

# Video Self-Modeling Applications With Students With Autism Spectrum Disorder in a Small Private School Setting

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Videotaped self-modeling (VSM) was developed as a means to allow participants to view themselves in situations where they are performing at a more advanced level than they typically function. VSM has been used effectively to train positive behaviors and reduce unwanted behaviors across a range of ages and behaviors; however, few studies of VSM have been conducted with students with autism. The present study was designed to analyze the effects that VSM had on children with autism spectrum disorders across a variety of behaviors, including language, social initiations, tantrums, and aggression. Multiple-baseline designs across students and behaviors were used to evaluate performance in several substudies. The results indicated that all of the 5 participants exhibited immediate and significant gains and that those gains were maintained after cessation of treatment. The findings suggest that VSM may constitute a positive behavior change intervention worthy of consideration for persons with autism.

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For many years parents, teachers, and therapists have actively and aggressively pursued a wide range of approaches to treating students with autism. The enigmatic nature of the behaviors associated with autism, especially those related to language, social skills, and attending to tasks, has been a source of frustration for teachers and therapists. At present, the state of the art in treatment remains confusing. Controversy surrounds many forms of intervention, emanating either from the level of obtrusiveness of the intervention or from the lack of supporting research evidence (Bailey, Phillips, & Rutter, 1996; Lovaas, 1987; Murray, 1996).

A relatively new genre of treatments that holds promise for individuals with autism spectrum disorders (ASD) has focused on the use of videotapes. Video interventions have been used to successfully train new behaviors and eliminate undesired ones with persons with a range of disabilities. In particular, videotaping individuals acting as their own models has been

proposed as a method that maximizes characteristics that serve to promote attention to the model (Creer & Miklich, 1970; Hosford, 1981). Researchers have found that the most effective models tend to be individuals close to the observer's age who have similar characteristics (gender, personality, race, and mood) and are functioning only slightly above the level of the observer (Bandura, 1997, 2001; Thoresen & Hosford, 1973). Other benefits experienced by peers when acting as models in the classroom, such as increased prestige, improved retention by practicing recently acquired skills and knowledge, and learning of responsibility, lead to the question of whether a child with an ASD, given the opportunity to view him- or herself performing well at an advanced level, would serve as an even better model than a peer. The technology is now available to permit observers to act as their own models.

Videotaped self-modeling (VMS), in which observers are shown only their positive performances of a targeted behavior, has been shown to be an effective treatment across an extensive range of behaviors, ages, and abilities. Positive results have been obtained for treating depression (Kahn, Kehle, Jenson, & Clark, 1990), stuttering (Bray & Kehle, 1996), elective mutism (Pigott & Gonzales, 1987), attention disorders (Dowrick & Raeburn, 1995; Woltersdorf, 1992), behavior disorders (Lasater & Brady, 1995), and aggressive behaviors (Creer & Miklich, 1970; McCurdy & Shapiro, 1988). Likewise, VSM has proved efficacious as a tool for teaching skills such as math (Schunk & Hanson, 1989), life skills (Miklich, Chida, & Danker-Brown, 1977), social behaviors (Lonckecker, Brady, McPherson, & Hawkins, 1994; Rasing, Coninx, Duker, & Van Den Hurk, 1994), and language (Buggey, 1995a; Haarmann & Greelis, 1982; Sherer et al., 2001; Whitlow & Buggey, 2003; Yingling & Neisworth, 2003). In a review of 27 studies using VSM (Meharg & Woltersdorf, 1990), moderate to dramatic gains were reported across all target behaviors. There also was consensus that the gains occurred almost immediately after in-

tervention began, that they generalized across settings and conditions, and that the behaviors were maintained after intervention was withdrawn. In spite of the efficacy of VSM apparent in the literature, there are few references to it ever being used with persons with autism.

Several studies have been conducted to examine the effect VSM has on language skills in students with autism. Buggey, Toombs, Gardner, and Cervetti (1999) used VSM to train response-to-question behaviors with three middle school students who had moderate to severe autism. Students were taped over 2 weeks in play sessions within their homes and were asked frequent questions by the researchers. Any responses were extracted from the videos and edited into a VSM videotape. Students were then allowed to watch themselves respond rapidly and often to the researchers' questions. One of the participants had only three responses in the 2 weeks. These were looped repetitively in the video to produce a tape 1½ minutes long. The overall results indicated that the students doubled their responding after they began to watch their videos. Results for questions requiring one- or two-word responses concerning identification of items improved at a much more dramatic rate. Two of three parents reported marked gains by their children in responding to questions even though they were kept ignorant of the behaviors being addressed.

Yingling and Neisworth (2003) used VSM to train spontaneous requesting in four preschoolers with autism. The children were trained to request items via a discrete trial method; however, the resulting requests were rote and there was no generalization to spontaneous requesting—that is, the children requested only when prompted to do so. The prompted requests were included in the VSM tapes with the prompts and any negative behaviors edited out. Results for all four participants showed substantial gains. The gains in mean production of spontaneous requests ranged from 800% to 1,200%. As in other studies (e.g., Buggey, 1995a; Creer & Miklich, 1970; Dowrick & Raeburn, 1995), the results were maintained following withdrawal of the videos.

In the only study comparing two methods (self- vs. peer-modeling), Sherer et al. (2001) found both modes of intervention effective. Five children with autism ages 4 to 11 years were shown videos wherein they or a peer were engaged in responding to conversation questions. Through a combination of multiple-baseline and alternating-treatments designs it was found that three of the five participants performed at levels of 100% accuracy at posttreatment. No difference in rate of task acquisition was indicated between the two conditions.

