Teaching Children with Autism to Mand for Information Using Video Modeling

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Skinner’s taxonomy of verbal operants defines language in functional terms specifying the relevant controlling variables in terms of antecedent and consequent influences. A mand for information is a request for a specific verbal response that has momentarily high reinforcing value due to the presence of an establishing operation. Contrived establishing operations have been used for teaching mands for information, however, researchers have not yet investigated the effects of using video modeling to teach mands for information to children with autism. This study investigated the effects of video modeling with a contrived establishing operation for teaching two children with autism to mand for information using a multiple baseline design across participants. Video modeling was ineffective in establishing the mand for information for both participants, however, an in vivo vocal prompt was effective in conjunction with the contrived establishing operation. These results illustrate two instances in which video modeling was ineffective and replicate the effects of contriving establishing operations and using an in vivo vocal prompt to teach mands for information (Sundberg, Loeb, Hale, & Eigenheer, 2002).
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INTRODUCTION

Autism is a developmental disorder characterized by qualitative impairments in social interaction, communication, and restricted and repetitive behaviors (American Psychiatric Association, 2000). Leo Kanner (1943) first described infantile autism. His description was based on 11 clients exhibiting similar deficits in each of these areas (Tidmarsh & Volkmar, 2003). Autism was formally included in the mental health diagnostic classification system in the DSM-III (American Psychiatric Association, 1980), though the description was vague. The current version of the diagnostic manual, the DSM-IV Text Revision, includes autism as one of the Pervasive Developmental Disorders (American Psychiatric Association, 2000). The current criteria for autism require multiple impairments in social functioning, communication, and restricted and repetitive behavior present before the age of 3.

Because communication is one of the core deficits observed in children with autism, speech delays are often observed in this population. While some children develop idiosyncratic speech patterns, some children with this disorder fail to develop language at all. Approximately 50% of preschool-age children with autism do not develop speech (Charlop-Christy, Carpenter, Le, LeBlanc, & Kellet, 2002). Those that do develop speech often engage in echolalia, repeating words or phrases heard previously, or do not speak for social purposes, such as engaging in conversation (Smith, 1999). Because one of the best predictors of outcome for children with autism is the development of spontaneous language before six years of age (Szatmari, Bryson, Boyle, Streiner, & Duku, 2003), it is essential to develop effective programs to teach language to children with autism. Effective behavioral language interventions have been developed for children with
autism, which typically follow either a psycholinguistic language approach (i.e., Lovaas, 2003) or a functional language approach (i.e., Sundburg & Partington, 1998)

Application of Skinner’s Functional Analysis of Language to Children with Autism

Skinner (1957) created a functional behavioral conceptualization of language in his book *Verbal Behavior*. This conceptualization differed from traditional psycholinguistic models of language (i.e., Chomsky) in several important ways. Traditional models divide language into two categories, receptive and expressive language. Receptive language is the language a client is able to listen to and process while expressive language is the language a client is able to emit. These two forms of language are thought to be part of that same underlying information processing ability (de Villiers & de Villiers, 1999). Skinner’s analysis, however, focused on the functional aspects of language (i.e., the specific antecedents and consequences of language) rather than the syntactical and structural aspects of language. He proposed a taxonomy of specific verbal operants, organized by the specific antecedents and consequences that control language.

