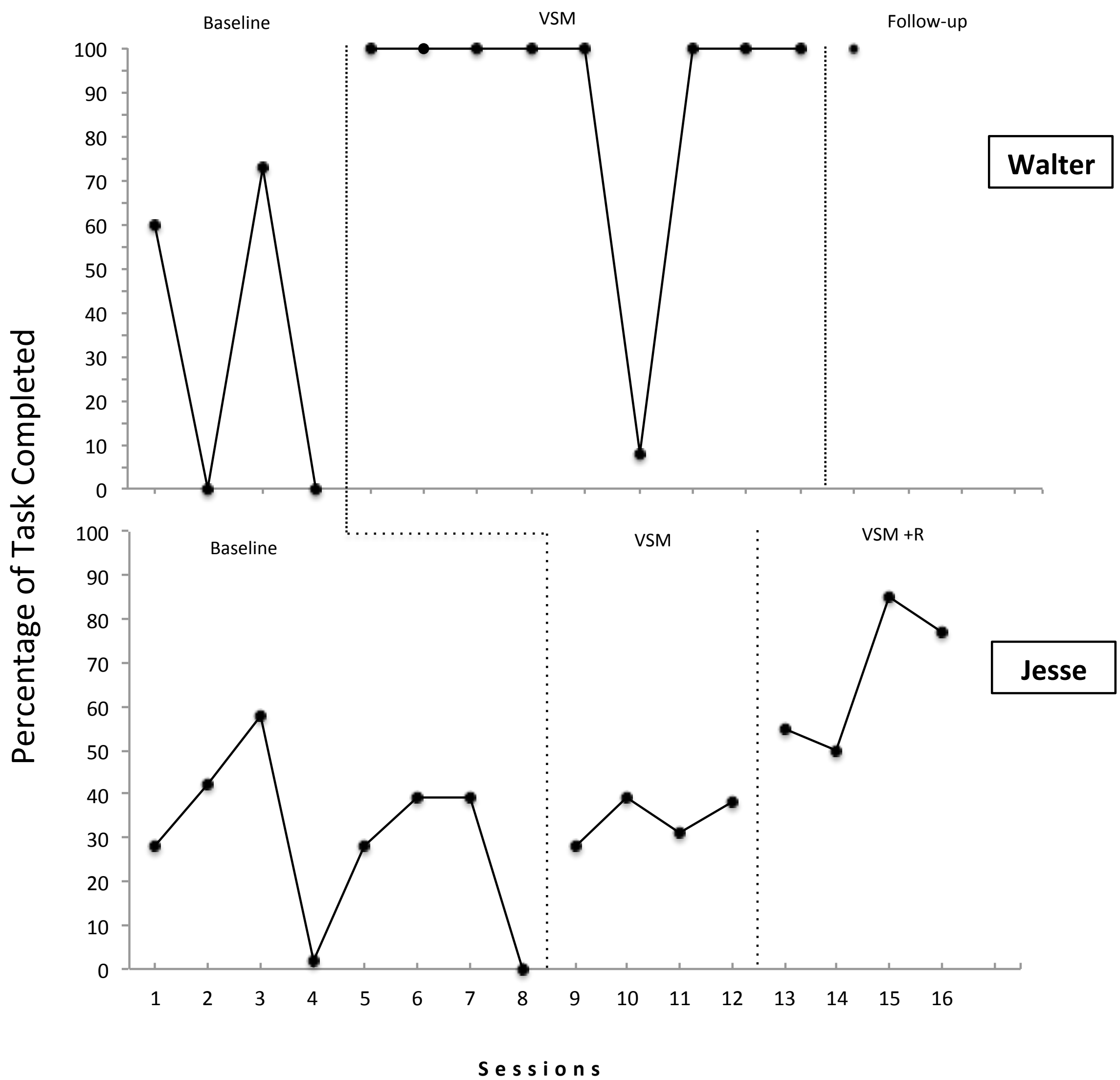


Jesse refused to engage in the sessions.

Figure 2 depicts the percentages of work completed for each participant. For Walter, work completion data collected during four baseline sessions revealed a high

Figure 2.

Percentage of Task Completed by Walter and Jesse



level of variability. The mean percentage of work completed during baseline was 33.25 (range = 0-73%). When the VSM intervention was delivered beginning with session five, an immediate increase in the percentage of work completed was observed and sustained for eight of the following nine sessions. During the VSM, the mean percentage of work completion was 89.78 (range 8-100%). During a four week follow-up probe, Walter earned a prorated work completion score of 100% during an interrupted session. Jesse's mean percentage of work completion during baseline was 29.5 (range = 0-58%). During the VSM intervention phase, the mean percentage of work completion was 34 (range = 28-39%). During the VSM plus reinforcement phase, Jesse's mean percentage of work completion was 66.75 (range = 50-85).