Unlike other methods of change, VSM offers a way for individuals to confront their own behaviors. It also allows individuals to see themselves as they could be. This process was described by Dowrick (1983) as *feed forward*. It is unclear exactly why self-modeling seems to be so effective; however, Bandura (2001) believed that it was a function of improved self-efficacy (the belief that one will be successful at an endeavor) on the part of the observer. There may be additional

reasons why VSM could be effective for persons with autism. Zihini and Zihini (1998) believed that television offers a relatively nonthreatening medium of teaching when compared to direct human interaction. Furthermore, Grandin (1996), who has autism, in the first paragraph of her book *Thinking in Pictures* offers another possible mitigating factor:

I think in pictures. Words are like a second language to me. I translate both spoken and written words into full-color movies, complete with sound, which run like a VCR tape in my head. When somebody speaks to me, his words are instantly translated into pictures. (p. 1)

Although Grandin's description may not represent the thinking process of all persons with autism, she offers a rare look into a thinking process that may be somewhat representative of the population. It is possible that VSM, along with other video methods, provides a particularly good match for those persons with autism who are primarily visual thinkers and learners.

The basic procedure used to conduct VSM intervention involves (a) videotaping behaviors, (b) editing a portion of video to create or show a desired version of behavior, and (c) allowing individuals to view videos of themselves exhibiting desired behaviors (Buggey et al., 1999; Dowrick, 1983; Meharg & Woltersdorf, 1990). There are two major methods for having students perform desired behaviors for videotaping. The less time-consuming of these methods is to have the student role-play or imitate the target behavior. This method is especially effective when working with language and social behaviors. Children can often imitate correct language forms or role-play correct responses to social situations before they adopt them into their everyday usage. For example, Buggey (1995a) used VSM to train preschoolers to use the contractible copula form of the verb "to be." These children were videotaped imitating the use of short sentences with the words *am*, *is*, and *are*. The tapes were edited to include their best imitations and then shown to the children for 3 to 5 minutes each morning. Audio recordings done during recess and lunch indicated that the students were using the new forms in natural situations soon after intervention began. This finding of strong generalization is found throughout the literature on VSM (e.g., Buggey et al., 1999; Dowrick & Raeburn, 1995; Whitlow & Buggey, 2003).

The second method for obtaining tapes of desired behaviors is more time-consuming and requires taping a person's behavior over time and then editing the tape so that only exemplars of the behavior are present in the final product. Persons who may not readily role-play, such as those with autism, are candidates for this form of the technique. This method also requires that some baseline form of the behavior be demonstrated by the person being taped.

A requirement or VSM to be effective is that the viewer is able to attend to the video. The problems children with autism

often exhibit in terms of attention to task may be one of the reasons why this method has rarely been attempted with this population. However, children with autism often display selective attention that is directed toward viewing television. It is interesting that two studies were found in which self-modeling was found to be ineffective, and both of these had preschoolers as participants. Clark et al. (1993) found that self-modeling did not modify aggressive behaviors in a group of six preschoolers who were labeled as oppositional-defiant. Bugey (1995b) had mixed results in a study aimed at training language skills to two preschoolers: One child made significant gains in mean length of utterance and intelligibility, whereas the second child made no measurable gains in his target behaviors. The child who made gains was interested in the tape and paid rapt attention to it. Although she was asked to repeat utterances she heard herself make on the video, she refused to do so. The child who did not make gains was very imitative of his own utterances but did not seem to focus on the video; he moved around the room (either physically or with his eyes) while repeating what he heard on the video. The results of these studies underscore the need to further investigate the impact VSM has on students with autism. It is important that researchers expand the database of VSM by investigating efficacy with new behaviors and across age ranges and environments. At the same time, replication of previous studies must be undertaken to assess the method's validity and reliability.

The purpose of this study was to investigate whether videotaped self-modeling could be used to modify the behaviors of children with autism across a range of ages in a school setting. Specifically, the behaviors addressed were (a) language production, (b) social initiations, (c) tantrums, and (d) aggressive pushing. It is hoped that the results of this study will contribute to an expanding database of information that examines the effects of VSM on behaviors that have yet to be studied. For those behaviors that have been studied, this research will serve as an additional form of validation through replication.

## Method

### Participants

Students who were diagnosed with autism spectrum disorder who attended an urban, inclusive private school were the focus of these studies. Ages of the participants ranged from 5 to 11 years, and the level of involvement of their autism ranged from milder Asperger's syndrome to moderate autism. Ten families of students who had ASD were contacted and invited to a meeting to discuss the study. At this meeting, the VSM procedure was explained and parents were asked to fill out a questionnaire and consent form if they were interested in having their children participate. The questionnaire included items that allowed the researcher to determine whether the child had prerequisite skills for VSM training (e.g., self-recognition and ability to model correct behavior). To aid in establishing so-

cial validity, parents were also asked via open-ended questions to identify behaviors they would like to see changed and skills they would like their children to learn. The questionnaires were also presented to the teachers and staff. Estimates of present duration and/or frequency of the behaviors were also requested. Ultimately, all 10 families agreed to participate. The behaviors were then analyzed in order to group them for multiple-baseline designs across persons or behaviors. Two groups of two students were found to have similar behaviors and were of similar ages and thus were grouped for studies using a multiple-baseline design across persons. Due to time constraints, only one child had two behaviors addressed, and he was included in a third study, which used a multiple-baseline design across behaviors. Five other students were included in single-subject designs that addressed only one behavior. Due to the length limitation of the present article, I decided to present the results of only those studies using multiple-baseline designs.

All participating students were receiving sensory integration therapy daily, which involved brushing, stretching, rolling on a large ball, and compressing joints. With the exception of John, all of the students had Individualized Education Programs (IEPs) and participated in the state standardized testing program. As part of their assessments for the IEPs and eligibility for special education, students were tested using the *Wechsler Intelligence Scale-Revised* (Wechsler, 1974), the *Woodcock Johnson Achievement Test* (Woodcock, McGrew, & Mather, 1990), and the *Peabody Picture Vocabulary Test* (Dunn & Dunn, 1997). Late in the spring, prior to completion of the research, the school was flooded and all student records were destroyed.

