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Intervention and Instruction with Video for Students with Autism: A Review of the Literature

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Abstract: Efficacy research on video based instruction for children with autism is a promising area for practitioners and researchers. Researchers are successfully using video to teach a variety of social and functional skills. This literature review synthesizes these findings and examines critical features of each of the studies that contribute most to the ways of educators, care givers and others can best employ video to teach young people with autism. While this area of research is expanding, more detailed studies are needed to better describe specific aspects of video based instruction.

Individuals with autism often have considerable difficulty interacting in social situations. Probably the critical behavioral manifestation that exacerbates this problem is that people with autism also have difficulty expressively and receptively communicating with others in their environment (American Psychiatric Association, 1995). In addition to social and communication problems, individuals with autism often demonstrate deficits in functional skills that are generally more pronounced than their cognitive functioning (Carpentieri & Morgan, 1996) Contrasting these deficits, individuals with autism, as a group, appear to have strengths processing visual rather than auditory stimuli (Hodgdon, 1995). For example, individuals with autism have demonstrated the ability to use visual supports like picture activity schedules to improve time on-task (Bryan & Gast, 2000).

For researchers and educators an important area of study is instructional strategies that incorporate the strengths of visual discrimination to assist individuals in learning important social/social communication and functional skills. Much literature exists detailing instructional methods of teaching social and functional skills to students with autism. Often times, these interventions involve at least some aspect of modeling target behaviors. Considering modeling as an important component of nearly any instructional package, the possibilities and utility of using video models pose new research questions and possible future instructional strategies.

In particular, consider the time investment needed to have a model (whether a teacher or peer) repeat a behavior several times. Repetition is important but what if the student trying to learn the skill requires more opportunities to view the model than the model has time to perform? While this may not be difficult to implement in classroom situations, certain logistical considerations may pose obstacles. Simply presenting a varied and sufficient number of exemplars for acquisition and generalization can be enhanced through use of video based instruction (e.g., different social partners, conversation topics, novel situations or materials).

Bandura (1977) condensed the literature about modeling in the text *Social Learning Theory*. He discussed at length ways that humans learn many behaviors by observing other people engaging in those behaviors and observing consequences that followed. Adapting from the terminology of applied behavior analysis he explained these consequences and their impact on the future behavior of the observer as vicarious reinforcement and vicarious punishment.

If students observe models, whether *in vivo*, on television, or on the computer, more op-

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portunities exist to teach new behaviors and to enhance stimulus generalization. The focus of this review is video-based modeling for people with autism. Studies were identified that use video as part of an instructional package for students with autism. In the process of reviewing the studies, the focus of instruction with video separated into two primary areas: (a) instruction of social skills with video and (b) instruction of functional skills with video. Information regarding the literature reviewed here is presented in relation to these categories and includes recommendations for future research and implications for practice.

Method

Studies identified for this review met the following criteria (1) the study was empirical and published in a peer-referred journal (2) the study examined use of video as an intervention tool for students with autism, (3) at least some participants in the study were identified as having a diagnosis of autism (4) if the study included other participants, results needed to be reported in a format that allowed evaluation of treatment effects on individuals with autism separate from the others, and (5) the article had to be written in English. To locate studies, a computer search on the ERIC and PsyInfo databases was conducted using combinations of the search terms and phrases: video and autism. After identifying the initial group, an ancestral search of their references was conducted in to locate additional articles. Lastly, a manual search was done of the tables of contents of relevant journals: *Focus on Autism and Developmental Disabilities*, *Journal of Educational Computer Research*, and *Journal of Special Education Technology*. Fifteen articles were ultimately identified for this review.

In the process of cataloging the studies, patterns were found in the clusters of skills researchers targeted for intervention; in nine of the studies researchers used video in an effort to teach social skills (see Table 1) and in six of the studies the researchers used video primarily to improve functional skills of the participants (see Table 2). Evidence of other patterns in the literature surrounded what students viewed in the video and when they viewed it relative to opportunity to engage in the target behaviors. Seven studies identified used video of either adult or peer models for the video portion of their intervention (Alcantara, 1994; Charlop & Milstein, 1989; Charlop-Christy, Le, & Freeman, 2000; Haring, Kennedy, Adams, & Pitts-Conway, 1987; Ogletree & Fischer, 1995; Simpson, Langone, & Ayres, 2004; Taylor, Levin, & Jasper, 1999). In four studies, students watched video footage of themselves (Hagiwara & Myles, 1999; Lasater & Brady, 1995; Sherer et al., 2001; Thiemann & Goldstein, 2001, Wert & Neisworth, 2003). Three studies used video that did not directly depict human models (Norman, Collins, & Schuster, 2001; Schreibman, Whalen, & Stahmer, 2000; Shipley-Benamou, Lutzker, & Taubman, 2002).

