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Evaluating the Effectiveness of Video Instruction on Social and Communication Skills Training for Children With Autism Spectrum Disorders: A Review of the Literature

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Abstract

Video instruction as an intervention for teaching skills to children with Autism Spectrum Disorders (ASD) is gaining increased momentum in applied settings. Video instruction, comprised of video modeling, video self-modeling, and point-of-view video, has been utilized in various fields of study with various populations and target behaviors. Literature on video instruction will be reviewed to determine its effects on the acquisition and generalization of social and communication skills for students with ASD in order to determine whether empirical findings support video instruction as an evidence-based practice. Guidelines for effective implementation of video instruction strategies for students with ASD and recommendations for further research will be provided.

Keywords

Autism Spectrum Disorders, video instruction, video modeling, video self-modeling, point-of-view video modeling, social skills

A defining characteristic of individuals with Autism Spectrum Disorders (ASD) is their difficulty establishing and maintaining social relationships with others (Laushey & Heflin, 2000; Myles & Adreon, 2001; Myles & Simpson, 2001; Szatmari, 1991). Such individuals have been observed to display relative disinterest in social interactions (Dawson et al., 2004), social attachment, instrumental actions, and experience-sharing relationships (Gutstein & Whitney, 2002). These characteristics appear to prevail due to deficits in executive functioning (Fisher & Happe, 2005), sensory processing (Dawson et al., 2004), joint attention (Murray et al., 2008), pragmatic use of language to communicate (Tager-Flusberg, 2003), imitation (Ham, Corley, Rajendran, Carletta, & Johnson, 2007), and social reciprocity (White, Koenig, & Scahill, 2007).

While researchers have continued efforts toward the development of effective interventions for teaching social and communication skills to individuals with ASD (McConnell, 2002), generalization of these skills to natural environments continues to be problematic, especially for older children and adults (Owen-DeSchryver, Carr, Cale, & Blakeley-Smith, 2008). One approach that is gaining enormous momentum for facilitating generalization of these skills is video instruction (Charlop-Christy & Daneshvar, 2003; Hine & Wolery, 2006; Nikopoulos & Keenan, 2004b; Paterson & Arco, 2007; Schreibman, Whalen, & Stahmer, 2000).

Video instruction generally comprises several techniques including video modeling (VM), video self-modeling (VSM), and point-of-view video modeling (PVM). VM is described as a process where (a) a person is asked to watch a video prior to instruction in the target skill, (b) the target skill is modeled by an adult or peer within the activity context, (c) the instructor provides prompts and reinforcers to the person for attending to relevant stimuli, and (d) the person then imitates the behavior of the model when provided with the opportunity to perform the skills displayed in the video (Bellini & Akullian, 2007; Graetz, Mastropieri, & Scruggs, 2006; Sigafoos, O'Reilly, & de la Cruz, 2007).

Similar to VM, VSM involves the use of the individual being instructed as the model in the videotape instead of adults, peers, or siblings. VSM is described as a process where (a) *only* the exemplary target behavior of the student

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is displayed on the videotape minus teacher prompts and reinforcers (Hitchcock, Dowrick, & Prater, 2003), (b) the student observes his/her own adaptive behavior in the video (Buggey, 2005), (c) the student is provided with opportunities to imitate his/her own target behaviors after watching the video (Bellini, Akullian, & Hopf, 2007; Hine & Wolery, 2006; Schreibman et al., 2000), and (d) after watching oneself engaging *only* in the appropriate behavior, the student's actual behavior also tends to change (Coyle & Cole, 2004).

In contrast to the use of others or self as models for appropriate behavior, PVM has been defined as the process of videotaping elements of the environment or activity context from the *visual perspective or vantage point* of the student who needs to acquire and/or master the target responses (Hine & Wolery, 2006; Schreibman et al., 2000; Shipley-Benamou, Lutzker, & Taubman, 2002). The videographer records steps for completing an activity or transitions from one setting to another by actually navigating through the process at the eye level of the student. When students review the videotape, they see exactly what they are supposed to do from the beginning until the end of the task or routine. Such a technique, when viewed repeatedly, promotes visual comprehension, increases familiarity with materials and settings, and provides a "picture" of the completed process, ostensibly reducing task anxiety and inappropriate behavior.

While video instruction has gained momentum in recent years in the pursuit of effective practices for social skills instruction for individuals with ASD, the technology itself is not novel. In fact, the concept of using modeling for observational learning dates as far back as 40 years to the social learning theory exemplified by Albert Bandura (Bandura, 1969, 1976). Bandura emphasizes the importance of observing and modeling behaviors, attitudes, and emotional reactions of others. This theory explains human behavior in terms of continuous reciprocal interaction between cognitive, behavioral, and environmental influences. In 1969, Bandura focused primarily on neurotypical individuals and those with psychological disorders utilizing the behavior modification framework. In 1976, he advocated for the use of film as a teaching tool to enable children to watch themselves acting appropriately.

