Teaching Social Skills to Children with Autism using Video-Modeling: A Component Analysis

by

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Abstract

Children with autism spectrum disorders (ASD) experience extreme difficulty learning and engaging in new social interactions. The behavior analysis research literature contains evidence that several procedures including discrete trial training, incidental teaching, and in-vivo modeling are effective teaching modalities when teaching social skills to children with ASD (Lovaas, 1987; McGee, Morrier, & Daly, 2001; Odom & Strain, 1986). In addition, video modeling intervention packages (VM) have shown efficacy. Despite this evidence, no studies to date have revealed the controlling components of learning when using VM package interventions; therefore it is unknown which components are critical for learning to occur.

The present study's aim was to conduct a component analysis of a VM package to systematically reveal critical components controlling learning. Four preschool age children diagnosed with autism were taught socially relevant skills using video. The primary components of the package intervention were introduced one at a time and these included: multiple viewings, rules, response rehearsal, response prompting following the video, and viewing the peer model on the video receive a preferred item for correct performance of the task, and subsequently receiving a preferred item for correct performance.

The component analysis revealed that all components examined, except for single viewing of the video, response rehearsal and response prompts increased correct responding for three of the four participants at varying levels. Future directions include examination of components that were not introduced during the present study and further research into the necessity of the components found relevant.

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List of Abbreviations

ABA	Applied Behavior Analysis
VM	Video Modeling
ASD	Autism Spectrum Disorder

CHAPTER I

Teaching Social Skills to Preschool Children with Autism Spectrum Disorders Using Video Modeling: A Component Analysis

Ineffective Social Repertoires in Children with Autism Spectrum Disorders

Since Kanner's (1943) observation of children who were uninterested in the people and activities going on around them, the diagnostic criteria for autism has become much more refined. Currently, the Diagnostic and Statistical Manual of Mental Disorders (DSM-IV-TR; American Psychiatric Association [APA], 2000) includes the following criteria for diagnosis: behaviors must be exhibited in three areas: (a) difficulties in language and communication skills, (b) restricted range of activities and/or stereotyped behavior patterns, and (c) difficulties in social interactions (Kanner, 1943).

Due to the heterogeneity within the disorder, behavioral profiles of children with autism vary widely. To include all presentations of the disorder the phrase, autism spectrum disorders (ASD), is currently used by professional and research communities. The disorders in the DSM-IV TR that comprise ASD include Autistic Disorder, Asperger's Disorder, and Pervasive Developmental Disorder, Not Otherwise Specified, (PDD-NOS; APA, 2000). Despite the heterogeneity observed in ASD, the difficulties observed in social interactions are more heavily weighted than the other two diagnostic criteria (APA, 2000;Siegel, 1989)

The most distinguishing feature of ASD is the failure to develop a social repertoire, which has remained consistent with Kanner's initial observations. Researchers in the field speculate that deficits in the social repertoires in ASD either are caused by, or result from weak skill repertoires across many classes of behavior including language, toy play, imitation skills, and excesses in stereotypy (Vaughn & Michael, 1982). Social behaviors commonly missing from the repertoires of individuals diagnosed with ASD include, but are not limited to, verbally or non-verbally acknowledging the presence of another person, joint attention behaviors, responding appropriately to non-verbal interactions and cues, initiation of social interactions, appropriate verbal responses, and lack of empathy (Mundy, et al. 1986). Regardless, the research literature continues to reveal a variety of ways social skills can be taught to preschoolers with ASD (Lovaas, 1987; McGee, Alameda, Sulzer-Azaroff, & Feldman, 1992; McGrath, Bosch, Sullivan, & Fuqua, 2003; Pierce & Schreibman, 1997). A description of representative studies is summarized below.

Applied Behavior Analysis Interventions for Social Skill Development

Although many interventions exist to teach children with ASD social skills, the most effective interventions rely on the field of Applied Behavior Analysis (ABA). The behavioral techniques within the field of ABA have received a substantial amount of empirical support (Eikeseth, Howard, Sparkman, Cohen, Green & Stanislaw, 2005; Lovaas, 1987; Smith, Jahr, & Eldevik, 2007). ABA has grown out of the Experimental Analysis of Behavior, which focuses on operant research of both human and animal behaviors. Based on the conceptual underpinnings of behaviorism, the primary tenet of ABA is that all behaviors occur in the context of particular environmental conditions and are followed by consequences. By understanding and controlling the environmental variables and the consequences of a behavior, behavior can be modified and new behaviors can be taught. Using this basic principle, a large portion of the research efforts in ABA has directly impacted treatment for ASD's, and more recently interventions for social skills development (Reichow & Volkmar, 2010).

Many behavioral processes and procedures are found within the ABA research literature when teaching social skills to children with ASD. Some of the basic processes are commonly found in the literature and are defined here. Positive reinforcement is the process by which a behavior is strengthened on some dimension due to the addition of a consequence following the behavior Prompting is the addition a stimulus to ensure that the correct response occurs, and may be presented prior to the behavior or following the behavior, and is faded out as quickly as possible (Cooper, Heron, & Heward, 2007). Intervention studies teaching social skills to children with ASD commonly include these two basic processes. These processes are often embedded within the procedures discrete trial training, naturalistic teaching, and video modeling. These procedures are the most commonly found in the ABA literature and a more detailed examination of these procedures will be provided next.

Discrete trial training. Over the past 65 years, researchers have attempted to identify the optimal conditions in which children with autism learn new behaviors. The procedure that has resulted in marked results is discrete trial training. Discrete trial training (DTT) is a highly structured teaching procedure that consists of five parts. The first part is the discriminative stimulus, usually a verbal or visual stimulus provided by a teacher. The second part includes prompts; these consist of any additional stimuli needed to ensure the correct response occurs and may occur prior to the learner's response or following it. The third part is the response from the learner. The fourth part is differential consequences following the learner's response, followed by the last part, an inter-trial interval. Implementation of these steps constitutes a discrete trial (Smith, 2001). During intervention, many of these discrete trials are repeated during a session in a one-on-one format (teacher and child) providing multiple learning opportunities for each behavior being taught.

A study conducted by Ivar Lovaas (1973) was first to document improved functioning in a group of children with Autistic Disorder who received intensive behavior analytic intervention before they reached four years of age. This study utilized the techniques of discrete trial training, discrimination learning, prompting, shaping and chaining to teach institutionalized children with Autistic Disorder. Efforts focused primarily on language development because Lovaas deemed this a pivotal skill. His plan was for these children to return to their normal environment after one year of treatment, however, 90% of children regressed to near baseline levels of functioning in a natural, unsupported environment (Lovaas, 1973; Lovaas, 2003).

Lessons learned in the 1973 study play a major role in development of Lovaas' next study. For the 1987 study, he designed the Young Autism Project with the following points in mind: 1. Younger children made the greatest progress, 2. Treatment effects did not generalize to other settings, 3. Response generalization to other environments or response classes did not occur, 4. Parents can become skilled teachers of their children, 5. Treatment was conducted for at least two years (discrete trial and peer interaction), 6. Teaching procedures based on behavioral principles were improved.

In the 1987 Young Autism Project, the experimental group received 40 hours per week of early, intensive treatment over two years, consisting primarily of discrete trial training. Two control conditions were employed and the first group contained 19 children receiving 10 hours of intervention per week for two years, and the second control group contained 21 children that received unspecified community interventions (i.e., not ABA). Outcome data from this study were reported as IQ gains and educational placement. Of the nineteen children in the experimental group, 47% had IQ scores in the normal range and were functioning in first grade classrooms without additional support. The experimental group's mean IQ quotient increased from 63 to 83. Only one child from either of the control groups demonstrated this level of improvement (Lovaas, 1987). Although not empirically determined, recommendations from the Lovaas studies generally suggest that social skills be taught in a discrete trial format, then moved to a more natural setting (i.e., small peer groups or a classroom) for additional practice using teacher prompting (Lovaas, 2003).

More recently, Eikeseth, Smith, Jahr, and Eldevik (2002) conducted a study to evaluate the outcomes achieved of 4 to 7-year-olds with ASD after one year in an intensive behavioral intervention program. Intervention occurred at the children's school and outcomes were compared to a group of children with ASD who received intensive, eclectic special education services (Eikeseth et al., 2002).

The behavioral treatment began with teaching simple tasks using discrete trial training such as following receptive instructions, imitating verbal and non-verbal behaviors, and basic discrimination training. The treatment subsequently focused on more advanced skills such as answering questions, following multi-step instructions, and forming friendships with peers. Social skills were taught initially using discrete trial training, and incorporated a progression to more naturalistic setting teaching play and language skills with peers present The eclectic treatment group was designed to reflect best practices for children with ASD and included elements from a variety of interventions including TEACCH, sensory-motor therapies, speech therapy, and ABA. Both the behavioral and the eclectic group received 28 hours per week per child and the eclectic interventions were implemented in a one-to-one format, as DTT (Eikeseth et al., 2002).

The children in the behavioral treatment group made significantly larger gains on standardized tests that the children in the eclectic group. The differences were statistically significant for IQ, language, and adaptive behavior. Seven of the 13 in the behavioral group achieved IQ scores above 85 compared to only two in the eclectic treatment group (Eikeseth et al., 2002). To summarize, these findings further support the use of DTT as a method to teach social skills to children with ASD.

There has been criticism of DTT due to the lack of spontaneous use and generalization of the skills taught (Koegel, 2000). Regardless, ABA techniques, specifically DTT, remain the most commonly utilized intervention for teaching social skills to children with ASD (Reichow & Volkmar, 2010).

Naturalistic teaching. Although the direct benefits of discrete trial training are well established, other studies have shown support for more naturalistic teaching procedures. Referred to in the literature as incidental teaching, milieu teaching, pivotal-response training and natural environment teaching (Cowan & Allen, 2007; Ingersoll & Schreibman, 2006; Koegel, O'Dell, & Koegel, 1987), these procedures were designed to address the limitations of DTT. While also based on the principles of ABA, naturalistic teaching procedures emphasize teaching that is focused on the learner's motivation in a less structured environment compared to that of DTT. This intervention takes advantage of the motivating operations of the learner to teach and increase social interactions in a natural setting such as the school classroom or home (McGee, et al., 1992). An example of this type of teaching interaction would be the teacher closely observing a learner's interest in a toy car on a shelf that is just out of reach. The teacher would then approach the child and wait, or prompt the child to interact socially in some way (e.g.: saying "car please", making eye contact with the teacher then looking at the car, labeling the color of the car, etc.) before getting access to the car. The naturalistic teaching approach also provides increased generalization (Charlop-Christy & Carpenter, 2000) through naturally occurring teaching opportunities. It also provides opportunity for increased spontaneity because teaching is embedded in ongoing play interactions (Keiser et al., 1992).

Ingersoll and Schreibman (2006) conducted a study employing the techniques commonly used in naturalistic teaching interventions. They taught reciprocal imitation skills to five children with ASD, ages two to four. Treatment included several naturalistic techniques implemented in phases with the first being contingent imitation, in which the therapists imitated the actions of the child. The second was linguistic mapping, in which the therapist verbally labeled the actions that they were performing and modeling of actions with toys. Finally actions with toys were modeled for the child and were prompted if not performed by the child after three opportunities (Ingersoll & Schreibman, 2006).

Results of this study showed that all children made substantial gains in their spontaneous object imitation and gains remained after the removal of treatment and over a one-month delay. Findings also showed that imitation generalized to novel play materials a different setting and to different therapists. This study gives support to naturalistic teaching procedures to teach imitation skills, a basic skill necessary to teach more advanced social skills (Ingersoll & Schreibman, 2006).

Kohler, Anthony, Steighner, & Hoyson (2001) employed naturalistic techniques to increase the frequency of four boys with ASD’s social interactions by placing items out of reach, requiring expansion of verbalizations, arranging the classroom environment so that children have multiple opportunities to join other peers in play, and utilizing novel materials that were shown to be high-preference for the child. The classroom teachers were trained and provided daily technical assistance in implementing these techniques. Each boy exhibited higher levels of social exchanges after teachers received daily assistance, and two of the boys not only directed more social behaviors toward the teachers, but also toward their classmates. This study provides evidence suggesting that correct implementation of naturalistic procedures can also increase the frequency of social behaviors (Kohler et al., 2001).

It is important to note that some intensive behavioral intervention programs that promote inclusion for children with ASD often function on the assumption that social behaviors will be learned from only observing peers model appropriate behavior. Odom and Strain (1986) sought to determine if this was a false assumption. They taught peers to initiate interactions with preschool children with ASD to determine if their social responses would increase to a higher level compared to teacher prompting. The peer initiation condition did increase their social responses, however, teacher prompting increased initiations *and* responses, resulting in longer chains of social interactions (Odom & Strain, 1986). This study concurs with the Lovaas recommendations and naturalistic studies that support utilization of in-vivo prompting to teach social behaviors.