### Setting

All participants attended a small inclusive school in a large southern city. The school was located in the basement of a church and had an enrollment of 30 students. Ages of the students ranged from 2 to 14 years. The percentage of students with and without disabilities was 50%, and the majority of those with disabilities (10) were diagnosed with autism spectrum disorder. The physical space consisted of four classrooms, a large central communal area, a teacher work area, and a room for meetings that also served as the administrator's office. There were two outside play areas, one fenced for younger children and another, larger area for the older students and for team games. Students were divided into ungraded classes consisting of preschool, primary, elementary, and middle school-aged students. A certified teacher and one assistant were present in all classrooms. All students had an IEP based on state-mandated objectives. A schoolwide behavior management plan was in place, and all students met at the end of the day for distribution of rewards. The physical education program was therapeutic taekwon do. Each morning students would work on aspects of their training, and an outside instructor would come in every Friday morning for an intensive training session with all students.

For this study, a TV/VCR combination was purchased for the school and placed in the elementary classroom. Participants would view their tapes when they arrived at school, prior to classes starting. They were thus able to view their tapes while other students were not present.

## **Procedure**

As part of a semester-long educational sabbatical, I took on the role of a teacher assistant at the school and worked the hours of 9:30 until 3:00 each day, starting in mid-October and continuing until the winter holidays in mid-December. For the spring semester, I devoted 3 days per week to this research. Routine classroom tasks, from opening tins at lunch to giving spelling tests, were assigned to me. I served in the classroom where participating students were involved in the intervention. When several studies were ongoing simultaneously, I alternated among classrooms. What differentiated me from typical assistants was that often I was accompanied by a camera. To desensitize students to the camera, or at least to the purpose of the filming, I produced two videos during the first 2 weeks of my presence. One of these was a promotional video of the school, and the other was a video of the students' Friday tai kwan do class. All students appeared in these videos.

The present research was conducted using three single-subject, multiple-baseline designs to evaluate results. Two of the designs were based on similar behaviors across two participants, and the other was with one student across two behaviors. Once the target behaviors were chosen, I began filming during recess, lunch, or free time. The videotaping was done with a Sony Digital Handicam. I did all video editing using iMovie software for the Macintosh. Interobserver reliability was determined using one of two methods. When behaviors were mainly exhibited within the classroom (tantrums in Study 2 and the language and social behaviors of the preschooler in Study 3), the teacher or teacher assistant and I collected data. The data for the social behaviors targeted in Study 1 were collected in communal areas; thus, a college student was employed to collect these data. The variations in data collectors were necessary due to the small classroom sizes and the teachers' variable schedules during the communal times. For determining reliability in Studies 2 and 3, the college student calculated the interobserver agreement of the two observers. Because the college student was directly involved in data collection for Study 1, she and I collaborated on comparing these data. Percentage agreement was determined by dividing the total number of agreements by the total number (or duration) of incidents and multiplying by 100.

## **Study 1: Social Initiations**

### **Participants**

The children participating in Study 1 were members of the middle school classroom. Child 1, Roy, was 11 years 3 months old at the beginning of the study. He was diagnosed with

autism at a university child developmental center when he was 5 years old. Roy is very tall for his age and walks with a lumbering gait. While at school, Roy tended to be very quiet. He verbalized and had a well-developed expressive vocabulary but rarely initiated conversation or asked questions. During free time and recess Roy would remain quiet and would not usually participate in activities unless an initiation was made by one of his peers. The one exception to this was with his best friend, who happened to be the other participant in this study. Roy had a history of frequent absences and was taking medication for seizures and depression. He was functioning approximately 2½ years below age level in reading and math.

Child 2, Tommy, was 9 years 11 months old at the beginning of the study. He was diagnosed with mild autism/Asperger's syndrome at 5 years 6 months of age by a team of medical and behavior specialists. Tommy exhibited a very positive and happy personality. He was rarely seen without a smile. He had a tendency to perseverate on tasks and in his expressive vocabulary. He was responsive to requests and questions, but his verbal responses were often off topic. Tommy was 2 years below his age level in reading and 1 year below in math. He was considerate and friendly and would quickly agree to participate in activities with peers; however, he rarely initiated social contacts with anyone but Roy.

### **Observation and Data Collection**

For the purpose of this study, social initiations were defined as unsolicited verbalizations (not preceded by peer or staff prompts for a period of 10 seconds) addressed to peers (other than their counterpart in the study) or staff. Baseline data were collected for a period of 2 weeks prior to intervention with the first student. The videos were filmed 1 week prior to intervention for both students so that any effects of the role-playing activity on performance could be monitored. Identical data-collection procedures were used in the intervention and maintenance phases of the study.

I conducted daily observations of participants; in addition, a college student attended the school twice a week and also observed the students. Observations were completed during lunch, recess, and free time (with each activity lasting 30 minutes), when social interactions were most likely to occur. Both observers were present and recording throughout these periods. The college student was trained in identifying and recording social initiations. Observation forms were used that contained areas for stating the behavior, recording the time of the behavior, and noting conditions surrounding the behavior (e.g., location, who was involved, type of activity, and other relevant information). At the end of the week, the college student and I independently charted each occurrence of the behavior based on time and description of the behavior. These data were then analyzed across observers, and reliability was assessed by calculating percentage agreement per session. In order for there to be an agreement, the time (within 1 minute) and description of the behavior had to match. The percentage of agreement between the college student and me was 94% for

both behavior and time of behavior. Virtually all of the discrepancies in scoring were due to omissions by one of the observers.

### **Intervention**

Following the first week of observations, a role-playing script was written and peers from the school were asked to participate in the creation of a movie. Scenes in the movies showed Roy or Tommy walking up to a group of students outside the school and asking them what they were doing this weekend, followed by a brief discussion in which the participant asked his peers about their favorite activities. The participating student wore a wireless microphone to ensure clarity of his verbalizations. Following each simulated initiation, the camera was stopped and the next exchange was discussed and modeled prior to the next take. Other taped activities included asking the teachers about homework and asking peers to play with them in the communal area.

