Effects of Video Modeling and Video Feedback on Peer-Directed Social Language Skills of a Child With Autism

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Abstract: Identifying practical strategies for teaching children with autism to use social language with their peers is a challenge for professionals designing treatment programs. The purpose of this multiple baseline study was to assess the effectiveness of video modeling and video feedback for teaching a child with autism to use social language with typical peers during play. Video modeling was effective in increasing social language in two of the three activities. Video feedback and prompting were required in the third activity to effect a stable rate of increased social language. Unscripted verbalizations predominated across all three activities, as did initiations. The results are discussed with reference to previous research, future directions, and implications for practice.

Children with autism demonstrate impairments in social interactions, social reciprocity, relationships, verbal and nonverbal communication, imitation, and play skills (American Psychiatric Association, 2001). Social language skills are invariably affected, particularly with regard to initiations toward and responsiveness to peers. The ability and motivation to respond to peers varies widely across children with autism; some have severe deficits in this regard whereas others show some ability to respond to social overtures. However, even children with autism who respond to peers almost always show deficits in the ability to initiate or maintain interactions, especially those that do not result in preferred items or activities (Krantz & McClannahan, 1998). Verbal initiations are rare without instruction, as children with autism are not likely to ask questions, offer information, or comment spontaneously about play materials or interests (Taylor & Levin, 1998).

Because of the pervasive nature of the core social interaction deficit in autism, it is highly unlikely that these children will experience the benefits of social relationships with peers in the absence of interventions designed specifically for this purpose. However, as Hall and Smith (1996) emphasized, "proximity alone is not sufficient to promote positive social interactions between children with autism and their peers; that is, most children with autism do not 'become socialized' merely by spending time with typical children" (p. 83). Thus, direct interventions targeting social language and other interaction skills with peers are clearly warranted. A promising practice in this regard is the use of videotape technology, which has been used to teach a wide variety of skills to individuals across a range of disabilities and ages. Recently, there has also been interest in the use of treatments such as video modeling and video feedback with children with autism.

Video modeling involves the child "observing a videotape of a model engaging in a target behavior and subsequently imitating" (Charlop-Christy, Loc, & Freeman, 2000, p. 537). Video modeling procedures have been used successfully to teach children with autism a variety of adaptive behaviors including social, play, requesting, self-care, purchasing, and academic skills. Video feedback involves videotaping the target individual performing specific behaviors and then co-reviewing the videotape so that the person can evaluate his or her own behaviors. Only two studies to date have investigated the use of this technique with individuals with autism. One was aimed at teaching self-help skills to two adolescents (Lasater & Brady, 1995), while the other incorporated video feedback as one component of a multielement intervention to teach peer-directed social communication skills to young children (Thiemann & Goldstein, 2001).

Videotape treatments have many features that make them (at least theoretically) ideal for implementation with children with autism. First, they are relatively unobtrusive

and can be readily incorporated into almost any treatment paradigm (Alcantara, 1994; Buggey, Toombs, Gardener, & Cervetti, 1999; Thiemann & Goldstein, 2001). Second, research has shown that videotape treatments can be effective with children with autism in a wide range of environments, including homes (Buggey et al., 1999; Lasater & Brady, 1995; Sherer et al., 2001; Taylor, Levin, & Jasper, 1999), specialized schools or clinics (D'Ateno, Mangiapanello, & Taylor, 2003; Nikopoulos & Keenan, 2003), after-school programs (Charlop & Milstein, 1989; Charlop-Christy et al., 2000), classrooms (Kern-Dunlap et al., 1992; Wert & Neisworth, 2003), and community settings (Schreibman, Whalen, & Stahmer, 2000). Third, videotape equipment is becoming increasingly available at decreasing cost, and most families and schools consider videotape playback machines to be standard (Schreibman et al., 2000). Fourth, many children with autism find watching videotapes to be reinforcing and display high levels of motivation to watch them (Lasater & Brady, 1995). Fifth, the use of videotapes may help to compensate for the stimulus overselectivity often exhibited by children with autism since, when filming, a video camera can readily zoom in on relevant cues to highlight specific target behaviors (Charlop-Christy & Daneshvar, 2003). Finally, video techniques may be more effective for children who have limited ability to comprehend verbal descriptions and/or whose visual processing abilities are relatively intact compared to their auditory processing skills (Schreibman et al., 2000; Sherer et al., 2001).

Despite these advantages, few studies to date have evaluated the outcomes of videotape modeling procedures for teaching peer-directed social skills to children with autism, and several of these included only a single social skill among other behaviors that were targeted. Furthermore, the primary social skills targeted in most videotape intervention research have been either very basic or imitative in nature, including skills such as greetings (Charlop-Christy et al., 2000); verbal statements, gestures, facial expressions, and intonations (Charlop-Christy, Carpenter, & Dennis, 2002); social initiations (Nikopoulos & Keenan, 2003, 2004); requesting desired items or activities (Wert & Neisworth, 2003); responding in a scripted manner to specific questions (Buggey et al., 1999); answering a question and then asking the same question back in a rote format (Sherer et al., 2001); and engaging in scripted conversations (Charlop & Milstein, 1989; Charlop-Christy et al., 2000; Sherer et al., 2001). Taylor et al. (1999) were successful in teaching two children with autism to initiate play statements to siblings, but no unscripted comments were made by one of the children and very few were made by the other. Similarly, D'Ateno et al. (2003) used video modeling to teach complex solitary play skills and "self-talk" verbalizations to a preschooler with autism, but found that the child exhibited almost no unscripted utterances following intervention.

Based on the persistent finding of limited generalization to novel, unscripted utterances, some authors have speculated that videotape interventions may be effective only for teaching scripted social language skills to children with autism (Taylor et al., 1999). However, this speculation seems premature given that no studies to date have used specific strategies that are designed to promote response generalization. One such strategy, referred to by Stokes and Baer (1977) as "training sufficient exemplars" (p. 355), involves providing a sufficient range of examples of the desired target behaviors to elicit generalized responding. Several authors have suggested that this strategy seems particularly applicable to interventions designed to promote generative social language use (Charlop-Christy & Daneshvar, 2003; D'Ateno et al., 2003).

