Research Article

Improving Social Initiations of Children with Autism Using Video Self-Modeling with Video Feedback: A Case Study

Lema Kabashi

Ph.D., Assistant Professor – Special Education
Educational Studies, University of Wisconsin-La Crosse, La Crosse, WI, USA
Corresponding Author

Ann Epstein

Ph.D., Associate Professor – Early Childhood
University of Wisconsin-La Crosse, WI, USA

Abstract

The purpose of this A-B subject research design was to investigate the efficacy of video self-modeling with video feedback using an iPad to promote social initiation skills in a young child with Autism Spectrum Disorder (ASD). It was hypothesized that the participant would increase social initiations toward peers in an inclusive preschool classroom by viewing a video of himself performing four targeted behaviors. The participant's paraprofessional and his early childhood special educator implemented the intervention and provided feedback on his performance. Findings of this case study revealed improvements in the four targeted behaviors: approaching, greeting, inviting, and interacting with a peer. As a result of the intervention, the participant demonstrated generalization of target behaviors across settings, peers, items, and activities. In addition, the target behaviors were maintained one month after the intervention was withdrawn. Social validity results from the participant's parents as well as his paraprofessional and teachers supported efficacy of the intervention.

Keyword: autism, children, social initiations, video self-modeling, video feedback

1. Introduction

Difficulties in social communication and interaction skills distinguish children with Autism Spectrum Disorder (ASD) from children with any other developmental disability. Commonly observed deficits include establishing and maintaining friendships, initiating and responding to others and engaging in meaningful conversations (Macphearson, Charlop, & Miltenberger, 2014). Asking questions, smiling and making eye contact, giving and acknowledging compliments during a social exchange (Rao, Beidel, & Murray, 2008), and participating in cooperative and interactive play with peers (Boudreau & D'Entremont, 2010) are challenging skills as well.

Such deficits may impact not only children's communicative and social development but also their academic achievements, independence, and overall mental health (Rao et al., 2008). Relationships and acceptance with peers (Plavnick, Sam, Hume, & Odom, 2013) and eventually employment and other community functioning (Yakubova & Taber-Doughty, 2013) may also be negatively affected.

Although such difficulties may be present throughout one's lifetime, researchers claim that children with autism have better outcomes when provided with appropriate behavioral or developmental interventions, or some integration of the two, in their early years (Boyd, Odom, Humphreys, & Sam, 2010; Wong et al., 2015). Numerous evidence-based strategies have the potential to improve social communication and interaction skills for children with autism, for example social skills training (Reichow & Volkmar, 2010), Pivotal Response Training (PRT) (Koegel, Vernon, & Koegel, 2009), social stories (Kokina & Kern, 2010), and peer mediated interventions (DiSalvo & Oswald, 2002).

The recent infusion of video technology into behavioral interventions offers children with autism, who have an affinity for visual learning, another tool for strengthening social communication and interaction skills, in particular social

initiation skills. Video self-modeling, one type of video based instruction, has proven to support children with autism by increasing social engagement (Bellini, Akullian &, Hopf, 2007), spontaneous requesting (Wert & Neisworth, 2003), and social initiations (Buggey, 2005; Buggey, Hoomes, Sherberger, & Williams, 2011).

In addition to video self-modeling, video feedback has also been shown to be effective in promoting social initiation skills. Video-based feedback, according to Gyl and Vuran (2010), consists of the study participant watching a non-edited video of his/her own behavior and then co-reviewing it with the interventionist in order to evaluate his/her own behavior(s) and make adjustments in future performances. Thiemann and Goldstein (2001) coupled video feedback with written text and pictorial cuing. Deitchman, Reeve, Reeve, and Progar (2010) incorporated video feedback into self-management training. They presented participants with two video clips, one showing a social initiation and the other not showing a social initiation. After the experimenters modeled discrimination of appropriate vs. not appropriate behaviors, the participant was invited to evaluate his behaviors on videos from the previous day. Correct discrimination resulted in specific verbal praise by the experimenter as well as tangible rewards (i.e., penny in the jar). Thiemann and Goldstein used video feedback (similar to Deitchman et al.) with the addition of written and pictorial cues. Both studies used a reward system to reinforce participants' accurate discrimination of appropriate vs inappropriate behaviors. Results of both studies indicated increases in social initiations for all participants, demonstrating intervention efficacy.

Several studies aimed at improving social initiation skills of young children with autism were implemented in a natural environment using peers as communication partners (Bellini et al., 2007; Buggey, 2005; Buggey et al., 2011). Typically, researchers or teachers implement the intervention. Teachers may show videos in the morning before the participants' peers arrived and free play begins (for example, Bellini et al., 2007) or alternatively, teachers and study participants watch the videos just before the opportunity for the target interaction (Buggey, 2005).