A 3-minute video was created that showed the participants engaging in relatively typical and positive social interactions. As with all the videos, a visual and auditory introduction was added to the tape in which the behavior was named (e.g., "A movie starring Roy (Tommy). Let's watch Roy (Tommy) and his friends talk and play together."). At the end of the tape, a flattering freeze-frame of the student was placed with a printed overlay of "Great job, Roy (Tommy)!!" followed by clapping.

Once the videos were created, they were presented to the teachers. The teachers watched the video with the participants the following morning before classes began. Thereafter, the students watched the tapes in the classroom prior to the start of classes. The teacher was often present for these sessions, but other students were not. Data collection proceeded as during baseline. When obvious results were detected for the first participant, the second participant began to watch his video. After 10 days of viewing, the videos were withdrawn, but data collection continued.

### **Results**

Both participants in this study made substantial gains in the frequency of their social initiations. A summary of these results is provided in Figure 1. Roy made no social initiations during baseline. His mean during intervention rose to 4.0 and maintained at an average of 4.4 initiations a day. Although there seems to be a slight downward trend in the data during the maintenance stage, analysis of teacher journals indicated that the initiation behaviors continued throughout the school year.

Tommy had two social initiations in the 12 days of baseline observations, for a daily mean of .17. During intervention, this rate rose to 3.8 and was maintained at 4.25 initiations per day. Initiations with peers and teachers seemed almost equally divided for both participants. On the first day of intervention, Tommy walked up to his teacher during recess and said, "I hope we aren't going outside today. I wore my light jacket and

it is really cold." The teacher did not respond for several seconds. Later, she stated that she was stunned and that this was the first time he had made any remarks to her without prompting. Prior to intervention these two students kept to themselves during recess and would play only with each other unless invited to play by another student. Following intervention, they continued to spend much of their free time together; however, much more interaction was noted with other members of the school, as documented in the daily journals maintained by the teachers.

## **Study 2: Tantrums**

### **Participants**

Both of the participants in this study were members of the primary classroom. Scott was 6 years 9 months old at the outset of the study. He was diagnosed with Asperger's syndrome by school district personnel at 5 years of age. Scott would persevere on some tasks and tended to be distractible during academics. However, he was often outgoing and cheerful and had appropriate achievement levels in reading and math for his grade. The behavior identified by both his parents and teachers was his reaction to criticism and frustration, which often took the form of hysterical tantrums where he would flail his arms and legs and weep for long periods. These episodes could last for half an hour, with follow-up pouting lasting for half a school day. There was a progression into the tantrum, beginning with folding the arms and looking downward. A behavior modification plan was in place and had been practiced at home and school for several months with little effect.

Aaron was 8 years 1 month old at the beginning of the study. He was diagnosed with autism at the age of 5 by a medical team. Aaron was only slightly delayed in reading and math achievement and had expressive and receptive vocabularies appropriate for his age. His thinking and discussions tended to center on Star Trek. He exhibited an almost savant knowledge of the cast and episodes of all of the TV and movie formats of this show. His recess time was invariably spent using LEGOs to construct starships. Aaron would respond to questions concerning academics and his family when class was in session. He also could respond to specific questions during play time but would redirect conversation back to Star Trek after one or two sentences. Aaron would become very agitated when frustrated or when his sense of fairness was violated (e.g., for not getting called on or not being first in line). When this occurred, he would furrow his brow, fold his arms, mutter under his breath, and stare at the ground. His muttering could become loud and disruptive, and he could stay in a pouting state for more than half an hour.

### **Observation and Data Collection**

A procedure similar to that used in Study 1 was used to obtain baseline data for the two students involved in the second