The purpose of this study was to explore the use of video modeling and video feedback to teach verbal social interaction skills to a child with autism in peer play activities. The unique features of the study included (a) the use of adults rather than peers as models in the videotapes; (b) the use of both scripted and unscripted initiations and responses as dependent measures, and (c) the use of multiple exemplars in the video modeling scripts.

Method

PARTICIPANT

Ryan, the participant with autism, was 5 years 7 months old when the study began. He is the youngest child in a middle-class Chinese Canadian family and has an older sister as well as an older brother. He was diagnosed with autism at the age of 2 years 7 months following a multidisciplinary assessment at a regional hospital diagnostic center. He was recruited for the study through a home-based program providing applied behavior analysis treatment to young children with autism spectrum disorders. He had participated in this program for 1.5 years prior to the study and had received 15 to 20 hours per week of 1:1 structured teaching during this time. In addition, he had participated in regular structured peer play sessions at home for approximately 6 months prior to the beginning of the study. Ryan also attended kindergarten five mornings per week.

Ryan's primary language was English. On the *Clinical Evaluation of Language Fundamentals–Preschool* (CELF-P; Wiig, Secord, & Semel, 1992), he received an age-equivalent score of 3 years 1 month. His mean length of utterance in morphemes (MLU-M), based on a language sample elicited during play and conversational interactions, was calculated at 4.4. This was described as "significantly below that expected for his age" and placed him in the age-equivalent range of 3.5 to 4 years with regard to language ability. Although Ryan had made significant gains through his in-home treatment program, he continued to demonstrate significant difficulty interacting with

peers, particularly with the use of social language during peer play. He was able to engage in parallel play with other children and responded well to prompting from an adult to use his language and interact with peers. However, without this additional support, Ryan's level of cooperative play interactions and spontaneous language use with peers decreased significantly, and he was usually very quiet. Without adult support, Ryan also engaged in occasional perseverative behavior and played with toys in a restricted, repetitive fashion.

PEERS

Ryan's parents were provided with letters of invitation to participate in the study that they distributed to the parents of peers with whom Ryan played regularly. Two families agreed to have their children participate. Jay was a 5-year-old Chinese Canadian boy who lived near Ryan and attended the same kindergarten class. He had known Ryan for approximately 2 months prior to beginning the study. Pamela was a 7-year-old Chinese Canadian girl who had participated in peer play dates with Ryan for several months prior to the beginning of the study. Neither peer had any identified sensory, motor, language, communication, or social/emotional/behavioral disabilities, and both spoke English fluently.

MATERIALS

Play Materials

Prior to the start of the study, Ryan's parents identified appropriate play materials and high-priority social language skills. Three sets of play materials were selected that were suitable for interactive play; these included Play Doh (i.e., McDonald's food and ice-cream making sets), Chevron cars (i.e., popular toy cars with eyes and faces on them that are available at Chevron gas stations), and Caillou's tree house (i.e., a playground-type activity set including figurines).

Videotapes

A total of nine videotape vignettes were developed for the study, three for each of the target play activities (three vignettes showing models talking and playing with Play Doh, Chevron cars, and Caillou's tree house, respectively). Each videotape consisted of two adult models talking to each other while playing together with the target toys. The adults spoke in short phrases (e.g., three to six words each), consistent with Ryan's expressive language abilities. To promote variety, flexibility, and unscripted verbalizations, the models used different language in each vignette. Modeled language skills included both those already in Ryan's repertoire and those that were displayed infrequently or not at all.

The videotapes were created from three different script templates that included a variety of comments, questions, acknowledgments, initiations, responses, and other language behaviors. Each script template was used to create one videotape vignette for each activity. Thus, across the three vignettes for each activity, there were an identical number of each type of language behavior. For example, Script Template 1 was used to create three scripts specific to Play Doh, Chevron cars, and Caillou's tree house. The scripts created with each template were slightly different to reflect the three activities, but contained an identical number of initiations, responses, questions, comments, and so forth; see the Appendix for an example. The nine videotapes ranged in length from 1 minute 10 seconds to 1 minute 27 seconds, with no more than a 5-second difference across the three videotapes based on a single template.

SETTING AND INTERVENTIONISTS

All activity sessions, video modeling sessions, and follow-up sessions occurred in Ryan's home. Activity sessions took place in different locations within the home: the Play Doh activity was situated at the kitchen table, Chevron cars were played on a large area rug in the living room, and the Caillou's tree house activity occurred on a coffee table in the living room. The video modeling sessions occurred in the living room or family room, both of which were equipped with a television and videotape player.

Activity sessions were conducted either by the first author or by one of two tutors who worked regularly with Ryan. The video modeling intervention was implemented by Ryan's mother, one of the two trained tutors, or the first author. All video feedback sessions and prompting sessions were implemented by the first author only. The first author provided training to all parties regarding how to conduct the activity and video modeling sessions. Because Ryan's parents worked full time and because the two tutors worked different shifts, decisions regarding who implemented activity sessions or video modeling sessions were usually made on the basis of supervisor availability.

MEASUREMENT

The dependent measures included (a) the total number of verbalizations made by the participant, (b) the frequency of both scripted and unscripted verbalizations, and (c) the frequency of initiations and responses.

Scripted verbalizations were defined as participant verbalizations that exactly matched (i.e., were identical to) the verbalization of a video model, with a few minor exceptions. Verbalizations were considered to be scripted if the form of a participant verb or adjective utterance was slightly different from that of the video model, but the verb or adjective itself was clearly identical. For example,

"I'm going to eat" and "I'm gonna eat" were considered identical, and "I am hungry" and "I'm hungry" were considered identical. Utterances with minor substitutions, additions, or omissions of an article (e.g., "Do you want the milkshake?" and "Do you want a milkshake?") were also considered to be identical and therefore scripted. However, if a verbalization was only one word in length, it had to match the video model exactly (e.g., "Look" and "Look it" were considered to be different). Single words typically used to respond to the peer, such as "yes," "no," "OK," "yeah," and "sure," were also coded as scripted, since these words were all used in the modeling tapes. Finally, if a participant verbalization substantively matched the *beginning* of a modeled verbalization but was shorter than the model, it was coded as scripted (e.g., "I like to play" was coded as scripted because "I like to play cars" was modeled in the video). *Unscripted verbalizations* were defined as participant verbalizations that were different from a video model in any way other than described previously (e.g., model: "Caillou is tired"; participant: "Caillou feels tired").