Children with autism are being educated more often in inclusive environments, usually with paraprofessionals providing support (Bolton & Mayer, 2008; Robinson, 2011). Effective intervention requires effective training for paraprofessionals. In a study of the efficacy of paraprofessionals as interventionists, Robinson (2011) addressed four levels of engagement: (a) "hovering", which included non-target activities such as bouncing a ball or giving instructions that were not connected with the behavior ("put the jump rope away") (p. 108), (b) "implementing" an appropriate strategy, (c) "monitoring", which included both observing the student engaged in the target behavior and providing contingent reinforcers, and (d) "uninvolved", standing or sitting near the child without interacting. At baseline, the four paraprofessionals spent most of their time either uninvolved or hovering. Following the intervention, which included modeling and video feedback, all four paraprofessionals demonstrated appropriate use of PRT. In a similar study, Feldman and Matos (2012) trained four paraprofessionals to implement PRT. Paraprofessionals were videotaped using 10 minute probes as they implemented PRT strategies. Interventionists provided feedback while reviewing videos with each paraprofessional. All four demonstrated correct implementation of targeted PRT strategies within 4 to 7 sessions.

The aforementioned video-based instruction studies (Thiemann & Goldstein, 2001; Deitchman et al., 2010) incorporated other instructional strategies in addition to video feedback (e.g., written text, pictorial cues, reinforcement, prompting). One might speculate that video feedback alone is not powerful enough to elicit social initiations of young children with autism. The present study used only video self-modeling with video feedback (using iPads) to improve social initiations of a child with ASD. Two paraprofessionals (educational assistants) and a special education teacher were trained to use the intervention. Thus, the study extends current research by streamlining the use of video self-modeling with video feedback (no additional strategies were used) and by training a special education teacher and two paraprofessionals to implement the intervention (rather than researchers).

The purpose of this study was to investigate the efficacy of video self-modeling with video feedback using iPads to improve social skills of young children with autism. This investigation attempted to answer three research questions. First, does video self-modeling with video feedback using an iPad increase social initiations of young children with ASD toward peers? Second, does video self-modeling with video feedback using an iPad implemented by paraprofessionals and/or special education educators in inclusive classrooms promote social initiation skills of young children with autism? Third, does video self-modeling with feedback support generalization of social initiations across peers, settings, and play situations?

2. Research Methods

2.1 Target Population and Selection

The participant was a preschooler with Autism Spectrum Disorders (ASD). His participation in the study was selected in accordance with the following criteria: the participant a) had a diagnosis of autism spectrum disorders, b) was between 3

and 6 years of age, c) was able to say at least three-word sentences or use an Augmentative and Alternative Communication (ACC) device, and d) did not initiate social interactions with peers.

Initially, three participants were selected to participate in this study. However, at the end of the pre-experimental phase two participants withdrew from the study. The first participant moved from the area and the second participant increased targeted behaviors after five baseline data points were collected. As a result, the study design changed from a multiple probe across participants to a case study using a multiple baseline single subject design.

2.1.1 Participant

The participant, Sam, was five years of age at the beginning of the study. His primary disability was autism and his secondary disability was speech and language impairment. His teachers described him as being able to follow one and two-step directions and respond to others using spoken phrases and sentences. Sam was well liked by his peers and had a great sense of humor. He had shown no aggression toward peers but displayed intermittent aggression toward adults. Clean up time and transitions were also difficult for Sam. He used vocal requests for assistance and preferred items from adults but did not display spontaneous social initiations with peers. During play, Sam engaged in parallel play only.

2.1.2 School Professionals

An early childhood education (ECE) teacher, a special education teacher, and paraprofessional from the early childhood program participated in the study. The ECE teacher had a BS in elementary education with a minor in early childhood education, a masters' degree in reading, and five years of teaching experience. The early childhood special educator had a BS in elementary education with a minor in early childhood education, an additional certification in early childhood special education and five years of teaching experience. The paraprofessional had a BS in psychology and had worked for a year as an educational assistant in this early childhood program.

2.1.3 Setting

The study was conducted in an early childhood inclusive classroom where the participants had access to general education curriculum. The classroom was comprised of several play areas including a sensory table, blocks, library, puzzles, art, Legos, dramatic play, and discovery (science). Preference and self-recognition assessments and attendance to the video were conducted in the participant's classroom. Baseline, intervention, two generalization sessions, and maintenance were also conducted in this setting.

2.2 Pre-experimental Procedures

The experimenters conducted a preference assessment using a paired stimulus procedure (Lavie & Sturmey, 2002) in order to generate a list of preferred items for the participant. A list was generated based on the information from interviews with the child's teachers and parents. The sessions were video recorded and the data was recorded for each trial on a prepared score sheet. Three different items (i.e. trains, Connect 4, and an iPad) were identified as his highly preferred toys/games. In addition to the preference assessment, a self-recognition assessment was conducted in the classroom setting. A video of each participant was created to assess the participant's self-recognition skills. The video was stopped and the participant was asked to point to the person whose name was called on the screen. The participant was able to identify himself on the video. Finally, the participant's ability to attend to the video was assessed by instructing him to watch his own video on an iPad. He was able to attend to the video for one minute.