Structuring this review around social skills and functional skills allows a detailed and focused discussion on these curricular areas significant to students with autism. Each article is discussed with regard to three primary variables: first, what or who was filmed for the video portion of the intervention; second, how the video was used as part of an instructional package; third, a critical analysis of the study's results and features of the interventions that had an impact on student behavior. The final portion of the overall review will examine commonalties between successful use of video to teach students with autism, highlighting implications for practitioners and suggesting future research.

Review

Social Skills

The *Diagnostic statistic manual of mental disorders-IV-TR (DSM-IV-TR,* 1995) delineates several characteristics of autism that are directly related to social skills. For example, deficits in non-verbal behaviors (e.g. eye gaze), lack friendships with peers, absence of behavior related to sharing interests or emotions with people all illustrate behaviors exhibited by people with autism. Other characteristics included in the DSM-IV-TR describe how people with autism often have difficulty engaging in conversation and that they may use repetitive words or phrases in their conversation. Children's play may be restrictive and be void of social imitation. Further, people with autism may exhibit adherence to schedules or rou-

tines that appears extreme. A great deal of research in autism attempts to address these social-behavioral issues. Six studies reviewed in this article used video in an attempt to improve social behaviors so that students would have greater access to everyday interactions with their peers without disabilities and have greater opportunity to integrate with their peers in general education and social situations.

Studies designed to remediate social skills deficits addressed a range of specific behaviors. Most narrowly targeted conversational skills and social conventions of conversation (e.g. topic maintenance, eye gaze). Two used video of scripted scenarios to teach conversation skills. Charlop and Milstein (1989) filmed two adults engaging in scripted conversation about different concrete objects (e.g. a box) and common abstract issues (e.g. how some one is feeling). Taylor et al. (1999) also used scripted conversation of an adult conversing with one of the participants' siblings.

Charlop and Milstein (1989) used their videos as instructional models for three young children with autism. The videos contained scripted conversational exchanges in the format of questions and answers between the two adult conversation partners. Students viewed these videotapes individually and then were asked to do what they saw in the video. During probe trials on the concrete conversations, the objects that the adults used in the video models were present as referents for the conversation. Students acquired the scripted conversation and generalized the conversation to novel settings and conversation partners. Students also exhibited increases in related response variation. Further, students maintained these conversation skills 15 months after intervention ended and researchers reported positive findings in regard to social validity. One of the conclusions the researchers inferred from their findings was that their participants' echolaic speech patterns and strong rote memories helped them to acquire the target skills. In sum, video proved useful as a tool to model conversational speech.

Taylor et al. (1999) took a similar approach except that they varied their videos slightly from the format employed by Charlop and Milstein (1989). First, rather than filming adults conversing they filmed an adult engaging in conversation with a child during a play scenario. This approach aligns with what Bandura (1969) suggested about the characteristics of peer models and the ability to predict how well other students will imitate their behavior. Second, the researchers reported results from another experiment in which they only scripted the conversation of the adult model in the video and allowed the child conversation partner more natural opportunities to respond. Participants in the study viewed the videos three times and then were given the opportunity to engage in the play scenario depicted in the video clip. While the students viewed the video, the researchers supplied positive verbal praise for attending to the clip. In the first experiment the student made dramatic increases in his play comments after introduction of the intervention (in baseline conditions the student did not make any scripted or unscripted response). In the second experiment, the participant made increase in his verbal statements during play; he repeated statements modeled in the video but also made novel statements.

This study replicated the findings of Charlop and Milstein (1989) but with some variation. Taylor et al. (1999) concluded that because their second experiment succeeded in increasing the number of statements made by the participant, both novel and scripted, that using a normative, more natural conversational model with a wider variety of response than would be allowed by a scripted conversation may promote more spontaneous unique speech. Regardless, in both studies use of video facilitated acquisition and response generalization of conversation skills by students with autism allowing them more naturalistic social interactions with peers and adults.