Video modeling. Over the past 15 years, video modeling has been increasingly used as a modality to teach children with ASD new behaviors. Imitation is the primary skill by which learning occurs via video modeling. Imitation can be defined as viewing a behavior performed by a model, then the viewer is said to have engaged in imitation if their response is topographically identical to that of the model. Imitation is also referred to in the research literature as observational learning (Cooper et al., 2007).

Video modeling has theoretical roots in Bandura's social learning theory (1977) that involves learning a new behavior from watching a model perform the behavior. In short, the basic premise of his theory was that watching a model experience the consequences of the behavior would influence whether or not the observer will engage in the behavior themselves (Bandura, 1965).

Since Bandura's seminal work, abundant research has documented and extended the effects of, in- vivo or "live", modeling. In early modeling research with individuals with developmental disabilities, children learned simple discrimination tasks after the behavior had been modeled by typically developing peers (Barry & Overmann, 1977; Charlop, Schreibman, & Tyron, 1983; Egel, Richman & Koegel, 1981). Within the ASD field, video modeling is defined as a teaching technique in which a person watches a model on video and then imitates the behavior of the model in the appropriate context (Charlop-Christy, Le, & Freeman, 2000).

Categories of video modeling. There are several types of video modeling categories in the literature. These include videos that show adult models (D'Ateno, Mangiapanello, & Taylor 2003), peer models (Simpson, Langone, & Ayers, 2004), self-models (Wert & Neisworth, 2003), point-of-view modeling (Hine & Wolery, 2006) and mixed models (Nikopoulous & Keenan, 2003). Each of the categories will be defined and described next.

First, the categories of adult models and peer models involve showing a video scene of either an adult or peer of the observer engaging in the target behavior. Adults may be familiar, such as a parent or teacher, or unfamiliar. Peers utilized are often the same age and gender as the learner, although peers close in age and those of different genders have shown efficacy. Peers may also be either familiar or unfamiliar (McCoy & Hermansen, 2007). Acquisition of purchasing skills (Alcantara, 1994), perspective taking skills (Charlop-Christy, & Daneshvar, 2003, language and social skills (Charlop-Christy et al., 2000) and play skills (D'Ateno et al., 2003; MacDonald et al., 2005; MacDonald et al., 2009) have support in the ABA research literature.

The next category is video self-modeling. This type of video modeling involves videotaping the learner engaging in the desired behavior, and then having the learner watch the video of him or her self. There are two approaches to creation of this type of video. The first approach involves video taping the learner across time, then editing the video to exclude all inappropriate behavior and non-examples of the target behavior. The second approach involves the learner watching unedited video and allowing the individual to self-critique (McCoy & Hermansen, 2007). These approaches have been used to increase the frequency of social interactions (Buggey, 2005), language skills

(Wert & Neisworth, 2003), and adaptive skills (Lasater & Brady, 1995), and to decrease the frequency of disruptive behavior during transitions and aggression toward others (Buggey, 2005). In contrast to other types of video modeling, video self-modeling is generally used to increase or decrease the frequency of a targeted behavior, rather than to teach a new behavior.

The third type of video modeling is point-of-view modeling. This type of video modeling involves showing the exact visual images that would be viewed by the learner as they engaged in the behavior (e.g., the visual field or image only shows someone's hands making a sandwich). This type is relatively new in the literature with the first study being conducted in the year 2000 (Schreibman, Whalen, & Stahmer, 2000). The literature contains point-of-view modeling studies teaching social skills (Hine & Wolery, 2006) and adaptive skills (Norman et al., 2001; Shipley-Benamou et al., 2002; Sigafoos et al., 2005).

The last type of video modeling found in the literature is the combination of any of the aforementioned types and often includes other video features, referred to as mixed models (McCoy & Hermansen, 2007**).** An example of this type of arrangement was described in Shipley-Benamou, Lutzker, and Taubman's 2002 study where they taught daily living skills to three, 5-year old boys with ASD. A video featuring the child's favorite cartoon character giving instructions to complete the upcoming task was viewed prior to an adult's demonstration of the task. An adult's hands were viewed up close on the video completing tasks such as making orange juice, setting the table, feeding a cat, and preparing a letter to be mailed. All tasks were learned and maintained in a post-video phase and at one-month follow up (Shipley et al., 2002).

Findings from McCoy and Hermansen's 2007 review of video modeling suggest that self and peer models seem to have the most influence on the effectiveness of video modeling, and that peer modeling studies make up the majority of studies in the ASD research literature. Sherer et al. (2001) found no difference between peer models and self models, suggesting that they are equally effective for teaching new skills. Additional findings suggest that video modeling with peers generated more rapid acquisition of the target behavior compared to in-vivo modeling (Charlop-Christy, Le, & Freeman, 2000). Given these collective findings, peer modeling social skills was the focus of this study.

Summary of video modeling studies with preschool children. A list of studies published using video modeling to teach preschool children with ASD is provided in the Appendix. This table (A1) contains relevant studies using peer video modeling with preschool children. Representative research studies teaching social skills to preschool-age children will be reviewed here. Then, a study in which two components commonly found in video modeling packages is reviewed to further illustrate clarify questions yet to be answered about video modeling as an efficacious procedure for teaching children with autism (Apple, Billingsley, and Schwartz, 2005; Gena, Couloura, & Kymissis, 2005;).

A study by Gena, Couloura and Kymissis (2005) examined the effectiveness of in-vivo modeling compared to video modeling for teaching three preschool-age boys with autism affective responses. A multiple baseline across subjects, with a return to baseline condition design was used. The components included were reinforcement (i.e., praise and a token system), video-modeling (3 viewings of the video), in-vivo modeling in a 1 to 1 setting, verbal and gestural prompting, and error correction. Results demonstrated that affective responses (both verbal and non-verbal) could be taught to preschool children with ASD using *either* in-vivo or video modeling, supplemented by reinforcement, error correction and prompting. It must be noted however, that the return to baseline phase does not eliminate the possibility that the behavior was influenced by the intervention that preceded it. The author also notes that from anecdotal observations it seemed as if acquisition of appropriate tone of voice and facial expressions were more expedient when video modeling was used (Gena et al., 2005).

Apple, Billingsley, and Schwartz (2005) used video modeling to teach two preschool-age boys social skills to compliment their peers. A multiple-baseline across participants was employed to assess the effectiveness of the intervention components (i.e., video modeling with rules and reinforcement). Each child was exposed to the baseline phase, video modeling phase, video modeling phase plus reinforcement, and two subsequent phases that withdrew the video modeling component followed by the reinforcement component. This study stands alone in the literature as it is the only one to examine the effects of reinforcement as a component of the video modeling package.

Results showed that participants acquired the skill of compliment-giving responses (e.g., Peer: “Look I have new shoes!” “Participant: Oh, cool!”), but not compliment-initiations (e.g., “I like your shirt.) as a result of video modeling and rules alone. In the withdrawal phases, both children maintained compliments in the response form, but not in the initiation form. A limitation of this study was that the teachers might have served discriminative stimuli for the children to initiate complements (Apple et al., 2005). The findings suggest that artificial reinforcers (and the presence of a teacher to deliver them) may be necessary for acquisition and maintenance of compliment-giving initiations, but not responses. Additional studies examining component analyses are needed in the literature to address this limitation and for replication purposes.

Video modeling has become a very popular method for teaching children with autism because of its time and cost efficiency (Charlop-Christy et al, 2000; McCoy & Hermansen, 2007) and effectiveness shown in studies across varying ages of individuals with autism (Charlop-Christy et al, 1993, 1994, 2000; Taylor, Levin, & Jasper, 1999; LeBlanc et al., 2003; Reeve, Reeve, Townsend, & Poulson, 2007). The Autism Center's National Standards Project (2009) includes video modeling in the category of modeling as an evidence-based practice. Bellini and Ackullian's (2007) review of video modeling interventions for children with autism examined studies that show video modeling as an effective strategy for teaching social-communication skills, functional skills, and behavioral functioning to children with autism ages 3-20.

Recently, Rayner, Denholm, and Sigafoos (2009) state that many practical and theoretical questions remain unanswered about video-based interventions for individuals with autism. Although approximately 30 studies show evidence of learning, video modeling is a package intervention containing between three and eight different components that vary across research labs and intervention programs. Some of these components and variations include: reinforcement (praise or tangible; after watching video model), verbal prompts after the video is watched, rules during or after the video is watched, repeated viewing of the video, multiple exemplars of the social skill, differences in latency of video viewing and opportunity to emit the trained response, and use of error correction procedures and prompting in the test session, and matching the video environment to the test environment (Bellini & Akullian, 2007; Charlop-Christy

& Daneshvar, 2003; McCoy & Hermansen, 2007). Therefore, it might be misleading to state that video modeling is an empirically supported procedure.

Another important point is that most video modeling studies that include children with ASD fail to report if prerequisite skills (e.g., motor imitation, watching a video for a continuous period of time) are examined or required for video modeling interventions. Currently, there is no definitive evidence indicating which prerequisite skills are necessary for a child to benefit from video modeling, nor is there research in support of measures for predicting if learning will occur with video modeling (Rayner et al., 2009). Some exceptions to this include Nikopoulos and Keenan (2003, 2004, 2006). They required that all participants be able to watch television for at least one minute and then provided training to achieve this if necessary. Also, Hine and Wolery (2006) administered a motor imitation ability scale prior to implementation of their study. More studies such as these are necessary to aid teachers and clinicians in choosing effective teaching modalities.

Component Analyses in Behavioral Research

In behavior analytic research studies, component analyses are employed to examine treatment packages commonly implemented in clinical settings. For example, Cooper et al., (1995) used this research design to identify active variables in treatment packages for feeding disorders, specifically food refusal. The components included non-contingent access to toys, escape extinction, differential reinforcement of alternative behavior (DRA) and positive reinforcement in the form of praise and attention. All components of the package were implemented together. Once treatment resulted in improved food acceptance, a component analysis was conducted by removing one component at a time across several sessions to identify crucial components. In this study, one component, escape extinction, was necessary to maintain treatment effects for all participants.

In the above referenced study, introducing a multi-component package first and removing components was advantageous when compared to an alternate option of analyzing the package by gradual inclusion of individual components. When teaching a new behavior, it is often advantageous to start with only the primary components of the package and gradually include new components to clearly reveal when learning occurs.

Purpose of the Current Study

The extant literature has only focused on specifying categories of video modeling packages that are effective (e.g. point-of-view, self, others). However, research revealing the influential components of these packages has not yet been conducted. The primary aim of this study was identify the components influencing the learning of social behaviors in children with autism when using a video modeling treatment package. The secondary aim of this study was to begin the examination of pre-requisite skills or characteristics that predict performance or are required for video modeling to be an effective teaching procedure. To accomplish the first aim, a component analysis was conducted by first introducing the primary component found in video modeling packages. This included watching a video of the peer model perform the social behavior. Subsequently, additional components were added one at a time to see their effects on responding. Conducting the analysis in this manner controlled prior exposure to the component(s), allowing for each successive condition to clearly show the effects on responding. To accomplish the second aim, assessment data were gathered prior to the study on the skills of imitation, matching and delayed matching-to-sample for each participant. These data were then compared to their respective performance on the video modeling tasks to determine if any of these skills may be potential pre-requisite skills for learning via video modeling.

CHAPTER II

Method

Participants

Participants were four, 4-year old children diagnosed with Autistic Disorder (autism). All participants were recruited from a private, non-profit, preschool in the southeastern United States. The preschool serves both children with autism and typically developing children ages 30 months to 72 months. The children diagnosed with autism receive intensive, behavioral intervention services at the preschool for 35 hours per week. The staff of the preschool consisted of (a) a director who was a Board Certified Behavior Analyst (BCBA) and a doctoral candidate at a local university, (b) a teacher in the 4 and 5-year-old classroom who was also a BCBA, (c) a teacher in the 2 and 3-year-old classroom who was a certified teacher completing her master's degree in Early Childhood Special Education, (d) seven Master's level students enrolled in an Applied Behavior Analysis degree program from a local university who served as case managers for the children receiving intensive intervention, (e) four Special Education Master's students from a local university who served as classroom teaching assistants, and (f) approximately 25 undergraduate students who were enrolled in an experiential learning course or gaining volunteer experience from a local university.

Children attend the preschool from 8:00-3:00, Monday through Friday. Children with autism receive between three and six hours per day of one-on-one instruction in the form of discrete trial teaching and incidental teaching. Each child with autism had an intervention program specifically designed for them based on skill deficits and maladaptive behavior reduction. The remaining time at preschool was spent in the classroom setting with typically developing peers. The daily activities in which the children with autism participated with the typically developing peers included meals, free play, and music time.