Definitions and examples for initiations and responses were adapted from the taxonomy used by Thiemann and Goldstein (2001). *Initiations* were defined as comments or questions that were *not contingent* on a peer's immediately prior utterance. Initiations could be used to (a) introduce a new idea or topic; (b) request an action, object, or information from the peer (e.g., "Can I have the car?"); (c) comment about observable objects or events within an ongoing activity, or make appropriate social comments unrelated to the activity; (d) compliment the peer or oneself (e.g., "That's cool," "Good for you"); (e) secure the peer's attention (e.g., "Look at this"); or (f) express enjoyment or displeasure to the peer regarding the ongoing interaction together (e.g., "This is fun" or "This is boring"). *Responses* were defined as verbalizations that *were contingent* on a peer's immediately prior utterance. Examples of responses included (a) acknowledgments (e.g., "oh") or direct or partial repetitions of the utterance; (b) agreements (e.g., "yeah"); (c) answers to the peer's questions; (d) comments about observable objects or events within the ongoing activity, as well as appropriate social comments unrelated to the activity; (e) questions related to peer's comments; and (e) clarifications of questions asked by the peer (e.g., "What did you say?").

Other codes included repeats, unintelligible utterances, self-stimulation, and adult-prompted utterances. With the exception of the latter, none of these were counted in total verbalizations or scored as either initiations/responses or scripted/unscripted utterances. Verbalizations were scored as *repeats* if, within 5 seconds, the participant repeated the exact wording of a previous utterance and/or if he changed, added, or omitted the article; pluralized or depluralized a word; or changed the form of a word (but used the same root). Any other changes (e.g., adding a new word, changing a word) were considered to be new utterances rather than repeats. Verbalizations were scored as *unintelligible* if more than 50% of the utterance could not be understood. Verbalizations were scored as *self-stimulation* if they consisted primarily of perseverative, off-topic speech or sounds that were characterized by an odd tone of voice. Verbalizations were scored as *adult prompted* if they occurred within 5 seconds of an adult verbal cue.

DESIGN

A multiple baseline design across three play activities was used to assess the effects of the intervention. The multiple baseline design consisted of three to six phases for each activity, depending on the activity. The first activity, Play Doh, included four phases: baseline, video modeling, video modeling plus video feedback, and follow-up. Chevron cars, the second activity, included six phases: baseline, video modeling, video modeling plus video feedback, video modeling plus video feedback plus prompting, video modeling plus video feedback, and follow-up. Finally, the third activity, Caillou's tree house, included three phases: baseline, video modeling, and follow-up. The video modeling intervention was introduced to each activity in lagged fashion consistent with a multiple baseline design (Barlow & Hersen, 1984; Kazdin, 1982). Stability of baseline measures was established for each activity prior to implementation of the intervention phase of the study. Follow-up probes occurred 7, 16, and 18 days after the completion of intervention.

PROCEDURE

Activity Sessions

Throughout baseline and intervention phases, 15-minute activity sessions were held two to three times per week in Ryan's home to assess the occurrence of the target behaviors. During these sessions, Ryan and one of the two peers engaged in all three play activities. Typically, Jay served as the peer for two sessions per week and Pamela served as the peer for one, although this varied somewhat depending on their availability. No training was provided to either of the peers. The activities and related materials were available to the participant and peers only during activity sessions. Each activity took place in a different area of the home, as described previously. The order of activities was counterbalanced across sessions to control for an order effect.

At the start of each activity session, the children were told, "Time to play [activity]" and directed to the first activity scheduled for that day. A timer was started as soon as the children began playing and was set for 5 minutes. A 5-minute limit was selected for each activity to guard against satiation and to reduce the likelihood that Ryan would perseverate with the materials, which tended to

occur in longer play sessions. When the timer rang, the supervisor prompted the children to stop the first activity and move to the next; this was repeated until the children had played with all three activities. No prompts or reinforcement were provided to either of the children during the activity sessions (except during the prompting phase for Chevron cars). If either Ryan or the peer left the play area for more than 20 seconds before the timer went off, he or she was redirected back to the activity one time and in structed to "Play [activity] with [peer]." This rarely occurred.

All activity sessions were videotaped by the supervisor from at least 9 feet away to simulate a natural setting in which an adult provides minimal supervision of children's play and interactions. The video camera was located in one of two corners of the room, depending on the play activity, and was positioned there during three peer play sessions prior to the start of the study to reduce reactivity. Ryan wore a wireless lapel microphone during all activity sessions so that his verbalizations and those of the peer could be recorded clearly.

Activity sessions were later transcribed and coded from the videotapes by the first author. The frequency of target behaviors for each activity was counted from the point when the timer was started (i.e., when the children were positioned by an activity and began to play) to the point when the timer rang 5 minutes later.

Baseline

During baseline, Ryan and a peer were instructed to play with the target toys during the activity sessions, as described previously. No videotape modeling occurred during baseline. Once a stable baseline was established for the first activity, the intervention phase was initiated for that activity.

Video Modeling

During this phase, activity sessions were held two to three times per week, as described previously. In addition, daily video modeling sessions occurred, during which Ryan watched three 1-minute video vignettes for each target play activity for which intervention had been initiated, according to the multiple baseline design. Each video modeling session ranged from approximately 3 to 9 minutes in duration, depending on the number of vignettes that were shown (i.e., for the first play activity, the three vignettes totaled 3 minutes; once the second activity was introduced, three more vignettes were added for a total of 6 minutes, and so forth). Once the vignettes for the second and third activities were introduced, the order of presentation was counterbalanced daily across activities to control for an order effect. Video modeling sessions were held every evening throughout the study except on days when activity sessions also occurred, when the video modeling sessions occurred between 30 to 60 minutes prior to the session.

