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Video Self-Modeling in Children with Autism: A Pilot Study Validating Prerequisite Skills and Extending the Utilization of VSM across Skill Sets

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Given the recent interest in the use of video self-modeling (VSM) to provide instruction within iPod apps and other pieces of handheld mobile assistive technologies, investigating appropriate prerequisite skills for effective use of this intervention is particularly timely and relevant. To provide additional information regarding the efficacy of VSM for students with autism and to provide insights into any possible prerequisite skills students may require for such efficacy, the authors investigated the use of VSM in increasing the instances of effective initiations of interpersonal greetings for three students with autism that exhibited different pre-intervention abilities. Results showed that only one of the three participants showed an increase in self-initiated greetings following the viewing of videos edited to show each participant self-modeling a greeting when entering his or her classroom. Due to the differences in initial skill sets between the three children, this finding supports anecdotally observed student prerequisite abilities mentioned in previous studies that may be required to effectively utilize video based teaching methods.

Keywords: special education, video self-modeling, mobile technology, autism, prerequisite skills

Video self-modeling (VSM) involves the viewing of one's self using only positive images of performance (Buggey, Toombs, Gardner, & Cervetti, 1999). Peter Dowrick (1999), a leader in video based intervention research, described VSM as an intervention utilizing the idea of feed-forward in which, through editing, the intervention portrays images of a skill not previously mastered in the child's current repertoire. While the use of VSM is not new to the field of special education (Ayres & Langone, 2008), recent advances in video technologies including the introduction of handheld mobile devices with video capture, editing, and play capabilities has re-kindled an interest in this method of instruction. Advances such as the iPod, iPad, iPhone, and Android based handheld mobile devices have sparked the interest of teachers, researchers, school systems, and parents to apply the video capabilities of these mobile devices to support the use of VSM in the lives of people with disabilities.

Historically, VSM has been shown to be effective across a wide range of ages from pre-school through adulthood and in modifying a variety of skills (Buggey, 2007; Ayres & Langone, 2008). VSM has shown to be an effective form of instruction to moderate the effects of mental illness (Dowrick & Raeburn, 1977; Kahn, Kehl, Jenson, & Clark, 1990; Woltersdorf, 1992),

modify inappropriate behaviors (Buggey, 2005; Creer & Miklich, 1970; McCurdy & Shapiro, 1988), increase responding behaviors for students with autism (Buggey et al., 1999; Wert & Neisworth, 2003), and to increase social communication for students with autism (Buggey, 2005; Charlop, Gilmore, & Chang, 2008; Hitchcock, Prater, & Dowrick, 2004). Additionally, an influential meta-analysis of research involving video based techniques that support students with autism conducted by Ayres and Langone (2008) concluded that video-based technology holds "tremendous potential" to support students with developmental disabilities including autism (Ayres & Langone, 2008).

With most research pointing to positive results when using the VSM teaching process, little research outlines possible prerequisite skills that students may require to effectively and efficiently utilize the strategy. The following studies illustrate the plausible limitations and/or prerequisite student attributes associated with the effectiveness of VSM however none of these focus specifically on the identification of limitations regarding the method.

VSM's ability to influence responding behaviors in students with autism was the focus of a study by Buggey et al., (1999) that also eluded to possible limitations of the method. In this study, the authors focused on VSM as an intervention for children with developmental delays in both adaptive behaviors and language development. During the 1999 study, edited video tapes were made for each study participant portraying examples of appropriate responses to playtime questions. After viewing the

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tapes created by the authors, all three children showed significant progress in their ability to respond appropriately to the questions. Parents of the children, however, expressed differing views concerning the effects of the VSM tapes. Two of the three participant's parents reported marked improvement in their children's abilities in language and social interactions during the study. One parent, however, reported that no significant effects were noticed. The study interestingly points out that this parent's child exhibited more severe manifestations of her disabilities than the other two participants including a greater difficulty attending to the VSM tapes themselves. This finding points to the possibility that a child may need the prerequisite ability to attend to the video for the VSM method of instruction to be most effective.

Neisworth & Wert (2002) examined VSM's effectiveness with participants displaying differences in modes of communication. This study investigated the use of VSM in increasing the instances of requesting behaviors or "manding" in young children with autism. The term mand was first coined by Skinner in 1957 in his book, *Verbal Behavior*, and is defined as the ability to ask for a reinforcer to be delivered. This is an important skill for all because the result of a deficient mand repertoire may deprive individuals from receiving the items or needs he or she may require. In individuals with disabilities, the individual may not only not receive the item that they are wanting but may also engage in maladaptive and inappropriate behavior in an attempt to access the item. This maladaptive behavior endangers not only the individual but also others who are in close proximity.