Video instruction has evolved since the 1970s as an intervention strategy. Its effectiveness has been documented in the literature with regard to training with a variety of populations on a variety of skills (Dowrick, 1999; Embregts, 2002; Haring, Kennedy, Adams, & Pitts-Conway, 1987; Hitchcock et al., 2003; Jambor & Weekes, 1995; Kern-Dunlap et al., 1992; Lasater & Brady, 1995; O'Reilly et al., 2005; Shipley-Benamou et al., 2002; Walther & Beare, 1991). Recent researchers have shown that video instruction can be used for teaching a variety of skills to students with ASD, either as an intervention by itself (MacDonald, Clark, Garrigan, & Vangala, 2005; Nikopoulos & Keenan, 2004b, 2007) or as an intervention component included with prompting and/or reinforcement (Keen, Brannigan, & Cuskelly, 2007; Murzynski & Bourret, 2007; Reeve, Reeve, Townsend, & Poulson, 2007), Social Stories™ (Scattone, 2008), and self-management (Apple, Billingsley, & Schwartz, 2005).

Researchers have evaluated the effectiveness of video instruction as a teaching tool specifically for individuals with ASD. Bellini, Peters, Benner, and Hopf (2007) conducted a meta-analysis to evaluate the *quality of evidence* on VM and VSM for children and adolescents with ASD. They reviewed 23 single-subject studies based on the criteria delineated by Horner et al. (2005) to determine the effectiveness of video instruction strategies for promoting the social, behavioral, communication, and functional or daily life skills of students with ASD. Based upon these criteria, Bellini, Peters, Benner, and Hopf (2007) suggest that VM and VSM could be labeled as an evidence-based practice. However, it is critical to note that in only 4 of the 23 studies included in their meta-analyses was VM or VSM used as the only intervention; in the other studies, researchers had combined VM and/or VSM with instructional prompts and reinforcers or additional components to the intervention (e.g., Social Stories, self-management, computerized instruction). Therefore, it seems that more evidence is needed for the effectiveness of VM or VSM alone, before qualifying these as evidence-based practices for producing behavior change in individuals with ASD.

Similarly, McCoy and Hermansen (2007) conducted a review of empirical literature on VM intervention for individuals with ASD. The authors classified 34 studies based on the type of model used for instructional purposes (e.g., adult, peer, self, point-of-view, and mixed). Their purpose was to assess the impact of video instruction on the social, academic, and functional skills of students with ASD. Their findings document effectiveness of video instruction for improving the above-noted skills for students with ASD; however, some of the researchers did not use experimental designs, and not all participants were identified with ASD. In addition, the authors did not delineate the specific intervention components of video instruction (e.g., using the VM and/or VSM alone versus additional components).

In the literature review of 19 studies conducted by Delano (2007), video instruction was the primary independent variable or intervention for students with ASD. Her analyses showed that these strategies were effective in teaching students a variety of skills including functional life skills, social-communication responses, perspective-taking skills, and problem behavior. However, a thorough analysis reveals that instructional prompts and reinforcers were included as an integral part of VM/VSM intervention in at least 5 of the 19 studies reviewed. This distinction is critical because studies in which VM or VSM were used alone (e.g., D'Ateno, Mangiapanello, & Taylor, 2003; Nikopoulos & Keenan,

2004a) were evaluated using the same criteria as those in which the use of instructional prompts and reinforcers were imbedded within the training routine.

Researchers using video technology for skills instruction for individuals with ASD have demonstrated promising outcomes. However, there is a need to (a) delineate a taxonomy of video instruction based upon the specific intervention components involved (e.g., use of video alone versus video plus instructional prompts, reinforcers, or error correction) and (b) evaluate the effectiveness of video instruction for social and communication skills training based upon technically sound research designs and procedures.

Method

Locating Studies

The focus of the literature review was on video instruction (i.e., VM, VSM, and PVM) within the last three decades. In locating relevant studies, journal articles published between 1980 and 2008 were searched utilizing a university EBSCOhost database (e.g., Academic Search Complete, ERIC, Education Research Complete, JSTOR, Professional Development Collection, Psychology and Behavioral Sciences Collection, PsycARTICLES, PsycCRITIQUES, PsycINFO, Social Sciences Abstracts). Specific key words used in the search were as follows: *video modeling, video feedback, video modeling and autism, video modeling interventions, videotape modeling, video instruction, Asperger syndrome and video modeling, ASD and video modeling, video self modeling and autism, video self-modeling, social skills and autism, social skills interventions and autism spectrum disorders, social skills and video self modeling, social skills and video instruction, and social skills and video modeling.* Other articles were found by cross-referenced citations from previously identified studies. Journal articles that were not available through this database were obtained by directly contacting the authors (e.g., Simpson, Langone, & Ayres, 2004). Of the 40-plus studies that were identified, only 26 studies met the criteria for inclusion in this review.