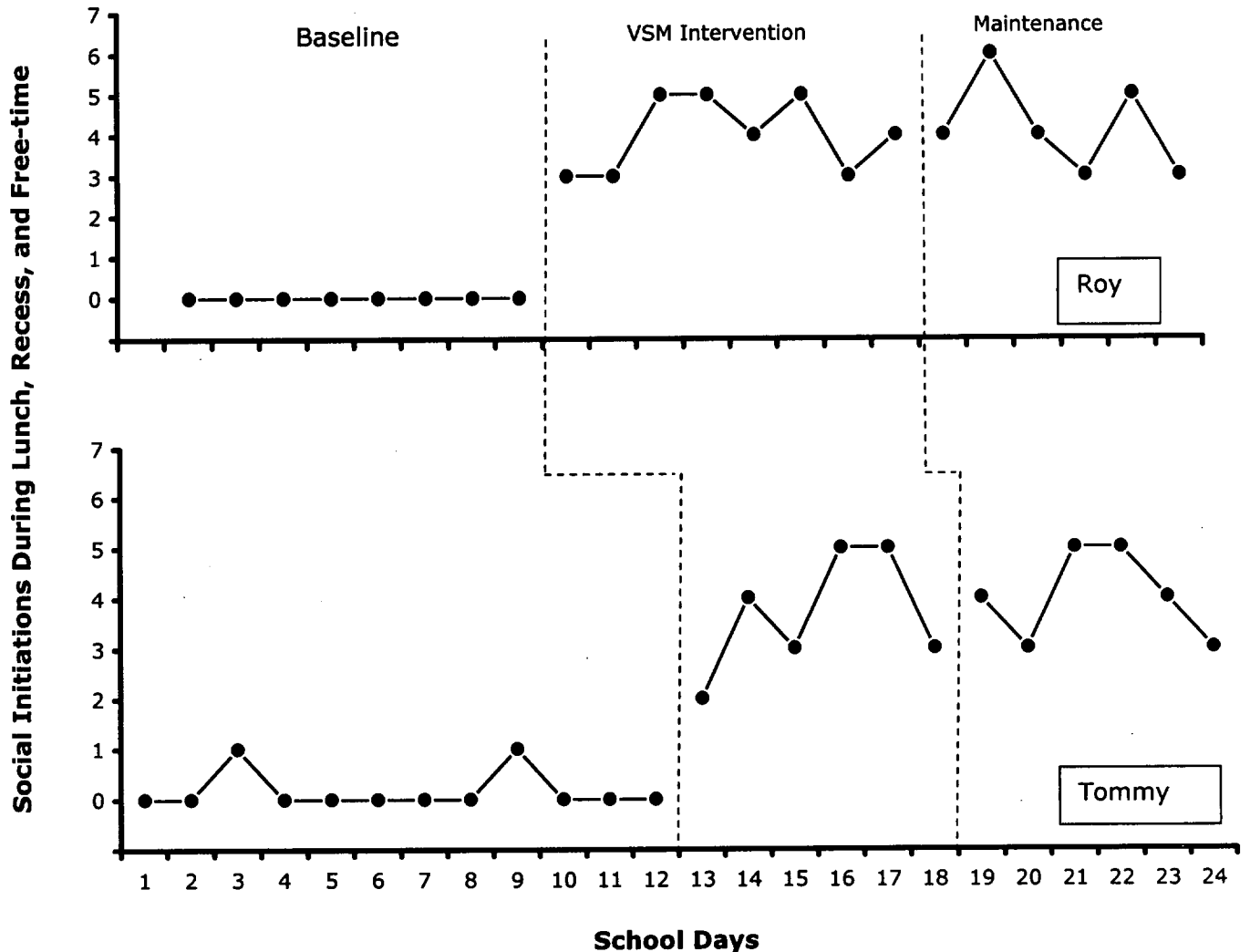


FIGURE 1. Social initiations of Roy and Tommy.

study. The definition of *tantrum* used in this study was a negative reaction to criticism or adversity that involved physical withdrawal and an outward manifestation, such as negative verbalization, flailing of limbs, or hysterical sobbing. Both students involved in this study had similar behaviors antecedent to the tantrum (folding of arms, looking down, and pouting). Observations of these participants took place in the classroom during academic instruction, when the behavior was more likely to occur. Because observations were done in the classroom and space was limited, only the classroom teacher and I were involved in data collection. The behaviors involved in the tantrums were so obvious and of such duration that relying on the teacher to accurately record time of onset and duration was deemed appropriate. Duration was recorded starting from the folding of arms until the student ceased exhibiting the tantrum behaviors. Due to the relatively lengthy times for the behaviors, duration times within 3 minutes were considered in agreement. Record forms were collected and analyzed at the end of

each week by the college student and me. As in Study 1, baseline evaluations were conducted for 2 weeks prior to the first participant's receiving intervention, and the filming occurred 1 week prior to intervention. These evaluations continued through the intervention and maintenance stages of the study. An additional 2 days of evaluation were conducted 2 weeks following the end of maintenance data collection. Interobserver reliability for this study was 100% agreement on the number and time of onset of the behaviors. There was a 94% agreement on duration.

### Intervention

Both students agreed to participate in the making of the video. Several classmates and the teacher were recruited as extras, and the video was filmed in the classroom while other students were at recess. A script was written whereby the participants would act out situations that typically resulted in the tantrums.

For example, the participant would be with other students at circle time, the teacher would ask a question, everyone's hand would go up, but the teacher would not call on the participating student. Other scripted situations included receiving minimal rewards during the end-of-day communal gathering, being told they had missed spelling words on an exam, and not being granted permission when a request was made. The participants were also told how to react to these situations in a polite and friendly manner. The participants had no negative reactions to the filming. As in Study 1, the video was made by editing out all but the most positive reactions to these situations. A trailer was included at the beginning of the tape, and the freeze-frame and clapping were added at the end. For the first viewing of the tape, participants were accompanied by the teacher. Thereafter, viewing took place in the classroom prior to the beginning of class, often with the teacher present but with no classmates in the area.

## Results

Analysis of the results indicated that the rate and duration of tantrums for both participants decreased substantially. In the 10 days of baseline observations, Scott exhibited the behavior every day, and on 3 of these days the behavior manifested twice. The mean duration of the behavior was 16.25 minutes during baseline, 1.6 minutes during intervention, and 2.8 minutes during the maintenance phase. Three weeks following the maintenance phase, a 2-day follow-up observation was carried out. No evidence of the behavior was detected. Teacher reports and journals confirmed that the behavior was rarely exhibited since maintenance, and on the occasions when it did occur, the duration never was more than 5 minutes.

Aaron demonstrated similar results, improving from a mean duration of 19.3 minutes per event to 4 minutes during intervention, and 2.3 minutes in the maintenance phase. As with Scott, the behavior was not observed during the 2-day follow-up. A summary of the results is presented in Figure 2.

## Study 3—John: Pushing and Language Production

### Participant

John was 5 years 5 months old in October, when the study began, and was enrolled in the preschool class at the school. He had been diagnosed with pervasive developmental delay 2 years previously by a team of professionals from the state early intervention program. John was born with two of his fingers joined on his left hand. He was a very active child who occasionally hit and pushed his classmates. He had delays in receptive and expressive vocabulary, with the latter being more pronounced. He also had a significant speech defect. During play times, he often walked around the classroom producing perseverated sounds in a babbling fashion. He was nonre-

sponsive to questions and requests unless an adult was eye-to-eye with him. In those instances, he was limited to reciting most of the alphabet, numbers to 5, the names of family members, and the names of his favorite food.

### Observation and Data Collection

Data were collected on two of John's behaviors: pushing classmates and language production. John's pushing behavior consisted of going up to a classmate, grabbing his or her cheeks, squeezing, and then pushing off with both hands. A behavior modification plan had been in place since the beginning of the school year in which John would be rewarded after a given period of time when he did not push. A functional behavior assessment had not been conducted, nor had a set of antecedents to the behavior been established. The teacher would physically pull John from a classmate if she could get to him in time, but usually John would complete his push before the teacher or the assistant could intervene. Baseline data were collected over a 1-week period on the frequency of this behavior.