Prior to the first video modeling session only, the first author cued Ryan to watch the people in the videotape and pointed out three to four occasions of "good talking" in the vignettes to highlight the behaviors of interest. Following this, no further explanations were provided to Ryan regarding the videotapes, and neither the supervisors nor his parents talked to him about the tapes either during or after the video viewing.

Video Modeling Plus Feedback

After five sessions of video modeling for the second activity (Chevron cars), there was no evidence of change in the frequency of Ryan's verbalizations with either of the peers for this activity. This appeared to be related to his intense preoccupation with the Chevron cars, because he asked to play with them frequently throughout the day and engaged in perseverative behaviors with them during activity sessions (e.g., spinning the wheels at eye level, reading the names on the bottom of the cars over and over). Thus, video feedback was added to video modeling in an attempt to provide additional input to Ryan with regard to the desired behaviors. The video feedback intervention was implemented for both the Play Doh and Chevron cars activities at the same time, because target verbalizations had already increased considerably during Play Doh and provided numerous examples of "good talking." The first author implemented the video feedback sessions on the same days the activity sessions occurred.

During video feedback, the first author showed Ryan the videotape of himself and a peer engaging in the play activities during the immediately previous activity session, paused the tape occasionally, and helped him evaluate whether he was engaged in "good talking." The first author drew a green happy face representing "good talking" and a red sad face representing "not good talking" on a piece of paper, cued Ryan to recognize good and not good talking in the videotapes, and helped him put a mark under the appropriate face. She provided verbal reinforcement for instances of good talking, remained verbally neutral for instances of not good talking, and provided two or three examples of what Ryan could have said at times when he was not talking. By the end of the second feedback session, Ryan had learned to recognize and discriminate between good and not good talking independently and began to suggest things he could say. Each video feedback session required 8 to 15 minutes to complete.

Video Modeling, Feedback, and Prompting

While the addition of video feedback to the Chevron cars activity resulted in a mean increase in the frequency of the target behaviors, there was considerable day-to-day variability in the data. Furthermore, Ryan continued to engage in perseverative behavior with the cars during the Chevron cars activity sessions. Thus, a phase that included an adult prompting procedure during the activity sessions was added

to the intervention for Chevron cars only. During this phase, in addition to video modeling and feedback, the experimenter provided both a verbal prompt (i.e., "Remember to talk when you are playing") and a visual prompt (i.e., a green happy face similar to that used during feedback sessions, with the word "Talk" printed under it) after every 10 seconds of the Chevron cars activity during which Ryan did not speak. Initially, both visual and verbal prompts were provided; all prompts were faded over five sessions. Ryan required 4, 6, 11, 6, and 4 prompts, respectively, over five sessions before all prompts were withdrawn and he was able to maintain a stable rate of verbalizations without them. No prompts were provided for the other two activities at any point during the study.

Follow Up

Follow-up data were collected in activity sessions that occurred 7, 16, and 18 days after the completion of the intervention. In the interim, no video modeling or feedback occurred, and Ryan did not have access to the experimental materials. The follow-up sessions were conducted in the same manner as baseline and intervention sessions.

DATA COLLECTION

Training

A research assistant (RA) who was blind to the purpose of the study was trained to code the tapes for reliability. The adult model videotape vignettes produced for the study and a pilot videotape of Ryan and one of the peers prior to the beginning of the study were used for this training. In addition, the RA was provided with a scoring manual containing operational definitions, examples and nonexamples of the target behaviors, and a scoring protocol. Initial training was provided over 2 to 3 hours until the RA achieved 90% accuracy (compared to experimenter codings) over three practice transcripts. In addition, two of Ryan's tutors were trained through role-playing to conduct the activity sessions and video modeling sessions; Ryan's parents were also trained with regard to the latter. Training protocols that consisted of procedural checklists and instructions were developed to support this training.

Interrater Reliability

The first author acted as the primary coder and transcribed and scored occurrences of the dependent measures from all videotapes across phases (i.e., scripted and unscripted verbalizations, initiations and responses, repeats, etc.). In addition, the RA independently scored the transcripts for 35.7% of all sessions across phases. Reliability checks occurred randomly during baseline, intervention, and follow-up conditions. Interrater reliability was calculated by dividing the total number of agreements by the total number of agreements plus disagreements and multiplying by 100, for both initiations/responses and scripted/unscripted verbalizations. The mean interrater agreement for initiations and responses across all activities was 93.7% (Play Doh: 95.6%, Chevron cars: 94%, Caillou's tree house: 91.1%). The mean interrater agreement for scripted/unscripted verbalizations was 92.4% (Play Doh: 95.7%, Chevron cars: 93.3%, Caillou's tree house: 83.3%). No single reliability score was less than 80% for any measure.

Treatment Fidelity

To ensure that the videotape modeling protocol was followed accurately, parents and tutors were asked to complete a form that specified the steps of the protocol and the amount of time required for Ryan to watch the videotape vignettes each day. They also recorded data on the number of times Ryan left the room and/or stopped watching the videotape and the number of prompts needed to encourage him to sit and watch the videos. The experimenter also observed 10% of the video modeling sessions and independently coded the accuracy of each step of the protocol. Treatment fidelity was calculated by dividing the total number of steps completed accurately by the total number of accurate plus inaccurate steps and multiplying by 100. Treatment fidelity was 100% throughout the study. Ryan never left the video viewing area and always watched the complete videotape. In a few instances, the supervisor provided reminders to watch the video when Ryan became excited about the tapes and began talking to the supervisor about what he was watching.

A second measure of treatment fidelity was also included with regard to the activity sessions. The supervisor of each session completed a form indicating whether she followed each step of the activity session protocol. The experimenter independently observed 39.3% of all activity sessions, approximately one per week. Treatment fidelity was calculated by dividing the total number of steps completed accurately by the total number of accurate plus inaccurate steps and multiplying by 100. With the exception of the ninth session, procedural reliability for activity sessions was 100%. On the ninth session, Jay raised his voice to Ryan, grabbed toys from him, and called him a name. In response, the supervisor ended this activity at approximately 4 minutes 30 seconds instead of the required 5 minutes. Subsequently, rules were established for Jay about playing nicely and were reviewed prior to every activity session in which he was involved. After Jay was reminded to play nicely on approximately three occasions, no further problems of this nature occurred.