Assessments. Diagnostic tools, skill assessments, preference assessments, and parent questionnaires were administered prior to baseline sessions. A *Childhood Autism Rating Scale* (CARS) and the *Pervasive Developmental Disorder-Behavior Inventory, Parent Rating Form* (PDD-BI PRF; Cohen & Sudhalter, 2005) were administered to verify the diagnosis of the participants. The CARS is a 15-item behavior rating scale that helps identify children with autism and assists in distinguishing them from developmentally delayed children who are not autistic. This scale also assists in distinguishing mild to moderate autism from severe autism. The scale has a cutoff score of 30; therefore if the child scores higher than that their likelihood of being diagnosed with autism is high. According to the test manual, the following score categories are associated with these categories of autism: *15-30, Non-Autistic; 31-37, Mildly-Moderately Autistic; 38-60, Severely Autistic.* (Scholper, Reichler, & Renner, 1988).

The *PDD-BI* is a norm-referenced questionnaire that measures problem behaviors and social communication skills. It is comprised of five composites scales: Approach/Withdrawal problems, Receptive/Expressive Communication abilities, Expressive Social Communication abilities, Repetitive, Ritualistic, and Pragmatic Problems, and an Autism composite score. T-scores between 40 and 60 for the composite scales and subscales are typical of children with Autism Spectrum Disorders.

This instrument assisted in confirming or disconfirming the presence of a Pervasive Developmental Disorder. (e.g. autism, Asperger's, or PDD-NOS). Research has demonstrated sound psychometric properties for these two assessments (Cohen, 2003; Cohen, Schmidt-Lackner, Romanczyk, & Sudhalter, 2003; Sparrow, Cicchetti, & Balla, 2005).

The *Mullen Scales of Early Learning* was used to assess several skill areas. The Mullen is a norm-referenced measure of cognitive function for infants and preschool children. This measure consists of four cognitive scales: Visual Reception, Fine Motor, Receptive Language, and Expressive Language. An Early Learning Composite can be obtained from the four cognitive scales. The Visual Reception domain tests a child's performance visual discrimination and visual memory. The Fine Motor domain measures visual-motor ability. The tasks involve fine motor planning and control. The Receptive Language domain measures the child's ability to respond to the verbal behavior of others. It includes auditory comprehension and auditory memory. The Expressive Language domain measures a child's ability to use language functionally. The Early Learning Composite provides an estimate of overall cognitive ability. For these scales, a standard score of 50 is considered average. An Early Learning Composite can be obtained from the four cognitive scales. For this composite, a standard score of 100 is considered average. The confidence interval provides a range in which a score would likely fall 95 out of 100 times if testing was repeated (Mullen, 1995).

Parents completed the *Vineland Adaptive Behavior Scales, Second Edition* (VABS-II; Sparrow, Cicchetti, & Balla, 2005), during an interview with the experimenter which was used to gather information about the child's adaptive communication skills, daily living skills, and socialization skills relative to same-age peers. This assessment is a questionnaire dependent on answers provided by the child's caregiver.

Participant's records were also accessed to gather specific information about each participant's compliance with instructions, instructional control in teaching environments, verbal operants, visual performance skills, classroom skills, play skills, and social skills. The assessment that provided most of this information was the *Verbal Behavior-Milestones Assessment and Placement Program (VB-MAPP)*. These results were helpful in selecting specific tasks absent from the participant's repertoires. This criterion referenced assessment tool, curriculum guide, and skill-tracking system is designed specifically for children diagnosed with autism. The VB-MAPP is based on B.F. Skinner's analysis verbal behavior, published in his book *Verbal Behavior* in 1957. There are five components of the VB-MAPP, however only the Milestones Assessment was utilized for the purposes of this study mentioned previously. The Milestones Assessment provides a representative sample of a child's existing verbal and related skills. It contains 170 measurable learning and language tasks that are sequenced and balanced across three developmental levels (0-18 months, 18-30 months, and 30-48 months). The skill areas include mand, tact, echoic, intraverbal, listener, motor imitation, independent play, social and social play, visual perceptual and matching-to-sample, linguistic structure, group and classroom skills, and early academics (Sundberg, 2008).

In addition, the *Assessment of Basic Language and Learning Skills-Revised* (ABLLS-R) were also utilized to make target behavior selections. The ABLLS-R is an assessment that provides the examiner with a learner profile similar to that of the VB-

MAPP described previously; however this assessment does not provide age equivalents (Partington & Sundberg, 2006).

Hypothesized pre-requisite skills assessment. Additional assessments conducted to determine the participant's ability to engage in responses hypothesized to be relevant to video modeling are described next. The experimenter conducted: (a) a delayed matching-to-sample test, (b) a matching-to-sample test, (c) a motor imitation test, and (d) an object imitation test. Obtaining these measures provided the experimenter information about the participant's matching and imitation repertoires, which are considered skills required for modeling (Bandura, 1965). These tests showed if the participant could imitate a motor action or action with an object, or match an object (with and with a delay) to one shown on the monitor. A conceptual analysis of the video modeling procedure would lead one to predict that matching and imitation would be necessary pre-requisite skills for learning via vide, although the research literature does not conclude they are of necessity. These tests were conducted using the same video monitor utilized during the study, which will be described later.

A video-watching assessment was conducted for each participant. This involved measuring the duration of eye contact with the computer monitor while watching a video of peers (This video was not used in the study). During the video-watching assessment, participants watched videos with footage of their peers engaging in routine classroom activities. Children who watched the video clip for at least 10 seconds were eligible to participate in the study.

A multiple-stimulus without replacement preference assessment was administered to determine the toys used as preferred items during the reinforcement component of the study. This assessment followed the procedures similar to those described by Pace, Ivancic, Edwards, Iwata, and Page (1985). These were administered by presenting the child with nine items that parents and teachers had reported as being highly preferred. The nine items were presented three times across a period of one to three days. The items were then ranked according to the order in which the participant selected them. The highest ranked items were included in the video model clip when the participant was exposed to the reinforcement component during the study.

Participant characteristics. The four children selected to participate were Daniel, Ben, Ellen and Bo. The first participant, Daniel, was a four-year-old boy diagnosed with autism. Daniel has been enrolled in the preschool and receiving intensive behavioral intervention for one year and nine months. Daniel's score on the CARS suggests that he is in the severely autistic range. During the preference assessments, Daniel's top five toy choices were a rubber-sticky hand, a drum, small ball with suction cups on it, a blue vibrating ball, and moon sand. Daniel viewed the video during the viewing test for 18/20 seconds.

The second participant was Ben, a four-year-old boy diagnosed with autism. Ben has been enrolled in the preschool program and receiving intensive behavioral intervention services for one year and six months. Ben's score on the CARS was in the mildly-moderately autistic range and his PDDBI Autism Composite was typical for that of a child with autism. During preference assessments, Ben's top five toy choices were a rubber, sticky hand, a doll with a baby bottle, a mirror, a wiggly water toy, and moon sand. Ben viewed the video during the viewing test for 15/20 seconds.

The third participant, Ellen, was a four-year-old girl diagnosed with autism. Ellen has been enrolled in the preschool program for four months. Ellen's CARS score suggests that she is in the mildly-moderately autistic range. Her PDDBI Autism Composite score was typical for children diagnosed with autism. During preference assessments, Ellen's top five toy choices were a rubber- sticky hand, a drum, small ball with suction cups on it, a blue vibrating ball, and moon sand. Ellen viewed the video during the viewing test for 15/20 seconds.

The last participant, Bo, was a four-year-old boy diagnosed with autism. Bo had been enrolled in the preschool program and had been receiving intensive intervention services for one year and four months. The Childhood Autism Rating Scale (CARS) showed he is in the mildly-moderately autistic range. His PDDBI Autism Composite score was typical for children diagnosed with autism. Bo's top five toy choices were a book, a rubber/sticky hand, a light and song phonics toy, a blue vibrating ball, and etch-a-sketch. Bo viewed the video during the viewing test for 15/20 seconds. See Table 2.1 for additional assessment results for all participants and Table 2.2 for participant performance on hypothesized pre-requisite skills.

Table 2.1

Participant Demographics and Assessment Scores

Participant Name	Age	CARS	PDDBI	Mullen	Vineland
Daniel	4.11	51	N/A	Below 24 mos.	47-low
Ben	4.6	31.5	52	52	58-low
Ellen	4.8	33	52	Below 24 mos.	73-moderately low
Bo	4.9	37.5	51	Below 24 mos.	72-moderately low

Note. Scores on the CARS above 30 are in the "Autism" range. Scores on the PDDBI between 40-60 are in the "Autism" range. Daniel's score on the PDDBI could not be calculated due to it being too low. All participants' Mullen scores except Ben's are listed as age equivalents because they scored too low to calculate a composite score.

Table 2.2

Hypothesized Pre-requisite Skill Performance

Participant Name	MTS-video	DTMS-video	Imitation-video	MTS	DMTS
Daniel	No	No	Yes (object only)	Yes	No
Ben	Yes	Yes	Yes	Yes	Yes
Ellen	Yes	No	Yes (object only)	Yes	No

Bo	No	No	No	No	No

Setting and Materials

All research sessions were conducted at the preschool where the participants were recruited. Training sessions for each participant were conducted in a one-on-one teaching classroom that was approximately 8 feet by 8 feet. In the training session area, a 19-inch Apple computer was placed on a child-size table to display the taped video model via computer file. (See Appendix Figure A1.) The participants sat in child-sized chairs, and the computer monitor was placed on a table so that it was at an appropriate eye level for the child. This area was uncluttered and contained only the items relevant to this study. Preferred items that the child had an opportunity to access were kept in a locked cabinet in the classroom. These items included small toys, crayons and paper, and other age appropriate activities. Materials needed for data collection, such as the video camera and data sheets were kept on top of the cabinet.

Ninety-four percent of training sessions were videotaped using an iSight™ camera located at the top of the computer monitor. (See Appendix Figure A1). This recorded the participant's eye contact with the monitor throughout each session. Test sessions were conducted in the child's classroom, a one-on-one teaching area, or in the hallway outside the classroom, depending on the task selected for that child. In addition, 90% of test sessions were video taped by a research assistant using a Sony Handicam™.

Peer Models. All children used as models for the target behaviors attended the same preschool as the participants and had met criteria to be a peer model. These criteria were determined by the preschool staff and consisted of the following requirements: 1.

Peers could have no diagnosis of Autism Spectrum Disorder or other developmental disability, 2. Peers must engage in age-appropriate play skills, 3. Peers must be cooperative and engage with the classroom routine without intervention from preschool staff. See Table 2.3 for more details on each peer model and the video clips used during training.

Table 2.3

Peer Model and Training Video Characteristics

Participant	Peer used	Peer Age	Length of Clip
Daniel (Bx 1)	Tommy	4	10sec
Daniel (Bx 2)	Tommy	4	15 sec
Daniel (Bx 3)	Tommy	4	10 sec
Ben (Bx 1)	Meagan	4	8
Ben (Bx 2)	Meagan	4	8
Ben (Bx 3)	Meagan	4	15
Bo	Meagan	4	8
Ellen	Jenny	3	15

The videos viewing during training sessions were created by the experimenter using a Sony HandiCam™ video camera and then downloaded and saved as in an iMovie™ file format on the same Apple™ computer used to view the video. Peers were videotaped engaging in the target behaviors selected for each participant following instructions provided by the experimenter or research assistant.

Dependent Measures

Target behaviors for each participant were determined by the results of the skill assessments and consultation of records obtained during the assessment phase. A response was scored as a correctly imitated behavior (action) if the participant performed the action(s) modeled in the video within 30 seconds of the discriminative stimulus presentation during the test session and it matched the model in form. A task analysis was conducted for each target behavior; therefore, the dependent variable for all participants was the number of steps performed correctly. The selected targets for each participant were behaviorally defined and staff was trained to competency on correct performance of these behaviors. Training sessions and test sessions were video taped for the purposes of determining inter-observer agreement, eye contact with the monitor, and to determine if other social behaviors (e.g. eye contact, joint attention) were observed during test trials.

Design and Procedure

A component analysis was conducted to systematically examine and reveal critical components of a video modeling package. First, approval from the university institutional review board was obtained and a pilot study was conducted to determine which components potentially have the greatest effect on learning. One participant was used as a pilot participant. During the pilot study and the experiment proper, a video showing a preschool child engaging in the target behavior was shown. This is referred to as a training session. A test session involves providing the child an opportunity to engage in the behavior soon after watching the video, as this is the standard method that video modeling studies in the literature are conducted (Banda, Matuszny, & Turkan, 2007). During the pilot studies and experiment proper, components of the video-modeling package were added systematically to see effects on responding. Listed in the table below are components that have been included in video modeling packages found in the literature and ones that were included in this study are highlighted in bold.