2.2.1 Training of School Professionals

The experimenters trained two teachers and the paraprofessional regarding implementation of the intervention. First, experimenters modeled procedural steps and then the school professionals role-played implementation of the intervention. A treatment fidelity form was used to record procedural steps. The training was conducted for three sessions until 95% agreement on accuracy and consistency of implementation was reached. There was no formal training of peers. Just before the session, teachers informed the peer what was expected of him in the activity session.

2.2.2 Materials & Video Vignettes

The classroom contained typical teaching materials (i.e., tables, chairs, shelves, toys). A video camcorder, an iPad for video viewing, and highly motivating toys/games (i.e., trains, sensory table, iPad game, Connect 4, Legos) were used. At least three weeks before the start of baseline, three video vignette(s) were created. The participant served as the primary model for construction of a total of six video vignettes. Initially three video vignettes were created. However, because the reinforcing effect of toys/games changed throughout the intervention, three additional video vignettes were created using his new preferences. Each one showed the participant approaching the peer, greeting him, inviting him to play, and then interacting with him while playing with highly preferred toys/games. The principal investigator edited out prompts and created video vignettes for each of the preferred toys/games.

2.3 Research Design

The purpose of this study was to investigate the efficacy of video self-modeling with video feedback using iPads to improve social skills of young children with Autism Spectrum Disorders (ASD). A multiple baseline single subject design was utilized to demonstrate experimental control and establish a functional relationship between the independent and dependent variables. The design of this study was composed of a) baseline, b) intervention, c) generalization, and d) maintenance.

2.3.1 Dependent Variables

The dependent variable, social initiation skills, consisted of the following specific skills: (a) *Approaching a peer,* which consisted of the participant leaving the area where he watched the video on the iPad and approaching the peer within at least one meter once per session, (b) *Greeting,* which consisted of the participant saying "Hi", "Hello", "Hi/Hello (name)" or waving to a peer once per session, (c) *Inviting* the peer to play, which consisted of the participant saying: "Do you want to play (name of the game)" or "Do you want to play with me?" once per session and (d) *Interacting with a peer*, which included any of the following behaviors: sharing toys, commenting, making requests, making validating statements, or asking questions. Sharing toys was defined as the participant handing over an item that was in his possession. Making requests consisted of the participant verbally asking for assistance or for an object. Asking questions consisted of the participant verbally asking "WH", "Do/Does", "Is/Was" questions. Making a validating statement consisted of the participant verbally stating, "That's cool"; "Nice (item)"; "I like it (item)", etc. Interactions were defined as behaviors clearly directed to a peer. They were distinguished from an ongoing interaction by a change in items/activities or a discontinuation of the previous interaction for at least five seconds.

2.3.2 Independent Variable

The independent variable consisted of video self-modeling with video feedback using an iPad. Video feedback used in this study differed from the video feedback used in other studies in a few key ways. The participant was not required to discriminate and evaluate his own performance (e.g., smiley face for "good behavior" and a frown face for "not so good behavior"). While watching the video the teachers/paraprofessional provided feedback by commenting and/or complimenting the participant's exemplary behavior. After watching the video, the participant was provided with an opportunity to practice target behaviors as seen in the video in a five-minute activity session. Finally, a rewards system was not part of the intervention.

The criterion performance consisted of the child displaying four target behaviors. Three target behaviors (i.e., approaching the peer, greeting, and inviting a peer to play) were expected to occur only once per session, whereas the fourth target behavior, interacting with a peer, was expected to occur at least four times per session for three consecutive sessions.

2.3.3 Baseline

The participant was observed for a minimum of five consecutive days for five minute sessions during free play in order to determine if he was able to display targeted skills toward peers. The communication partner was present in the participant's classroom along with other typically developing children. The behaviors were video recorded for data

collection and reliability purposes.

2.3.4 Intervention

The intervention consisted of the participant viewing a video vignette of his exemplary behavior at the beginning of free play on an iPad. At the beginning of the activity session, the teacher or paraprofessional offered him the iPad with three different toys/games, already determined as highly motivating. The participant selected one of the three videos. The teacher/paraprofessional then invited him to view the selected video (e.g., "(Name) let's watch the video"). While viewing the video, the teacher/ commented on his exemplary behavior (e.g., "You invited (the peer) to play" or "You shared your toys with (name of the peer)". At the conclusion of the video, the teacher/paraprofessional invited the participant to "do the same as in the video". If the participant didn't display the target behavior during the first trial, then the teacher/paraprofessional invited him to watch a segment of that target behavior (i.e., approaching, greeting, inviting, sharing) while providing feedback again on his exemplary behavior. The specific segment of the target behavior was only shown one additional time. For example, if the participant approached the peer but didn't greet him, then only the greeting segment was shown again. No other prompts were delivered any other time during the activity session. The expectation was that the participant would approach the peer, greet him, and invite him to play once per session. Then, the participant was expected, without any prompts, to engage in interactive play with a peer. Therefore, the overall expectation was that the participant would display one approach, one greeting, and one invitation to play, and numerous interactions with a peer.