Inclusion-Exclusion Criteria

Guidelines provided by Odom et al. (2005) were used as the basis for specifying inclusion and exclusion criteria. Articles included in this review had to meet the following five conditions:

1. The intervention (i.e., the independent variable) had to be a video instruction strategy (i.e., VM, VSM, or PVM) where it was (a) the primary intervention *without* other components (e.g., prompts and reinforcers), (b) the primary intervention *with* additional components (e.g., prompts and reinforcers), (c) one component of a multielement intervention package, (d) compared with another intervention strategy (e.g., in-vivo) to determine the relative effect of each intervention. Studies in each classification category were evaluated separately. Non-examples included studies where video instruction was not used to teach target skills but to provide feedback after conducting the observation, especially in the absence of another component of video instruction (i.e., VM, VSM, or PVM) (e.g., Thiemann & Goldstein, 2001).
2. *All* research participants in the selected studies had to have been diagnosed with an autism spectrum disorder unless participants also included a control group or students without a disability who served as communication partners of the participants. Non-examples included studies where video instruction was used with participants with disability classifications other than ASD (e.g., Bidwell & Rehfeldt, 2004; Embregts, 2002), unless the classification was comorbid with ASD (e.g., Dauphin, Kinney, & Stromer, 2004; Nikopoulos & Keenan, 2003). In addition, studies where some but not all participants had ASD were excluded (e.g., Norman, Collins, & Schuster, 2001) because the purpose of these studies was to evaluate the effectiveness of video instruction per se, not specifically as implemented with students with ASD.
3. The video intervention had to be used to target social and/or communication responses as the primary dependent variable. Non-examples included video instruction for teaching functional life skills (e.g., Alcantara, 1994; Ayres & Langone, 2007; Haring et al., 1987; Keen et al., 2007; Murzynski & Bourret, 2007; Shipley-Benamou et al., 2002) or academic performance (e.g., Coyle & Cole, 2004).
4. Researchers had to utilize a research design and methodology that allowed for evaluation of the effect of intervention on participant behavior (e.g., experimental with group comparisons, quasi-experimental, and/or single-subject research; a reversal or a Multiple Baseline [MBL] design). Non-examples included studies that utilized a non-experimental design (e.g., Baharav & Darling, 2008; Bernad-Ripoll, 2007; Coyle & Cole, 2004; Dauphin et al., 2004; Reagon, Higbee & Endicott, 2006) or a design with no baseline for comparing intervention effects (e.g., Ogletree, Fischer, & Martin, 1995).
5. The articles had to have been published in a peer-reviewed journal in the English language (selected under the advanced search option on EBSCOhost).

Non-examples included articles in journals or bulletins where the editor alone was the primary reviewer and decision-maker or articles that were disseminated in a foreign language without English translation.

Two or more experiments within a single article were counted as replications of the first experiment instead of separate studies (unlike the reviews by Delano, 2007, and McCoy & Hermansen, 2007). Similarly, each article was classified in only one category (i.e., VM, VSM, or PVM) even though more than one type of video instruction strategies was included (e.g., VM and VSM as in Sherer et al., 2001).

Results and Discussion

Twenty-six studies were included in this literature review involving a total of 104 participants. All except one (e.g., Kroeger, Schultz, & Newsom, 2007) of these studies utilized a single-subject research design to document effect. While the ages of participants ranged from 2.5 to 15 years, approximately 96% (n = 24) involved preschool- or elementary-age children. Of the 26 studies, adults, peers, and/or siblings were utilized as video models in 20 interventions, self (i.e., the target student) was the model in 4 studies, and point-of-view videos were used in 2 studies. Eleven of these studies were conducted in regular school settings alone, 4 in home settings alone, 5 in clinical settings or medical centers alone, 1 in a residential program, 1 in the university-based preschool program, and the remaining 4 in any of two of these settings including school, clinical, home, community, or university-based preschool.

VM Interventions

The purpose of VM is to allow a student to see the appropriate actions for performing the target behavior immediately prior to performing the skill, increasing the probability of successful performance. Students watch a short video clip of discrete target behaviors in its entirety before performing these behaviors or watch a clip of one step, perform the step, and continue the same until the task procedure is completed. For discrete behaviors of short durations, a 3- to 5-min video clip is generally considered to be adequate given the relatively low attending skills of students with ASD (Buggey, 2005).

VM as the primary intervention without additional intervention components. Of the 20 studies on VM included in this review, only 4 studies (D'Ateno et al., 2003; MacDonald et al., 2005; Nikopoulos & Keenan, 2004b, 2007) used VM alone without any additional component including instructional prompts or reinforcers for teaching target skills to nine children between the ages of 4 and 10.5 years (see Table 1). During intervention, if participants initiated an interaction (e.g., asked a question, made a comment), the experimenter responded accordingly; however, the response was not a prompt, correction, or reinforcer. Outcomes from 3 of the 4 studies (MacDonald et al., 2005; Nikopoulos & Keenan, 2004b, 2007) were interpreted to conclude that participants not only acquired the target skills but also maintained and/or generalized the target responses to untrained people, objects, and settings. The adult (i.e., experimenter) and peer models used by Nikopoulous and Keenan (2004b) were unfamiliar to the children prior to the study; however, the children liked watching videos, which may have resulted in attention to the relevant features. It also is possible that two viewings of short (30-s) and scripted video clips may have facilitated attention to the relevant stimuli. The 4 studies in this category were designed to provide a true evaluation of the effect of VM on the acquisition of target skills because no other variables that could potentially confound the outcomes were included in the intervention.