Table 2.4

Components included in Video Modeling Packages

A. Antecedent manipulations during video sessions:

- Narration of the video as it is being watched,
- **Instructions or rules are given to the participant during or after watching the video**,
- Important features of the video may be zoomed in on to highlight their importance,
- Point- of-view video modeling,
- **Watching the video more than one time during the session (no more than 3 viewings)**,
- Watching up to 3 different examples of the target behavior being performed,
- Matching video and performance environment,
- **Viewing the model receive a preferred item after completing the target behavior.**
- **Response rehearsal**

B. Consequence-related manipulations during test sessions

- **Providing access to a preferred item after watching the video**,
- Stating a contingency at the end of the video (e.g. if you go into the

classroom and tell the teacher hi, then you can play with your Elmo toy)

C. Antecedent manipulations during test sessions:

- providing instructions
- **using response prompts (verbal, gestural, gentle physical guidance)**,
- using a stimulus prompt (e.g. a picture of a child engaging in the social behavior),
- presenting the instruction in a smaller group than normally in the classroom.

Note. Items highlighted in bold designate video modeling components examined in this study.

Baseline sessions. Once the assessment phase was complete, the baseline and training sessions of the study began. At the beginning of each baseline session, the classroom teacher or experimenter presented an opportunity for the participant to engage in the target behavior. Across these sessions, stable responding was required before introduction of a component. Stable performance was determined by examining the participant's performance data, specifically looking at the number of correct responses displayed graphically. Criteria for stable performance were between five and ten sessions, with the range of correct responses within 10% of each other and a flat (stable/no change) or downward trend line in performance. If the performance showed an increasing trend across sessions, the baseline phase continued until stability criteria were met or there was 80% correct performance across five consecutive sessions. If 80% correct performance was met over three sessions during the baseline phase, no intervention was needed or implemented. When this occurred, an additional baseline phase was implemented using a different target behavior.

Training and Test Sessions. During training sessions, video taped examples of typically developing peers engaging in the target behaviors were viewed by participants in the training area. Up to three sessions were attempted per day. The test session occurred immediately following and lasted up to three minutes. First, the primary component, the video taped model of the target behavior, was viewed without antecedent manipulations or consequence components added. Following completion of this component, other antecedent components were introduced. Following those, consequence- related components were introduced. See Table 2.5 for a listing of the components introduced for each participant. New components for each participant were selected from both antecedent and consequence manipulations that showed increased correct responding in previous video-modeling studies, showed increased responding during the pilot study, or from teaching procedures shown to be effective in the child's record review conducted by the experimenter.

Given the parametric nature of this investigation, introduction of new components into the video-modeling package occurred based on the participant's responding. For example, if the participant's behavior did not reach a steady state, or if the participant was absent for several days, the current condition may have been extended until it stabilized.

Table 2.5

Components Included for Participants

Participant	1 viewing	3 viewings	Rules	Response Rehearsal	Preferred item viewing/contact	Response Prompts
Daniel (Bx 1)	X	X			X	X
Daniel (Bx 2)	X	X			X	X
Daniel (Bx 3)		X			X	X
Ben (Bx 1)	X					
Ben (Bx 2)	X					
Ben (Bx 3)	X	X		X	X	
Bo	X	X			X	X
Ellen	X	X	X		X	X

The decision criteria for adding another component to the analysis were set as the following: if the data showed an increase in performance that maintained between five and ten consecutive sessions, or stable performance, or remained highly variable over ten consecutive sessions. Criteria for stable performance are at least three sessions with the range of correct responses within 10% of each other and a flat (stable/no change) or downward trend line in performance. Once stable responding was met, an additional component was added. Up to five components were examined for each participant.

Stop criteria were also in place during this analysis. If the participant's correct responding did not increase more than 50% compared to baseline, following addition of five components to the video modeling package, the target behavior would be taught using discrete trial teaching, which has been empirically validated as an effective teaching procedure for children with ASD (Lovaas, 1987).

If discrete trial teaching was utilized, it occurred as described here. The experimenter or RA presented an instruction for the participant to engage in the target behavior (same target behaviors taught during video modeling sessions). A most-to-least prompting procedure was utilized during trials to reduce errors to ensure participants engaged in the correct behavior. Then, a least-to-most probe trial was presented every three trials to determine if the response would occur using a lesser intrusive prompt. A preferred item and praise was provided when the child engaged in the correct behavior, even for prompted responses. The target behavior was presented up to 12 trials per session. If the participant did not learn the skill after discrete trial teaching, the experimenter contacted the parents to let them know that the study was complete.

Generalization and follow up sessions. If the participant learned the target behavior via either video modeling or discrete trial teaching, a follow up session that functioned as a return to baseline, was conducted exactly as the procedures described above, except that it was conducted with different staff. Up to three follow up sessions were conducted during the two months following conclusion of the teaching.

Interobserver Agreement and Procedural Integrity

Ninety percent of test sessions were videotaped to allow interobserver agreement and procedural integrity to be measured. Agreement on each child's performance was examined on a trial-by-trial basis. Three trained observers independently recorded participant responses during 80% of sessions. Reliability was calculated by dividing the number of agreements by the total number of disagreements and multiplying by 100%. Mean agreement scores were 90% or better across participants.

Procedural integrity, or the accuracy with which the training and test session procedures were implemented, was also measured. This was measured by the experimenter completing a procedural checklist immediately after training, then again two weeks following training. The procedural checklists (See Appendix) described all the steps the research assistant should follow when conducting sessions. At the initial training, each research assistant was required to score 100% on the checklist before they were allowed to conduct sessions. If necessary, additional training was provided to achieve 100%. Six research assistants assisted the experimenter and procedural integrity was evaluated for all conditions and participants. Mean accuracy scores were between 90% and 100% for all research assistants.

Data collection and analysis. Data during all sessions were collected on specified data sheets and most sessions were video taped. Sessions occurred at least daily on each school day and up to three times per school day. During training sessions, an iSight™ camera was used to record the participant's eye contact with the video on the screen. During test sessions, a video camera was used to record not only target behaviors, but any other behaviors and interactions with peers that may occur in conjunction with the target behaviors. Both the experimenter and research assistants scored the iSight™ videos and video clips of test sessions to determine duration of eye contact with the screen and all dimensions of the participants responding.

It is important to note that one trial occurred during each test session; therefore the graphical display created to track correct responding provides a response-by-response view. Data was graphically displayed throughout the experiment to allow visual analysis of responding as each component was added to the video-modeling package.

Data collected during baseline was compared to phases during which components were cumulatively added. For example, following baseline, one viewing of the video was introduced, once stable responding occurred, two more video viewings were provided. This allowed for comparison of each phase (new component addition) to be compared to baseline, as well as to the component previously added.

CHAPTER III

Results

Based on the assessment results and the pre-requisite skills observed during the assessment phase, target behaviors were selected for each participant. A target behavior was defined as a skill that assessment results revealed was not present in the child's repertoire and was relevant to their current clinical programming needs in their behavioral intervention program.

Daniel

Based on assessment results, the skill area selected for Daniel was self-help skills that are commonly observed in preschool classrooms. The first target behavior chosen for Daniel was putting his coat into his cubby when he arrived at school or after playing outside. This was defined as holding his coat when the teacher gave it to him, walking to the correct cubby, and placing it on the hook inside. His level of performance during baseline was zero correct responses. An example of his typical performance of this task, per teacher report and observation, included the following: when he arrived in the classroom, his teacher took his coat off and when she handed it to him and asked him to place it in his cubby (an area where the children's personal items were stored) he immediately dropped it on the floor.

The peer video model that Daniel watched performed three steps: 1. Taking the coat from the teacher, 2. Holding the coat while walking toward cubby, 3. Placing the coat in the correct cubby. Figure 3.1 depicts the video modeling components that Daniel was exposed to during training along with the number of correct steps he completed during each session. During the first component, Daniel watched one viewing of the video model each session. He did not respond correctly during component one. After seven sessions, the criterion to introduce the second component was met. The second component varied only from the first in that Daniel watched three viewings of the video model each session. Responding immediately increased during this component; however, Daniel started putting his coat in another child's cubby, rather than his own cubby. Due to this error, the experimenter decided to introduce component three before criteria was met to allow the opportunity for Daniel to contact reinforcement by putting the coat in the correct cubby.

Generalization probes with different preschool staff were conducted during the week following mastery, and all three steps were performed correctly. A return to baseline was conducted at one month and two month and his performance maintained at previous levels.

The second target behavior selected for Daniel was taking his coat off. This behavior was defined as Daniel grabbing the sleeve of the left arm with his right hand and pulling his arm out of the sleeve, then grabbing the sleeve of the right arm with his left hand and pulling his arm out of that sleeve. During baseline correct responding was zero, except for two trials where Daniel grabbed one of his sleeves and pulled his arm out of it. According to classroom observations and teacher report, Daniel consistently required physical prompts to remove his coat and attempts to fade the physical prompts had been unsuccessful.

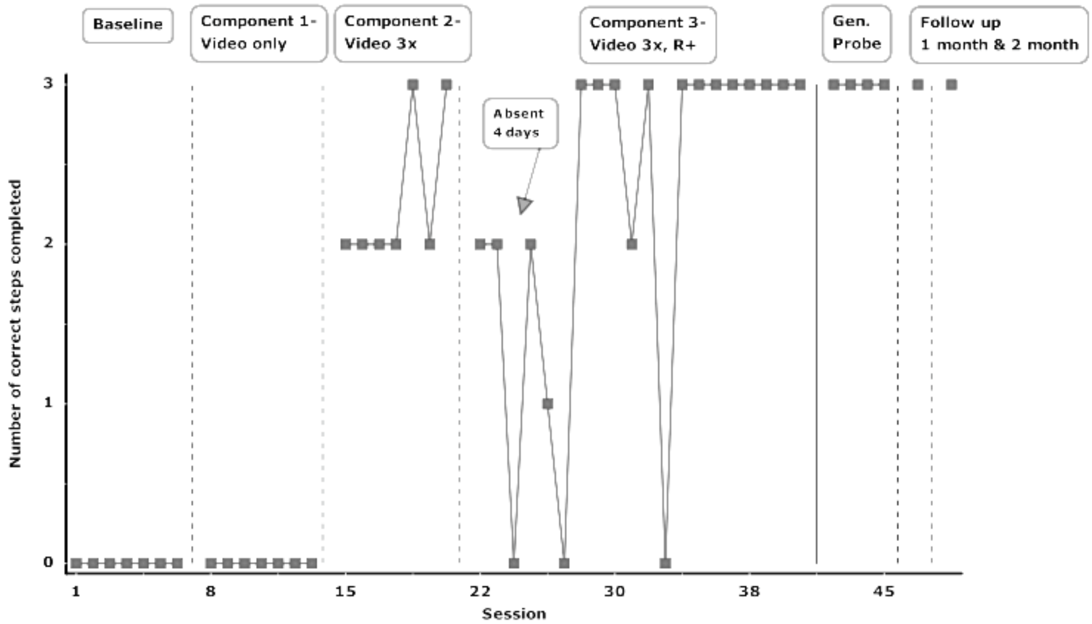

Figure 3.1. Number of correct steps completed by Daniel during the task "Putting coat in cubby". Correct responding increased during component two and mastery criteria was met during component three.

The peer video model that Daniel watched performed four steps: 1. Grabbing the sleeve of the left arm, 2. Pulling left arm out of sleeve, 3. Grabbing the sleeve of the right arm, 4. Pulling right arm out of sleeve. Figure 3.2 illustrates Daniel's responding for this task. Daniel's responses did not increase past 25% correct across all components. He completed only one step correctly during two sessions across all components. The lack of correct responding during training for this task did not allow for analysis of the components introduced.

The third target behavior chosen for Daniel was putting his coat on the back of his chair. Baseline performance for this task was zero correct responses. Often when coming in from outside, Daniel went immediately to his one-on-one teaching area. When this occurred, it was necessary for him to remove his coat and place it on the back of his chair, rather than placing it in his cubby in the classroom. The steps modeled via video for this task included: 1.Taking the coat from the teacher, 2. Walking toward his chair in his work area, 3.Placing the coat on the back of chair. Figure 3.3 shows Daniel's responding during training.

Three components were introduced for this task. The first was viewing the video three times. Correct responding immediately increased during this component, however did not reach mastery criteria. Component two added showing the peer model on the video receiving a preferred item. Daniel did not complete all steps in the task; therefore he did not contact reinforcement during this component. Component three added physical prompting by immediately prompting the correct response after watching the video, then providing a trial where Daniel could respond independently. He did not meet mastery criteria under any of these conditions. At one month follow up, a return to baseline was conducted and he continued to perform only the first two steps of the task correctly.