2.3.5 Generalization

The participant was observed for three consecutive sessions, once in a different setting, then with different activities, and finally with a different peer. This was done to determine generalization of skills across settings, items, and people. As in baseline, the generalization condition did not include video viewing.

2.3.6 Maintenance

Maintenance of the participant's targeted skills was assessed one month after the intervention was withdrawn. This condition was the same as in baseline.

2.4 Reliability

An undergraduate student served as the reliability observer in order to establish inter observer agreement (IOA). Videos of participants collected for creating video vignettes, unedited, were used for reliability training. A scoring manual containing operational definitions of the target behaviors, examples and non-examples of the target behaviors, and a scoring protocol were provided to the reliability observer as well. Training consisted of the reliability observer engaging in a practice session during which she recorded target behaviors while watching the participant's videos. Then her recordings were compared to the experimenter's recordings. Training continued in this fashion until 90% agreement of her recordings with the experimenter's recordings for each condition on three consecutive sessions was reached. The reliability observer reviewed randomly selected session videos, independently scoring 33% of sessions for each condition. Her recordings were compared to the second author's recordings. The IOA was calculated by dividing the total number of agreements by the total number of agreements plus disagreements multiplied by 100. The IOA was 90%.

To determine whether the intervention procedures were being implemented accurately and consistently, procedural reliability data sheets were developed for all conditions. The same undergraduate student served as the procedural fidelity observer. She reviewed the video recordings using a checklist to evaluate whether the teacher/paraprofessional accurately implemented the intervention. The observer recorded "yes" if the step was followed and implemented accurately, "no" if it was not followed, and "n/a" if the step did not apply. Training followed the same procedures as the IOA. Procedural fidelity for each session was calculated by using the total number of steps completed accurately divided by the total number of steps completed accurately plus the total number of steps completed inaccurately/missed multiplied by 100. The procedural data was recorded on 33% of sessions for each condition and her recordings were compared to the second author's recordings. The criterion for procedural fidelity was set at 85% of the steps implemented accurately and consistently (see Table 1).

Table 1: Interobserver Agreement (IOA) and Procedural Fidelity (PF) for Each Condition

Conditions	Sam		
	Sessions	IOA	PF
Baseline	33%	100%	85%
Video Self-Modeling + Video Feedback	33%	90%	92%
Generalization	33%	85%	90%
Maintenance	33%	87%	100%

2.5 Data Analysis

The effect of the independent variable on the dependent variables was determined through visual inspection of the graphic representation of the data, as well as by calculating the average level and analyzing the range level of independence for each dependent variable across each condition. The average level of independence for each dependent variable was calculated by summing the scores of the dependent variable for all sessions within that condition and dividing them by the total number of sessions conducted in that condition.

2.6 Social Validity

Upon completion of the study, the participant's mother and father, his classroom teacher, his paraprofessional, and his early childhood special educator (ECSE) participated in a social validity assessment. They first watched a video of his performance at baseline and then a video recording of his performance during the intervention. The video of the intervention was purposefully selected to depict the teacher/paraprofessional providing video feedback to the participant in order for parents to have an understanding of the procedures used in this study. They answered yes/no questions regarding each of his four target skills (approaching, greeting, inviting, and interacting with a peer during play). Then they completed a questionnaire comprised of five yes/no questions and rated six items using a Likert scale (1-disagree to 5-strongly agree). Finally, respondents were encouraged to provide any other additional comments regarding the study.

3. Results

3.1 Participant

Visual inspection of the data revealed that the participant accomplished all four of the targeted skills. It was hypothesized that Sam would approach his peer, greet him, invite him to play, and engage in a social interaction after watching a video of himself carrying out each of these behaviors (see Figure 1).
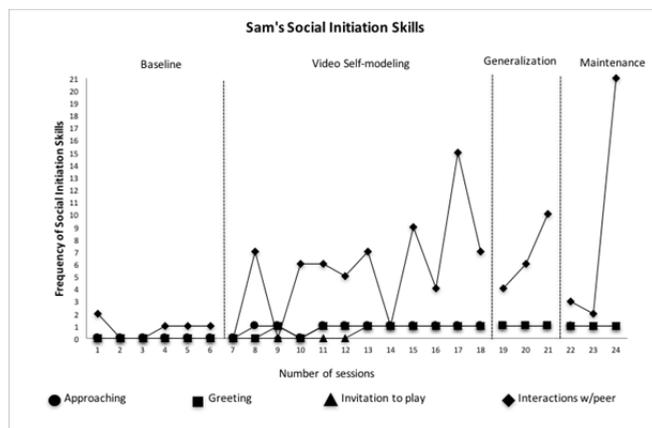
Figure 1. Frequency of social initiation skills across conditions.