These findings are critical for inferring that the acquisition of target skills occurred by watching video clips of the model performing the target responses without any instructional prompts, corrections, or reinforcers contingent upon the occurrence of target responses. Many educators assume that all instructional situations targeting novel skills require the use of antecedent prompts to evoke correct responding, the use of error correction procedures to promote accurate responding, and reinforcers to maintain the rate of occurrence. In each of these studies, researchers used stimulus materials that promoted acquisition of skills in the absence of prompts, corrections, and reinforcers.

VM as the primary intervention with additional intervention components (e.g., instructional prompts and reinforcers). In the 20 studies involving VM, five sets of researchers (Charlop & Milstein, 1989; Charlop-Christy & Daneshvar, 2003; Kroeger et al., 2007; Paterson & Arco, 2007; Taylor, Levin, & Jasper, 1999) reported using instructional prompts and reinforcers for teaching target skills to 23 children between the ages of 3 and 9 years (see Table 2). In all except 1 of the 5 studies (i.e., Kroeger et al., 2007), a single-subject research design was used to evaluate effects. VM in these studies was accompanied by the use of instructional prompts; tangible, edible, or verbal reinforcers; redirection (e.g., Paterson & Arco, 2007); or review of video content after the viewing (Charlop-Christy & Daneshvar, 2003; Taylor et al., 1999) for training on target skills. All researchers except Charlop-Christy and Daneshvar (2003) reported using tangible or edible reinforcers to maintain correct responses.

In the only experimental study in which researchers utilized a matched random group comparison design (Kroeger et al., 2007), intervention involved direct instruction to teach target responses for 5 weeks, with a new target skill each week. While students in both groups showed increases in prosocial behavior, 13 children in the experimental group

Table 1. Studies Where Video Modeling (VM) Was the Only Intervention Component

Author(s)	Design	Participants	Target Skills	Model	Setting	Intervention Components	Outcome
D'Ateno, Mangiapanello, & Taylor (2003)	MBL across responses	1 child, 3 years	Play behavior (verbal and motor responses)	Adult	School	VM alone (without prompting, correction, or reinforcement procedures)	VM led to acquisition of scripted verbal and modeled motor responses but not for unscripted verbal and non-modeled motor responses.
MacDonald, Clark, Garrigan, & Vangala (2005)	Multiple Probe within child across play sets	2 children, 4 and 7 years	Scripted and unscripted actions and verbalizations for pretend play	Adult	School	VM alone (no prompts or reinforcers except to cue play time)	Both children acquired scripted verbalizations and play actions during VM with maintenance during follow-up. Zero or low occurrence for unscripted responses was noted.
Nikopoulos & Keenan (2004b)	MBL across participants	3 children, 7.5 to 10.5 years	Social initiation, reciprocal play, object engagement, and others	Unknown adult and peer	School	VM alone without any instructional prompts or reinforcers, but response to participant initiations were provided	Target skills were acquired and generalized across toys and settings; effects were maintained at follow-up.
Nikopoulos & Keenan (2007)	MBL across participants in the first experiment	3 children, 6.5 and 7 years	Social initiations, reciprocal play, and imitation	Peer	School	VM alone wherein different videos showed engagement in increasing number of play activities. Responses to participant initiations were provided.	VM enhanced acquisition of target skills that generalized across peers and maintained at follow-up. Results of Experiment 2 not noted because the design was non-experimental (AB).

Note. MBL = Multiple Baseline design.

showed higher gains during play activities. The authors noted that the use of direct instruction of social skills per se, whether through the use of video or in-vivo instruction, is what may have resulted in skill acquisition. In other words, it is not clear whether VM specifically was more effective given that children in the control group who also received direct instruction in target skills also showed increases in target skills. This definitely appears to be an area requiring further study.

VM as one component of a multielement intervention package. Eight of the 20 studies on VM fell into this category, where a multielement intervention was used to teach target skills to 27 children ages 4 to 15 years (see Table 3). In 6 of the 8 studies (i.e., Apple et al., 2005; LeBlanc et al., 2003; Maione & Mirenda, 2006; Nikopoulos & Keenan, 2003, 2004a; Reeve et al., 2007), additional components were added when VM alone did not increase the target responses of participants. These multielement interventions included not only instructional prompts to evoke correct responding and tangible or verbal reinforcers for correct responses but also other teacher-directed strategies contingent upon incorrect responding. In other words, researchers in all 8 studies

Table 2. Studies Where Video Modeling (VM) Intervention Included Instructional Prompts and/or Reinforcers