During the task "coat on chair", Daniel consistently made errors by putting the coat somewhere other than what was modeled on the video, on the back of his chair. Due to this error pattern, this task was introduced again to Daniel using a different teaching modality, discrete trial training. Figure 3.4 shows Daniel's responding during discrete trial training of this task. All three steps in the task were prompted using most to least prompting and constituted one trial. This method was utilized to reduce the number of errors emitted by Daniel. Twelve trials were completed during each session. Four of these

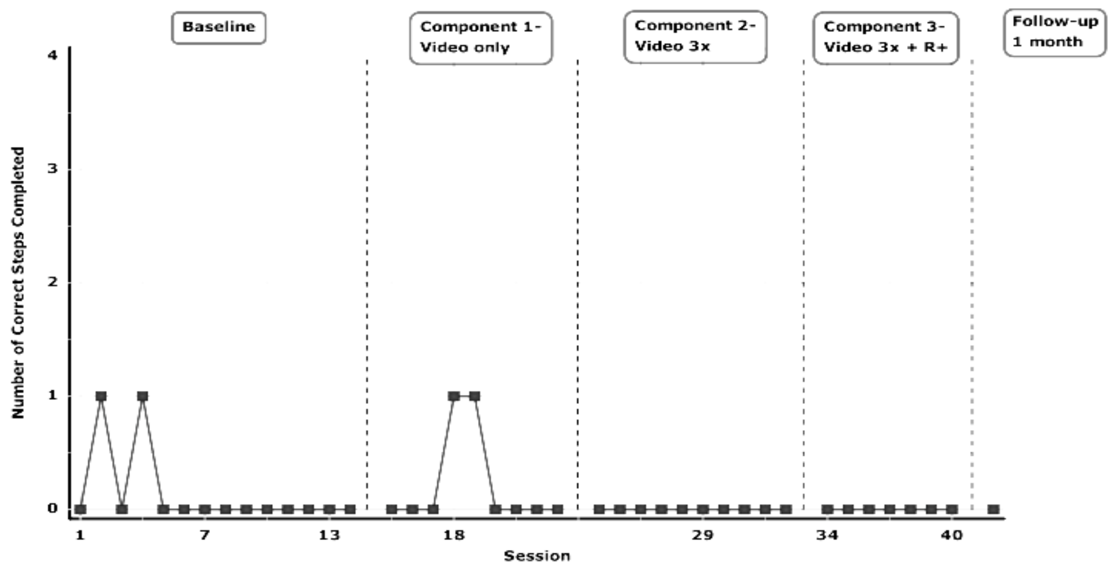

Figure 3.2. Number of correct steps completed by Daniel for each component during the task "taking coat off". Two correct steps were completed during component one.

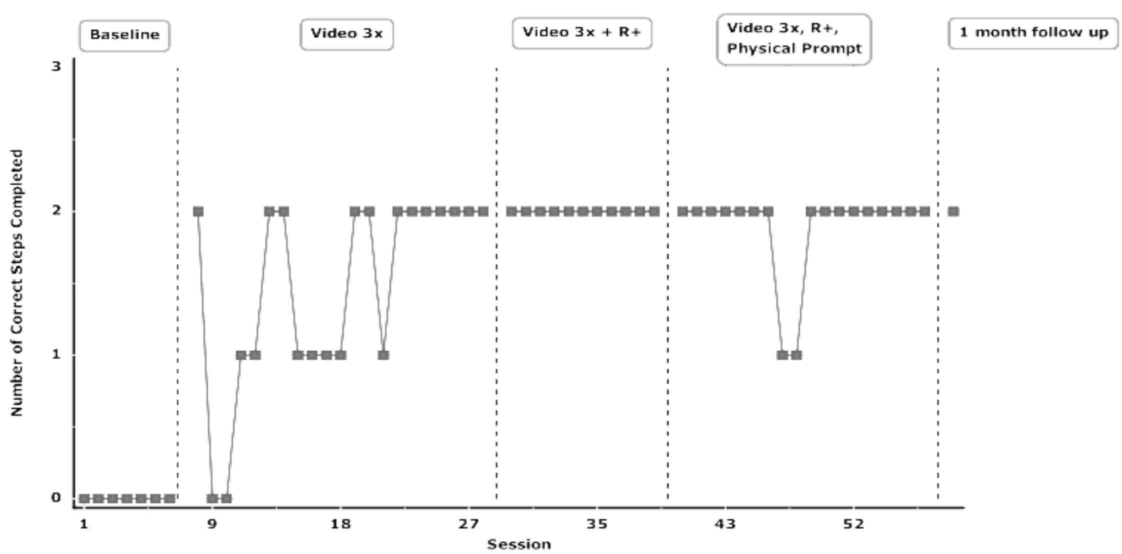

Figure 3.3. Number of correct steps completed by Daniel for each component during the task "putting coat on chair". Daniel reached stable responding during component one, however component two and three resulted in no increase in correct responding.

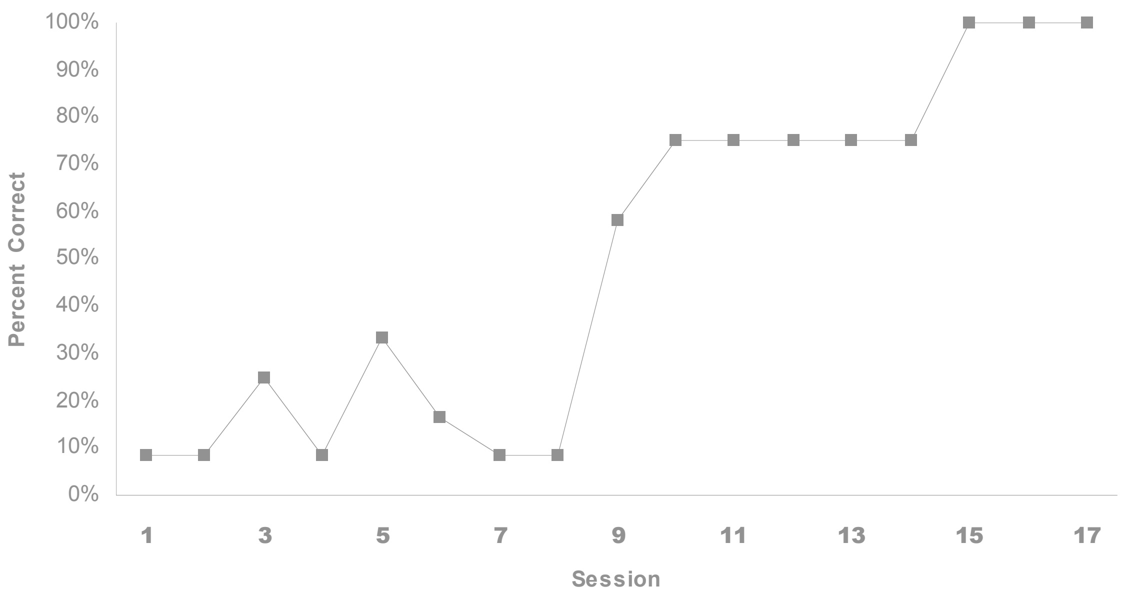

Figure 3.4. Percentage of correct responses emitted by Daniel during discrete trial training of the task “ putting coat on chair”. Daniel met mastery criteria after 17 trials.

trials were least to most probes. The probes were conducted every three trials to determine if the prompt could be faded without an error occurring.

Ben

Based on assessment results, the skill area chosen for participant two, Ben, was solitary play skills. Ben engaged in high levels of motor stereotypy during free-play opportunities in the classroom according to his assessment results and during baseline. He had no functional play skills with toys that he frequently engaged with, other than stereotypic responses such as, repeatedly pressing a button on a toy or book that made a sound, tapping on objects with his fingers in a pointing position, and repeatedly engaging in the same inappropriate motor action with a toy such as spinning the wheels on a car.

The first target behavior selected for Ben was a behavior that involved playing with a toy kitchen set. The target behavior for Ben was defined as picking up a bowl that was located on the stove, opening the oven, putting the bowl in the oven, then closing the oven. The kitchen set used was one that is commonly found in toy stores for preschool age children, and it is large enough so that several children can play with the set at the same time. It is approximately 3 ft tall (.91m) and 4 ft (1.22 m) wide. The set has a simulated microwave, sink, oven, refrigerator, and dishwasher. (See Appendix: Figure A1). The video model viewed by Ben showed a peer engaging in a play task with the oven that contained the following steps: 1. Picking up a pan placed on the kitchen set, 2. Opening the oven, 3. Placing the pan in the oven, 4. Closing the oven. Ben did not engage in any of these steps during baseline.

Ben met mastery criteria for the oven task after exposure to the first component, viewing the video one time. Seven sessions were needed for Ben to meet mastery criteria for this task. Figure 3.5 depicts the number of correct steps Ben completed during the oven task.

The second task taught was a play task using the microwave. This target behavior was defined as picking up a bowl on the stove, opening and placing the bowl in the microwave, closing the microwave and pressing buttons on the microwave. Ben did not engage in any of the steps including in this task during baseline. The microwave task performed by the model was combined into the following three steps: 1. Picking up a bowl from the stove, 2. Placing the bowl in the microwave, 3. Pressing buttons on the microwave keypad. Ben also met mastery criteria for this task after exposure to the first component, viewing the video one time. Six sessions were needed for Ben to meet mastery criteria. Figure 3.6 depicts the number of correct play responses during baseline and treatment for Ben during the microwave task.

During baseline, Ben engaged in more motor stereotypy than appropriate play responses when asked to play with the kitchen set. Figure 3.7 depicts the reduction in stereotypic responses during test session after exposure to the video.

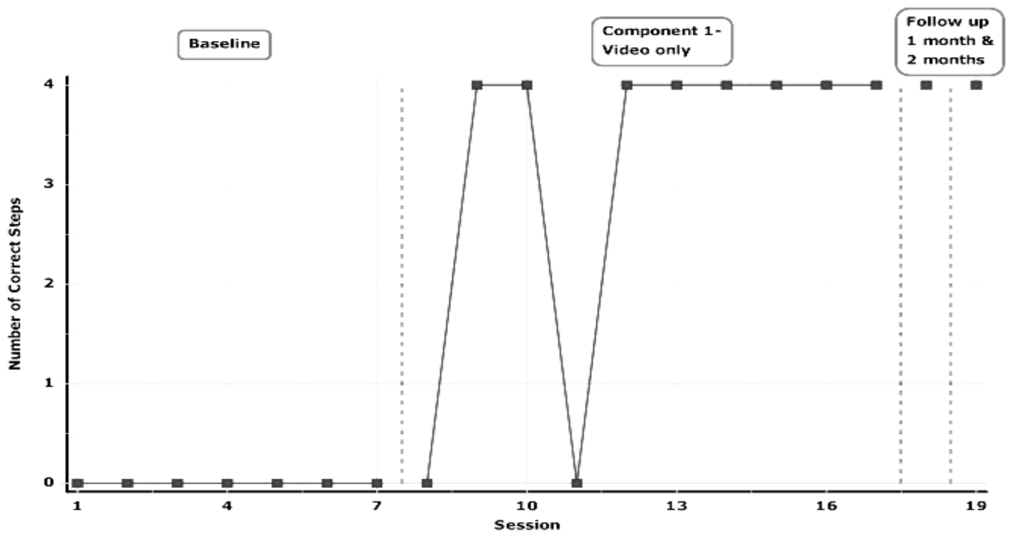

Figure 3.5. Number of correct steps completed by Ben during the “oven task”. Responding met mastery criteria during the component where the video was viewed one time. Performance maintained at one and two month return to baseline.

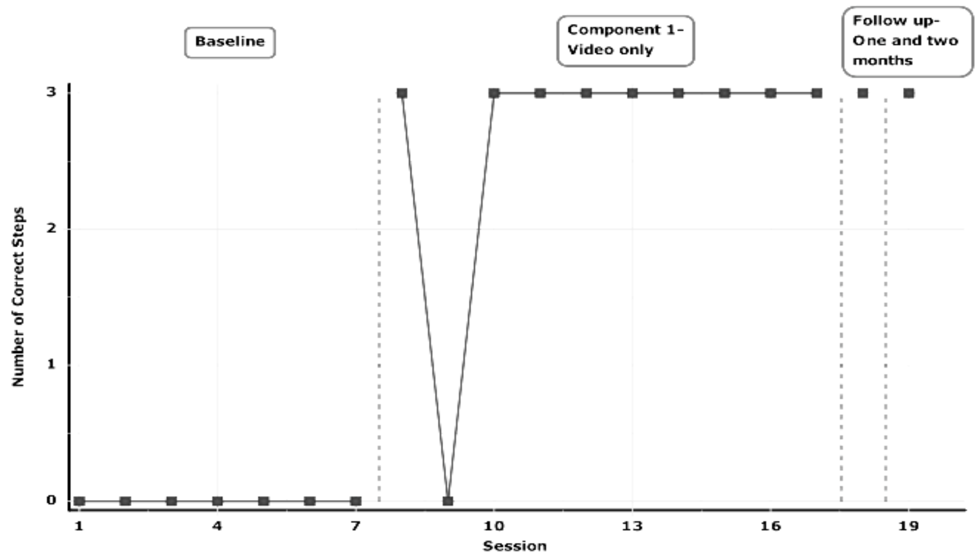

Figure 3.6. Number of correct steps completed by Ben during the “microwave task”. Responding met mastery criteria during the component where the video was viewed one time. Performance maintained at one and two month return to baseline.