In the Neisworth & Wert (2002) study, initial communication abilities varied greatly in four subjects, ranging from slightly below age level verbal communications to sub-verbal vocalizations with gestural type communication. In all four subjects, instances of self-initiated manding behaviors increased following the intervention of the VSM method regardless of each child's preferred communication method. This would suggest that modes of communication might not be associated with the effectiveness of VSM as an instructional model and that a specific type of communicative method is not a prerequisite skill needed for VSM to be successful.

In another study conducted by Buggey (2005), the author chose participants according to certain prerequisite abilities including: (a) being able to attend to the video; (b) exhibiting the capacity to model correct behavior; and (c) displaying self-recognition abilities (Buggey, 2005). The inclusion of these abilities with the children chosen to participate in the study was not the result of any specific research regarding those skills, but instead were chosen due to the researcher's general observations from previous studies conducted by the author regarding the possible influence of the chosen skills on the effectiveness of a VSM intervention. After choosing participants displaying the observed skills, Buggey's study went on to examine the effects of VSM on the behaviors of students with autism in a small private school. This study focused on using VSM to increase appropriate social behaviors (social initiations and unsolicited verbalizations) as well as decrease inappropriate social behaviors (tantrums and pushing). The results indicated that for students with the three prerequisite attributes used for selection to participate in the study, the VSM intervention worked dramatically and quickly to effect these changes. These positive changes did not significantly

decrease following removal of the VSM intervention. This suggests that the VSM intervention was successful in assisting the participants to generalize the positive gains following removal of the VSM intervention. Although the researchers did not specifically seek to find specific prerequisite skills required for VSM to be effective, the results do not preclude any of the chosen prerequisite skills as appropriate for effective use of the VSM method.

More recently, Buggey authored a book outlining VSM methods (2009). Within his text, Buggey noted the relative absence of literature concerning the age and ability levels a child should display in order to best benefit from VSM as a teaching method. In addition, Buggey noted that a child's ability to recognize him or her self on screen or in a mirror and their ability to maintain their focus on a short video seem to be prerequisite to success (Buggey, 2009). Again, however, no specific research indicating his assertion was cited.

Hints as to possible prerequisite skills may be found through foundational work in social psychology. Fundamentally, the work of Albert Bandura and the development of his social learning theory (Bandura, 1976) has been affiliated with results seen in video self-modeling studies. Specifically related to prerequisite skills, would be those traits that according to Bandura, would be most associated with repeating behaviors seen in others. Among those, include the assertion that human beings tend to mimic those individuals that are most like themselves (Bandura, 1976). It may be, that viewing one's self through edited videotapes used in video self-modeling strengthens Bandura's argument in that one's self is an exact match when viewing the VSM models. It may then be hypothesized that having an understanding that one is viewing one's self may be prerequisite to the efficacy of VSM as an instructional tool or behavioral intervention.

These studies, while not specifically focusing on prerequisite skills, help in the understanding of possible prerequisites found in their results. However, a review of the current literature shows that there has been no specific research into using VSM as a teaching modality that seeks to find prerequisite skills that may be required for the method to be efficient and effective. The huge increase in mobile apps that use VSM as a learning foundation mandate that practitioners choose students that are best suited to benefit from the methodology when deciding which apps may be most appropriate. As practitioners continue to have extreme demands placed on their time, and are responsible for the outcomes of their students, understanding for whom the method is applicable and what type of skills VSM lends itself to teaching seem particularly relevant. This study extends previous studies by furthering the understanding of the uses of VSM by examining whether VSM may be effective in increasing the instances of self-initiated greetings by three very different middle school students with autism. The differences in prerequisite abilities between the participants enhance the findings as results also relate to types of prerequisite skills that may be required for effective use of the model.

Prerequisite skills targeted for study included: (1) the ability to attend to a video, (2) the ability to use verbal communication, (3) the ability to imitate, and (4) the ability to recognize self. With regard to attending to video, this targeted prerequisite skill was defined as the student being able to attend to a video of up

to 5 minutes in length without requiring teacher redirection. The ability to use verbal communication referred to how the student typically initiated his or her wants and needs during the school day. The defining difference in this skill area was between the ability to communicate verbally versus the need to use an alternative augmentative communication (AAC) device. The ability to imitate behavior reflected the degree to which assistance was required for a student to imitate a modeled behavior (prompt level) and self-recognition was defined as being able to point to one's self in pictures or video.

Method

Participants and Setting

Following the acceptance of this study's protocols by the researchers' university-based Institutional Review Board (IRB), three students with autism assented (and received parental consent) to participate in this research study. Parental consent was obtained using an IRB approved informed consent document while student assent was obtained through the use of a social story concerning this research study's protocols and the student's rights with regard to participating or refusing assent. Further, an on-going assent protocol called for succession of participation if any participant showed signs of refusal to participate (such as tantrum or other types of behaviors) when asked to participate in any aspect of the research protocols. No such tantrums or refusals took place during the implementation of this research study.