It was further hypothesized that if Sam did not carry out one of the behaviors, he would do so after seeing the segment of the video again and receiving feedback on his performance from his teacher or paraprofessional. The first three behaviors were to occur once per session whereas the fourth target behavior, interacting with the peer, which may include sharing, commenting, and/or asking questions, was expected to occur at least four times per session, which was double the number of interactions displayed at baseline. Sam's growth was documented across four phases (baseline, intervention, generalization and maintenance) of the study (see Table 2).

Table 2: Mean Number of Social Skills During Each Condition of VSM

Sam's target skill	Baseline *M*	Intervention *M*	Generalization *M*	Maintenance *M*
Approaching peer	0	.83	1	1
Greeting peer	0	.83	1	1
Inviting peer to play	0	.5	1	1
Interacting with peer	.83	4.6	6.6	8.3

At baseline, Sam did not approach, greet or invite his peer to play (*M* = 0 for all three target skills). Sam displayed minimal interactions with his peer at baseline, only uttering one or at most two comments during five minutes of play (*M* = .83; range, 0-2).

Sam approached a peer after watching his video in the second intervention session. With the exception of the fourth intervention session, he approached a peer each time (*M* = .83, range, 0-1). Sam began saying "hi" (greeting) to his peer on the third session. He maintained his greetings throughout the intervention with the exception of the fourth session. After not receiving a response from his peer on the eighth session, Sam greeted him a second time. He achieved a mean of .83 (range, 0-1) during intervention.

Sam did not initially invite his peer to play after watching his video. His special education teacher or his paraprofessional replayed the portion of his video that displayed his invitation and commented that he was asking a peer to play, thereby noting his exemplary behavior. Then they encouraged Sam to "do what you see in the video". With a combination of VSM and video feedback, Sam was able to invite a peer to play (*M* = .5; range, 0-1).

Sam's interactions increased throughout the study. At baseline, he only exchanged a comment (usually one word, for example, "play") once or twice. He engaged in parallel play without turn taking or other interactions. By the third session of the intervention, Sam commented or interacted six times during the five minutes of play. However, his interactions decreased to only one on the sixth session. He displayed three interactions during the seventh session. Teachers, paraprofessionals and researchers determined that the toy options were no longer motivating for Sam. Based on teacher recommendation, the sensory area was added as a possible play choice. Sam interacted with his peers at least five times and up to 15 times for the remainder of the intervention (*M* = 4.6; range, 0-15).

Sam demonstrated all four targeted skills (approaching, greeting, inviting and interaction with a peer) by the eighth session. The intervention was carried out for four additional sessions to assure consistent use of the target skills. Criterion performance was met at the twelfth session.

During the generalization condition, the paraprofessional or his special education teacher asked Sam to play (a) with different toys (peer and setting remained the same), (b) with a different peer (new toys were included, setting remained the same) and (a) in a new setting (new toys were included while the peer remained the same). Sam consistently approached his peer, greeted him, and invited him to play in each of these conditions (*M* = 1). Interactions steadily increased, from four to six and then from six to ten. The sharp increase (from six to ten) interactions during Sam's third generalization session occurred when he was playing with super hero action figures (new toys) in the therapy room (new setting). Sam averaged 6.6 interactions during the generalization condition.

Three maintenance sessions (five minutes each) were carried out three weeks after the generalization phase. His special education teacher or his paraprofessional offered Sam the choice to play with a peer using any of his preferred toys or at the sensory table. Sam approached, greeted, and invited a peer to play (*M* = 1) during three maintenance sessions. The number of his interactions increased steadily, peaking with 21 comments about super heroes during the third (and final) maintenance session (*M* = 8.3).

3.2 Social Validity

Teachers, the paraprofessional and parents answered four yes/no questions on the social validity assessment. They all

responded "no" to questions regarding target skills at baseline and "yes" to the same questions during intervention (see Table 3).

Table 3: Teacher and parent responses to social validity procedural questions.

	Baseline		Intervention	
	Teachers	Parents	Teachers	Parents
	N = 2	N = 2	N = 2	N = 2
The child approaches the peer and/or holds his hand	No	No	Yes	Yes
The child greets peer ("hi (name" or "hi)	No	No	Yes	Yes
The child invites the peer to play	No	No	Yes	Yes
The child shares with/asks/comments to the peer	No	No	Yes	Yes

In addition, they rated six items using a Likert scale. Teachers, the paraprofessional and parents strongly agreed that Sam watched the video as directed ($M = 5$) and that target skills were important ($M = 5$). While they rated his enjoyment of the video as moderate ($M = 3$), they rated ease of implementation and generalization to other settings moderately high ($M = 4.2$). All respondents strongly agreed that they would recommend VSM plus video feedback for use with young children with ASD ($M = 4.5$).

Overall, respondents' comments regarding the intervention were positive. However, Sam's ECSE stated, "the intervention itself was easy to implement, [but] I think the need to video for the study made it more challenging." Sam's regular teacher provided an example of how his skills generalized.

He has been interacting with a variety of kids in the classroom and not just the peer used in the video modeling. He also is starting to do much more in different settings, such as out on the playground.