Simpson et al. (2004) focused on a broader array of social skills: taking turns, following teacher instructions and initiating greetings. Students worked on a computer program that presented a declarative statement about one of the target behaviors and then showed video examples of peers engaging in the target behaviors. Students all showed improvements in the target behaviors but some of the students had accelerating baselines. These accelerations are somewhat muted by the steady baselines and sudden changes in level for most of the behaviors. One limitation of their study

TABLE 1

Primarily Social Skills

Reference	*Participants*	*Targeted Skills*	*Dependent Variables/Measures*	*Independent Variable(s)*	*Research Design*	*Conclusions/Results*
Charlop-Christy, Le, & Freeman (2000)	• 5 students 7–11 years old • All diagnosed with autism	• labeling emotions • independent play • spontaneous greetings • Oral communication • Conversation • Cooperative play • Social play • Brushing teeth • Washing face	• Percentage of correct and independent performance of target behavior	• Compared in-vivo modeling to video modeling • Same procedures for video and in-vivo modeling. • Students watch model and then are asked to do the same	• Multiple baseline design across students and multiple baseline within participant across two settings • Interobserver agreement reported • Procedural fidelity reported	• Report that video led to faster acquisition and facilitated generalization more than in vivo
Charlop & Milstein (1989)	• 3 students 6–7 years old • All diagnosed with autism	• Conversation skills	• Adherence to scripted conversation	• Students watched video of 2 adults having the target conversation then student asked to do the same	• Multiple probe design across settings and within subjects • Multiple probe design across behaviors • Interobserver agreement reported • No procedural fidelity reported	• Increase in adherence to script • Increase in response variation • Generalization to other topics of conversation • Generalization across settings and people
Ogeltree & Fischer (1995)	• 1 student 5 years old • All diagnosed with autism	• Semantic and pragmatic language skills	• Eye gaze • Topic maintenance • Response latency	• Watch and discuss one 2–5 min video segment from a Disney movie	• Multiple baseline design across behaviors • No procedural fidelity reported • No interobserver agreement reported	• No change in response latency • No improvements in eye gaze that can be assuredly attributed to treatment effects • Increase in topic maintenance
Simpson, Langone, & Ayres (2004)	• 4 students 5–6 years old • All diagnosed with autism	• Following directions • Sharing materials • Greeting others	• Frequency of skill performance per 36 opportunities per day (12 per target skill)	• Video embedded into an interactive computers based program describing and showing the target behaviors	• Multiple probe across students • Reports procedural and interobserver reliability	• All show improvements • Some accelerating baselines • No tests of generalization to novel settings

TABLE 1—(*Continued*)

Reference	*Participants*	*Targeted Skills*	*Dependent Variables/Measures*	*Independent Variable(s)*	*Research Design*	*Conclusions/Results*
Schreibma, Whalen, & Stahmer (2000)	• 3 students 3–6 years old • All diagnosed with autism	• reduce tantrum behavior	• Percentage of observation intervals with tantrum behavior	• View video of transition just prior to transitioning • Video did not depict models rather it showed the rout of the transition. • Verbal praise for attending to video	• Multiple probe design across participants • Interobserver agreement reported • No procedural fidelity reported	• All students reduced tantrum behavior to near zero levels
Sherer, Pierce, Paredes, Kisacky, Ingersoll, & Schreibman (2001)	• 5 students 4–11 years old • All diagnosed with autism	• Answering conversational questions	• Percentage of correct conversational exchanges including latency or response, accuracy of response and asking the therapist the same question	• Student viewed tapes of themselves correctly performing the target behavior • Students viewed tapes of others correctly performing the target behavior	• Multiple baseline design across participants • Alternating treatments design • Interobserver agreement reported • No procedural fidelity reported	• No immediate changes for 2 participants • All improved over baseline • The 2 participants who reached mastery also generalized the target skills to untrained settings and conversation partners
Taylor, Levin, & Jasper (1999)	• 2 students ages 6 and 9 • All diagnosed with autism	• Social communication • Comments during play	• Percentage of scripted comments repeated during play • Number of scripted and unscripted comments during play	• Student viewed a video segment 3 times prior to play • Video depicted sibling engaging in play with an adult	• Multiple baseline design across settings • Interobserver agreement reported	• Students acquired scripted dialogue • Evidence of response generalization
Theimann & Goldstein (2001)	• 5 students ages 6–12 years old • 4 students diagnosed with autism • 1 student with social impairments but not diagnosed with autism	• Social communication	• Number of contingent response • Number of securing attention behaviors • Number of initiating comments • Number of initiating requests	• Social story read prior to session • Self monitoring of video feedback after session	• Multiple baseline design across behaviors replicated across students • Interobserver agreement reported • Procedural fidelity reported	• Students acquired the target behaviors • Some students generalized the target behaviors to untrained settings.
Wert & Neisworth (2003)	• 4 pre-school aged children • All diagnosed with autism	• Spontaneous requesting (requesting something without prompting)	• Frequency of spontaneous requests during a 30 minute play session	• Students viewed 5-min VSM tapes daily for 5 days 60 min prior to arriving at school	• Multiple baseline design across participants • Interobserver agreement reported	• All students acquire the target skill