The elementary verbal operants are the mand, tact, echoic, autoclitic, and intraverbal. Each of these operants serves a different function, and therefore, operates under different relevant controlling variables (see the Table). The relevant controlling variable for the mand is the existence of an establishing operation (EO; Michael, 1993), which increases the reinforcing qualities of requesting the desired reinforcer and evokes behavior that has resulted in access to that desired reinforcer in the past. Tacts are controlled by a stimulus in the presence of which the speaker is reinforced for emitting a particular verbal response. For example, in the presence of an apple, a speaker is likely to
be reinforced for saying "apple." The controlling variables for echoics, autoclitics, and intraverbals are all verbal stimuli. Echoic behavior occurs when, upon hearing a verbal stimulus, the listener responds by repeating the verbal stimulus. Skinner (1957) discusses this verbal operant as showing a point-to-point correspondence between the stimulus and response. Intraverbal behavior occurs when the response evoked by a verbal stimulus does not have point-to-point correspondence between the stimulus and the response (Skinner, 1957). An example of an intraverbal is the response "four" when a person says, "two plus two." An autoclitic is a verbal operant in which the speaker negates, quantifies, or asserts information regarding his/her own verbal behavior or the verbal behavior of another person (Skinner, 1957). For example, a speaker may say, "I am going to say, 'jump'." This is an autoclitic because the speaker is referring to his/her own verbal behavior in this response. Skinner’s taxonomy and recent empirical evidence (Sigafoos, Reichle, Dross, Hall, & Pettitt 1990; Sundberg, San Juan, Dawdy, & Arguelles, 1990; Twyman, 1996) suggests that the elementary verbal operants are functionally independent, meaning that each must be taught separately in early language acquisition. For example, a child who can say “banana” in the presence of a banana may not be able to name a banana when asked to “name a yellow fruit.”

Skinner’s analysis of language has recently been applied to the behavioral treatment of autism in a relatively widespread clinical application and a small, but growing, empirical literature (Carr & Firth, 2005; Sautter & LeBlanc, 2006). Assessing the communicative abilities of children with autism using Skinner’s taxonomy may provide much more in depth information about the deficits in stimulus control that contribute to their language difficulties. One can determine whether children are able to
respond to nonverbal controlling variables and the receipt of desired reinforcers (i.e., mand), respond to nonverbal stimuli for social reinforcers (i.e., tact), and respond to a variety of verbal stimuli for social reinforcers (i.e., echoics, intraverbals, autoclitics). The Assessment of Basic Language and Learning Skills and the Behavioral Language Assessment Form (BLAF; Sundberg & Partington, 1998) are tools that directly or indirectly sample a child’s language abilities according to Skinner’s taxonomy allowing users to pinpoint specific aspects of environmental control to manipulate for intervention.

In the verbal behavior approach to language training, mands have been identified as the target that should be first addressed with children with autism. Because this type of verbal operant allows the speaker to specify precisely what he or she wants and to gain access to an object or event that currently has reinforcing properties, it allows the speaker to gain control over his or her environment (Sundberg & Michael, 2001). Unlike the other elementary verbal operants, the mand does not rely on nonspecific social reinforcers to increase the verbal behavior of children with autism. Because of the social deficits observed in children with autism, tangible reinforcers are more likely to increase and maintain initial language acquisition in children with autism than social reinforcers. Teaching a child with autism to mand for desired objects before teaching other verbal operants is sensible because it allows the client to contact reinforcers that are highly desirable, thus pairing therapists and language training with reinforcement instead of demand situations and corrections (Sundberg & Michael).

Mand Training Procedures

The main goal of mand training is to teach a child to request an item or event/activity in response to the presence of the relevant EO without extraneous or
artificial prompts. Skinner (1957) specified that in order for a mand to be a true mand, it must occur in the presence of the relevant EO and be controlled by that operation. Mands can take many forms other than a vocal request for a reinforcer. Many people with developmental disabilities are taught to use picture communication systems or manual signs to mand for reinforcers (Chambers & Rehfeldt, 2003). As with vocal mands, these alternative mands must occur in the presence of the relevant EO to be considered true mands. Many studies on mand training attempt to capture or contrive an EO while teaching a mand for a desired object or information (Drash, High, & Tudor, 1999; Shafer, 1994; Sigafoos, Doss, & Reichle, 1989), but some have failed to illustrate the control of the EO. For example, Ross and Greer (2003) attempted to teach children mands by preceding a vocal model of the mand with a variety of motor imitation trials (e.g., touch head, touch nose, touch eyes, say, “Cookie”). Using this procedure, all participants increased the frequency with which they echoed the teacher’s modeled request for a reinforcer. However, a true mand should be under the control of the relevant EO, and not a discriminative stimulus (e.g., the teacher’s model or instruction to request), so it is unclear whether these “mands” would occur outside of training when the teacher’s model and instruction were not present. In this instance, the teachers may have only taught the children to emit an echoic response, not a mand.