The three student participants came from two middle school classrooms in one large suburban middle school near a large Southern city in the United States. All three participants were receiving special education services in a self-contained classroom setting under the eligibility criteria of autism. All were also diagnosed with having significant cognitive delays relative to their chronological age. Each displayed significant communication difficulties. All three participants were receiving speech therapy services through the school district to assist in addressing their communication difficulties. All students were Caucasian and came from similar middle class, socio-economic backgrounds thus controlling for age, race, and socio-economic status (SES).

Samuel (pseudonym) was 6th grade male student chosen to participate by his classroom teacher due to his needs as reflected in his individual education plan (IEP) as well as for his prerequisite abilities. Samuel had shown all four hypothesized prerequisite abilities (see Table 1) prior to the study and thus represented one student participant that was hypothesized with a high probability for effective use of VSM as an instructional intervention.

While Samuel represented a participant with all four hypothesized prerequisites, he still displayed significant language, communication, and behavioral difficulties in the school setting relative to typical peers. Samuel demonstrated frequent (one to two episodes) daily of physical assault and/or aggressive destruction of property sometimes requiring approved physical restraint. He typically used spoken language in one or two word utterances several times during a school day when initiating communication. His difficulty in expressing himself using his one to two words often resulted in noticeable physical manifestations of frustration and had been hypothesized in his functional behavior assessment

as being a possible antecedent to his frequent assault/tantrum behaviors. Samuel's spoken language suffered from an additional, significant articulation disorder. Those knowing Samuel well, frequently required Samuel to repeat his one or two words several times prior to being able to understand him.

Samuel did display a love of video and could attend to a video for hours if allowed. He brought DVD disks—mostly involving the display of trains—from home to school each day and would tantrum if he was not allowed to bring them. Limited viewing of these DVD's had been used as positive reinforcement for appropriate behaviors as part of this participant's positive behavior support plan. This positive reward had been in place for approximately two months prior to this study and the positive behavior support plan had shown limited yet positive success at the point of this study's implementation. Note that the positive reward video's remained in effect as outlined in Samuel's positive behavior support plan and involved limited viewing of the train videos throughout the study.

Samuel was also readily able to self-identify in both pictures and videos. Samuel frequently pointed to himself in pictures and other videos he brought to school stating his name in an affirmative way. He was also able to recognize his first and last name in print. Notably, Samuel had limited exposure to VSM as a method of learning in the past, referring to the previous VSM videos as "Samuel" movies. VSM had been used beginning eight months prior to this study to enhance/modify this student's behavior in the cafeteria setting (i.e., bringing his empty tray to the cleaning counter independently) and to assist in the teaching of basic sight words. Both prior uses of VSM as a teaching method for this student had shown to be successful and achieving rates of skill acquisition higher than previously used teaching methods emphasizing the acquisition of the same skill.

Lastly, Samuel displayed strong imitation skills. Imitation of teacher actions had been built into Samuel's instructional routine during his school day. Samuel (and other students) daily imitated the actions of the teacher during large group activities involving the use of music. Samuel required no prompting or action from the teacher at any time during these activities and seemed happy when mimicking the actions of the teacher during these group activities.

Katarina (pseudonym) was a 6th grade female participant chosen for this study by her classroom teacher based on her IEP needs and her prerequisite skill abilities. She typically communicated using gestures but could use spoken language (one to two word utterances) on rare occasions. Katarina rarely communicated during the school day. Katarina mostly responded to questions with one word and was very difficult to understand by most typical peers and classroom staff. She rarely attempted expressive speech and instead, used physical pulling and pointing (gesture) to communicate most requests.

This student also displayed behavioral difficulties in the school setting. Her behaviors included self-injury (in the form of hitting herself) and hair pulling (self and others). She too, was served under a functional behavior support plan and like Samuel, it had been hypothesized that her limited ability to expressively communicate may have been an antecedent to her frequent tantrums (two to three times weekly). Katarina displayed a refusal to follow teacher directions approximately one time daily. She displayed an energetic personality but was not able to

Table 1. Prerequisite characteristics by participant.

Participant	Characteristics			
	Attending	Communication	Imitation	Self-Recognition
Samuel	Yes (Highest)	Frequent 1–2 words (Verbal*)	Yes (Highest)	Yes (Highest)
Katarina	Yes (Medium)	Rare 1–2 words (Gestural*)	Yes (Medium)	Yes (Medium)
Brandon	No (Lowest)	AAC (4 options) (Physical*)	No (Lowest)	No (Lowest)

Note. (*)Denotes dominant communication style for initiation of communication.

sit or attend to lessons/materials for greater than 5–10 minute intervals. She enjoyed videos in general, however she was not observed or reported to attend to any single video for greater than an approximate 5–10 minute attention interval.

Katarina was able to recognize herself in pictures and in videos. She would point to herself in pictures and videos when asked. Katarina also recognized her first name. Katarina was able to imitate behaviors shown by another (modeling) however she typically required physical and gestural prompts to achieve success. Katarina had not been exposed to VSM as a learning method prior to this study.