Simultaneously, data were recorded on John's expressive language output in terms of frequency of unsolicited utterances of words and responses to questions (word utterances that were appropriate for the question). John had only one utterance of more than one word and never said a word without being prompted. For the purposes of this study, *unsolicited utterances* was defined as any word or words spoken with intent (e.g., naming objects, greeting, requesting) without prompting from staff or peers. Responding to questions was arranged so that the teacher would ask John at least 10 questions during activities where socialization and language skills occurred naturally; that is, during circle, center, and play time. These activities had durations of 20, 30, and 30 minutes, respectively. The questions were not scripted; rather, the teacher and assistant were instructed to ask questions that were appropriate to the activity. Scoring was done on the first 10 questions asked during observations across all phases of the study. The assistant and I each were responsible for collecting the data. A standard scoring form listing both behaviors (language and pushing) was used. Data on both behaviors were collected during circle, center, and free times each day.

The college student and I collected the forms used to record data weekly and analyzed them independently. For the pushing behavior there had to be agreement of the time of occurrence to within 2 minutes and exact matches of person(s) involved. For the language behavior, observers recorded the time of the occurrence, the exact word or words that were spoken, and the prompt (for responses) or significant environmental factors that might have contributed to an utterance (e.g., a child took a toy and the participant stated, "It mine!"). Observers were considered in agreement when the time of the occurrence was within 3 minutes and the words spoken and associated prompts were identical. The time discrepancy was considered important because although I was often able to record immediately, the assistant often had delays prior to re-

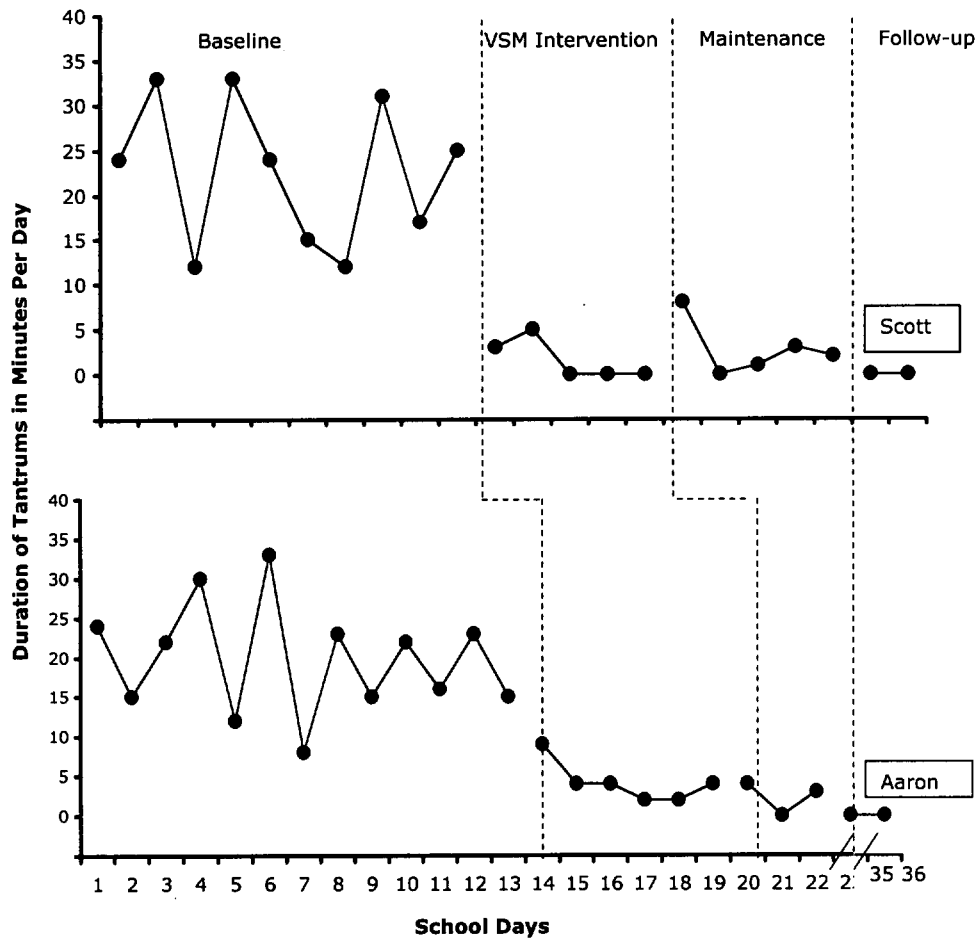


FIGURE 2. Duration of tantrum behaviors for Scott and Aaron.

coding. Interobserver reliability between evaluators was 100% for the pushing behavior. Reliability was also high for the language behaviors. There was 96% agreement between observers concerning occurrences of a verbalization and 94% agreement for the content of the utterance.

### Intervention

John did not have the capacity to follow directions so that he could role-play appropriate touching and *gentle* behavior. Therefore, he was taped in normal activities over a 3-day period. From this lengthy footage, 2½ minutes of what were deemed appropriate examples of alternative and appropriate behavior were extracted. Scenes included John hugging a classmate in an appropriate manner, sharing a toy, and obeying the teacher's directions. Only about a third of the video dealt directly with touching or close interaction with peers. The other two thirds dealt with compliance, politeness, and quiet attending. The trailer added to the beginning of the video stated, "Here's John playing nicely with his friends. John never pushes."