After identifying factors that may influence the lack of development of vocal manding in children with autism, Bourret, Vollmer, and Rapp (2004) developed mand training procedures to teach children with autism. Factors identified by Bourret et al. that may be responsible for the lack of vocal manding include an item having minimal or no reinforcing properties, a child lacking a mand for the item in his or her repertoire, limited
reinforcement opportunities (e.g., poor articulation means that only the parents provide
the requested reinforcer), or improper stimulus control (i.e., occurs only in the presence
of a particular person). Bourret et al. found that when mand training procedures target the
specific deficit experienced by the child, the training procedures are more effective. For
example, a child who emits a partial word utterance as a mand may experience more
benefits from a shaping procedure than a prompt fading procedure.

Mand training has also been identified as a procedure that can be used to reduce
rates of aberrant behavior in children with autism who engage in problem behavior to
increase the probability of an adult providing the relevant reinforcer (Bowman, Fisher,
Thompson, & Piazza, 1997). Functional communication training (FCT) attempts to
replace these aberrant behaviors with more constructive means of requesting desired
items (Brown, Wacker, Derby, Peck, Richman, Sasso, et al., 2000) and represents a large
part of the literature on mand training (Sautter & LeBlanc, 2006). FCT has generally
proven highly effective in establishing replacement mands that serve the same function as
problem behavior, especially when extinction or punishment contingencies are in effect

Brown et al. (2000) demonstrated the importance of EO control when conducting
mand training with children with severe problem behavior. In this study, a functional
analysis was used to identify the reinforcer for aberrant behaviors before participants
were taught appropriate alternative methods for requesting two reinforcers: the functional
reinforcer and another event that was irrelevant to the function of the aberrant behavior
(e.g., mand for escape when aberrant behavior served an attention function). When the
relevant EO was present (i.e., low attention for the attention function), participants
emitted the relevant mand to request a reinforcer and the irrelevant mand was almost never observed. When the EO was absent (i.e., continuous attention for attention function), neither the relevant nor the irrelevant mand was observed. These results demonstrate the importance of the presence of the relevant EO when teaching a true mand if one desires subsequent unprompted mands.

*Mands for Information*

A mand for information is a specific type of mand that specifies certain information as the reinforcer (Sundberg & Michael, 2001). That is, a person may query someone about specific information that will allow them to come into contact with a preferred event (e.g., “Who has my Elmo?”). In this instance the information (e.g., “Jane hat it,”) has reinforcing value, as does the preferred event that eventually may be accessed (Elmo).

While many studies have been conducted on mand training (e.g., Drash et al., 1999; Sigafoos et al., 1989), few studies have focused on mands for information and fewer of those have employed clear EO control. Three studies described below illustrate procedures for teaching question-asking that occurs under conditions of unclear stimulus control (Hung, 1977; Taylor & Harris, 1995; Twardosz & Baer, 1973;) while more recent studies illustrate clear EO control (Sundberg, Loeb, Hale, & Eigenheer, 2002; Williams, Donely, & Keller, 2000).

Twardosz and Baer (1973) investigated procedures used to teach children with autism to ask questions. During baseline of their study, participants were trained to tact letters, colors, and numbers using echoic prompts and contingent praise and tokens. When tact training was completed, untrained probe items were interspersed among
trained items and no statements (e.g., "say __") were made for untrained stimuli, thus creating the need for the child to ask "what letter/number/color is that?" in order to be able to provide an answer that would earn a token. Question responses would also have earned a token throughout baseline but never occurred. Next, the researchers modeled the target question by saying "what ___?" just before presenting the items. Finally the researchers presented a blank card to the participant and reinforced "What ___?" with praise and the answer to the question and an opportunity for the child to also say the name of the item to earn a token. Neither participant acquired the question during modeling but both participants mastered the questions when praise and the answer to the question were provided. The presence of praise and tokens throughout the study makes it unclear whether these were pure mands for information but the final training phase approaches contriving EO to teach pure mands.