Author(s)	Design	Participants	Target Skills	Model	Setting	Intervention Components	Outcome
Charlop & Milstein (1989)	MBL across participants	3 children, 6 to 7 years	Conversation skills	Adult	Home and clinical	VM with instructional prompts and tangible reinforcers from 4 to 20 presentations for effect	Conversational skills of children generalized and maintained over a 15-month period
Charlop-Christy & Daneshvar (2003)	MBL across children and within child	3 children, 6 to 9 years	Perspective-taking skills	Adult	Clinical	VM with prompts and training in target skills; reviewed content with child after two viewings	Positive outcomes for both stimulus and response generalization
Kroeger, Schultz, & Newsom (2007)	Matched random group comparison	25 children, 4 to 6 years (13 in experimental group)	Social and communication skills	Peer	PDD clinic	Direct instruction during VM with prompts and edible reinforcers followed by prompts to display target skills during play	Both groups increased prosocial behavior, but the experimental group (VM) showed higher gains in initiating, responding, and interacting with peers
Paterson & Arco (2007)	MBL across toys and a reversal	2 children, 6 to 9 years	Verbal and motor play behavior	Young adult	School	VM plus instructional prompts, redirection, and reinforcers (verbal and tangible)	Appropriate play increased, repetitive behavior decreased; generalized play with related toys
Taylor, Levin, & Jasper (1999)	MBL probe design across activities	2 children, 6 and 9 years	Scripted, unscripted play comments	Adult and sibling	Home	Three video viewings; repeated prompts until correct response was made. Reinforcers for correct responding to adult's comments.	VM resulted in a slow or variable but steady increase in play comments or statements for both children during play activities with their respective siblings.

Note. MBL = Multiple Baseline design; PDD = Pervasive Developmental Disorder.

used additional components to decrease errors in responding. LeBlanc et al. (2003) described their intervention as "VM and Reinforcement," whereas skills instruction and error correction procedures were incorporated as well. Addition of instructional prompts to VM promoted acquisition of complex skills (Reeve et al., 2007). However, any effects could be a function of all or some components (Scattone, 2008; Simpson et al., 2004). Additionally, comparisons between conditions may not be appropriate due to structural differences in the content and delivery of intervention conditions (Apple et al., 2005).

The implication of adding these intervention components to VM is the need to evaluate the reasons why VM alone was ineffective in producing the desired target responses. Specific attention needs to be paid to the elements of the video itself, for example, the length of each video clip watched by participants (only some studies reported the length), the number of viewings, time lapse between video-viewing and opportunity to perform the target response, and whether experimenters conducted debriefing sessions with participants after watching the video clip. The implication is to document the procedural fidelity of implementation of the various components of the intervention package.

VM compared to another intervention strategy to determine relative effects of each intervention. Of the 20 studies on VM, only 3 constituted this category (Charlop-Christy, Le, & Freeman, 2000; Gena, Couloura, & Kymissis, 2005; Sherer

Table 3. Studies Where Video Modeling (VM) Was a Component of a Multielement Intervention

Author(s)	Design	Participants	Target Skills	Model	Setting	Intervention Components	Outcome
Apple, Billingsley, & Schwartz (2005)	MBL across participants	5 children, 4 to 5 years	Compliments and social initiations	Adult and peer	School	VM and tangible reinforcement in Study 1; VM and self-management (clicker or checklist) in Study 2	Addition of tangible reinforcement (Study 1) and self-management (Study 2) to VM increased target skills of children.
LeBlanc et al. (2003)	MBL across tasks for each student	3 children 7 to 13 years	Perspective-taking skills (mutually exclusive coding category, i.e., pass or fail)	Adult	School	VM with prompts and tangible reinforcers for correct responding; video paused to instruct on target skills; replay of video with instruction and error correction for incorrect responses; three to eight viewings	VM with added components resulted in delayed acquisition of target skills; learned responses showed limited generalization.
Maione & Mirenda (2006)	MBL across play activities	1 child, 5.7 years	Social initiations and verbalizations	Adult; peer + self	Home	Multiple conditions included VM alone; VM + feedback; VM + feedback and prompting	The addition of feedback with and without prompting to VM increased scripted and unscripted verbalizations and initiations.
Nikopoulos & Keenan (2003)	Multiple-treatments design for 6 children; an AB for 1	7 children, 9 to 15 years with autism as the primary diagnosis	Latency (for social initiation) and duration of appropriate play	One familiar or unfamiliar adult, a peer or self	School	VM with toy sets for 5 children; VSM for one child, and extended appropriate play for another child due to low duration of target behavior; prompts used	High variability for both latency and duration; mixed evidence of effect for all students during follow-up. Zero effect was noted for 3 of 7 students.
Nikopoulos & Keenan (2004a)	MBL across participants	3 children, 7 to 9 years	Social initiations; reciprocal play	Peer	Clinical	VM with modified conditions or change in stimulus materials when target behavior did not occur within 25 s of viewing	Target skills improved and maintained at follow-up
Reeve, Reeve, Townsend, & Poulson (2007)	MBL across participants	4 children, 5 to 6 years	Helping behavior	Adult and peer	Separate school	VM plus verbal prompts when no target response occurred at initial presentation of S^d (verbal and manual prompts until correct); S^{R+} for correct responding.	Various topographies of helping increased; generalization to novel stimuli as a function of discrimination training
Scattone (2008)	MBL across three behaviors	1 child, 9 years	Eye contact, smiling, and social initiations	Adult	Medical center	Social Stories™ on the three target responses were presented in a video. First viewing was with interventionist; others were at home with parent daily.	The combined intervention increased eye contact and social initiation but did not increase smiling.
Simpson, Langone, & Ayres (2004)	Multiple probe design across behaviors	4 children, 5 to 6 years	Sharing, following teacher directions, and social greetings	Peer	School	A computer program (HyperStudio) with 22 skills-instruction cards with embedded video clips on each social skill. Teacher prompts for navigating the program but not for target response. Used comprehension questions.	While interaction with their peers without a disability increased for all students, target skills for 1 student had already started to increase during baseline, and target skills did not reach criterion levels for another student.