Sam's dad stated, "I think it [the intervention] really helped him talk to other kids and make new friends." Social validity results are displayed in Table 4.

Table 4: Teacher and parent social validity mean responses regarding VSM

Statement	Teacher means N=2	Parent means N=2	Group means
1. Child watched the video on the iPad as directed by the teacher/educational assistant.	5	5	5
2. The child seemed to enjoy watching the video on the iPad.	3.5	2.5	3
3. Skills targeted in this study are important skills for children with autism to learn.	5	5	5
4. Video self-modeling intervention plus video feedback seems to be easily implemented in the regular education classroom.	4.5	4	4.2
5. I would recommend using the video self-modeling intervention plus video feedback with other children with autism.	4.5	5	4.7
6. I have noticed that the child has been generalizing the skills targeted in the study to other environments.	4.5	4	4.2

4. Discussion

This study examined the efficacy of VSM with video feedback using an iPad to improve four social initiation skills for a preschool aged child with autism. It was hypothesized that after watching videos of himself approaching, greeting, inviting, and then interacting with a peer, the participant would be able to display these target behaviors while in a play session with a peer.

An important finding of this study is that Sam demonstrated progress quickly for two target behaviors, approaching and greeting. He independently approached and greeted a peer after only three sessions. He did not greet his peer during the next (fourth) session, but from the fifth session until the conclusion of the study he consistently approached and greeted his peer. Greeting is usually a challenging skill for children with autism to acquire and often requires additional interventions. For example, Litras, Moore, and Anderson (2010) added prompting to VSM with social stories to assist a preschooler in increasing greeting behavior from 33% to 100%. Consistently displaying these skills from the fifth session suggests that VSM with video feedback is both effective and relatively fast in comparison to other approaches.

VSM with video feedback was also effective in helping Sam learn to invite a peer to play. However, seven

sessions were required before he consistently displayed this target behavior. One speculation for this result may be that inviting a peer to play required Sam to ask his peer, "Do you want to play with me (or name of toy)?" in contrast to approaching (no verbalization needed) and greeting ("hi" or simply waving). As Koegel, Koegel, Bradshaw, and Ashbaugh (2014) indicated, children with autism struggle with initiating questions throughout their life span. By providing additional opportunities for video viewing and for feedback Sam was not only able to acquire the skill of inviting his peer to play but he also generalized and maintained it across time.

Another key finding of the study is that VSM with video feedback improved Sam's peer interactions. Although there was variability of this target behavior across sessions, the change in the data trend indicates progress toward meeting the criterion performance. The eighth session shows a decline in Sam's interactions from seven to one, but it is important to note that he started to display reluctance to watch videos of himself playing with his selected toys around the sixth session. Teachers and researchers determined that Sam was no longer interested in the three toys (iPad games, "Connect 4" game, and a wooden train track set) featured in his videos. This aligns with previous findings that children with autism often have limited interests in toys and activities (Leaf et al., 2012). Based on observations, Sam's classroom teacher suggested including the sensory table as an additional option; a new video for this play option was created. Interestingly, Sam did not choose this new option more often than the other three for the remainder of the intervention. However, viewing the video of himself playing at the sensory table seemed to spark Sam's interest and help him resume interacting with his peer. This affirms the importance of observation as a means to establish a toy or activity preference (Leaf et al., 2012). In addition, providing high-interest activities and toys (Vartuli & Rohls, 2008; Copple & Bredekamp, 2009) is more likely to expand the range of interests for children with autism.

4.1   Implications for Practice

One possible explanation for the efficacy of this intervention may be attributed to errorless learning. Video feedback intervention typically consists of having the learner and the teacher view a non-edited video of the learner's performance while the teacher guides them in evaluating whether or not their behavior is appropriate. In this study, instead of viewing a non-edited video, the participant and the teacher/EA viewed edited video vignettes. They provided feedback regarding only the exemplary behaviors. As in errorless learning, an approach that attempts to minimize the child's errors by ensuring correct production of the behavior and consequent reinforcement (Donaldson & Stahmer, 2014), video feedback provided by the teachers/paraprofessional minimized chances for the participant to make errors or not display the target behaviors altogether. For example, the teacher/paraprofessional complimented the child's exemplary behavior (e.g., you are sharing toys nicely with (name of the peer) or you invited (the peer) to play).

The social validity assessment revealed strong support from Sam's teachers, paraprofessional, and parents regarding the use of VSM with video feedback for other young children with ASD. Furthermore, Sam's mom shared that VSM appeared to foster more awareness from the children in his class, in addition to helping Sam. She commented that, "[VSM with video feedback] has helped with making classmates more approachable to ask to join in play." The current study did not target the impact of VSM and video feedback on typically developing peers. However, this somewhat unexpected outcome suggests that VSM with video feedback is effective in increasing classmates' willingness to interact with their peers with autism.