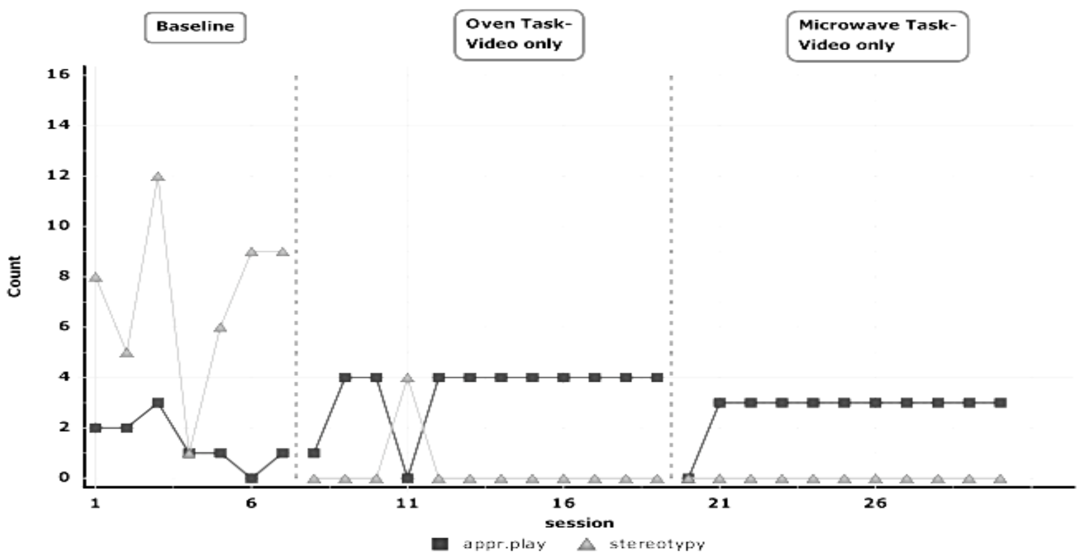

Figure 3.7. Count of stereotypic responses observed during baseline and treatment during the oven and microwave task. Stereotypic responses remained at zero following session 11 throughout the experiment.

The next kitchen play task taught to Ben was an oven play task that included a verbal response. The target behavior was defined as opening the oven, removing a bowl from the oven, sniffing the bowl, saying the verbal response “umm, it’s ready” and then pretending to take a bite of the food. Again, Ben did not engage in any of these steps during baseline. The task included five responses. These included: 1. Opening the oven, 2. Taking a bowl of pretend food out of the oven, 3. Sniffing the bowl of food, 4. Saying “umm, it’s ready!”, 5. Pretending to eat the food.

Figure 3.8 shows Ben’s correct responding for this task. During component one, one viewing of the video was presented. During this component, he met mastery criteria for steps 1, 2, and 5 (correct performance across three consecutive sessions). This is consistent with the performance observed in the first two tasks Ben was taught. During component two, the video was viewed one time, and the verbal response was rehearsed immediately following. Ben correctly echoed the verbal response on all trials, however he only engaged in the verbal response during session 15. Criteria to move to component three were met during session 24. Component three included two more viewings of the video, making the total viewings three. Ben responded correctly during sessions 38 and 41, completing both steps three and four correctly. Due to Ben's correct completion of all steps during these sessions, component four was introduced to increase the likelihood that Ben would contact reinforcement. Component four added viewing the peer model receive one of Ben's preferred items. After component four's introduction, there was an increase in correct responding, however Ben did not meet mastery criteria for steps three and four. Following session 63, Ben did not respond correctly to steps three or four. During the return to baseline probe, Ben's performance remained stable, omitting steps three and four from the task.

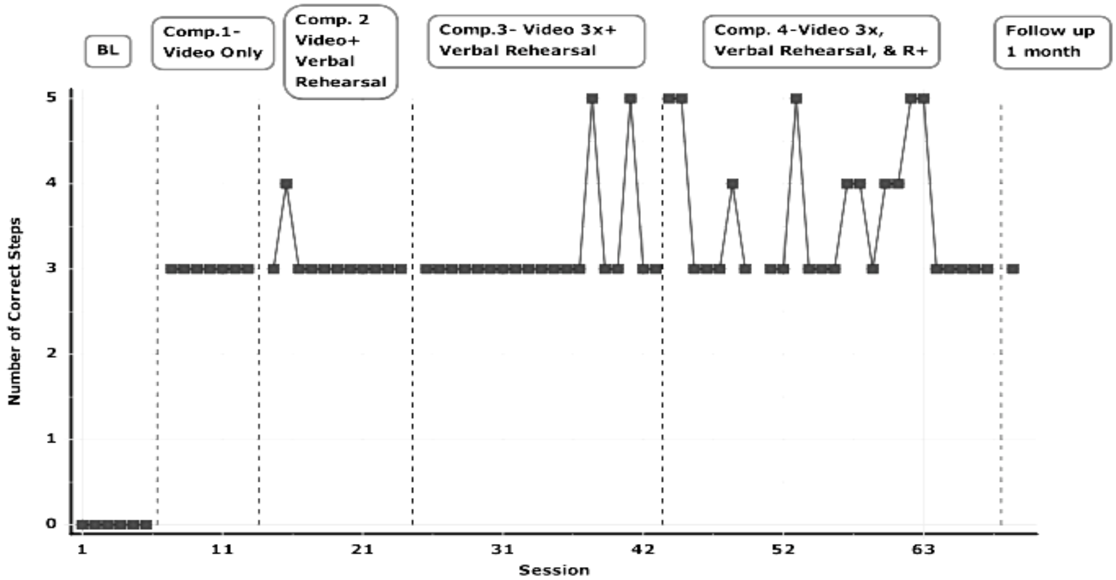

Figure 3.8. Number of correct steps completed by Ben during the oven task (verbal).

Ellen

Based on assessment results, the target skill area selected for the next participant, Ellen, was play behavior. These play behaviors were rarely observed in the classroom according to observation and teacher report. During baseline however, it was noted that Ellen's play behaviors with the kitchen set increased without introducing any components of the video modeling procedure. It is hypothesized that Ellen's play skill repertoire may not be as weak as reported, and may be negatively affected by the presence of peers due to her reluctance to approach or request toys from them. Also, the lack of preferred toys available to her in the classroom may have affected the frequency of which these behaviors are observed. Based on this data, a new behavior was selected for Ellen.

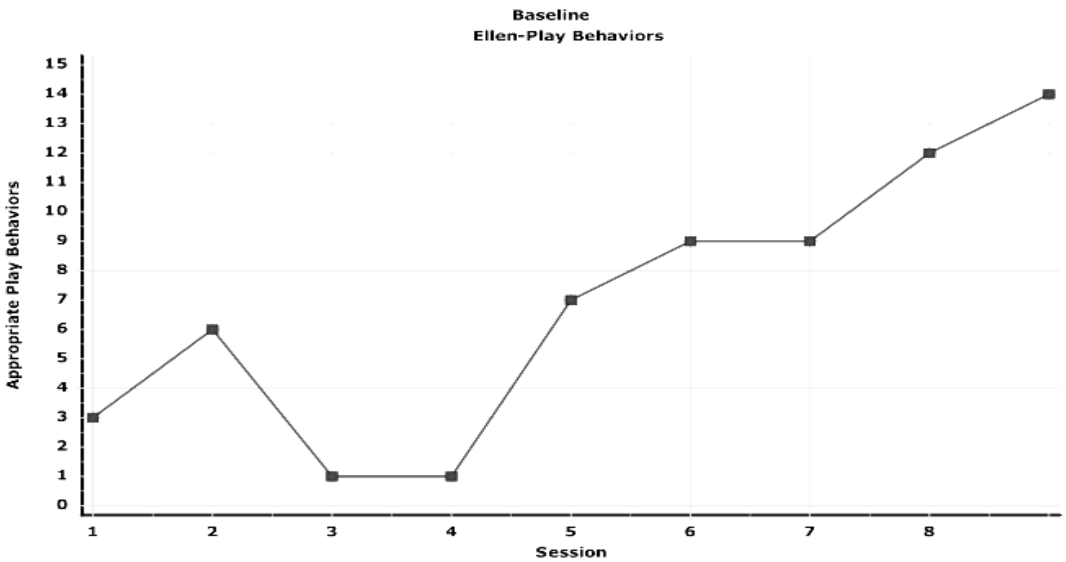

Figure 3.9. Appropriate play behaviors observed during baseline for Ellen. Based on this information, a new target behavior was selected.

Based on assessment results a second behavior, brushing hair, was selected for Ellen. Ellen refused to brush her hair before going out in public, nor would she allow anyone to brush it for her. This often resulted in knotted hair and an unkempt appearance per staff and parent report. During baseline, Ellen did not engage in hair brushing when a brush was presented to her, and she was told to brush her hair. Figure 3.10 shows Ellen's responses during each component.

During component one, Ellen viewed the video one time. Her responding did increase from zero, however minimally. The criterion for introducing component two was met after session 13. Component two included the addition of rules presented verbally to Ellen as she watched the video. These rules consisted of two statements describing what was being viewed on the video, "First, you brush this side, then you brush the other side." as the model switched the brush to her other hand and brushed the other side of her hair. Responding during this component was highly variable, ranging from zero correct responses to 10 correct responses, and the phase was extended past ten sessions to see whether responding would stabilize. After 14 sessions, Ellen met mastery criteria. Also, during this phase, it was noted that Ellen was watching her own movements in the reflection of the doorknob. To determine if looking in a mirror would increase correct responding, Ellen was directed by the experimenter to look into a mirror placed on a wall as the discriminative stimulus "Brush your hair" was presented during sessions 31-34. Correct responding decreased when the mirror was presented, and returned to previous levels after it was removed.

Component three was introduced to determine if viewing the peer model on the video receiving access to one of Ellen's preferred items would increase correct responding. Initially correct responding decreased during sessions then gradually increased to previous levels, however during the session after Ellen contacted the preferred item, a downward trend was noted starting session 46. During component four Ellen viewed the video three times in addition to the other components already in place and responding continued to be variable, and at a low level. The fifth and last component included physical prompting (See data path for physical prompting in Figure 3.10). Ellen completed the task correctly only with physical prompting, that is, the research assistant used hand-over-hand guidance. During follow up sessions, responding remained at similar levels to that observed during component one.

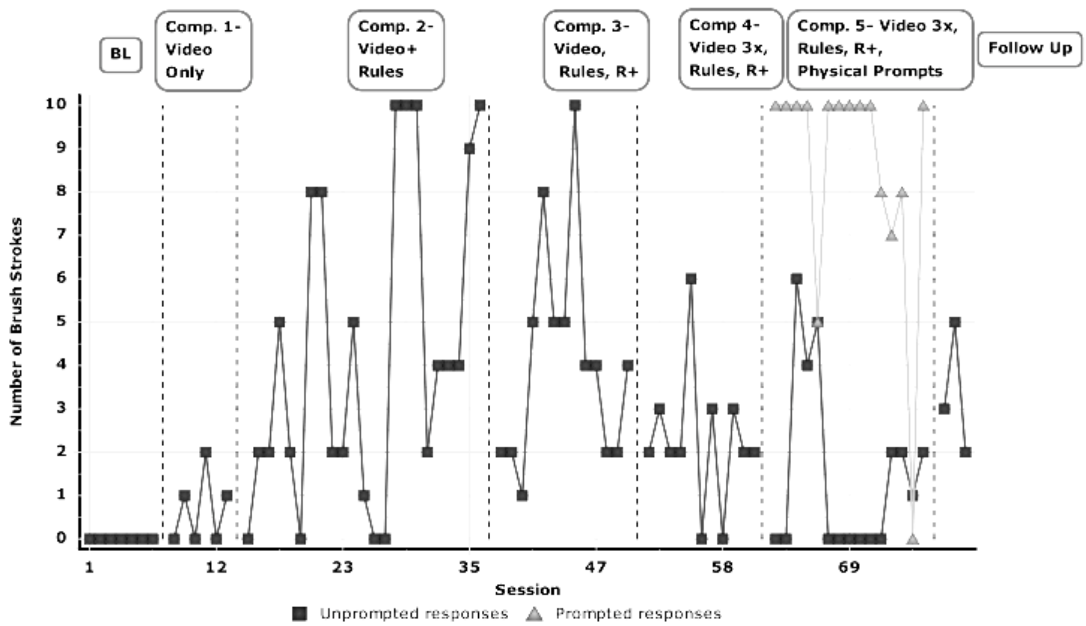

Figure 3.10. Number of correct brush strokes completed by Ellen.