Note. MBL = Multiple Baseline design; VSM = video self-modeling.

Table 4. Studies Where Video Modeling (VM) Was Compared With Another Intervention

Author(s)	Design	Participants	Target Skills	Model	Setting	Intervention Components	Outcome
Charlop-Christy, Le, & Freeman (2000)	MBL across children and within child	5 children, 7 to 11 years	Social, communication, and functional responses	Adult	Clinical	VM and in-vivo with prompts and reinforcers for attending to the model but not for target skills; prompt was used to evoke imitation of model's behavior	VM rather than in-vivo modeling led to faster acquisition and generalization of target responses for 4 of 5 children.
Gena, Couloura, & Kymissis (2005)	MBL with ABAC with generalization where B was VM and C was in-vivo instruction	3 children, 4 to 6 years	Affective behaviors	Peer	Home	VM included prompts, error correction, and reinforcement for attending; in-vivo included prompts, correction, and reinforcement for accurate target responses.	Both VM and in-vivo were relatively effective in the acquisition and generalization of affective responses. A steady pattern during in-vivo might have been produced through contingent reinforcement for target responses.
Sherer et al. (2001)	MBL with alternating treatments (peer vs. self as model)	5 children, ages 4 to 11 years	Response to conversation questions (asked by adult)	Peer	Home and clinical	Each child watched the videotape thrice in the evening before going to bed. Subsequently the therapist conversed with child to assess learning.	Skill acquisition for 4 of 5 students occurred with one or the other or both types of models; however, for 1 student neither method was effective.

Note. MBL = Multiple Baseline design.

et al., 2001) across 13 children, ages 4 to 11 years (see Table 4). In a study comparing VM versus in-vivo training, Gena et al. (2005) used different error correction procedures. During the in-vivo condition, the therapist modeled the correct response following an error with three demonstrations per trial. During the VM condition, the participant was shown the video of the peer model while the therapist guided the child to attend to the peer in the video and display the same response during three trials. If the participant still displayed the incorrect response (i.e., words and emotion), the therapist modeled the correct response one time. In other words, children in the VM condition did experience at least one demonstration of in-vivo modeling of the correct response, making the comparison between VM and in-vivo technically not equal or comparable. Charlop-Christy et al. (2000) also compared VM with in-vivo training and noted that overall VM was more time and cost efficient when compared to in-vivo training. While the researchers compared the relative effect of VM versus in-vivo training in the first 2 studies, Sherer et al. (2001) compared the effectiveness of VM to VSM on target skills. The two participants with the highest level of performance on target responses in the Sherer et al. study also indicated greater preference for visual stimuli and qualitatively better visual memories. Unlike their less successful peers, these two children also generalized and maintained target responses. This finding relates to the need for assessing visual preferences of participants prior to using video instruction as an intervention strategy.

VSM Interventions

VSM differs from VM in that VSM involves videotaping the participant instead of other adults, peers, or siblings as a model. The assumption is that there is no better model similar in age, gender, race, and other characteristics than oneself (Bandura, 1969; Buggey, Toombs, Gardener, & Cervetti, 1999). VSM interventions usually fall into two categories (Dowrick, 1999), positive self-review and video feed forward. Positive self-review refers to individuals viewing themselves successfully engaging in a behavior or activity that is already in their repertoire or one they are learning. In

Table 5. Studies Where Video Self-Modeling (VSM) Was the Primary Intervention

Author(s)	Design	Participants	Target Skills	Setting	Intervention Components	Outcome
Bellini, Akullian, & Hopf (2007)	MBL across students	2 children, 4.4 and 5.2 years	Unprompted social engagement with peer	School	A 2-min video of children displaying target behavior; prompts for attending but not for eliciting target responses	Highly variable behavior pattern despite an overall increase in target responses; social engagement maintained after VSM was withdrawn
Buggey (2005)	MBL across students or behavior	5 children (across 3 studies), 5 to 11 years	Social initiations, response to questions, and problem behavior	School	A 3-min videotape using role-play scripts for self and peers; praise embedded in the video but not during the viewing	Target responses improved for all, but the response rate for 2 students decreased during the maintenance phase. Problem behavior for all students decreased.
Buggey, Toombs, Gardener, & Cervetti (1999)	MBL across students	3 children, 8 to 11 years	Verbal responses to questions of an adult	Home	Prompts for attending to video; children could watch the 3- to 5-min video as many times as they wished	Overall increase in appropriate responding were noted; however, gains were noted during baseline, and responses decreased during maintenance.
Wert & Neisworth (2003)	MBL across participants	4 children, 3 to 6 years	Spontaneous requesting	School and home	A 5-min video with embedded adult prompts that children watched at home on five school days	Spontaneous requesting increased and maintained for 3 of 4 children; maintenance was not evaluated for one child.