Initially, the study began with one peer. While Peer 1 was pleasant and compliant, he simply played alongside Sam without initiating verbal exchanges, sharing or turn-taking. At the conclusion of the third session, Sam's teachers suggested adding an additional peer to the study. Peer 2 asked Sam questions and made comments during their play. While little turn-taking or sharing occurred, there were more verbal interactions with Peer 2. Identifying the "right" willing peer is essential when assisting young children with ASD in developing interaction skills. This outcome aligns with studies of peer-mediated strategies, which claim that "socially competent peers can model and reinforce appropriate social behavior" (DiSalvo & Oswald, 2002, p. 198). Similarly, research based in social constructivism theory also emphasizes the critical role teachers play in encouraging typically developing children with ASD to interact with their peers (Walker & Berthelsen, 2008). Studies comparing children's interactions in segregated vs inclusive settings (Kishida & Kemp, 2009) emphasize the teacher's role in both modeling and serving as a bridge.

This study explored the feasibility of training paraprofessionals to carry out VSM interventions. Two paraprofessionals were members of the teaching team in Sam's inclusive classroom. Both participated in an initial training, and one participated in a follow-up training. This paraprofessional was quite comfortable engaging Sam with his videos and eventually, video-taping him as he approached, greeted, invited and then interacted with his peer. Her comfort appears to have contributed to teacher and parent confirmation that VSM was easy to implement, documented

during the social validity component of the study.

Additional strengths of this intervention are time efficiency, generalizability and maintenance of the target behaviors. It was encouraging that Sam not only generalized skills across peers, settings and toys/games but also maintained his skills across time. Of particular note is the short amount of time needed for video feedback regarding Sam's exemplary behaviors. This portion of Sam's video was only 15 seconds long, providing an easy, effective intervention for busy teachers and paraprofessionals.

4.2 Limitations and Recommendations

This single subject multiple probe design began with three participants. Three video vignettes were created for each participant. Baseline data was collected for two participants. The third participant moved away just before baseline data was collected.   The second participant demonstrated increased levels of target behaviors during the fifth baseline session. His teachers and the researchers determined that he was no longer eligible for the study. Therefore, the intervention was implemented with one participant, resulting in the study changing from a multiple probe design with several participants to an A-B design with one participant only.

While several adjustments were needed (an additional peer with a more engaging style of interacting and a more motivating play choice), the study results provide clear evidence that VSM with video feedback using an iPad was successful for Sam. In addition, Sam's teachers, his EA, and his parents stated that VSM with video feedback was an easy intervention to implement. However, since only one child participated, further research with several children is needed to confirm efficacy as well as ease of implementation, particularly when paraprofessionals take the lead during the intervention.

Perhaps the most significant implication for this study is the impact that VSM with video feedback using an iPad has regarding increased independence for children with autism. An ongoing concern among teachers and families is that children with autism become dependent on verbal prompting (MacDuff, Krantz, & McClannahan, 2001). Our study demonstrated that Sam was able to independently approach, greet, invite and interact successfully with different peers, in different settings, and with different toys even one month after the intervention was withdrawn. While additional studies are needed to confirm the effectiveness of video self-modeling with video feedback, findings from this case study indicate that this intervention holds promise for teaching children to use the targeted social skills independently.

References

Bellini, S., Akullian, J., & Hopf, A. (2007). Increasing social engagement in young children with autism spectrum disorders using video self-modeling. *School Psychology Review, 36*(1), 80-90.

Bolton, J., & Mayer, M. D. (2008). Promoting the generalization of paraprofessional discrete trial teaching skills. *Focus on Autism and Other Developmental Disorders, 23,* 103–111.

Boudreau, E., & D'Entremont, B. (2010). Improving the pretend play skills of preschoolers with autism spectrum disorders: The effects of video modeling. *Journal of Developmental and Physical Disabilities, 22,* 415-431.

Boyd, B.A., Odom, S.L., Humphreys, B.P., & Sam, A.M. (2010). Infants and toddlers with autism spectrum disorder: Early identification and early intervention. *Journal of Early Intervention, 32*(2), 75-98.

Buggey, T. (2005). Video self-modeling applications with students with autism spectrum disorder in a small private school setting. *Focus on Autism and other Developmental Disabilities, 20*(1), 52-63.

Buggey, T., Hoomes, G., Sherberger, M.E., & Williams, S. (2011). Facilitating social initiations of preschoolers with autism spectrum disorders using video self-modeling. *Focus on Autism and Other Developmental Disabilities, 26*(1), 25-36.

Copple, C., & Bredekamp, S. (Eds.). (2009). *Developmentally appropriate practice in early childhood programs serving children from birth through age 8.* 3rd Ed., Washington, DC: NAEYC.

Deitchman, C., Reeve, S. A., Reeve, F. R., & Progar, P. R. (2010). Incorporating video feedback into self-management training to promote generalization of social initiations by children with autism, *Education and Treatment of Children, 33*(3), 475-488.

DiSalvo, C.A. & Oswald, D.P. (2002). Peer-mediated interventions to increase the social interaction of children with autism: Consideration of peer expectancies. *Focus on Autism and Other Developmental Disabilities, 17*(4), 198-207.