Results

The goals of the study were to determine whether the use of video modeling would result in an increase in (a) total social language verbalizations, (b) scripted and unscripted language, and (c) initiations and responses. The data suggest that the video modeling intervention was responsible

for a significant increase in social language in two of the three activities. During the third activity (Chevron cars), video feedback plus prompting were required in addition to video modeling to achieve a significant, stable change in the target behaviors above baseline.

FREQUENCY OF TOTAL, SCRIPTED/UNSCRIPTED, AND PROMPTED/UNPROMPTED VERBALIZATIONS

Figure 1 displays the results related to total, scripted/unscripted, and prompted verbalizations for each play activity.

Play Doh

During baseline, there was a decelerating trend and a mean frequency of 10.4 verbalizations per session. Stability in the data were achieved after five sessions. Upon implementation of the video modeling intervention, there was an immediate change in both the level and trend with regard to total frequency. The mean number of total verbalizations across seven sessions of video modeling was 25.3. Although some variability was evident, a consistent level of change over baseline was evident with the exception of one data point (Session 10). The mean number of unscripted verbalizations during video modeling exceeded those of scripted verbalizations by a factor of almost three (mean = 18.4 for unscripted and 6.9 for scripted verbalizations).

Following addition of video feedback, a gradually accelerating trend in total verbalizations was evident. The mean total frequency rose from 25.3 utterances per session during video modeling to 30.4 during video modeling plus video feedback. The mean number of scripted verbalizations doubled during this phase (mean = 12.8), whereas unscripted verbalizations remained virtually the same (mean = 17.5).

During follow-up, the data continued to show high frequencies of total verbalizations, with the final two data points reaching levels that were among the highest across all phases. Unscripted verbalizations also increased during follow-up, accounting for twice as many verbalizations as those that were scripted.

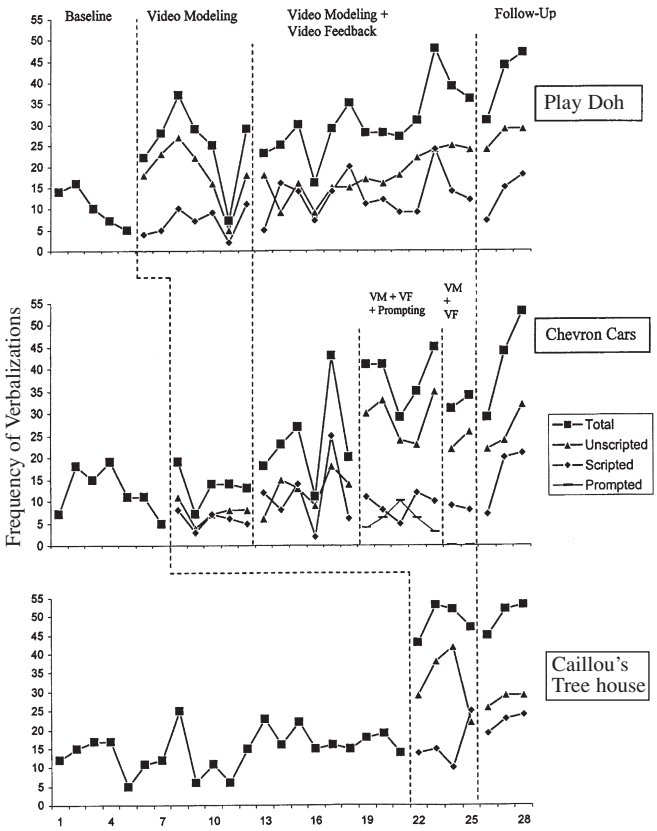

Figure 1. Frequency of total, scripted, unscripted, unprompted, and prompted verbalizations across play activities. VM = video modeling; VF = video feedback.

Chevron Cars

During baseline, there was considerable variability in the data, with a gradually decelerating trend beginning with Session 5 and stability evident by Session 7. The mean number of total verbalizations during baseline was 12.3. Following the introduction of video modeling, there was a change between the last data point in baseline and the first data point following intervention. However, there was no apparent change in level or trend over five sessions. The data showed some variability, with a mean of 13.4 verbalizations per session, almost the same as in baseline.

The addition of a video feedback component resulted in a gradual improvement in both the level and trend for total verbalizations, but the data continued to be quite unstable across six sessions. Although the mean number of total verbalizations per session during this phase rose from 12.3 in baseline to 23.7, this was largely because during Session 17 Ryan produced a total of 43 verbalizations. Aside from this, the range varied from 11 to 25 per session.

Because the data were still unstable, a decision was made to add a third component, prompting, to activity sessions. A total of 31 prompts were delivered over five sessions of this phase (mean = 6.2 per session). As is evident from Figure 1, 29 of these were immediately followed by a verbalization by Ryan. The mean number of total verbalizations rose to 38.2 in this phase, with the majority (84.8%) continuing to be unprompted. In addition, the range increased to 23 to 45 verbalizations per session and the data achieved greater stability. Across the last three sessions of this phase, prompts were faded gradually from verbal to visual and then discontinued entirely. Over two sessions involving video modeling plus feedback only (Sessions 24 and 25), Ryan produced a mean of 32.5 total ver-

balizations per session, slightly lower than when prompts were used but still substantially more than baseline. In addition, both scripted and unscripted verbalizations increased in the Chevron cars activity during the first video modeling plus feedback phase, but unscripted verbalizations did not predominate until prompting was added. The mean levels during the prompting phase were 9.2 per session for scripted verbalizations and 29 per session for unscripted verbalizations.

Finally, follow-up data indicated that Ryan maintained the gains in total verbalizations for up to 18 days after treatment was discontinued. In fact, the mean rate of total verbalizations during the follow-up phase was 42 per session, slightly higher than during treatment. Similarly, unscripted verbalizations continued to predominate during follow-up.