TABLE 2

Functional Skills

Reference	*Participants*	*Targeted Skills*	*Dependent Variables/Measures*	*Independent Variable(s)*	*Research Design*	*Conclusions/Results*
Alacantara (1994)	• 3 students 8–9 years old • All diagnosed with autism	• Grocery shopping skills	• 32 step task analysis of selecting an item and purchasing the item from the clerk at the store	• student viewed tape of teacher making a purchase then was taken to the store to do the same • Supplemented video instruction with a least to most prompting system in the community stetting	• Multiple baseline design across settings and within participants	• Students acquired the target skills • Generalized the skills across settings • Decreased total time required for student to make a purchase in the store.
Hagiwara & Myles (1999)	• 3 students 7–9 years old • all diagnosed with autism	• Washing hands • Time on task	• Percentage of steps completed of a task analysis • Average duration of on-task behavior during a 20 min session	• Viewing of a multimedia social storybook on the computer prior to opportunity to engage in target activity.	• Multiple baseline design across settings • Interobserver agreement reported without explanation of procedures • No procedural reliability reported	• Minimal change for all students • Intervention was not successful
Haring, Kennedy, Adams, & Pitts-Conway (1987)	• 3 adults 20 years old • All diagnosed with autism	• purchasing skills	• Percentage of social and operational steps performed correctly on task analyses	• Students instructed in-vivo until they achieved 90% of task analysis steps independently • Then students watched video of a familiar peer performing the target skills and were asked to do the same	• Multiple baseline design across participants • Interobserver data reported • No procedural fidelity reported	• Students all acquired skills in-vivo • Student data stabilized after introduction of the video intervention • Largest increase in the percentage of social skills performed correctly.
Lasater & Brady (1995)	• 2 students 14–15 years old • 1 participant diagnosed with autism	• Shaving • Making lunch • Sort and load laundry • Make peanut butter and jelly sandwich • Hang pants • Make bed	• number of steps performed independently on task analysis of skill • time to complete task • percentage of intervals with interfering behavior	• View sequence of 4 videos 15–30s • Answer questions during video • Behavioral rehearsal	• Multiple baseline design across behaviors • Interobserver agreement • No procedural fidelity reported	• Increased fluency in all behaviors • Reduced off-task behavior • Fluency generalized to untrained activities

TABLE 1—(*Continued*)

Reference	*Participants*	*Targeted Skills*	*Dependent Variables/Measures*	*Independent Variable(s)*	*Research Design*	*Conclusions/Results*
Norman, Collins, & Schuster (2001)	• 3 students ages 8–12 • 1 student diagnosed with autism	• cleaning glasses • putting on a watch • engaging a zipper	• % of independent response on task analysis of target skill	• Group instruction utilizing video footage as a prompt in CTD procedure • Modified with massed trials for student with autism	• Multiple probe design across behaviors replicated across students • Interobserver agreement data reported • Procedural fidelity reported	• Student with autism acquired 2 of the 3 target skills. • Reduced response duration
Shipley-Benamou, Lutzker, & Taubman (2002)	• 3 students all 5 years old • all diagnosed with autism	• Prepare to mail a letter • Mail a letter • Pet care • Set table	• Percentage of task analysis steps performed independently	• Students viewed video shot from the first person perspective • Narrator spoke on tape to give task instructions • Student was asked to do what they saw in the video right after viewing the video clip	• Multiple baseline design across behaviors replicated across students • Interobserver agreement reported • No procedural fidelity reported	• Students all made large gains in independent performance of the target skills • Maintenance data reported durability of results one month after intervention ended.

was that some of the students already possessed parts of the target behaviors in their repertoire so the gains made by these students was limited by a ceiling effect.

Three other studies specifically addressed conversation and each used video in a different manner. Ogletree and Fischer (1995) used video segments from animated Disney movies to teach a young student with autism to improve her response latency to questions, her ability to stay on topic during a conversation, and the length of time she would look someone in the eye while speaking to them. The student watched the selected video clips while discussing good and bad examples of the target behavior with the teacher. Then 10 min segments of the student's interactions were videotaped and evaluated for her engagement in the target responses. The researchers reported marginal improvement in the student's target behaviors.

Ogletree and Fischer (1995) saw the largest impact of their intervention on topic maintenance where the student moved from a ratio of on topic to off topic statements of 54% up to 100% after intervention. This comes with a caveat; the researchers admit that control over the topics in probe sessions varied and that certain topics may have provided better opportunities for the student to remain on topic. The researchers never gathered baseline data on the student's eye gaze so any data gathered after intervention cannot be attributed to effects of treatment. With regard to reducing the student's response latency, the researchers did not report any significant gains; however baseline data already showed the student responding within appropriate lengths of time to most dialogue thus intervention on this behavior may not have been warranted.