Hung (1977) attempted to teach children with autism to ask "curiosity questions" about items in their environment using pictures cards and a token economy. Once participants learned to ask questions about items seen in the picture cards, participants were trained to generalize these responses to real items in a variety of environments using prompting strategies. As in Twardosz and Baer (1973), participants received tokens when an appropriate response was emitted. Interestingly, participants were unable to provide information regarding the questions they had asked and for which they had received answers suggesting that it is unlikely that the information obtained in response to the question had any reinforcing value. It is likely that question asking was maintained by tokens solely. In a similar study, Taylor and Harris (1995) taught children with autism to ask, "What's that?" using picture stimuli as prompts and tangible reinforcers for correct
responding. Clearly the items pictured in the stimuli were reinforcing but it is unclear whether the information obtained (i.e., label of the object) had its own reinforcing value.

It is often difficult to increase the reinforcing value of information, a social reinforcer, to such a level that children with autism will engage in question-asking behavior, but a few studies have attempted exactly this. Williams, Donley, and Keller (2000) investigated a procedure designed to teach children with autism to mand for information by manipulating the relevant EO in such a way that information became valuable. They presented participants with many brightly colored and interesting boxes and taught the children to ask, “What’s that?” (mand for information), “Can I see it?” (mand), and “Can I have it?” (mand) using echoic prompts. The experimenter’s response to each mand was specific (i.e., what – name it, see it – show it, have it – give it). Unlike previous studies, this study provided the answers to questions only and did not rely on extraneous reinforcers to increase mands for information. All three questions were acquired but only the mand for information and the direct mand for access maintained while the mand to see the object decreased. These results suggest that the name of the object was valuable because that information allowed the child to effectively emit the direct request for access.

In a systematic replication of Williams, Donley, and Keller (2000), Williams, Perez-Gonzales, and Vogt (2003) manipulated consequences following the emission of the same three questions to determine whether these three questions constituted three independent behavioral repertoires, a chain of behaviors, or three members of a single response class. Using verbal prompts, researchers taught three children with autism to emit the questions “What’s in the box? Can I see it? Can I have it?” When participants
met mastery criteria for each of these questions, prompts were no longer given, and researchers responded “No!” when participants asked, “Can I see it?” If these questions were a chain of behaviors, it is likely that all questions emitted before the question that received a non-reinforcing response would be extinguished and all questions following the question that received a non-reinforcing response would be maintained. If these questions were all members of the same response class, all questions would be extinguished when one question received a non-reinforcing response. However, they found that only the question receiving the non-reinforcing response extinguished while all other questions were maintained, indicating that each of these questions is a separate behavioral response. This indicates that the teaching strategies employed in both Williams, Donley, and Keller and Williams, Perez-Gonzales, and Vogt create responses with sufficient flexibility to be applicable in real world situations.

In a similar study, Sundberg et al., (2002) used hidden objects to teach children with autism to mand for information. In their study, children were taught to look into a container for an object before beginning the study. Two items were used for each client, one preferred and one neutral. During the experimental evaluation, the researcher removed the items from the box and handed it to the child to observe any response to the now-empty box. During intervention, the child was then prompted to ask, “Where is ____ (name of the object)?” The adult responded with the information that allowed the child the opportunity to find and access the item. Therefore, prior to the start of the study, children had to have the ability to hear and follow simple directions (e.g., It’s in the red box, go get it!). All mands for information were acquired, though mixed results were obtained regarding the rate of acquisition for preferred versus less preferred (i.e., no
history of reinforcement) items suggesting that the neutral items may have been preferred. Further research to determine whether level of preference affects rate of acquisition is warranted. In the second part of this study, in response to the question “Where is ____?”, the child was told that another person had the object and was then prompted to ask “Who?”. In response, the information was provided and the child was permitted to approach the person holding their item to retrieve it and interact with it. The participants quickly acquired this response as well providing evidence that contriving EOs can be an effective way to teach mands for information.