Katarina represented a participant that displayed all four of the hypothesized prerequisite skills for effectiveness of VSM however she displayed these skills to a far lesser degree than Samuel. She was able to identify self, attend to video, imitate, and had the ability to perform the communication skills however each of these skills were far greater developed in Samuel than in Katarina.

Brandon (pseudonym) was an 8th grade male who was likewise chosen to participate in this study by his classroom teacher. In addition to the diagnosis of autism, this student was also diagnosed with mild cerebral palsy. This student typically used an augmentative communication device or physical pulling to communicate. He displayed no verbal language abilities and required numerous prompts to utilize his AAC device. Brandon's AAC device was of the four-button variety and included a button for yes, no, hello, and I want. While no direct aggression or self-injurious behavior was noted, frequent daily refusals to follow directions and/or screaming behaviors were often apparent. This participant was extremely distractible and was not able to attend to lessons, materials, or other types of structured materials for more than a few seconds. This participant displayed an extreme interest in air born dust and had been known to blow or wave the dust about in the air for hours if not redirected. Brandon was not able to recognize himself when asked in either picture or video format. Brandon had not been exposed to VSM as a learning method prior to implementation of this study. Lastly, Brandon required physical assistance to imitate others and frequently pulled against such assistance.

Brandon did not display three of the four skills hypothesized to be relevant to the effective use of VSM as an instructional or intervention method. Brandon did not display an ability to identify himself nor did he display an ability to attend to video. He was not known to imitate others without extensive prompting. Brandon did have the capacity to use his AAC device to initiate a greeting however, and thus this skill could be deemed to have been in Brandon's developmental grasp.

Design

A single-subject, multiple baseline across time and participants design was used to evaluate results. The purpose of this approach was to attempt to best isolate the independent variable of viewing VSM videos from other external variables that might influence the dependent variable of initiating greetings. In addition, the embedded teaching component of making the VSM videos was recognized as possibly having an educational effect. For this reason, the making of the videos was followed with a return to baseline period prior to the introduction of the VSM intervention.

Additional experimental control was derived from the multiple baseline design through staggering the introduction of the VSM interventions over time. In this way, any extraneous causes of manipulation in the dependent variable other than that caused by the independent variable would be isolated in time and would show as a single point in time over which the dependent variable might change for all three participants if such an extraneous event occurred. Further, unlike true experimental A/B/A reversal designs, (e.g., when the removal of the intervention from a successful intervention period results in the dependent variable returning to baseline conditions), the nature of the current intervention was to successfully teach a desired behavior or skill, and thus one would expect (and hope) that learning would have occurred and not expect the dependent variable to return to baseline upon such removal. In other words, the nature of the intervention (as a teaching method) would be expected to generalize if the learning was actually acquired by the participant and not return to baseline upon the removal of an intervention. Within this design, there exists a chance that other variables might affect a change in the dependent variable; however, the staggered intervention times were intended to control for this to the extent possible within the educational setting utilized for this study. This design was chosen for its ability to measure similar interventions across relatively diverse subjects over time while enhancing external validity of any findings (McMillian & Schumacher, 2001).

Procedures

When using VSM as a planned intervention, each video must be made prior to initiation of data collection. During the video production phase, non-invasive (non-prompted) video was collected that attempted to show each student entering the classroom in the morning and initiating a morning greeting as well as sitting down at the lunch table and initiating a lunchtime greeting without prompting. However, we were not successful in obtaining all

the required raw video of these tasks for the making of the final edited VSM tapes. Thus, further film of each student performing required tasks was obtained by verbally and physically prompting each student to perform the desired skills. Each student was prompted to voice/use AAC (Brandon) to initiate a morning and lunch room greeting as well as to physically demonstrate entering the classroom and sitting at the lunchroom table. The combination of these two filming techniques resulted in adequate raw video material to be edited into suitable VSM tapes for both settings. Note that for Brandon, a separate AAC switch was used to say “good morning” (one button “big mac” switch) in an effort to maintain his already filled four-button AAC switch separate from the study.

Each tape was edited to show the basic components of entering the classroom in the morning, stating good morning, sitting at a table, and saying “hi” or “hello” depending on the student. One VSM movie was made for each participant containing both the component tasks with all prompting edited out and without narration. Film was taken using a digital camera and then edited using computer-based video editing software. Each movie was unique based on the raw video available through the above techniques. Each student’s VSM video is described as follows.

Samuel was shown entering the classroom. His mother could be seen in the background as was typical for his entrance to the classroom in the morning. The student was holding school supplies in his hands. The student then gave the supplies to the teacher in one hand. The teacher’s other hand was outstretched in a handshake and the student said “good morning” verbally. This was repeated (copied exactly) three times on the video. Next followed a scene showing Samuel sitting at the lunchroom table. After being seated, the student was shown saying “hi” close up and verbally. This lunch time VSM scene was also copied three times exactly and this lunch series was placed on Samuel’s VSM video directly following the three morning greeting scenes. The significant nature of this student’s communication and behavioral disabilities impacted the transitional flow of this VSM movie. This student was unable to articulate speech in a clear way and his tendency to look down interfered with volume levels; however the movie was adequate for the student self-demonstrating the desired behaviors.