In 2001, Thiemann and Goldstein used yet another permutation of video based intervention to address conversation skills for students with autism. Targeting a range of conversation conventions (e.g. responding, securing attention, initiating a request), Thiemann and Goldstein's intervention had three primary components. The first involved students reading a social story (see Gray, 1995) that was designed to discuss the targeted skills. Second, the student's had an opportunity to interact with peers without disabilities in a situation that would require engagement in the targeted skills. The peers were taught to use either written or picture cues to prompt the student to engage in the target behaviors. These interactions were video taped. Third, following taping, the students viewed the tapes and evaluated their own behavior on the tapes in a self-monitoring exercise.

Students made improvements on acquisition of all of the dependent variables. Some students generalized the behaviors to novel settings and activities. The authors also reported that maintenance data does not show durable effects of treatment over time. Despite these positive results for acquisition and mixed results for generalization and maintenance, experimental control was questionable for some of the behaviors. For example, accelerating baselines and highly variable data before and after treatment make attribution of positive changes in behavior to treatment difficult. Further, design of the treatment did not allow for separation of effects based on different treatment elements (e.g. social stories, peer prompting, and self-monitoring). This final points stands out as especially significant because the researchers essentially evaluated three different treatment options with varying degrees of research support. Social stories have little empirical data to support their use (e.g. Kuttler, Myles, & Carlson, 1998; Hagiwara & Myles, 1999). Peer mediated instruction or peer tutoring has wide acceptance as best practice (see Fischer & Schumaker, 1995) and effectiveness of self monitoring and self management techniques have also been verified through research (see McDougall, 1998). The unique aspect of this study that teachers could easily translate into practice is the self-monitoring component. Unfortunately, the data do not show that this alone had a positive impact on student behavior.

Wert and Neisworth (2003) contributed to a scant body of literature on video self modeling (VSM). This is a procedure whereby video is collected showing the student performing some target behavior with the assistance or prompting of others. The prompts are then edited out to give the appearance that the individual is performing the target behavior independently (Hosford, 1981). In a very well controlled study the researchers evaluated effectiveness of VSM to teach spontaneous requesting to preschoolers with autism. After

taping the students during a play session receiving prompts to request items, the researchers edited out the prompts. Students then viewed these tapes each morning before going to school. All students had very stable baseline data that increased markedly once VSM was introduced. Further, students maintained the target behavior for two to six weeks following intervention. This study suggests of VSM is an very effective tool for modeling social behaviors to students with autism. It may not be the most parsimonious, however, considering the investment in time and equipment to create video tapes.

In teaching conversation skills, Sherer et al. (2001) used a research approach. Using a multiple baseline design across participants paired with an alternating treatments design, they compared effectiveness of two different types of video models (VSM and peer modeling) to teach answering conversational questions to five students with autism. To facilitate comparison the researchers used two sets of questions, one for each treatment condition. Some questions required a finite answer (e.g. what school do you attend) while others required more abstract or indefinite responses (e.g. what is your favorite game). The researchers do not report any evaluation of comparable difficulty of the question sets.

In one set of videos used for intervention, students viewed themselves correctly engaging in the target behaviors; in the other set of videos, students viewed another child without disabilities conversing with an adult while modeling the target behaviors. The video of the participant engaging in the target behaviors was created by taping a conversation with the child where the researchers prompted correct responses. In editing, these prompts were removed to produce a video with the appearance of the child engaging independently in the target behaviors. The researchers took baseline data before and after the creation of the videos to control for threats to internal validity posed by the prompted conversations. In treatment, students viewed the video of the target conversation three times on the night prior to probes.

Data showed four of five participants making significant gains in regard to the dependent variables, with two participants responding correctly in nearly 100% of opportunities. Students that reached 100% levels of appropriate social engagements also generalized this behavior to untrained settings and conversation partners. Of these students who showed large gains, all but one made rapid gains immediately upon introduction of the intervention. One student made gains only after several probe sessions during intervention; therefore changes in the student's behavior may have resulted from repeated exposure to the probe conditions rather than the video intervention. Another student never correctly responded to more than 20% of opportunities; however at baseline levels, he did not perform any of the target behaviors. The most intriguing finding from this study was comparison of the two treatments. The researchers reported no significant differences in acquisition based on which video the student watched: themselves or others. This finding implies that if the time required to make edited self modeling videos is greater than the time to tape a single model accurately performing the behavior (without editing), then using the student as their own model is not an efficient use of time.