Sundberg et al. (2002) suggested that the children received two reinforcers for emitting the mand for information: the answer to their question and the item in the box. Additionally, more than one EO was in effect that established the received information as reinforcing. First, the missing item had to be a preferred item, otherwise locating the item would not be reinforcing. Because this preferred item was not in its usual place, locating the item became reinforcing. Finally, the information necessary to find the missing item gained reinforcing qualities. Because true mands must occur in the presence of the relevant EO, if these EOs were not in effect, it would not be possible to teach participants to emit a true mand for information (Sautter & LeBlanc, 2006).

While direct vocal models (i.e., in vivo modeling) have been effectively used to teach children with autism to mand for information, video modeling has not yet been employed to teach this skill. Video modeling has been used to teach children with autism several skills including language and social skills (Charlop & Milstein, 1989; LeBlanc et al., 2003) and has potential benefits including the removal of social requirements involved in more traditional teaching situations (Sherer et al., 2001). Video modeling
may be a reasonable strategy to use to teach mands for information, thus, the literature on video modeling for conversation and play acquisition is briefly reviewed below.

**Video Modeling**

Video modeling is a technology-based intervention that has been used to teach children with autism a variety of social and self-help skills (Goldsmith & LeBlanc, 2004). In recent years, video modeling has been defined as a presenting a video image of a behavior that the child is expected to imitate (LeBlanc et al., 2003). The skills successfully targeted using video modeling include increasing social initiations (Nikopoulos & Keenan, 2004), perspective taking (LeBlanc et al., 2003), and a wide variety of other social skills necessary to function on a day-to-day basis.

Charlop and Milstein (1989) used video modeling to teach children with autism to engage in appropriate conversational speech in the form of several scripted conversations. During baseline, the therapist held the item that was the topic of conversation and said the first line of the scripted conversation regarding that item. The therapist then waited 10 s for a response and continued with the next two lines of the scripted conversation if no response occurred. During video modeling, the entire conversation was modeled on a videotape three times. The therapist then said, “Let’s do the same” and provided the first line of the scripted conversation. Generalization probes of untrained conversations were tested to determine whether conversational skills generalized across conversational topics. One participant was able to meet the criterion for both the modeled conversation and the generalization topic after viewing one videotaped conversation. A second participant met the criterion for generalization after viewing the two video models of
conversations and a third participant met these goals after viewing three different
conversation video models.

Apple, Billingsley, and Schwartz (2005) used video modeling to teach children
with Asperger’s Disorder to provide people with compliments. In the first part of their
study, Apple et al. removed two children from their classroom during free play time and
had them watch a segment of two short videos, one of a peer initiating compliments
(initiating video) and one of a peer responding to another peer's initiation (response
video) by giving a compliment. During the video, an adult in the video would state a rule
about giving compliments. Both participants increased the number of response type
compliments given to peers, but neither participant increased the number of initiation
type compliments given to peers. It is possible that response-compliments increased
while initiated-compliments did not because the compliment given by another child acted
as a discriminative stimulus that evoked a response-compliment from the target child.
Further research to determine which characteristics of video models are likely to evoke
imitative responses may clarify the mechanism of action with regard to these two types of
compliments.

In the next phase of the Apple et al. study, participants were given tangible
reinforcers for providing four initiated compliments to their classmates. This addition
effectively increased the number of initiated compliments given by both participants. The
tangible reinforcers were later faded, however, as they were faded, the number of
initiated compliments given by the participants also decreased. This result does not seem
unusual, given that this type of compliment giving behavior requires the participant to
initiate a social interaction and provide another child with a compliment that, in the
absence of a tangible reinforcer, is likely to result in a social response, and possibly elongated social interaction, neither of which are likely to be very reinforcing for a child with social deficits.

Nikopoulous and Keenan (2004) used video modeling to teach children with autism to engage in reciprocal play with a peer. Prior to observing the videotape, none of the children engaged in reciprocal exchanges with a peer. One child showed an increase in reciprocal play after viewing a video model of a relatively complex exchange between two peers while the other two showed an increase in reciprocal play after viewing a video model of a less complex interaction. These increases in reciprocal play were maintained and again observed at one-month and three-month follow-up sessions.