Katarina was shown entering the classroom door and greeting a known teaching para-professional staff member with the verbal greeting of “Hi.” This was Katarina’s typical routine (absent the verbal greeting) for her classroom each morning. This scene was repeated three times (copied exactly). Following these morning greetings, Katarina was shown sitting at the lunchroom table. The student says “Hi Clyde” (pseudonym). That student (who always sits next to this participant and who was available for all intervention trials) was then shown replying with “Hi Katarina” (pseudonym). This scene was repeated three times by copying the scene to the video to show a total of three sequential times. This VSM tape achieved smoother scene transitions with greater speech clarity and volume than tapes for Samuel and for Brandon.

Brandon was first shown entering the classroom through the classroom door. He was then shown sitting at a classroom table (as was his typical routine) and using an AAC switch located on that table to say “good morning.” This was copied and repeated on his VSM tape three sequential times. Next Brandon was

shown sitting at a different classroom table and using a different “Big Mac type” AAC switch to say “hello.” This second scenario was not ideal, in that the location was in the classroom and not in the cafeteria. This was taken into account during data collection in that the student was not expected to execute his second greeting in the cafeteria but rather in the classroom as shown on his VSM tape and when sitting at that table. In this way, Brandon was not expected to initiate a lunch greeting but instead was expected to initiate a greeting to the small group seated at his table when he first sat down at that table for daily small group instructional activities.

Transitions were choppy, as considerable amounts of physical prompting were required to assist this student in making footage suitable for inclusion in his VSM tape and were then edited out. This was the best footage that could be achieved given the severity of this student’s communication and attention span abilities. Cooperation required the ability to follow directions and to minimally attend to tasks in order to make the VSM tapes, activities in which this student struggled during all filming attempts.

The making of the VSM tapes required three weeks time and involved some instruction so a return to baseline was needed to investigate if learning had occurred during the making of the videos. Therefore, another three-day baseline period was initiated just prior to the introduction of the VSM intervention phase of the study. This second baseline data collection period showed no self-initiated greetings on the part of any study participant. Thus, the interventions were initiated.

The dependent variables were self-initiated, unprompted greetings. For Samuel and Katarina, morning and lunch greetings were operationally defined as the student correctly stating out loud, the exact words as shown on his or her video (as described below). For Brandon, the self-initiated greetings were operationally defined as using the appropriate AAC switch during initial seating in the classroom and during small group activity seating (at a different classroom table) as specifically shown on his video.

The independent variable was viewing the videos after lunch one time per day. Students viewed their entire unique VSM tape following lunch. Duration data collection was used to collect data regarding each participant’s initiation of morning or lunch/table greetings as shown on their individualized VSM tapes. Duration observation began each morning from the time the student entered the classroom for 15 minutes. Lunch greetings for Samuel and Katarina also used duration event recording to obtain data and also lasted 15 minutes from the time the child sat down at lunch (or the group table) until 15 minutes after seating. Any exact replication of the greetings contained on each student’s individual VSM tape during the interval observed would result in one “y” or positive instance of the greeting. Only one positive was to be recorded no matter how many times a student may have used the greeting during any one interval however multiple greetings within the duration intervals did not occur with any of the participants being observed.

A data collection grid was developed for trained staff to use and was individualized for each participant. A grid was used so that the occurrence of the target behavior could be noted through the use of marks in the form of a “y” and an “n.” Any participant-initiated greeting (as shown on the student’s

VSM video) during an observation period resulted in one positive mark or the recording of a “y” in the data collection grid. When the student did not initiate any greeting during the time period (15 minutes when entering the classroom for the first time and 15 minutes upon sitting at the classroom/lunchroom table), a negative mark or a “n” was recorded in the collection grid. In addition, treatment fidelity was obtained through self-check questions contained on the data sheets. Observers checked boxes next to treatment fidelity indicators stating: (1) students were not greeted by another staff or student during the observation (i.e., responding vs. initiating), (2) students/teachers and/or paraprofessionals were present in the classroom/lunch room for the entire observation period without interruption, and (3) students were not experiencing undue stress as exemplified by tantrum or defiant behaviors during the observation periods.

Baseline

The baseline data collection consisted of 9 observations over a 15 day period for Samuel, 15 observations over an 18 day period for Katarina, and 13 observations over a 21 day period for Brandon. The number of observations available during the baseline periods were dependent on the number of days that child attended school and the staggering of intervention start times per the multiple baseline research methodology. The baseline data collection period consisted of observing each participant during daily observation periods that lasted 15 minutes (mornings and at lunch) and recording consisted of documenting the occurrence/non-occurrence of the behavior during each observation period.