In 2000, Schreibman et al. used video in an attempt to reduce tantrum behavior exhibited by three students with autism. The researchers produced videos of event sequences that parents reported typically elicit tantrum behavior. The videos did not depict human models, rather they showed what the student would see as the student made the transitions from their home to a community outing where they typically engaged in tantrum behavior. In treatment, students watched the videos just prior to transitioning to the community outings and they received positive verbal praise for attending to the video. This procedure appears in the literature as priming (see Wilde, Koegel, & Koegel, 1992), whereby the teacher attempts to prepare a student for a pending sequence of events by showing the student pictures, symbols or stimuli representative of coming events.

All students showed decreases in tantrum behavior to near zero levels and generalized this appropriate behavior to other community outings. Limiting the generality of these results the researchers did not provide an operational definition of their dependent variable: tantrum. While lay terminology may suggest

certain behaviors that constitute a tantrum, and the authors defined several of these, they did not describe precisely which combinations or which individual behaviors constituted a tantrum. For example, the authors described verbal resistance, which was defined as when a student said "No" or "stop," but they did not indicate if this alone was tantrum behavior. Regardless of this limitation, all students showed marked decreases in their tantrum behavior.

The last study to specifically address social skills bridges the discussion of using video to teach social skills and functional skills by evaluating the instruction of both. Charlop-Christy et al. (2000) reported on the use of video to teach an array of skills from spontaneous greetings, to appropriate cooperative play, to brushing teeth. Their research focused on comparing *in-vivo* modeling to video modeling. In the intervention students watched models (video or *in vivo*) and then were asked to do the same behavior. The researchers described using models in the video footage who engaged in the task at a slower than normal rate of speed. For their rationale they cite previous research on use of video suggesting that slower paced models facilitate acquisition, though the study they cite as an example, Charlop and Milstein (1989) did not report the evaluation of pace of modeling as an independent variable. The researchers did not specifically report if the *in-vivo* models also modeled behavior at a slower than normal pace but they stated the *in-vivo* and video conditions were identical except for means of delivery.

Both interventions were proved successful for some students on some behaviors but overall they did not have resounding effects. A few students showed dramatic gains; while some students showed only marginal gains in acquisition and in several cases trends in data remained flat across conditions. The researchers concluded that video led to more rapid acquisition and generalization.

Social skills instruction for students with autism remains a challenge for educators. Studies reviewed here provide initial evidence that video based instruction can be an effective component of intervention. Only further research will help to elucidate critical characteristics of video models and the most effective procedural uses of video as part of an instructional package. In the broadest sense, social skills function as the key to social inclusion and without proficiency in these skills, students with autism will remain isolated from their peers.

Functional Skills

In the field of developmental disabilities, the term functional skills has become a generic term used to collectively refer to sets of life skills that people need to use in the community, in their home, and in the work place. Researchers have reported use of video to teach a limited number of functional skills to students with autism. Two studies in this review (Alcantara, 1994; Haring et al. 1987) used video to teach shopping skills to students with autism. The remaining four studies used video to address a wider assortment of skills that primarily occur within the home.

Haring et al. (1987) taught three adults with autism how to purchase items from community stores *in-vivo* until they participants achieved 90% accuracy on the operational steps of the task analysis of the skill in one setting. Operational steps on the task analysis were separated from social steps with the former being essential for making a purchase (e.g. handing the cashier money) and the latter considered non-essential for making a purchase (e.g. saying hello). After achieving 90% accuracy on operational steps, the participant viewed video of a model performing the target behaviors in a store. The setting of the video taping (whether in the initial training store, in one of the generalization stores, or a setting the students never encounter) is unclear. However, once participants began watching the videos, impressive changes occurred in responses in the initial training setting and in generalization settings (these were probed periodically during training in the initial training environment and students consistently showed low levels of accurate performance).

The researchers reported large increases in number of accurate social responses made by participants after introduction of the video intervention. In addition, participants began to generalize their purchasing skills to the untrained environments. Results of this research are important to consider in the discus-

sion of community based instruction because of the inherent cost and logistical obstacles of such programs (Wissick, Gardner, & Langone, 1999). If educators can teach skills in a single setting to some degree of mastery and then use video to facilitate generalization to other settings, the teacher can maximize the effectiveness and efficiency of his or her instruction by allowing students the opportunity to learn more varied skills in more settings rather than having to spend large portions of time in a set of similar settings drilling the same skills. Video can serve as a supplement and extension of the *in-vivo* instruction.

Alcantara (1994) reported findings in use of video to teach shopping skills that differed somewhat from Haring et al. (1987). Where Haring et al. taught participants *in-vivo* and used video as a tool to facilitate generalization to untrained settings, Alcantara used video for teaching acquisition of purchasing skills following a 32 step task analysis. Students viewed narrated video of a model performing the correct behaviors. The narration included descriptions of the relevant stimuli in the video. Immediately after viewing the videos participants went into the community to make a purchase.