Bo

Based on assessment results, the target behavior selected for the final participant, Bo, was initiating a verbal greeting of "hi" when approached by a familiar adult. During baseline, Bo did engage in the behavior one time when his mother approached him, however he did not engage in the behavior when staff at the preschool approached him. Figure 3.11 depicts Bo's responding during treatment. Due to there being only one step required in the task, Bo's responding is displayed cumulatively. During the first two components, viewing the video one and three times, respectively, Bo did not respond at all when approached by familiar preschool staff. During the third component, presentation of the preferred item to the peer, it was noted that Bo was emitting incorrect verbal behaviors, whereas during the first two components he had not emitted any verbal behavior. Based on this observation, a verbal prompt was provided as soon as staff approached Bo during component four. Bo's responses did not increase; therefore the next component added was providing access to Bo's highly preferred item after an approximation to the correct response (Hi). Responding increased when approximations to "Hi" were reinforced, however the original mastery criteria was not met. At follow up, two return to baseline sessions were conducted by the experimenter. Bo responded correctly on both trials without exposure to the components presented during the study.

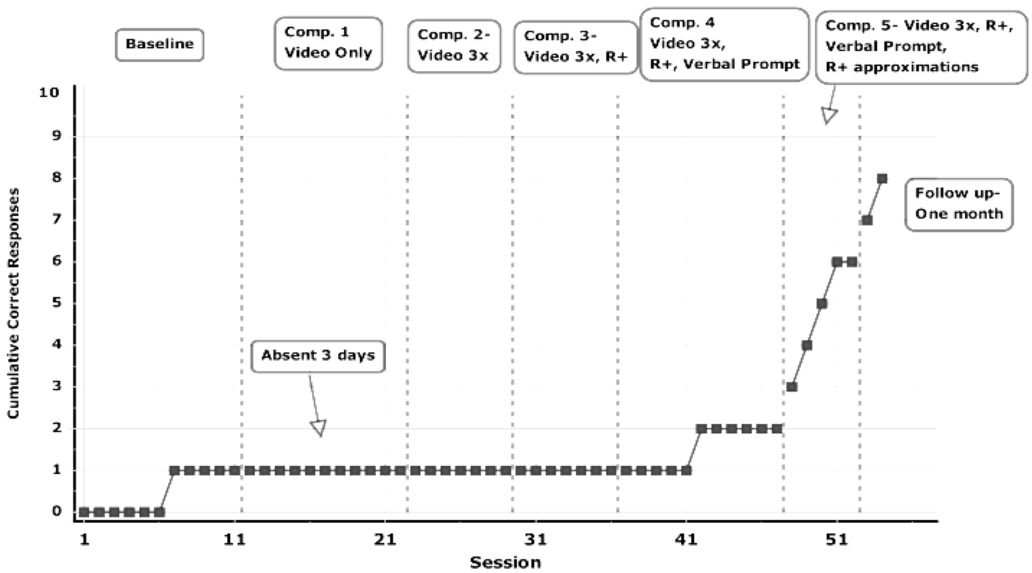

Figure 3.11. Cumulative correct responses for Bo during the "Hi" task.

Eye contact with monitor

Ninety-four percent of training sessions were recorded via the iSight camera to allow a precise measurement of the child's eye contact with the computer monitor. Ben's eye contact with the computer screen was at 80% across sessions measured. Ellen's was slightly lower at 78%, followed by Bo's at 75% and Daniel's at 70%.

CHAPTER IV

Discussion

The purpose of this study was to analyze the effects of components commonly used in video modeling packages when teaching preschool children with autism. This was accomplished utilizing a component analysis research design, presenting components one at a time to evaluate their influence on responding. In the behavior analysis literature, component analysis research designs are often utilized following a behavior reduction package intervention to isolate which component of the package was most effective (Cooper et al., 1995; Odom, Hoyson, Jamieson, & Strain, 1985; Wacker et al., 1990). For this study, the component analysis design was utilized to obtain a clear depiction of the components in a video modeling procedure that resulted in participants showing an increase in correct responding.

This study expanded the literature on video modeling in two ways. First, the results supported the findings that preschool children with autism can learn new behaviors using video modeling under particular conditions (Apple, Billingsley, & Schwartz, 2005; Gena, Couloura, & Kymissis, 2005). The results showed that none of the participants were able to perform the target behaviors during baseline, and that three of the four participants learned new behaviors via a video modeling package. This finding is of benefit because of the dearth of studies in the literature demonstrating learning via video modeling in a preschool population. The second way this study expanded the literature was the utilization of the component analysis design and its findings. In general, components shown to increase correct responding included participants viewing the video three times and viewing the peer model in the video clip receive a reinforcer and subsequently contacting the reinforcer themselves following occurrence of the correct behavior. The three components examined that did not result in some increase in correct responding were viewing the video one time (*note:* one participant [Ben] met mastery criteria for two target behaviors under this component), response rehearsal and using response prompts provided by the researcher following the video.

Components Analyzed

There were a total of six components examined during this study. The first component examined was an antecedent manipulation during which the participant watched the video model one time. Based on other studies in the literature (Bellini & Akullian, 2007) some children have learned new behaviors under these conditions. For three of four participants, this component resulted in no increase in correct responding. One hypothesis related to why one viewing was only effective for one participant could be attending behavior. Percentage of attending to the monitor (video) might explain this effect. In this study, all participants attended to the video for at least 15 seconds. Perhaps some participants require more than one viewing of the video in order to perform the target behavior. This hypothesis was tested by implementing the second component, watching the video model three times.

The second component examined was an antecedent manipulation during which the participant watched the video model multiple times. Based on other studies in the literature (Apple, Billingsley, & Schwartz, 2005; Charlop-Christy & Daneshvar, 2003;

LeBlanc et al., 2003), three viewings were utilized for this study to ensure that the participants were gaining sufficient exposure to the model's behavior. When the participants viewed the video three times, two of the four participants showed an increase in correct responding. An orienting response to the monitor was not used in this study, due to its exclusion in other video modeling studies; however, a future question to be examined involves the hypothesis that viewing the video multiple times is functioning in a similar capacity to an orienting response to the video monitor.

The third component analyzed was an antecedent manipulation involving hearing instructions (i.e., rules) presented by the researcher as the video was viewed. Only one participant, Ellen, experienced this component. Some increase in correct responding was observed, although variability was noted in her responding during this component and subsequent components. No clear conclusions can be made about the influence of this component due to her variability in responding.

The fourth component analyzed was an antecedent manipulation and required the participant to repeat or "rehearse" the verbalization made by the peer, prior to the test session. Only one participant, Ben, experienced this component. No stable increase in correct responding occurred during exposure to this component.

The fifth component analyzed was an antecedent manipulation and included presentation of a participant's preferred item to the peer model on the video after the correct response was performed. If the participant engaged in the correct behavior, they also received access to the preferred item. For all four participants, exposure to this component increased responding at some level, albeit for Bo, responses were only approximations to the correct response. For Ellen, exposure to the component initially increased correct responding. This finding supports the social learning theory proposed by Bandura, which asserts that watching a model experience the consequences of a behavior will influence whether or not the observer will engage in the behavior (Bandura, 1965).

The last component examined was the use of a response prompt provided immediately after the video clip, followed by an opportunity to perform the behavior independent of any prompts. The purpose of the usage of response prompts was to assist the participants in emitting all steps of the target behaviors correctly, particularly for response classes that were not as strong such as verbal responses, for Ben and Bo. Usage of response prompts did not increase the likelihood that participants would respond correctly on the next trial provided.

It is important to note that video modeling packages reported in the literature typically do not provide multiple trials of prompting or contact with reinforcement contingencies within a training session. Therefore, in this study, only one test trial was provided after the training session so as to implement the procedure exactly as those found in the research literature (Banda, Matuszny, & Turkan, 2007). If more trials had been provided during sessions, as is standard practice for discrete trial teaching sessions, the results of this study might be affected. This was not explored in this study because one of the primary reasons video modeling packages are considered desirable is due to the ease and expediency of implementation, compared to that of discrete trial teaching. Future studies should explore whether or not video modeling results in faster acquisition of new skills, as compared to discrete trial training.

Participant responding and considerations

The participant, Daniel, achieved mastery of and maintained the first target behavior presented: placing his coat in his cubby in the preschool classroom. He showed increased correct responding when the video was viewed three consecutive times, and when his preferred items were presented to the peer on the video. He maintained this skill at one month and three month follow up. The second target behavior selected for Daniel was removing his coat without teacher prompting. Daniel did not learn this skill after exposure to viewing the video one time, viewing the video three times, and viewing reinforcer delivery on the video. Due to his lack of correct responding, the components presented could not be analyzed. The last target behavior selected for Daniel was placing the coat on the back of his chair. This behavior was selected because he would often not have the opportunity to go into the classroom where his cubby was located before going to his one on one teaching area. Daniel had increased correct responding during the three viewings component for the first two steps of the task, however did not master all three steps. The errors Daniel made were consistent. Beginning around session 29, Daniel would place the coat in the garbage can rather than on the back of his chair. Throwing an item into the garbage can was one of six receptive tasks in his receptive verbal repertoire. Therefore, this finding reveals an issue that must be considered when selecting behaviors to teach using video modeling, or any other teaching modality: It may be important for learners whose responding is characterized by poor stimulus control that maximally different responses are selected as target behaviors. Future studies examining the effects of stimulus control on video modeling interventions should be conducted.

Based on Daniel's responding, it is also important to note that he had only five imitation responses in his repertoire prior to starting the study. During his early intensive behavioral intervention program, up to 500 or more trials were required for Daniel to learn a new imitation response. His weak imitation repertoire may have affected his performance in this study. The information highlights the importance of learning history and pre-requisite skills that must be taken into consideration when selecting target behaviors. Some studies suggest that in-vivo (live) imitation is a pre-requisite skill for learning via video modeling, although no studies have examined this explicitly (Charlop-Christy, Loc, & Freeman, 2000).

The second participant, Ben, showed increased correct responding when the video was viewed one time for the two motor tasks presented. It is important to note here that Ben's skill repertoires were the most advanced of all the participants. The only task that Ben did not master was the oven/verbal task. This target behavior consisted of simultaneously engaging in a verbal response and a motor response. The video model showed a child engaging in verbal behavior about the play task being performed with the kitchen set. After watching the video, Ben echoed the correct verbal response when prompted, however did not consistently engage in the verbal behavior while playing with the toys. This finding also highlights a nuance needing consideration when selecting skills to teach using video modeling. It may be necessary to include additional components in the package for correct responding to occur if more than one response class is targeted simultaneously. This issue has not been directly addressed in the video modeling literature, therefore should be explored further to effectively implement video modeling packages.

The findings for Ben do concur with studies in the literature insisting that simply watching a video model perform a new behavior is an efficient and effective way for children with autism to learn (Reagon, Higbee, & Endicott, 2006), however not as broadly as suggested, in that he was the only participant with this outcome. Ben met mastery criteria for two motor tasks without any other components (other than one video viewing) added to the package.

Another observation made during Ben's baseline and component phases was the reduction in stereotypic motor behavior. During all seven baseline sessions, Ben engaged in stereotypy including tapping on the kitchen toy with his fingers and repeatedly pushing buttons on the kitchen set to hear the audio output. Once the video component was introduced following baseline, stereotypic responding reduced to zero within five sessions and remained at zero throughout the study. These results are important to mention due to the lack of successful behavior reduction programming reported by his classroom teacher for these same stereotypic behaviors.

Ellen's first target selected was a play behavior with the same kitchen set described for Ben. However during baseline, Ellen showed an increase in appropriate play behavior with the kitchen set; therefore another target behavior was selected. The next task selected was hair-brushing. During baseline for this task, Ellen showed zero correct responses. Low levels of correct responding occurred during the "Video only" component, however Ellen did achieve 100% correct responding when rules were added during the video presentation. Nevertheless, Ellen's responding throughout all components remained highly variable. It was observed by the experimenter that sessions conducted in the mornings tended to result in Ellen engaging in crying or noncompliance. During sessions when this occurred, correct responding was less likely to occur. Another variable that affected Ellen's responding was noted during component three. Once she received the preferred item she had viewed on the video, each subsequent session she would mand for the item upon entering the research area and often cry when she did not receive access to it.

The participant, Bo, showed only one correct response throughout baseline, one viewing of the video, three viewings of the video and presentation of the preferred item to the peer via video. It was observed by the experimenter that Bo started to engage in incorrect verbal responses during this last component, and correct responses did not increase when a verbal response prompt added. Based on this a decision was made to using a shaping procedure to obtain the correct response, by reinforcing approximations to the target behavior rather than continuing to allow Bo to emit incorrect responses. This procedure immediately resulted in correct responding (component five), however after five sessions, school ended for a two week break, and Bo's parents were unable to bring him for additional sessions once school was out. Also, Bo's parent's decided to withdraw him from the school over the break, therefore follow-up sessions had to occur in Bo's home. It is interesting to note however, that correct responding did occur over the two-week break when return to baseline probes occurred.

The findings for Bo show that viewing the peer gain access to a preferred item did increase responding, however not correct responding. Also, the follow up sessions revealed that Bo did maintain this skill over a two-week break. This finding provides some support for shaping as a teaching procedure when it is included as a component in a video modeling package, however these findings showed that Bo did not learn the response with video and viewing preferred item access alone.