VSM Intervention

During this phase, Samuel began intervention while Katarina and Brandon continued with baseline data collection. A three-day time period was planned in between the initiations of the intervention, thus Katarina began intervention three days after Samuel, and Brandon began three days after Katarina. This study took place during the last three weeks of the school year. Abnormal amounts of absences for parts or whole days interfered with the planned three-day time limit for Brandon.

During the intervention phase, Samuel showed significant interest in his VSM tape, viewing the tape intently, and at times he would request to view the tape as a reward utilizing his positive incentive plan instead of his train videos. This was not allowed.

Katarina also showed significant interest in viewing her VSM tape. She often displayed tantrum type behaviors when the tape was finished and spent significant energies seeking to view the tape over and over again during her school day. This additional viewing was not allowed.

Brandon was absent from school for the first two days of his scheduled start of intervention and therefore began intervention on the first day of his return. He was extremely distracted during the viewing of his VSM tape. This student's compulsive behaviors such as tracking dust in the air and following reflections on walls interfered with his ability to concentrate on the VSM's content. Brandon required frequent cues for redirection to view his VSM tape during the intervention phase.

Follow Up

The final phase of the study consisted of follow up. During this phase, intervention was removed while data continued to be collected. Samuel and Katarina continued to request viewing of the VSM tape, but were not provided with this viewing. Brandon did not request to view his tape during the follow-up phase.

Results

Results of the baseline data period revealed almost no self-initiated greetings on the part of any study participant. Samuel and Brandon displayed no self-initiated interpersonal greetings during morning or during lunchroom/classroom table periods. Katarina displayed only one self-initiated greeting during the morning period and no self-initiated greetings during the lunch period. (See Figure 1)

Results during the intervention phase were varied. Samuel was observed two times over the intervention period to self-initiate greetings during the morning period. He never initiated a greeting during the lunch period. Katarina showed one self-initiated greeting in the morning observation period on day two of the intervention. No further self-initiated communication attempts were observed during the intervention period for Katarina. No self-initiated greetings were observed for Brandon during any observation period during the intervention phase of the study. (See Figure 1)

Upon removal of the intervention, only Samuel showed continuing self-initiated greetings and only in the morning observation period. Samuel displayed the target behavior three more times in the morning observation period over his entire follow up period. Katarina and Brandon did not display the target behavior during the follow up period in any observation time slot. (See Figure 1)

The inter-rater agreement process was carried out on 69% of overall data collection opportunities. This was achieved by two different observers taking data on separate data collection sheets at the same time for any given interval observation period for any individual student. Overall inter-rater reliability achieved 96% with disagreement occurring on only two occasions. Disagreement on the two occasions was based on the student's articulation abilities. In both instances, it was decided that the initiation did not constitute a greeting as exactly portrayed on the specific child's video and thus was removed from the data (i.e., counted as a non-occurrence). In all other instances (other than the previously mentioned two), interpretation of the student's articulated speech was not a factor in determining the content of the student's exact speech, as no attempts were made to speak during the observation periods. For Brandon, either the switch was used or not used. The student did not attempt to communicate a greeting during the observation periods in any other fashion.

Discussion

Examination as to whether VSM could be effective in increasing the instances of unsolicited morning and noon greetings in students with a variety of prerequisite skill levels and manifestations