Alcantara (1994) reported that students began to acquire skills through video based instruction alone; however some steps in the task analysis needed direct instruction *in-vivo*. For this component of the intervention, the researcher used a least to most prompting procedure. All students acquired and generalized the purchasing skills to new settings. The researcher also reported a decrease in the total amount of time required for students to make a purchase. Measurements like this help to provide a practical framework with which to consider the success of an intervention. While reporting that a student can perform all of the steps required to make a simple purchase, if that purchase takes them 30 min, then the intervention needs reshaping to reduce the duration to a more typical level.

The next two studies both used VSM to target increases in functional skills. Rather than using video to teach acquisition of target functional skills, Lasater and Brady (1995) used video to increase participant fluency in several skills. The researchers taped students performing the target skills and similar to Sherer et al. (2001) and Wert and Neisworth (2003), they edited the tapes to represent the ideal model of the behavior. In Lasater and Brady's case, that required editing out off-task behavior during performance of the functional skills. Students viewed four videos prior to engaging in the target behavior. The first video showed the student performing the behavior with all off-task behaviors edited out, the second video showed the student's natural performance of the behavior with all off-task behavior included, and the final two videos were identical to the first. During viewing of videos, the researcher asked the student questions about the clips in an attempt to help the student to discriminate appropriate on-task behaviors. Following the video, the student and researcher engaged in a brief behavioral rehearsal of the skill and the student was then asked to perform the skill. In all cases students increased their fluency in the skill and decreased off task behavior. Further, they generalized task fluency to other untrained tasks. This suggests that the intervention succeeded in specifically reducing off task behavior that interfered with task fluency and by repeatedly viewing and discriminating on-task from off-task behavior, students learned the appropriate response durations required to complete the tasks in a reasonable amount of time.

In another study designed using self modeling, Hagiwara and Myles (1999) designed multimedia based social stories with video vignettes of the student engaged in the target behaviors. The researchers specifically addressed hand washing and time on task. The description of video clips in the multimedia based social story is very limited and therefore it is difficult to discern how videos were edited but the researchers did provide screen captures of several pages from the story book. Students went through the storybook on the computer and then had the opportunity to engage in the target behavior. Results do not provide convincing evidence of the impact of treatment. For one student, data were nearly flat from baseline to treatment with percentage of overlap almost 50% in some cases. For another student, researchers reported overlap between baseline and intervention data near 70%. The high degree of overlap between baseline and treatment conditions in this study may be attributable, in part, to the al-

ready high degree of skilled performance students exhibited in baseline. With some students already achieving above 80% accuracy (or time on task), students had very little space to improve. This study is notable because it is the only study that tried to combine video with computer technology to teach students with autism.

The final two studies used video shot from the perspective of the person engaging in the task. Shipley-Benamou et al. (2002) filmed video as if the camera were the eyes of the person performing the task. Norman et al. (2001) described this video as being filmed from the subjective view point. Students saw the hands of a person setting the table or mailing a letter depending on the target skill. The video included narration describing the steps of the skill. The first 5 s of the video included a clip of a cartoon to capture the student's attention and during the video the researchers provided verbal praise for attending. After students viewed the video they had the opportunity to do what they saw. All students made significant improvements in the target skills and these changes in behavior proved durable one month after intervention ended.

In 2001, Norman et al. used a video based instructional package with subjective video to teach functional skills to a group of students, one of whom was diagnosed with autism. Using a well described procedure, researchers taught students in a small group format using a total task presentation paired with a constant time delay (CTD) procedure (Wolery, Ault, & Doyle, 1992). The video served as part of the controlling prompt in the CTD procedure. The student with autism acquired the first skill targeted in the multiple baseline design, cleaning glasses, but the researchers had to make alterations to the procedures for him because of the length of time it took for him to acquire the skill. The researchers added a massed trials component to the intervention to assist the student with acquisition. This student then returned to the group instructional format, skipping the second skill targeted for intervention, and he succeeded in acquiring the third targeted skill (engaging a zipper) without procedural modifications. Aside from acquiring the skills, the student also made dramatic improvements in the amount of time required to complete the tasks. They reported that this method of instruction was more efficient for this student than methods with which he had previously been taught.

Similar to studies reviewed addressing social skills, researchers have successfully used video to teach acquisition and generalization of functional skills to students with autism. Again, the components of intervention require further investigation but this small body of literature suggests that a variety of skills can be taught via video based instruction. Further implications with regard to community based instruction and video use exist when one considers the ability to include video as part of a simulation or training routine.