Caillou's Tree House

Baseline data collected over a 2-month period for Caillou's tree house reflected a stable level and trend, with some variability during the first half. There was no experimental drift related to the initiation of intervention in either of the other two activities. The mean number of total verbalizations for the baseline phase was 14.8 per session. Following the introduction of video modeling, there was an immediate level change to a mean of 48.8 verbalizations per session, more than triple that of baseline. There was no overlap of the data between the phases, suggesting a very strong intervention effect. During video modeling, the mean number of unscripted verbalizations (32.8 per session) was twice that of scripted (16 per session). Follow-up data continued to illustrate the increase in total verbalizations, with a mean of 50 per session and little variability in the data (range = 45 to 53). Unscripted verbalizations continued to show higher levels than scripted verbalizations during follow-up as well.

FREQUENCY OF INITIATIONS AND RESPONSES

Figure 2 displays the frequency of initiations and responses across the three play activities. Overall, initiations were higher than responses for all phases.

Play Doh

The number of responses during baseline was quite low, with a mean of 1.4 per session. Initiations during baseline were somewhat higher, with a mean of 9 per session. However, the trend of initiations during baseline was decelerating. Following the introduction of video modeling, there was a substantial and immediate change in both trend and level for initiations, with a mean of 22 per session. Responses increased slightly to a mean of three per session during this phase. The addition of video feedback resulted in an additional level change for responses, with the mean rate increasing to 7.2 per session. The addition of video feedback also resulted in a gradually accelerated trend for initiations, although the mean (22 per session) did not differ markedly from that of the previous phase (23 per session). During follow-up, both the mean number of initiations (30.3 per session) and the mean number of responses (10.3 per session) were higher than during intervention.

Chevron Cars

The mean number of initiations during baseline was 8.9 per session, and the mean number of responses was 3.9. However, there was a significant amount of variability for both initiations and responses during this phase, with a gradually decelerating trend in initiations noted. Following the introduction of video modeling, there was no significant change in either initiations or responses except for Session 8. The addition of video feedback resulted in a mean increase in initiations (from 9.4 per session during video modeling to 17.7 during video modeling plus feedback). However, there was considerable variability in this

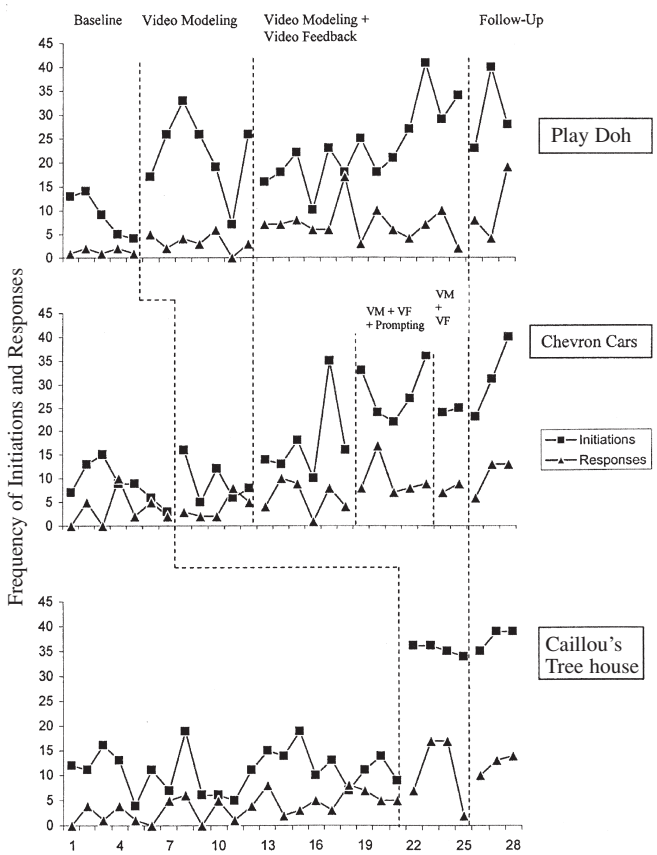

Figure 2. Frequency of initiations and responses across play activities. VM = video modeling; VF = video feedback.

measure, as indicated by the range of 10 to 35 initiations per session. The data were also quite unstable for responses, with a range of 1 to 10 responses and a mean of 6 per session.

During the video modeling plus feedback plus prompting phase, the mean number of initiations rose to 28.4 per session, a notable increase. In addition, the range across sessions decreased, indicating that the data achieved greater stability than during the previous phase. With regard to responses, with the exception of one data point (Session 20), the data became more stable and the mean increased from 6 per session during the previous phase to 9.8. The removal of prompts (Sessions 24 and 25) did not result in a marked decrease in the frequency of either initiations or responses. Finally, the means of both initiations (31.3 per session) and responses (10.7 per session) during the follow-up phase were the highest overall and showed an accelerating trend.

Caillou's Tree House

The data during the extended baseline for Caillou's tree house showed some variability, ranging between 4 to 19 initiations and 0 to 8 responses per session. No experimental drift was evident when intervention was introduced in the other two activities. Following the introduction of video modeling, the mean number of initiations rose from 11.1 per session in baseline to 35.3, and the mean number of responses rose from 3.7 per session in baseline to 10.8. However, the data for responses showed greater variability and, while two of the data points reached 17 responses per session, the other two overlapped with baseline data. Finally, follow-up data indicated that the gains made in both initiations and responses were maintained once the intervention was terminated. In addition, responses during this phase stabilized at a consistent level above that of baseline.

Discussion

This study examined the use of video modeling and video feedback to promote social language between a child with autism and his peers. For two of the activities in the study, video modeling alone was sufficient to produce an increase in social language; the addition of video feedback to one of these two activities appeared to augment this effect. For the third activity (Chevron cars), video feedback and prompting were required in addition to video modeling.

A considerable body of literature has focused on training peers to promote the social interaction skills of children with autism and on teaching both peers and children with autism skills related to social interaction. In contrast, the present study focused only on Ryan and did not include any peer training at all. In addition, the study utilized ordinary peer play interactions, without specific play "scripts" or additional instructions regarding how to play. Both the peers' familiarity with Ryan and their generally good play skills may have been contributing factors to the success of the intervention in the absence of peer training.