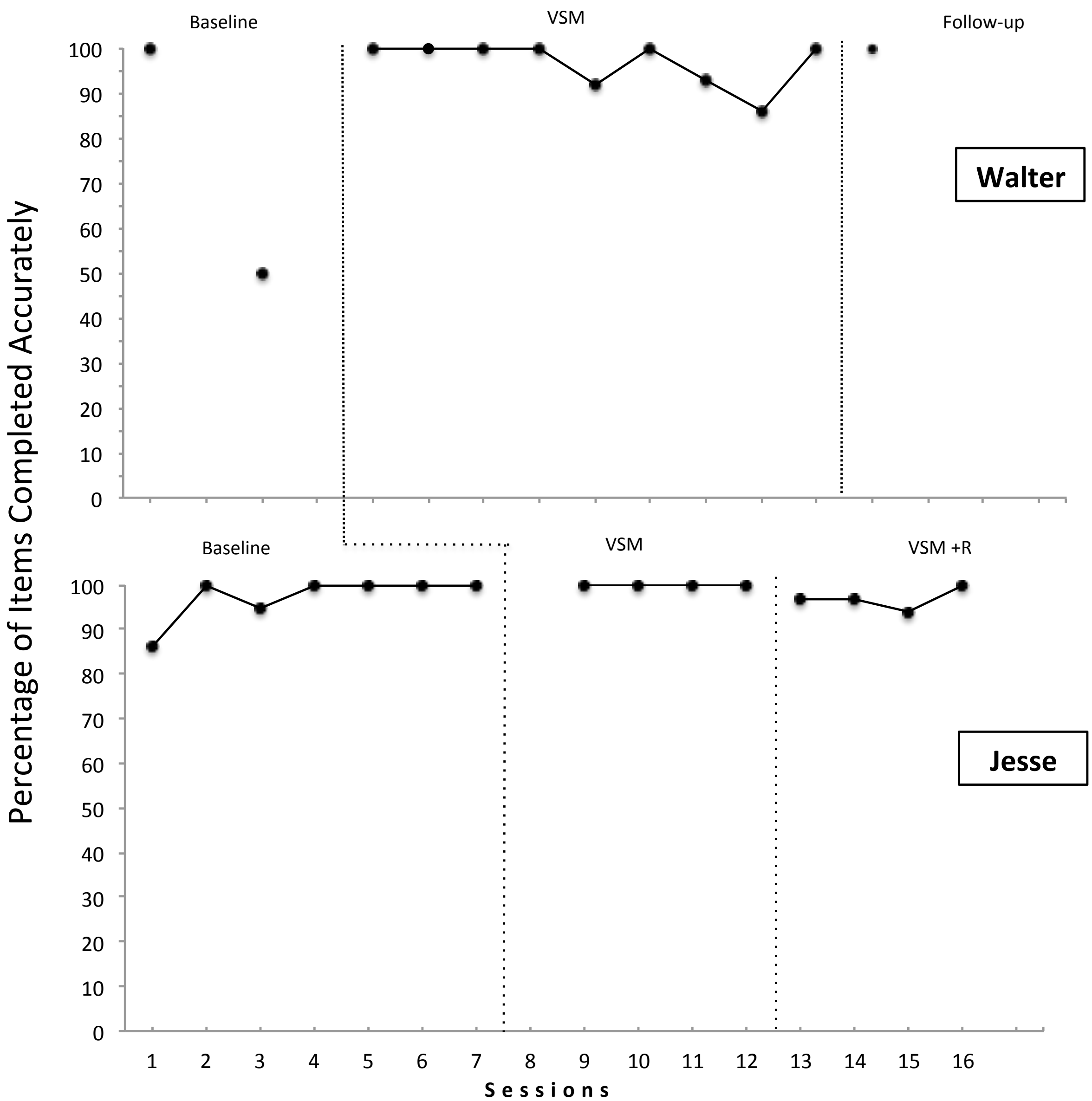
Figure 3 shows the data for task accuracy for each participant. Across all phases of the study for both participants, there was minimal variability in task accuracy, suggesting that task difficulty was not a factor in productivity or on-task behavior. Walter's accuracy score was calculated twice during baseline. His accuracy scores ranged from 50-100%. Thereafter, his accuracy scores were consistently between 85-100%. Jesse's rates of task accuracy were consistently above 85% for all phases of the study.