Donaldson, A.L., & Stahmer, A.C. (2014). Team Collaboration: The use of behavior principles for serving students with ASD. *Language, Speech, and Hearing Services in Schools, 45,* 261-276.

Feldman, E. K. & Matos, R. (2012). Training paraprofessionals to facilitate social interactions between children with autism and their typically developing peers. *Journal of Positive Behavior Interventions, 15*(3), 169-179. doi:10.1177/1098300712457421

Gyl, S.O., & Vuran, S. (2010). An analysis of studies conducted video modeling in teaching social skills. *Educational Sciences: Theory & Practice, 10*(1), 249-274.

Kishida, Y. & Kemp, C. (2009). The engagement and interaction of children with autism spectrum disorder in segregated and inclusive

early childhood center-based settings. *Topics in Early Childhood Special Education,* 29(2), 105-118.

Koegel, R.L., Koegel, L.K., Bradshaw, J., & Ashbaugh, K. (2014). The importance of early identification and intervention for children with or at risk for autism spectrum disorders. *International Journal of Speech-Language Pathology,*16(1), 50-56. doi:10.3109/17549507.2013.861511

Koegel, R.L., Vernon, T.W., & Koegel, L.K. (2009). Improving social initiations in young children with autism using reinforcers with embedded social interactions. *Journal of Autism Developmental Disorders, 39,* 1240-1251, doi:10.1007/s10803-009-0732-5.

Kokina, A., & Kern, L. (2010). Social story interventions for student with autism spectrum disorders: A meta-analysis. *40, 812-826.* doi:10.1007/s10803-009-0931-0

Lavie, T., & Sturmey, P. (2002). Training staff to conduct a paired-stimulus preference assessment. *Journal of Applied Behavioral Analysis, 35*(2), 209-211.

Leaf, J. B. et al. (2012). Observational effects on the preferences of children with autism. *Journal of Applied Behavioral Analysis, 45*(3), 473-483.

Litras, S., Moore, D. & Anderson, A. (2010). Using video self-modelled social stories to teach social skills to a young child with autism. *Autism Research and Treatment, 2010,* 1-9, doi:10.1155/2010/834979.

MacDuff, G.S., Krantz, P.J., & McClannahan, L.E. (2001). Prompts and prompt-fading strategies for people with autism. Retrieved from http://dddc.rutgers.edu/pdf/prompting.pdf.

Macphearson, K., Charlop, M.H., & Miltenberger, C.A. (2014). Using portable video modeling technology to increase the compliment behaviors of children with autism during athletic group play. *Journal of Autism Developmental Disorders, 44*(2), 1-10. doi:10.1007/s10803-014-2072-3.

Plavnick, J.B., Sam, A.M., M.F., Hume, K., & Odom, S.L. (2013). Effects of video-based group instruction for adolescents with autism spectrum disorder. *Exceptional Children, 80*(1), 67-83.

Rao, P.A, Beidel, D.C., & Murray, M.J. (2008). Social skills interventions for children with asperger's syndrome or high-functioning autism: A review and recommendation. *Journal of Autism and Developmental Disorders, 38,* 353-361.

Reichow, B., & Volkmar, F.R. (2010). Social skills interventions for individuals with autism: Evaluation for evidence-based practices within a best evidence synthesis framework. *Journal of Autism and Developmental DIsorders, 48,* 149-166. doi:10.1007/s10803-009-0842-0

Robinson, S. E. (2011). Teaching paraprofessionals of students with autism to implement pivotal response treatment in inclusive school settings using a brief video feedback training package. *Focus on Autism and Other Developmental Disabilities, 26*(2), 105-118. doi: 10.1177/1088357611407063

Thiemann, K.S., & Goldstein, H. (2001). Social stories, written text cues, and video feedback: Effects on social communication of children with autism. *Journal of Applied Behavior Analysis, 34,* 425-446.

Vartuli, S.A. & Rohs, J. (2008). Selecting curriculum content that stimulates thought. *Early Childhood Education Journal, 35,* 393-396.

Walker, S. & Berthelsen, D. (2008). Children with autistic spectrum disorder in early childhood education programs: A social constructivist perspective on inclusion. *International Journal of Early Childhood, 40*(1), 33-51.

Wert, B.Y., & Neisworth, J. T. (2003). Effects of video self-modeling on spontaneous requesting in children with Autism. *Journal of Positive Behavior Interventions, 5*(1), 30-34.

Wong, C., Odom, S. L., Hume, K. Cox, A. W., Fettig, A., Kucharczyk, S., … Schultz, T. R. (2015). Evidence-based practices for children, youth, and young adults with autism spectrum disorder: A comprehensive review. *Journal of Autism and Developmental Disorders, 45,* 1951-1966. doi:10.1007/s10803-014-2351-z

Yakubova, G., & Taber-Doughty, T. (2013). Effects of video modeling and verbal prompting on social skills embedded within a purchasing activity for students with autism. *Journal of Special Education Technology, 28*(1), 35-47.