SCRIPTED AND UNSCRIPTED VERBALIZATIONS

Surprisingly, although Ryan demonstrated a dramatic increase in both scripted and unscripted verbalizations, the latter predominated and accounted for two to three times the number of scripted verbalizations in several phases. This finding is significant in light of previous video modeling research in which little or no unscripted responding was documented (e.g., D'Ateno et al., 2003; Taylor et al., 1999). D'Ateno et al. suggested that this lack of unscripted verbalizations may have been due to a failure to include sufficient exemplars in the video modeling tapes for their study. Based on this suggestion, three vignettes for each play activity were included in the present study for a total of nine vignettes across three activities. Although it is not possible to say with certainty that the inclusion of multiple exemplars (Stokes & Baer, 1977) in the present study was responsible for the increase in unscripted verbalizations, this study was the first to both use multiple video vignettes across activities and show subsequent increases in unscripted language.

The predominance of unscripted verbalizations is also significant in light of the definitions used in the present study. D'Ateno et al. (2003) suggested that one explanation for the lack of unscripted responding in their study could be related to the "rather stringent" (p. 10) definitions they employed for unscripted verbalizations. To be scored as unscripted, a verbalization in that study had to be at least three words in length and had to differ from a modeled response by more than one word. Our definitions were quite similar to those of D'Ateno et al. except that we coded verbalizations that matched the beginning of a modeled verbalization as scripted, regardless of how many words from the model were omitted (e.g., "I like to eat" was coded as scripted because "I like to eat chocolate ice cream" was modeled in the video). Thus, it is unlikely that differences between the two sets of definitions can account for the different results.

In this study, frequency data were recorded to evaluate the rate of occurrence of scripted and unscripted verbalizations across phases. Qualitatively, Ryan demonstrated unscripted verbalizations that ranged from those that differed only slightly from that of a model to those that were completely novel. The following examples illustrate unscripted verbalizations that differed only slightly from their models:

MODEL: "I'm going to make a milkshake."
RYAN: "I'm going to make ice cream" or "I'm going to make vanilla ice cream."
MODEL: "I'll be Caillou."
RYAN: "I'll be Gilbert."

The following examples show more variability in Ryan's unscripted verbalizations:

MODEL: "Can you help build the road?"
RYAN: "Pamela, are you going to build a road?"
MODEL: "I'm right behind you."
RYAN: "I'm behind Sally school bus."
MODEL: "Here's the red box."
RYAN: "I need the French fry box."

Finally, Ryan often created novel utterances that were not apparently based on models in any of the scripts and were not evident in his language repertoire at baseline. Examples of such novel, unscripted verbalizations included the following:

"Awww, I dropped my chicken."
"Let's put sprinkles on chocolate ice cream."
"Did you drop your cool car?'
"Stop it, don't knock it."
"I wanna be Caillou and you be Rosie, Jay."
"Oh oh, don't want to fell off."
"No, I don't like dark brown."
"My favorite Chevron cars is Nando."
"No, not by the hair on my chinny chin chin" (after the peer said, "Let me in, let me in," while driving one of the Chevron cars up a truck ramp).

STIMULUS GENERALIZATION

Clearly, this study demonstrated high levels of response generalization in Ryan's use of unscripted language, a phenomenon that has not been demonstrated in previous video modeling research. Unfortunately, due to time constraints, stimulus generalization across novel environments or people was not formally evaluated. However, there was some anecdotal evidence of stimulus generalization outside of the activity sessions. For example, midway through the study, Ryan had a conversation with a peer other than Jay or Pamela that very closely resembled several lines of the Play Doh script. This occurred while Ryan and the novel peer were working on an arts-and-crafts activity and waiting for pizza that was being prepared for lunch by Ryan's father. When the peer asked Ryan if he liked pizza, he responded, "Yeah, I can taste it. I love pizza!" which was taken directly from two lines of a Play Doh script, substituting the word "pizza" for "ice cream." Ryan then proceeded to say to the peer, "Pizza tastes good," and "Mmmm, yummy!" two additional lines from a Play Doh script about chicken nuggets. Ryan used the same tone of voice and voice inflection as modeled in the tapes during these interactions as well. Additional video modeling studies examining this issue are clearly needed, and should incorporate specific techniques to promote generalization such as general case programming (Halle, Chadsey-Rusch, & Collet-Klingenberg, 1993) and the use of multiple exemplars and other strategies described by Stokes and Baer (1977).

INITIATIONS AND RESPONSES

Another interesting finding was that Ryan produced more initiations than responses following intervention. In light of the difficulties that children with autism have with regard to social initiation, this was somewhat surprising. This result is even more interesting when one compares the ratio of initiations to responses in the video modeling vignettes (66:34—almost 2:1) with the ratio of initiations to responses produced by Ryan during activity sessions (3:1 following the video modeling intervention for both Chevron cars and Caillou's tree house, and almost 7:1 for Play Doh). Thus, although Ryan observed an initiation-to-response ratio of 2:1 on the video modeling tapes, he produced an even higher proportion of initiations than was modeled. There are several possible explanations for this result. First, although the data were not analyzed with regard to specific communicative functions, it appeared that the majority of both Ryan's and the peers' utterances were comments (e.g., "I'm going down the slide!" "Cool!") rather than questions or directives that obligated a response. Second, perhaps the use of multiple exemplars provided Ryan with so many initiation examples that he was able to initiate at a higher rate than the models. Third, it may be that, because mimicking the video models appeared to be quite enjoyable for Ryan, he exaggerated the already-high proportion of initiations in the videotapes, especially in sessions where the peer initiated very little. Regardless of the explanation, Ryan's parents and the activity session supervisors all commented on several occasions that both Ryan and his peers clearly enjoyed playing together more after Ryan became more verbally interactive as a result of the video modeling intervention. Future research should include both formal measures of social validity to evaluate this issue and a more detailed analysis of peer and participant utterances with regard to their specific communicative functions (e.g., comments, questions, answers). Future research should also examine the impact of various initiation:response ratios in the video models themselves on social language produced after viewing.