For Walter, the percentage of non-overlapping points (PND) (Scruggs & Mastropieri, 1998) between baseline and VSM was 100% for on-task behavior and 89% for productivity. For Jesse, the PND between baseline and VSM plus reinforcement was 100% for on-task behavior, and 50% for productivity. According to Scruggs and Mastropieri (2001) a PND score of 90% is considered highly effective while a score between 70% and 90% is considered to moderately effective. A score below 50% is considered ineffective.

Data regarding the time devoted to collecting and editing video in order to create the VSM intervention are displayed in Table 1. The mean number of minutes necessary to collect video footage was 19.25 minutes. The mean number of minutes devoted to editing video footage was 28 minutes. Overall, the total number of minutes needed to

Figure 3.

Percentage of Items Completed Accurately by Walter and Jesse[3]



create the videos on the iPad was 47.25 minutes.

[3] Since no items were completed during sessions 2 and 4 for Walter, and session 8 for Jesse, accuracy scores could not be calculated.

Table 1.

Number of Minutes to Create Video Self-Modeling Videos on the iPad

	Videos				
	1	2	3	4	Average
Video Collection	23	18	21	15	19.25
Video Editing	29	33	26	24	28
Total Time	52	51	47	39	47.25

Discussion

This study examined the effects of an iPad-created VSM intervention on the behavior of two elementary students with EBD who attended a regional special purpose school for students with disruptive behaviors. Similar to the findings of past research (Clare et al., 2000), results for one participant in the current study showed immediate and substantial increases in on-task behavior and productivity after the VSM intervention was introduced and these increases were maintained over the course of treatment. For a second participant, VSM alone was ineffective in producing increases in on-task behavior. When positive reinforcement was added to the intervention package, an increase in on-task behavior was observed. Furthermore, the addition of positive reinforcement resulted in an increase in productivity, as evidenced by higher rates of task completion.

One of the main purposes of this study was to assess the feasibility of using an iPad to create a VSM intervention for students with EBD. While iPads have become commonplace in schools, very few studies have investigated ways in which this technology can be applied to produce meaningful changes in behavior for this population of students (Haydon et al., 2012). In addition to showing that VSM can be an effective intervention to increase on-task behavior and productivity of a student with EBD, the present study also showed that through the use of tablet technology, VSM videos can be developed in less than one hour. Furthermore, no formal training was required to create the videos and the cost of the editing application was inexpensive.

Some additional benefits of using the iPad for this intervention were highlighted through anecdotal observations. First, the participants in the study were familiar with iPads and appeared particularly interested in the video images of themselves. This was likely a factor that promoted the participants' attention to the videos, as well as their initial enthusiasm for the intervention. Second, the iPad was found to be well suited for the collection of video segments within a classroom. Students in this school are accustomed to seeing iPads in their school, and thus, the presence of an iPad in the classroom during video collection did not appear to distract the students or interfere with the activities that were occurring.

The promise of tablet technology is that it may ultimately enable educators to overcome the perceived barriers of wider implementation of VSM in educational settings. The previously cited obstacles associated with producing edited videos, such as equipment costs (Bellini & McConnell, 2010), perceived complexity of video editing, and time commitment (Hitchcock et al., 2003) are clearly eliminated by the low cost, simple to use, and commonly available iPad. While digital video editing hardware in the past was expensive and unlikely to be found in schools, a recent PBS LearningMedia (2013) survey suggests that 35% of teachers have access to tablet computers, up from 20% the year before. In addition, sales figures reported in the media (Bonnington, 2013) indicate that U.S. schools have purchased approximately 4.5 million iPads.

With a relatively modest commitment of time and cost, the results of this study show that commonly available tablet computing devices such as the iPad have the potential to produce meaningful and positive changes for students with challenging behaviors. This study demonstrates that these devices can aid in the development of an effective, evidence-based intervention capable of improving behaviors relevant to learning. Given the generally poor learning outcomes for students with behavior difficulties, it is especially important that "user-friendly" methods are developed that will decrease the gap between research and practice.

While understanding the underlying mechanism responsible for the positive effects of VSM was not the primary purpose of the present investigation, some consideration should be given to understanding how an intervention that does not alter reinforcing consequences is capable of producing increases in behavior. Past researchers have offered a range of explanations for the effectiveness of VSM, the most common of which has been based on Bandura's social cognitive theory (Bandura, 1977). Further refinements of this theory by Bandura, Barbaranelli, Caprara, and Pastorelli (1996) suggested that perceptions of self-efficacy enable the individual to initiate more adaptive behaviors and persist in the face of previously insurmountable obstacles. Self-efficacy, according to Bandura, is influenced by a number of factors, including mastery experiences and witnessing others successfully engage in the behavior, both of which have implications for VSM. While Bandura differentiated efficacy expectations (the belief that one can successfully engage in the behavior necessary to produce a consequence) from outcome expectancy (the belief that a behavior will lead to a certain consequence), it could be argued that VSM procedures lead to both. That is, viewing edited self-modeling videos that depict higher rates of a target behavior may not only make environmental consequences of a behavior more salient, they may also demonstrate to the individual that the requisite behaviors are within his or her repertoire.