Note. MBL = Multiple Baseline design.

video feed forward interventions, individuals observe themselves successfully demonstrating skills that are slightly above their current capability. The positive self-review form of VSM has been used as an intervention strategy for individuals with autism.

Using VSM to teach social skills to students with autism can be challenging for several reasons. First, videotape samples of students displaying exemplary behavior are generally accumulated over time by encouraging the students to role-play or imitate the target behavior (Buggey et al., 1999; Delano, 2007). Second, obtaining the child's cooperation with task demands for videotaping can be time consuming, especially if the target skill is novel (Bellini & Akullian, 2007; Sherer et al., 2001). Third, VSM necessitates acquisition of the target response at some level in order to videotape, which can be difficult for skills that a student has not acquired. However, VSM is considered to be effective for students who are motivated by watching themselves on video (Buggey et al., 1999). Nikopoulos and Kennan (2004a) suggest that observing one's target responses and contingencies for successful performance may serve as an establishing operation that increases the value of social praise as a reinforcer in the activity context.

Of the 26 total studies in this review, in only 4 studies (Bellini et al., 2007; Buggey, 2005; Buggey et al., 1999; Wert & Neisworth, 2003) was VSM utilized as the primary intervention *without* other intervention components like instructional prompts and reinforcers during the data collection. However, adult prompts were embedded within the video clip to enable participants to attend to relevant stimuli. All videotapes were edited to exemplify the student's appropriate or desired responses. These 4 studies included 14 children, ages 3 to 11 years, and intervention was implemented in the school and/or home setting (see Table 5).

Participants in each of these studies were shown the video clips ranging from 2 to 5 min, at the start of session or at home. Unlike interventions involving VM in school settings where students engaged in the target activity immediately after watching the videotape, the authors of the four studies on VSM did not discuss the latency between video viewing and opportunity to perform the target responses. However, all children watched the videotape on all school days of the week. Interpretation of the results of these four studies showed that overall, VSM increased target responses such as social initiations and engagement, response to others' questions, and spontaneous requests. Bellini et al. (2007) found while the absolute mean rate of social interactions of both participants increased relative to baseline and the percentage of non-overlapping data for intervention was 80%, the behavioral pattern of both children showed high variability (Range 5%–75%, Participant 1; Range 0%–50%, Participant 2) throughout the intervention and maintenance phases, undermining the impact of the intervention.

Similarly, Buggey et al. (1999) discovered the target responses of two of three participants started to increase

Table 6. Studies Where Point-of-View Video Modeling Was the Primary Intervention

Author(s)	Design	Participants	Target Skills	Setting	Intervention Components	Outcome
Hine & Wolery (2006)	Multiple-probe design across two behaviors and across 2 participants	2 children, 2.5 and 3.6 years	Toy-play skills	University-based preschool	Point-of-view modeling that showed adult's hands performing actions with target materials	Point-of-view modeling was effective in teaching toy-play actions for both children. Target behavior was maintained and generalized across materials and activity settings.
Schreibman, Whalen, & Stahmer (2000)	MBL Multiple Baseline across participants	3 children, 3 to 6 years	Severe problem behavior (e.g., crying, screaming, dropping on the floor)	Home and community	Transition routine as a child would see it when progressing from one setting to another; video showed only the settings	Video instruction led to decreases in problem behavior with generalization to new transition situations.

Note. MBL = Multiple Baseline design.

during baseline, which undermined the effect of VSM as an intervention strategy. The effectiveness of VSM was more clearly documented in Buggey (2005). Wert and Neisworth (2003) found large overall increases in the target behavior for three of four children, even though each participant exhibited varying levels of language capability. There is limited evidence on the effectiveness of VSM as an intervention strategy for improving the social and communication responses of students with ASD. Clearly, further research is warranted to determine what child characteristics make VSM an effective intervention strategy.

PVM Instruction

PVM requires videotaping elements of the environment or activity from the vantage point of the student. Among the 26 studies in this review, PVM was utilized by the researchers in only 2 studies involving five children (2.5 to 6 years; see Table 6). Hine and Wolery (2006) used an animated cartoon clip with task directions by a narrator whose voice was not familiar to the child. Embedded within toy play modeling was the narrator's voice providing contingent reinforcement for appropriate play behavior. After watching the video, each child engaged in the activity with the same materials, but further instructions and reinforcers were withheld. Schreibman et al. (2000) used PVM as an antecedent strategy to make transition routines more predictable for students in order to decrease their problem behavior. The researchers videotaped the entire transition routine from start to finish and asked the participants to watch the short video clip immediately prior to these transition routines at their respective settings. All children slowly and steadily showed decreases in problem behaviors that generalized across untrained routines. Researchers in both studies on PVM showed experimental effect. Based on these outcomes, it appears that PVM might be a promising intervention strategy; however, further research is needed to proclaim PVM as an effective intervention.