The video produced for John's language behavior may be unique in design in regard to language intervention. The iMovie software allowed for frame-by-frame editing; thus, the researcher was able to extract single words from the footage, place them on the desktop, and then click and drag them to form sentences. Although there was some "jumpiness" with the video, the auditory quality was very good. The audio track sounded as if John was speaking in sentences. Several techniques were used involving his teacher and mother to get John to say words. Prompted by his teacher, John was able to echo about 15 nouns. The only verb that could be elicited was "go." John's mother stated that John's vocabulary use at home was better than at school, so she was asked to assist in making the video. In this way we got film of John saying "is," "want," "eat," "sing," "drink," and "like," plus several more nouns. Sentences such as "I eat hot dog," "I drink juice," "I go home," and "I sing" were created. Once the sentences were created, I, the teacher, and other students were recruited to ask questions suited to the sentences. The final video appeared to be a series of questions asked by an assortment of people with immediate answers from John. A trailer was added to the

beginning of the video stating, "Let's listen to John talking to his friends." "He is using a lot of words!" Clapping and an audio, "Good job, John!" was added to the end.

## Results

The results of John's intervention are represented in Figure 3. For the pushing behavior, results were immediate and dramatic. Only one occurrence of the behavior was noted following intervention. This was maintained following withdrawal of the video. The maintenance phase was completed in early March, and the teacher noted that the behavior did not occur for the rest of the school year.

The results for the language intervention were not as promising. No unprompted utterances were noted after 1 week of observations. His rate of responding to questions did show a small increase, from a mean of .2 responses per day to 1.8 responses per day. That weekend, I reviewed the video and decided that the video was too busy: The visual transitions

from questioner to John, combined with the visual discontinuity between the words, may have made it difficult for John to focus on the salient feature. As a result, the video was further edited by adding several more sentences and eliminating all but three of the questions. The new tape showed much more of John. This appeared to make a difference in both his responding and, more significantly, John's unprompted verbalizations. His rate of unprompted verbalizations went from a mean of 0 in baseline and Intervention Tape 1 to 3 during Intervention Tape 2. It is interesting to note that his mean during maintenance was 5. Rates of responding to questions rose from a mean of 3 out of 10 during the first intervention to 3.67 in Intervention 2, and 4.67 during maintenance. On the second day following the introduction of the second tape, John and his teacher came to the school entrance, which needed to be opened from the inside for visitors. Just by chance, they were headed to the restroom near that door. The teacher allowed John to open the door, and when he did he said, "Hello, [Name of researcher]." This phrase was in his

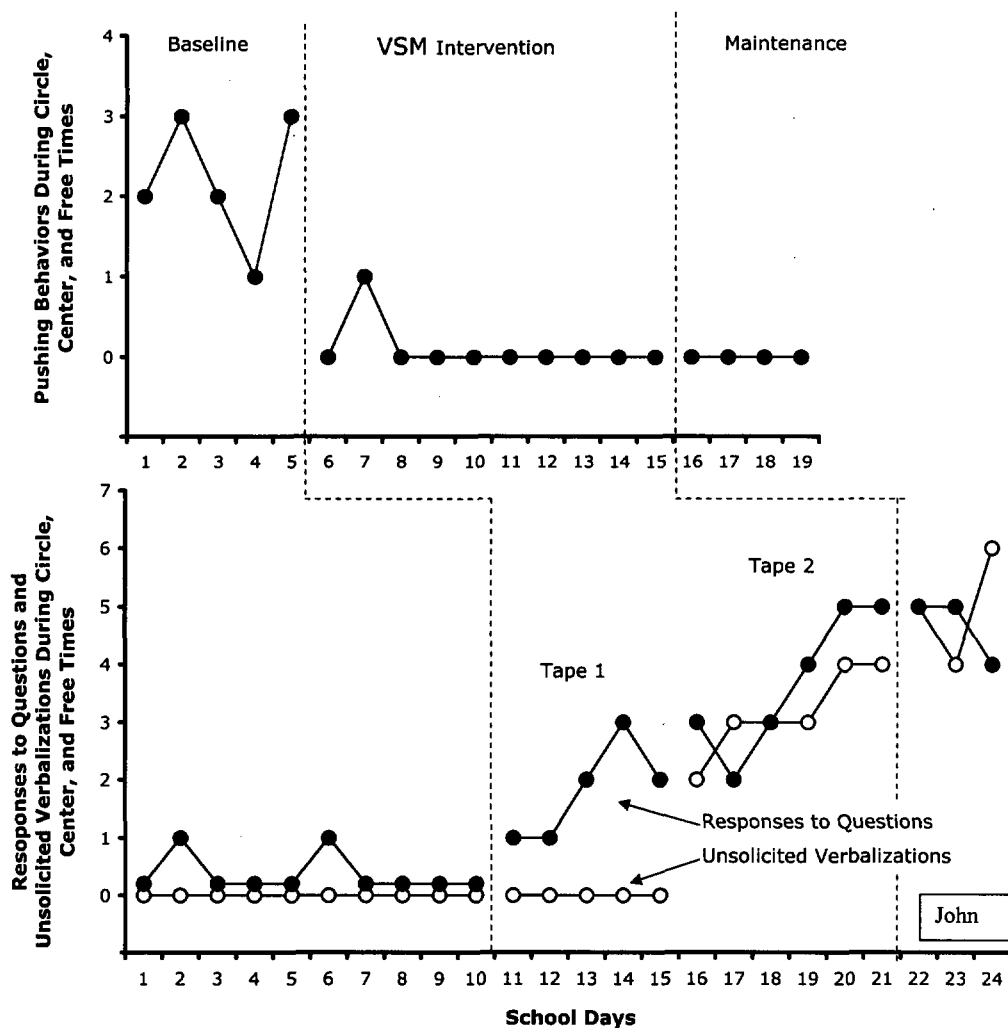


FIGURE 3. John's performance on pushing and language behaviors.

video. According to reports from both the teacher and the mother, this trend continued for the rest of the school year, with John becoming even more responsive and using a much wider spoken vocabulary.