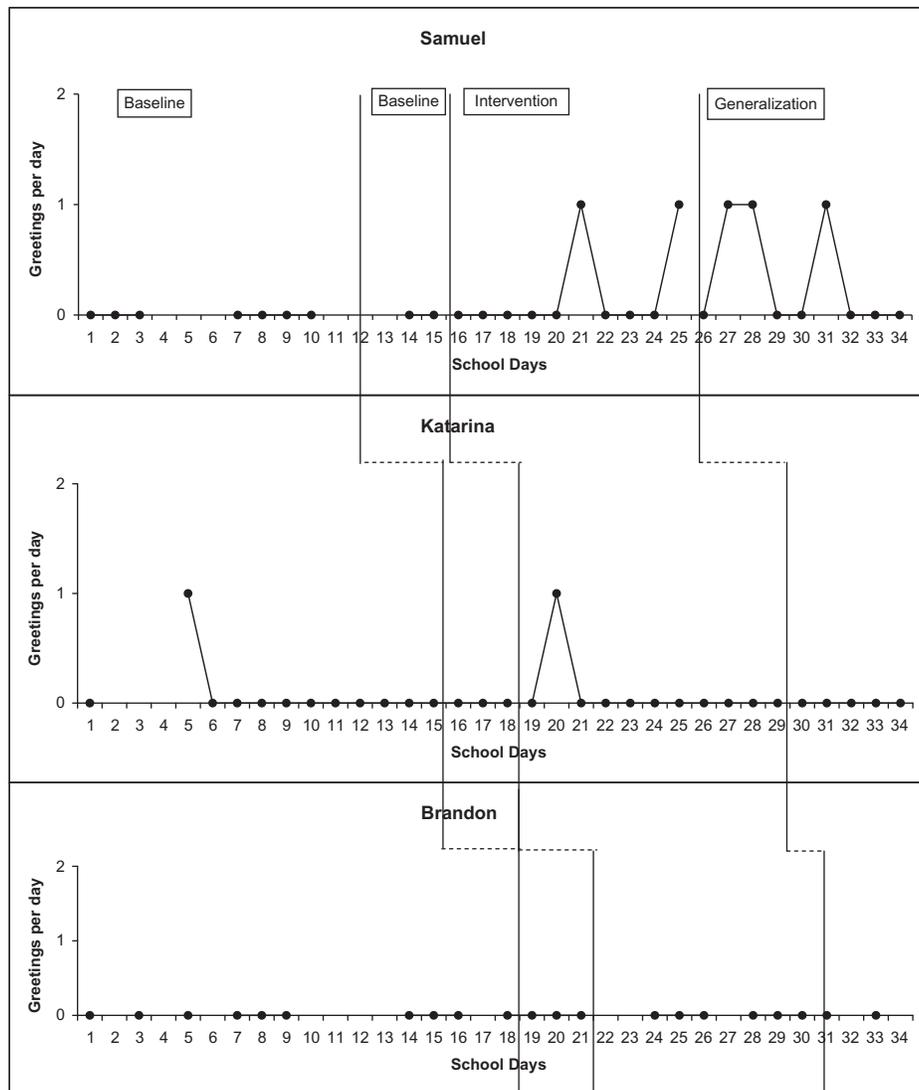


Fig. 1. Student self-initiated greetings per school day.

of their diagnosis of autism in this study has produced two distinct results. Samuel showed the most progress while both Katarina and Brandon showed none. This outcome matches the hypothesized outcome based on the individual skill levels of each student regarding prerequisite abilities outlined prior to initiation of the VSM intervention. Samuel showed the highest levels of skill in each of the four prerequisite skill areas and in fact, performed better than the other two participants. Katarina represented a lower achievement of prerequisite skills than Samuel while Brandon represented a skill level that might be considered too low in his prerequisite skills for VSM to be effective. Outcomes for both Katarina and Brandon showed that their lower levels of abilities within the hypothesized prerequisite skill areas may in fact, correlate with their not achieving the individualized greeting skills hoped for through the use of the VSM teaching intervention. Still, this result is not enough to conclude that the hypothesized prerequisite skills were anything but correlated with the outcome, as other variables may have impacted these results.

Samuel represented the only student with previous exposure to VSM as a teaching tool. His previous experience using this

method may have enhanced his ability to understand that he was expected to replicate the behavior he saw on his tape relative to the other two participants. In addition, the quality of the VSM tape for Samuel was high when compared to the quality of that provided to Katarina and Samuel. It is possible that while the parts of the greetings were contained in Katarina and Brandon's videos, the choppy nature may have been a distracting factor to the tape's content and thus may have influenced their lack of replication of the shown greetings.

Additionally, Neisworth and Wert (2003) seemed to show that communication differences did not effect the positive outcomes of VSM. Based on our findings in this study, we might question those earlier findings. Samuel and Katarina showed a level of communication that far exceeded that of Brandon. Both used speech and gesture as a means of communication while Brandon did not speak and rarely used his ACC for primary communication. This may have impacted his overall ability to receive the video based audio visual communication shown in his VSM film and thus may have impacted his ability to benefit from it. Overall, results seem to support the generally observed prerequisite skills

for VSM outlined in previous literature. However, while these findings shed some light on prerequisite skills, results are far from adequate to form any generalizable conclusions.

Limitations

Prior exposure to VSM methods may have influenced the success of Samuel. VSM had been used to show tray return in the lunchroom and as a tool to learn sight words. This student may have known that he was expected to repeat the behavior he viewed. His exposure to the VSM teaching methods in the past had been paired with positive praise when he repeated the viewed behavior. This may be viewed as previous linear pairing of teaching methods and may have assisted Samuel in understanding that the VSM method was intended for him to use to assist in his ability to mimic the behavior shown. This hypothesis also requires further research, but may suggest that VSM may be more effective when paired with other interventions or instructional methods. The other two participants who had no prior exposure to VSM as an intervention may have struggled with connecting the viewed behaviors to actual life situations. This may certainly have been the case for Katarina, as she began to show the behavior (one time) but was not positively rewarded verbally or otherwise which may have confused her in repeating the behavior. Certainly, further study of this variable would shed light on this premise and would contribute to the overall understanding of VSM prerequisite skills and the methodology in general. As with many instructional methods, the combination of methods such as positive behavior supports and the implementation of other instructional methodologies typically compliment each other, however such a construct was not used in an attempt to isolate the VSM intervention in this study. Still, from an instructional point of view, the combined approach would likely have improved the results for Katarina specifically and possibly for Samuel as well.