VIDEO FEEDBACK

Prior to this, only one study examined the use of video feedback to increase social language between children with autism and their peers, as part of a multielement intervention (Thiemann & Goldstein, 2001). Video feedback was included in the current study only after it became clear that Ryan was perseverating on the physical characteristics of the Chevron cars (i.e., by spinning the wheels repeatedly). Ryan was fascinated with seeing himself on videotape, showed considerable interest in accumulating "points"

(as he labeled them) for good talking, and frequently made comments such as "Good talking's going to be the winner!" While the addition of video feedback in this activity did lead to a mean increase in the target behaviors over several sessions, the session-by-session data still reflected considerable variability over several sessions. Hence, adult prompts at 10-second intervals were added and then gradually faded over five sessions. The prompts appeared to function to interrupt Ryan's perseverative behavior at the time it occurred. Following a prompt (e.g., "Remember to talk when playing"), Ryan frequently said "OK," removed his focus from the Chevron car or truck, and immediately began talking to his peer. Given the immediate impact of the prompting component, it is possible that prompting alone (i.e., without video feedback) would have been sufficient to increase Ryan's social language use during the Chevron cars activity. Because this was a short-term intervention component that was used in only one of the three activities in this study, additional research is needed to examine the impact of prompting for teaching social language to children with autism in the context of video modeling and video feedback.

LIMITATIONS

The results of this study are limited in that it included only one participant who had the ability to make requests, respond to questions, make comments, and utilize language to describe and explain concepts in short phrases/sentences. Though Ryan rarely used social language spontaneously with peers, he was able to do so with adult prompting. In addition, he had received many hours per week of intensive, home-based treatment utilizing methods based on the principles of applied behavior analysis, including, but not limited to, discrete trial teaching. It is not clear how effective the video modeling and video feedback interventions would have been with a child who was more significantly impaired in receptive and expressive language or who had not participated in intensive early intervention. Future research is needed to evaluate the effects of video modeling on social language with children with more limited language abilities and different early experiences.

A further limitation was that the first author, who was not blind to the purpose of the study, was the primary transcriber and coder. In addition, though the study showed impressive follow-up data up to 18 days following intervention, long-term maintenance data were not collected due to time constraints. Additional research is needed to assess both long-term maintenance and generalization across people (e.g., siblings, unfamiliar peers), environments (e.g., school, playground), and stimuli (e.g., novel play materials). Future research is also needed to examine the impact of video modeling and feedback on the acquisition of motor play skills as well as specific social language skills.

SUMMARY

Despite these limitations, the findings of this investigation make several unique contributions to the literature on video modeling, video feedback, and teaching social language to children with autism. First, this study documents the effects of video modeling for teaching language use with peers during typical play activities. Second, both scripted and unscripted language increased, perhaps as a result of the inclusion of multiple exemplars in the videotape vignettes. Third, though the results indicated positive changes for both responses and initiations, the latter increased considerably more than the former, suggesting that videotape treatments may be effective for teaching children with autism to initiate. Fourth, this study provides an example of the use of individual child data to adapt instruction when unexpected issues arise (e.g., Ryan's fixation on the Chevron cars). Finally, this study demonstrated that unfamiliar adults can be used successfully as models for an intervention with a child and that, for two of the three activities, having the participant simply watch a short (i.e., 3 minutes) videotape once per day resulted in increased social language. Practically speaking, this is good news for parents, interventionists, and others who might be in the position to implement videotape interventions in home and school settings.

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(see Appendix on next page)

Appendix

Video Vignettes Across Three Activities for Template 1

Play Doh	Chevron cars	Caillou's tree house
1 Come on. Let's play Play Doh!	1 Come with me. Let's play cars!	1 Come on. Let's play tree house!
2 All right	2 Yay!	2 OK
1 Do you want to make sundaes or McDonald's food?	1 Do you want the orange car or the blue car?	1 Do you want Rosie or Caillou?
2 I want to make sundaes.	2 I want the orange car.	2 I'll have Rosie.
1 I want to make some ice cream.	1 I'll be blue.	1 I'll be Caillou.
2 We can do it together	2 We can put them in Cary Carrier.	2 Gilbert can play in the sandbox.
1 I'm going to use brown. It's chocolate.	1 I'm going to drive blue car up. Blue is first.	1 Caillou is tired. He needs to sleep in the tent.
2 Can I have chocolate too?	2 Can my orange car come on?	2 Can Rosie sleep too?
1 Yeah, put it inside.	1 Yeah. Drive it up the ramp.	1 Sure, put her in the tent.
2 Num num num	2 Rrrrrrrrrr	2 (Snore noise)
1 Put the cone under.	1 Put the ramp up.	1 Time to wake up.
1 What shape do you want?	1 Where should we go?	1 What do you want to do?
2 Let's do the star.	2 Let's drive on a road.	2 Let's go on the swing.
1 OK. I like that one!	1 Yes. That's cool!	1 Yeah. Good Idea!
2 Here, push it down.	2 Here, push Cary Carrier.	2 Here, put Caillou on the swing.
1 Can you help push?	1 Can you help build the road?	1 Can you help me?
2 Sure . . . There you go!	2 OK . . . There's the road.	2 Yes . . . There!
2 I'll eat the ice cream.	2 I'll make it longer.	2 I'll make it go down.
1 I'll put sprinkles on.	1 I'll help build it.	1 I'll push it.
1 "Ch ch ch" (shaking)	1 "Ch ch ch" (hammering)	1 Wheeee!
2 Do you want some?	2 Do you want to drive?	2 Can Rosie have a turn?
1 Yeah, I can taste it.	1 OK, I can push Cary.	1 Yes, Rosie your turn.
1 I love ice cream!	1 I like playing cars!	2 I like swinging!
2 I like making ice cream cones.	2 I like building a road.	1 Caillou is playing in the sandbox with Gilbert.
1 This is great!	1 This is exciting!	1 This is fun!
2 Yeah. I like playing Play Doh!	2 Yeah. I like Chevron cars!	2 Yeah. I like Caillou's tree house!

Note. 1 = Actor 1; 2 = Actor 2.