## Discussion

The implementation of a video self-modeling intervention seemed to be successful across all behaviors and with all participants. Intervention that occurred in classrooms at the beginning of the school day seems to have caused changes in behavior that generalized to other settings within the school. These findings concerning change in behaviors and generalization support the results of many previous studies on VSM (e.g., Bray & Kehle, 1996; Buggey, 1995a; Buggey et al., 1999; Charlop & Milstein, 1989; Dowrick & Raeburn, 1995; Yingling & Neisworth, 2003).

All three teachers and their assistants gave extremely positive reports about the procedure. In her journal, the teacher who taught the two participants who had tantrums labeled participants' reaction to watching their videos as "life changing." She also stated that both parents contacted her about positive changes being seen in the home. Both students who participated in the study on tantrums exhibited instances where they abruptly stopped their tantrum and said things like "Whoops," "Forgot," and "Sorry." The teachers stated that this behavior, which seemed like self-regulation, had never occurred prior to the study. When asked about what they had said, the students said that they remembered the video. At the end of the study, the teachers requested training in the method, and one teacher's husband, who was familiar with iMovie, had already started to introduce other movies in her class dealing with academic performance. According to the teachers, all of the participants seemed to enjoy their videos and attended very well during the viewing. Even the filming process was enjoyed by all involved.

There were several other positive features of the VSM procedures used in the present study. The intervention was relatively nonintrusive, in that the students missed no instructional time, and they were exposed only to positive images. Another aspect of VSM supported in the present study is that it tends to produce results shortly after the procedure begins. No researchers have found instances of delayed effect or even slow, gradual effects. Thus, if immediate results are not exhibited, it is unlikely that continued viewing will be effective (unless, as in the case with John, the video was adapted in some way). VSM offers the opportunity to try a user-friendly treatment in which potential efficacy can be judged relatively quickly. It seems logical that the use of VSM with persons with autism could be an initial step prior to moving on to more intrusive types of treatments, if necessary. With further validation and refinements of the procedure, VSM could prove to be an effective mainstream tool for working with individuals with autism.

## Limitations and Implications

A constant threat to validity in single-subject design is the small sample size. In this study, that threat was confounded by only having two persons or two behaviors per study. It was hoped that the range of behaviors, ages, and degrees of involvement with the syndrome would compensate for this shortfall.

There was also a threat of contamination in this study. Although students watched their tapes in private, the filming was often done with the knowledge (and sometimes the participation) of other students. The teachers were briefed prior to the study about impartiality and objectivity. It was always explained that self-modeling was an experimental and unvalidated method and that the purpose of this study was to determine whether the method was effective and with whom. Still, considering my intimate involvement at the school, some bias may have been inadvertently communicated. Another possible threat to validity was the presence of the researcher in almost all observation sessions. Although much attention was given to desensitizing the students to the researcher's presence, this cannot be eliminated as a possible confound.

One area that might be described as both a strength and a weakness of this study was the analysis of maintenance. Due to the number of studies carried out at the school (the three addressed in this article plus five other single-subject studies), the collection of maintenance data was limited, as other studies had to be focused on. It would have been better had data collection been extended in the maintenance stage. However, teachers kept anecdotal records on the behaviors throughout the school year. From these records and teacher and parent reports, it seems that the changes in behaviors carried through at least to the end of the school year for all participants.

One aspect of the study with John concerning language production deserves further attention. It seems that the structure of the video played a significant part in the results. Findings were not very positive, especially with unsolicited verbalizations when the video contained questions voiced by adults and peers for each of his responses. Upon eliminating most of the questions and thereby leaving a relatively continuous stream of John talking, results were immediate. Further examination of how the content of self-modeling tapes affects results is warranted.

An important quality in any research in methodology is that it have treatment utility—that the methods used can be transferred to classroom, clinic, or home use. The editing and production of videos may have been daunting for most education professionals and parents in the past, but this should no longer be the case. With minimal training (half an hour for the teachers who were trained at the end of this study), teachers, parents, and clinicians can learn the necessary skills. The new technology associated with digital camcorders and software such as iMovie open up this form of intervention to everybody. iMovie is a free download for the Macintosh, and camcorders can be purchased for under \$500.

The filming that was carried out with the role-playing was a mere expansion of the often-used method of Social Stories (Gray, 1994). Story boards with scenes and dialogue were created, the filming was done within an hour (with some retakes done after the film was analyzed), and the editing process took less than 2 hours for each final video. The filming process itself was educational and enjoyable for the students. The same was true of videos requiring imitations, such as John's language video, although the production of that video did take significantly more time, due to the precision that was required. The most time-consuming form of VSM occurs when imitation and role-playing are not possible, as in the case of John's pushing video. John needed to be filmed over several days to capture the desired behaviors. Nevertheless, the staff at the school agreed that the time devoted to the intervention was well worth the effort.

## Suggestions for Further Research

The findings of the present study suggest positive outcomes across several students and a variety of behaviors. The sample size was small, however, and more research needs to be devoted to validating this method for use with persons with autism. Once there is sufficient validation, it would also be beneficial to investigate why this method seems to be so effective. If video alone is the key, it opens up several avenues of possible methodologies, such as peer modeling and instructional videos. It would also be interesting to conduct a study comparing peer and self-modeling.

If the key factor in the success of VSM is the implantation of an image of a future and more competent self, this too would provide openings to interventions associated with self-recognition and motivation. The idea of implanting an image that communicates "I can" to an individual might explain the tendency of VSM interventions to easily generalize across situations.

It would also be useful to assess the viability of using VSM in school, home, and clinic settings and to determine how the implementation of VSM could best be carried out in these settings. In the present study, teachers were easily trained in the method; however, the husband of the teacher was the one to do the filming and editing in the one instance where it was applied. It may be that guidance counselors, behavior specialists, or teaching assistants would be in a better position to oversee the intervention. In general, if we are beginning to see effective results for any method with students with autism, it becomes worthy of continued and increased research efforts.

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