Brandon's lack of attention or interest in the video likely had the biggest impact on his lack of success using the method. It could be argued that Brandon, by not attending to his intervention video, in essence, did not participate in the intervention at all and thus did not see any results. Including a positive reward for viewing videos may have positively affected his ability to attend. This should be examined in future studies seeking to determine prerequisite skills for using the VSM intervention and instructional methods for people with autism.

Another limitation involves the nature of the single subject design used in this study. While all attempts were made to isolate any extraneous causal forces that may have effected the manipulation in the dependent variable through the staggered intervention initiation periods of the design, the inherent limitations of single subject research make it impossible to concretely indicate that changes in the dependent variable are directly related to the manipulation of the independent variable. Results of this study cannot be transferred to any overall population through the results of this study alone. Only through refined further studies can such claims be explored and this study should be viewed as pointing to further needed research into these prerequisite skills rather than indicating any definitive conclusions in and of itself.

Still other prerequisites may be necessary for the effective use of VSM as a leaning modality. Communication abilities may have played a role in the outcomes of this study. There may be other influences that have not been examined or hypothesized to date as well, that may influence results. Only through further examining the pre-abilities of subjects participating in VSM research studies can such prerequisites be found and thus future research should be careful to include more detailed information regarding a participant's general abilities related to the VSM methodology within the study.

Another consideration is for whom the method is being used. Students with autism display a wide variety of symptoms in a wider variety of degrees. VSM represents an intervention and instructional methodology that may hold most promise in supporting those with more significant manifestations of their diagnosed disability. While it is acknowledged that numerical statistics are rare and more difficult to validly obtain when considering students with significant manifestations of their diagnosed conditions, every effort should be made to describe observational pre-skills as discussed previously. This type of information will greatly assist in current beginning efforts to better understand for whom the method is most useful and may even provide insights into why the method seems to work at all. The development and use of a pre-screening tool to quantify the prerequisite performance of skills and subsequent research would be particularly helpful in this cause.

Aside from the quantitative discussion, are the qualitative observations made during the study. Parents and staff associated with each participant reported an increase in overall unsolicited verbalizations and social interactions after the start of the VSM interventions. These self-initiated verbalizations and interactions were not always appropriate nor were they even related to the VSM material; however, such informal observations on the part of more than one person in more than one setting would seem worthy of note and are described as follows.

Samuel was observed by his mother to use the VSM greetings in locations and at times not directly studied and at times that were sometimes not appropriate. For example, Samuel was observed to use the "good morning" greeting toward car lane staff when exiting his mother's vehicle to enter the school building. He was also observed using the greeting at home and in the community at different times during his day. At one time during the study, Samuel stated "good morning" to a teacher in the school hallway while preparing to leave the building for the day. Early in the study, it seemed that Samuel used the greeting "good morning" as a noun to initiate discussion of the video and/or request to view the video. This changed over the course of the study to his using the greeting appropriately more often and rarely using the greeting inappropriately or at inappropriate times. It may be that the combination of the two separate locations and times of greetings may have been confusing to this student which suggests further research that focuses on the use of self-initiated expressive communication in one situation at a time.

Katarina and Brandon's use of speech in general increased following the start of the VSM intervention. Both mother and school staff reported that Brandon used vocalizations along with gesture to communicate his desires on several occasions (although not words) both at home and in the school setting. This seems strange

in that his VSM video portrayed him using an AAC device to communicate. The increase in vocalizations was nonetheless noted. Katarina's increase in speech was less notable than Brandon's vocalizations or Samuel's. She was observed on one occasion, using the greeting at a time during the school day that would typically be inappropriate for such a greeting. Again, these observations were not quantified nor included in the actual protocol of this study, but such observations seem to, in general, support prior research showing an increase in overall use of the skill portrayed in the VSM tape (Buggey, 2009).

Future Research

This study supports generally observed prerequisite skills in previous literature but also points to the need for further study in this area of what prerequisites are needed for VSM to be successful. This study supports the assertion that functional parameters may exist around which individuals may most benefit from the use of VSM as a learning modality and how VSM may be best implemented as a teaching modality. The limited data available through the use of the single subject designs and the lack of studies that have been conducted to assist in answering the question of prerequisite skills make any far-reaching conclusions elusive.

As more studies are conducted in this area, the promising nature of this instructional tool and for whom the tool is most useful will become further clarified. In addition to more single subject studies with expanded prerequisite skills upon introduction of VSM, the development of pre-screening skill instruments would greatly enhance the ability of current practitioners to select students for whom the VSM method of instruction would most likely be effective. Future researchers seeking to specifically quantify levels of skills needed to best utilize video based teaching and support methods should first find or develop useful pre-screening tools and research such tools directly while in pursuit of this answer. As more and more video based support software and apps are developed, the answer to for who the method is appropriate becomes more and more important and relevant.

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