Conclusions

What we know is what we possess in our knowledge base for educational treatment and intervention is much less than what we want to know and what we need to know. Using video to teach students with autism is an area full of possibilities for teaching individuals with autism complex skills. In the area of social skills, Sherer et al. (2001), Thiemann and Goldstein (2001), Charlop-Christy et al. (2000), Taylor et al. (1999) and Charlop and Milstein (1989) have demonstrated the power of video for teaching conversation skills. Students with autism were able to accurately imitate the models presented via video. Schreibman et al. (2000) used a unique strategy with VSM to alter tantrum behavior exhibited by students during transitions. Video has also proved useful for teaching grocery shopping skills (Alcantara, 1994; Haring et al., 1987). Others present convincing results concerning the potency of video as an instructional component for basic self-help or daily living skills of preparing food (Lasater & Brady, 1995), cleaning glasses (Norman et al., 2001), and mailing a letter (Shipley-Benamou et al., 2002).

A genuine question that arises out of syntheses such as this is: How can teachers take this information and apply it to everyday teaching and instruction? Therein lies the challenge, not only to teachers, but researchers as well. Thiemann and Goldstein (2001) presented one option of using video for students to perform self evaluations. Their report can help teachers to design protocols and pro-

grams specific to the students they serve. For example, teachers could use video to enhance student awareness of behaviors targeted for change such as the decrease of self stimulatory behaviors or the increase of time of task.

Several studies present possibilities for use of video recording of conversations (e.g., Charlop & Milstein, 1989). While this body of research demonstrates the utility of video for teaching conversations, educators need to design and implement individualized instruction to meet the needs of their students. Teachers might design video lessons that depict students initiating and sustaining a variety of conversation appropriate for individuals their age. Using information about style and types of conversations taped in the research literature as a foundation, teachers can build more comprehensive programs to help students meet their goals.

Finally, researchers have demonstrated effectiveness of using video models for teaching functional skills to learners who have autism (e.g., Norman et al., 2001). For example, video has been used to teach preparation of food, shaving, and other daily living skills (e.g., sorting clothes, making a bed). Video can isolate steps of a process and show perfect, repeated demonstrations of critical steps. Singularly, one of the more important behavioral principles for teaching students who have significant disabilities is the need to provide repetition of the targeted skills while manipulating important exemplars (e.g., materials). Video models allow for skills to be taught multiple times during the day without having the teacher involved in the instruction each time. Teachers can assign the instruction to their paraprofessional, for example, and be more confident that instruction will be reliably delivered because video models are archived, or standardized, and thus delivered in a consistent manner. In addition, video models allow teachers to provide learners with repetition of critical steps of the task analysis by replaying the prompt depicted in the video. This strategy can be especially useful when using digital video delivered by a computer. Therefore, teachers can prepare a number of lessons using video models to depict a variety of functional skills (e.g., making a bed) that can be used over again with many students.

In sum, researchers have explored a variety of skills sets in which teachers can integrate video as a component of instruction. While they have demonstrated the functionality of video to present multiple exemplars, control the presentation and allow repeated exposures to the identical stimuli as students are acquiring skills, little progress has been made in identifying the critical components of video models and video based instruction. The value of video to present an assortment of stimuli which may or may not be immediately accessible in the classroom is self-evident, but how that video is made and how it is used needs further exploration. Sherer et al. (2001) have begun to take the first steps in comparatively evaluating components of video modeling by weighing VSM against video models of adults performing target skills. Systematically isolating video components and then repackaging them into the most efficient and effective tools for teaching should be the goal of research in this area.

With video technology that can provide vivid depictions of the natural environment and with computer technology evolving to make incorporation of video into computer programs easier, researchers may want to focus further investigation into this area. Combining rapid feedback and salient interactive video features may create optimal learning environments for students with autism. The only obstacle to empirical investigation in this area is the creation of quality programs based on sound instructional practice. To date the educational software industry has provided little in this realm. If, by demonstrating products like these are viable, the dissemination of quality products to teachers and students becomes a real possibility.

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Children with autism spectrum disorders (ASDs) may struggle to self-regulate their learning, and such difficulty may be especially notable in the a...Â One intervention that has explored self-regulation in writing is the self-regulated strategy development (SRSD) approach. In this article, a review of the research using SRSD to teach children with ASD to write is conducted. Investigation yielded 11 studies including 27 participants with ASD. Results of the review indicated that students with ASD taught using an SRSD approach can improve their overall quality of writing, their discourse elements (e.g., persuasive or story) utilized, and the length of their products. Self-regulatory abilities, such as self-monitoring and planning, were also not