While Bandura's theory suggested that behavior changes resulted from changed beliefs, others have questioned whether the underlying process responsible for VSM was changed memories. For example, Kehle, Bray, Margiano, Theodore, & Zhou, (2002) suggested that watching oneself engage in more adaptive behavior through video editing may alter an individual's memory of past occurrences of maladaptive behaviors. These new memories of exemplary behavior that result from watching edited self-videos are believed to replace old memories of maladaptive memories, perhaps creating a "remembered" learning history that was viewed but never truly experienced.

Offering a behavior analytic perspective, Nikopoulos & Keenan, (2004) suggested that viewing edited self-modeling videos alters the reinforcing qualities of the activities and objects shown on the video. That is, the edited self-video is considered to be an example of a motivating operation (MO), which is an event or stimulus condition that momentarily alters the value of a consequence and increases the probability of the behaviors associated with the consequence. In the present study, it could be argued that for Walter, the value of engaging in the academic task was increased after he viewed himself doing so in the edited videos. The event in this case, given Walter's history, the presentation of a math worksheet, may have served as a reflexive conditioned motivating operation (CMO-R) during baseline. Since CMO-Rs signal a worsening condition, this likely evoked off-task behavior. Through the VSM intervention, it would seem that the

CMO-R was abolished, and viewing himself engaged successfully in the task increased the reinforcing value of the task as well as his on-task behavior.

A number of limitations of the current study are apparent. While four participants were initially selected to take part in this study, only two completed the study. With more participants, a multiple baseline across subjects design would be strengthened which would reduce threats to internal validity. Additional limitations of this study resulted from it being conducted during the school's summer program, which follows a variable schedule with less time devoted to academic learning. This prevented the evaluation of any generalization of treatment effects since the participants were not engaged in independent seatwork at any other time during the shortened summer day. Furthermore, attempts to assess maintenance through four and six week follow-up probes were hampered by the transition to a new school year, when changes in personnel had occurred and new structures had been implemented. Thus, future research replicating this study should ensure that the structure and schedule of the school program allows for these types of comparisons.

The current study evaluated the effectiveness of VSM (Walter) and VSM plus reinforcement (Jesse) in increasing academic behaviors within the context of mastery-level assignments. Future research could examine the effects of these methods with instructional level assignments. In addition, future studies should assess the effects of an iPad-created VSM intervention on decreasing disruptive and/or aggressive behaviors of students from this population. While it would appear likely that increases in on-task behavior would naturally lead to decreases in incompatible behaviors, this was not directly measured by the present study. Since the placement of students in restrictive settings such as this school is often precipitated by increases in disruptive and aggressive behavior, it would be important to assess the effectiveness of VSM in decreasing these types of behaviors. Such a decrease would potentially enable more students with EBD to be educated in less restrictive settings.

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James Hood Babcock was born in Durham, North Carolina. His family moved to Bangor, Maine when he was a child, which is where he received his high school diploma. In 1989, he graduated from Hobart College in Geneva, New York, with a B.S. in Psychology. Mr. Babcock attended Boston College, where he earned a Masters of Education degree in 1993 and Certificate of Advanced Educational Specialization in School Psychology in 1993.

Mr. Babcock has 24 years of experience working with students with disabilities. Mr. Babcock gained valuable skills early in his career as a counselor in residential and day treatment centers for adolescents with a range of behavioral and emotional disorders in Maine and Massachusetts. Mr. Babcock practiced school psychology in the Weymouth Public Schools in Weymouth, Massachusetts, from 1993 to 2002. He returned to his home state of Maine in 2002 and continued his career with the Windham Raymond School District. Recently, he completed his pre-doctoral internship at the Sebago Educational Alliance Day Treatment Center, a special purpose public school for student with emotional and behavioral disorders.

Mr. Babcock's areas of interest include systems-level change, Acceptance and Commitment Therapy, and the development of empirically based interventions for students with emotional and behavioral disorders. He is currently a candidate for the Psy.D. degree in School Psychology from the University of Southern Maine in December, 2013.