Guidelines for Effective Video Instruction

Based on this review of VM, VSM, and PVM research that met the criteria delineated by Odom et al. (2005) for evaluating the quality of special education research, it appears that some evidence exists to support video instruction to teach social and communication skills to students with ASD. This teaching strategy appears to (a) capitalize on the children's affinity for visual stimuli (Schreibman et al., 2000), (b) improve the efficiency with which instruction can be delivered (Charlop-Christy et al., 2000), (c) enable precise management of instructional stimuli and contingencies, and (d) promote consistency, with minimal training, across providers and settings, including homes (Wert & Neisworth, 2003). The guidelines for effective implementation of video instruction gleaned from this review are as follows:

1. The use of instructional prompts and reinforcers or error correction appears to be more effective for promoting acquisition, maintenance, and generalization of target skills. In some studies, the addition of reinforcement or prompting and feedback were necessary to improve the frequency of targets. This is critical as educators advocate the use of systematic instruction involving a sequence of prompts, corrective feedback, reinforcers, and opportunities to practice to promote learning of complex

behaviors such as social and/or communication skills. This point is reiterated by Kroeger et al. (2007), who showed that direct instruction was effective in teaching prosocial behavior whether it was delivered through a videotape (experimental group) or in-vivo (control group).

2. It is necessary to evaluate the child's skills in attending, imitation, visual processing and comprehension, matching-to-sample, and spatial ability in order to determine the amount of content and the length of the video. While a growing number of researchers document that children with ASD have deficits in imitation (see Rogers, 1999, and Smith & Bryson, 1994, for detailed reviews), researchers also have documented the success of teaching these children a variety of imitation skills through discrete trial training (e.g., Ingersoll & Schreibman, 2006; Stahmer, Ingersoll, & Carter, 2003).
3. Children who are able to attend to a video for at least 1 min are more likely to benefit from this instructional strategy when compared to students who are more distracted by irrelevant features like "noise" (conversation), clothes of the actors, or other features (Nikopoulos & Keenan, 2003). The camera should focus at a close angle only on the relevant cues and target responses to which children should attend.
4. It is important to keep the video clip between 3 and 5 min in duration as this feature was found to be effective in sustaining the attention of participants. Two viewings of the video clip appeared to be more effective than just one viewing. For children who were reinforced by watching videos, repeated viewing (3–4 times) also was effective.
5. The type of model (peer, familiar or unfamiliar adult, or self) did not appear to affect student learning in any manner. It appears that all types of models could be effective. However, using VSM was noted to be less efficient when compared to VM (Charlop-Christy et al., 2000).

Recommendations for Further Research

The method of implementation of intervention was not necessarily consistent across studies in this review with respect to the length of video clips, time lapse between video viewing and the opportunity to respond, number of video viewings per session, similarity between the real environment and the one depicted in the video, and sequence of the training routine and where instructional prompts and reinforcers were embedded. Clear delineation of these aspects is needed to determine whether video instruction could be considered to be an evidence-based intervention. Collecting data on the fidelity of implementation with respect to the integrity of the intervention and the process will lend more credence to the effectiveness of video instruction as an evidence-based intervention for social and communication skills instruction for individuals with ASD.

The specific effect of instructional procedures including prompting, error correction, and reinforcers relative to video instruction is needed in order to determine whether VM alone or with other components is more effective. Since there were only four studies in which researchers used VM alone, no conclusions can be made regarding its effectiveness. Conducting a component analysis (Cooper et al., 1995; Hanley, Piazza, Fisher, & Maglieri, 2005; Richman, Wacker, & Winborn, 2001; Wacker et al., 1990) is suggested to demarcate the effect of VM from instructional prompts (for attending and for evoking target responses), reinforcers, and error correction procedures. It is critical to know whether video instruction is an essential component of social skills instruction involving other instructional strategies, or vice versa.

Future research is needed to enable interventionists to make better decisions about which specific video instruction strategy (i.e., VM, VSM, or PVM) would be a good fit for students with ASD based on their varied behavioral characteristics. Based on this review, it appears VM would be more effective for students with good attending skills and higher tolerance for auditory stimuli. VSM appears to be more effective for students who are motivated by viewing themselves on tape and are more likely to cooperate with the interventionist during videotaping. However, it would not be effective with students who are more fascinated with their own image rather than the target behavior that should be observed. It also appears that PVM was effective with students who display problem behavior during difficult transition routines and other unpredictable events. With very few studies on VSM (4) and PVM (2) that met the inclusion criteria for this review, additional research is needed to investigate the effectiveness of VSM and PVM as strategies for skills instruction with students with ASD.

Finally, a majority of the participants in studies included in this review were preschool- or elementary-age children of Caucasian decent. There is a need to study the effectiveness of video instruction strategies with older children and adults as well as students with ASD who are culturally and linguistically diverse.

Video instruction for social and communication skills for children with ASD seems to demonstrate promising outcomes. To identify video instruction as an evidence-based intervention, future researchers should focus on (a) documenting the fidelity of intervention procedures, (b) analyzing the specific effects of VM vis-à-vis instructor behaviors, (c) developing a profile of participants based on behavioral characteristics to determine which strategy (VM, VSM, or PVM) would be more effective for skills instruction, and

(d) implementing video instruction with older children, adults, and individuals from diverse cultural and language groups.

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