Participant Characteristics

In addition to the individual findings and nuances described above, there are several overarching variables that should be considered when a behavior is being taught using video modeling. The first of these is learning history. Three of the four participants in this study had been receiving intervention services for a least one-year (See Table 4.1). (Ellen had only been receiving intervention services for four months.) These three participants had contacted reinforcement in similar teaching situations for longer periods of time, and their behavioral repertoires had expanded considerably since starting early, intensive behavioral intervention. Ellen's non-compliant behavior and resulting variable responding could have been due a lack of stimulus control in the school setting. Overall, stimulus control for the participants in this study was very good due to their history and contact with reinforcement in similar environments. This finding suggests that duration of intervention may have some level of influence on learning using video modeling as an intervention modality.

Other variables that must be considered are specific pre-requisite skills of the learner. Ben was the only participant who responded correctly to all the pre-requisite measures, suggesting that these skills were in his repertoire prior to the video modeling study, and he only required one viewing of the video model for two motor behaviors targeted. Conversely, Daniel's correct performance on "coat in cubby" and "coat on chair" tasks, both object-oriented tasks, and lack of correct responding on the "coat off" task, may also offer some insight into skills necessary for learning via video. The first two tasks mentioned involve taking an object to a location, while the last task involves a motor action involving his own body. His school records showed that he had not mastered imitation skills that involved actions involving touching his own body. The hypothesized pre-requisite skills examined for participants in this study do not reveal any clear findings as to a skill repertoire that predicts correct responding. Future studies should examine if the presence of these pre-requisite skills is required to learn new motor tasks by watching only a video, as in Ben's case.

Based on these participant characteristics, educators employing video modeling as a teaching modality might consider examining the child's existing skill repertoire to assist in predicting whether or not learning will occur using this modality. These response classes may include, but are not limited to, matching to sample, delayed matching to sample, motor imitation, and verbal behaviors. For example, if a child has a weak motor imitation repertoire, as Daniel did in the current study, video modeling may not be an efficient or effective method to teach a new motor behavior. The children in this study all showed the ability to imitate some responses of others, respond correctly as a listener to simple instructions, and matched identical objects. (See Table 4.1 for a summary of this information.) Based on these findings, knowledge of these skill repertoires is helpful for good clinical decision making when choosing whether or not to employ video modeling as a teaching modality for a child with autism. However, future studies on whether the presence or absence of these pre-requisite skills predicts response to video modeling interventions.

Figure 4.1

Hypothesized Prerequisite Skills and Learning History Information for Participants

Participant	Video task Matching	Video Task Imitation	Video Preference Duration	# of months of intervention prior to study
Daniel	No	Yes (object only)	18/20 seconds	21
Ben	Yes (both MTS & DMTS)	Yes	19/20 seconds	18
Ellen	Yes (No DMTS)	Yes (object only)	15/20 seconds	4
Bo	No	No	15/20 seconds	13

Limitations

There are several limitations that should also be mentioned. First, the number of participants and age of participants must be increased and expanded to be confident in making broad recommendations for all children with autism. Due to only four participants being included in the study and they were all of preschool age, it is not possible to apply these findings to older populations.

In addition, aspects of the procedure itself limit the potential efficacy and increase the potential for errors to occur. For example, watching a video of a skill being performed, as compared to a S^D presentation and prompts provided by a trainer during discrete trial training, removes the trainer from the training situation. In this study, rehearsal of incorrect responses was noted during the verbal task for Ben. Also, if the child looks away from the video monitor and a trainer is not aware that the child did not view the video, responding may be affected. Additionally, if the child is not responding during the test session, watching a video does not allow for quick representation of the S^D or prompting provided on the video itself. In addition, there would be a delay in teaching due to returning the child to the area where the monitor was located and restarting the video. Even short delays in teaching, such as these described, could increase off-task behavior of the child, and result in unproductive teaching sessions.

Another limitation involves the time involved in video creation. Approximately 30 minutes was needed to train the peer to create each video for this study. This length of time was necessary because training and modeling of the behavior had to occur for the peer model. Then, the peers had to clearly and consistently perform the target behaviors when asked. Often children make mistakes during filming as well, and several trials were necessary for them to perform the behavior correctly. When creating the videos for this study, two peers did not perform the target behavior during filming, even after extensive coaching and practice. For clarification, one of the peers laughed and would not perform the behavior as trained during filming; the other peer would not respond at all during filming. Therefore, this limitation should be considered when deciding which type of video modeling is best for learner. It may be the case that an adult model (LeBlanc, et al., 2003), point-of-view model (Hine & Wolery, 2006), or a self-model (Wert & Neisworth, 2003) would be more appropriate and just as effective. At this juncture, the literature supports peer, adult, point-of-view and self-model video modeling modalities as effective procedures.

Furthermore, related to the length of time that video creation requires, it is important to note that video creation for the play skills (Ben) used in this study took about 10 minutes less time to create than the adaptive skills filmed for Ellen, Daniel and Bo. This may be a helpful piece of information for teachers responsible for creating such videos. If editing of the video is necessary, additional time may be required. Most studies in the literature report video clips from 5 seconds in length (Corbett, 2003) up to 20 minutes (Lasater & Brady, 1995).

One final limitation involves the lack of exposure to peers during training. Having a real-time peer model (referred to as in-vivo modeling) available to perform the behavior, rather than displaying the task via video, could affect responding greatly. Learning from peers could assist in improving generalization of the learned skills to other peers (Charlop, Schreibman, & Tryon, 1983; Egel, Richman & Koegel, 1981), and result in a more natural learning environment similar to that of the child's classroom. Conversely, limitations of using a live peer model include potential variability in their responding and increased avoidance by the child with autism .A comparison of video modeling with in-vivo modeling (Charlop-Christy, et, al., 2000) showed that both procedures are effective in teaching new behaviors, although video modeling resulted in faster acquisition for four of the five participants in their study.

Future Directions

Although there were many findings in this analysis, there were several extensions that need further investigation. First, the results of this study suggest that a brief assessment of the components commonly used in video modeling could assist educators in choosing the necessary components for the learner, so that the procedure can be efficiently designed and quickly utilized. However, further analysis of other components commonly found in video modeling packages will need to occur before this recommendation can be carried out.

Also, more demonstration studies specifically comparing the effects of components using a within-subjects, multiple baseline design would be helpful. As a first step into the investigation of the controlling variables in video modeling packages, this study provided a springboard from which to expand the literature and ask further questions. The nature of the component analysis design utilized in this study does not allow for removal of the effects of components once they are introduced. Once a new behavior was taught, removing the effects of exposure to the components was not possible.

Third, generalization was not extensively tested in this study due to the primary focus being component analyses. As with other teaching procedures, it should be assumed that training a sufficient number of exemplars would be an important factor in both stimulus and response generalization (Stokes and Baer, 1977). Also, varying staffing and environments assists in this effort as well. Generalization needs to be addressed in future studies using video modeling in two ways: 1) viewing the target behavior performed by several different peers in several different environments or 2) assessing performance of the target behavior with different stimuli and in different settings. On a related note, novel responses were not explored systematically in the current study; although it was anecdotally noted for Ben that other play skills similar to the trained responses were observed during some test sessions. These included opening the other doors on the play set and retrieving or placing items in the compartments.

Finally, video modeling provides an efficient way to teach some children new behaviors utilizing technology. Further extensions in this realm may include watching videos on an iTouch™ or iPad™, so that the child does not need to leave the area where the behavior would occur during a test session. This would be helpful simply for convenience and decreasing reliance on staffing resources that are often scarce. Also, it would remove the possibility of extraneous variables such as interactions with other children or staff and noise interfering when traveling from the training area to the testing area.

Conclusion

As the results of this study has revealed, video modeling packages can assist preschool children with autism in learning new skills, if the appropriate components are selected. It is clear from the findings here that (a) viewing the video at least three times and viewing a peer receive access to a preferred item, and (b) then contacting the item following correct performance of the task (reinforcement), both increased correct responding for three of the four participants. These components appear to be important in successful utilization of video modeling as a teaching procedure for preschool children with autism. The generality of the findings include successful utilization of this research design to assist in identifying components that result in increased correct responding in video modeling packages. All findings revealed during this study are helpful in that they offers guidance to clinicians and teachers in designing video modeling packages for children with autism.

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Appendix

Table A1

Video Modeling Studies with Preschool Children using Peer Models (Listed in order of year published)

Reference	Participants	IV	Target Skills	Results
Taylor, Levin, & Jasper, (1999).	1 boy 6 years old Autism	VM (sibling models) containing an average of 10 scripted comments for the participant to imitate	Play comments with siblings	VM effective with scripted but not unscripted comments
Dauphin, Kinney, & Stromer (2004)	1 boy 3 years ASD 1-2 years age equivalent on adaptive scales	VM embedded into computer activity schedule	Social skills, specifically play	Increased scripted play, as well as unmodeled play, with teacher prompting
Simpson, Langone, & Ayres (2004)	4 students 2 girls and 2 boys 5 to 6 years old Autism-mild/moderated	2 peers displayed appropriate social skills	Social Skills (following directions, greetings, sharing)	Increased independent use of target skills

Gena, Couloura, & Kymissis (2005)	1 girl and 2 boys 4-6 years ASD	3 videos for each affect in which a peer displayed an appropriate affective response	Increase verbal and facial responses congruent with affective scenarios using video modeling and in-vivo modeling	Acquisition of appropriate affective responding increased using both methods
Apple, Billingsley, & Schwartz (2005)	2 boys 5 years old 1 had Asperger's Syndrome and the other autism Both were high functioning autism	Each participant viewed 3 videos modeling compliment giving and 1 modeling compliment-giving initiations. Adult voice-over with rules during video.	Social language	Video modeling alone (with rules) increased compliments, however reinforcement was needed to maintain the compliment giving behaviors
Reagon, Higbee, & Endicott (2006)	1 boy 4 years old Autism-mild/moderate (CARS)	Sibling served as model	Social/ Play behaviors	VM effective alone increased unscripted play (no prompting or reinforcement)
Kleeberger & Mirenda (2010)	1 boy 4 years old Autism	Highlighting features of video, response prompts, social reinforcement	Singing songs and toy play activities	Generalized imitation to actions not previously mastered

Figure A.1. Apple iMac computer used for viewing all video by participants. Also, note at the top of the monitor the iSight camera used to record the participants eye contact with the monitor while watching the video clips.

Figure A2. Kitchen set used in tasks for Ben. Note the location of the microwave at the top and the oven at the bottom center.

Training session checklist

RA observed:___________________________________

Please mark each column Y, N, or N/A and make comments as necessary.

Date:					
Observer:					
Activity:					
During implementation of the procedure did the person observed do the following: Write Y or N					
1. Prepare the video camera to record the test session.					
2. Prepare the computer to view the correct video file.					
3. Get child from classroom and direct him/her to the chair at the table in front of the computer.					
4. Click record using the mouse to start iSight camera.					
5. Present the SD "Watch the video" in a clear manner.					
6. Present the SD within 5 seconds of the child entering the test session area.					
7. If multiple viewings, re-present the SD each time.					
8. If the child attempts to leave the chair, direct back to chair.					
9. If the child successfully leaves the chair, restart the video at spot where viewing stopped.					
10. Present any rules or instructions for this phase.					
11.Once video is complete, turn off the iSight Camera.					
12. Direct child to the correct test area.					

If a N is listed on the checklist, review what steps were performed incorrectly and continue check-listing until 100% correct on 3 consecutive trials. ***Use only during specified phases.

Figure A.3. Training session checklist for research assistants. This checklist was utilized during the research assistant's initial training. 100% performance by the assistant was required across three sessions before experimental sessions were conducted.

Test session checklist

Teacher or RA observed:___________________________________

Please mark each column Y, N, or N/A and make comments as necessary.

Date:					
Observer:					
Activity:					
During implementation of the procedure did the teacher observed do the following: Write Y or N					
1. Present the SD provided on the session instructions in a clear manner.					
2. Present the SD provided on the session instructions within 10 seconds of the child entering the test session area.					
3. ***If the child responds correctly provide verbal praise and specified tangible item.					
4. ***If the child responds incorrectly, provide a verbal prompt by re-presenting the instruction.					
5. ***Wait 5 seconds for the child to respond independently and correctly.					
6. ***If the child responds incorrectly, provide a gestural prompt (if indicated) to help the child make the response.					
7. ***Re-present the instruction again, wait 5 seconds for the child to respond independently and correctly.					
8. ***If the child responds incorrectly, provide a physical prompt (if indicated) to help the child make the response.					
9. ***Re-present the instruction again, wait 5 seconds for the child to respond independently and correctly.					

If a N is listed on the checklist, review what steps were performed incorrectly and continue check-listing until 100% correct on 3 consecutive trials. ***Use only during specified phases.

Figure A.4. Test session checklist for research assistants. This checklist was utilized during the research assistant's initial training. 100% performance by the assistant was required across three sessions before experimental sessions were conducted.