In a study comparing self and peer video models, Sherer et al., (2001) attempted to teach children with autism conversation skills from a list of 20 questions from parents and caregivers. These questions were ones that the participants were unable to answer without prompts that the caregivers wished their children were able to answer. Two videotapes were created for each child. In one, a typically developing peer served as the model and in the other footage from prompted interchanges with the participant was edited to remove the prompts and create an effective self-model. Of the five participants, two acquired the conversations quickly and one acquired them more slowly while two were unable to reach the acquisition criterion of 100% of the questions correct. Of the two that reached acquisition quickly, one showed a preference for self modeling and one showed a preference for peer modeling. These findings may indicate that more research is needed to determine whether self or other modeling is superior, or may indicate that
preferences are individual and that the child’s learning preferences should be considered when choosing a treatment option.

Charlop-Christy, Le, and Freeman (2000) conducted a study designed to compare the effectiveness of video modeling with in vivo modeling. In this study, two target behaviors were taught to each of five participants. One of these target behaviors was taught using video modeling while the other was taught using in vivo modeling. When possible, each of the two target behaviors was broken down into two smaller targets, one taught using video modeling and one taught using in vivo modeling. For example, one target behavior was to teach the participant to identify facial expressions. This larger target was broken down into teaching the child to identify happy/sad facial expressions using in vivo modeling and tired/afraid facial expressions using video modeling. In all cases, video modeling required fewer training sessions for the participant to acquire the behavior. In addition, skills taught via video modeling generalized across people, settings, and stimuli. Charlop-Christy et al. also recorded the time and cost efficiency of in vivo modeling versus video modeling. For 4 of 5 participants, video modeling required less time to implement than in vivo modeling. For the fifth participant, equal amounts of time were required for video and in vivo modeling. In all cases video modeling was more cost effective than in vivo modeling.

There are many suggested benefits to using video modeling with children with autism. First, video modeling removes the social component of instruction, which is often aversive for children with autism, allowing the child to focus solely on the target skill. Additionally, many children with autism respond best to visual stimuli, so instruction that depends heavily on visual observation, such as video modeling, is suited to their
particular needs (Sherer et al., 2001). Takeshima, DeBery, and LeBlanc (unpublished) also list consistency of presentation of behavior across trials and use of the video model with multiple learners as potential benefits of video modeling. Video modeling also allows the therapist to focus in on aspects of the behavior that are particularly salient to acquisition (LeBlanc et al., 2003). These stimulus features can be enhanced, and as mentioned previously, will be presented in the same way during each trial. Video models can also be observed in the absence of a trained therapist, increasing the amount of exposure a client is likely to have to the modeled behavior. Finally, video modeling can allow a client to learn to emit behavior that is necessary in dangerous situations without placing the client in the dangerous situation, for example, learning to walk safely across a street (Goldsmith & LeBlanc, 2004).

Little literature is available delineating the aspects of video models that make these models more or less effective. For example, it is unclear whether self modeled videos or other modeled videos are more effective with children with autism (Sherer et al., 2001). Researchers have also suggested that video models should focus on the salient aspects of the behavior to be imitated (Takeshima et al.) but it is unclear to what extent videography renders a model more effective. Researchers have also suggested that video models are beneficial because they are highly engaging for child with autism who may be more likely to attend to a television than a person, but no clear data are available on visual attending during video modeling. Bandura (1977) also provided some guidelines to consider when using models in instruction. For example, he suggested that when the model engages in the target behavior, the learner should observe the model’s receipt of reinforcers for engaging in this behavior. Additionally, the model should either be similar
to the learner or should be someone of higher status. The behavior should be modeled in
the context in which the learner should engage in this behavior. Because of the flexibility
of video modeling, these are relatively easy to incorporate to promote generalization of
skills.

The Current Study

Mands for information are socially important because they can increase social
competence as well as functional independence. Communicating one’s need for
information regarding the location of various people and objects can give a person
control over his or her environment that he or she would otherwise not have. Requesting
this information allows a person to locate desirable objects with minimal help from
others. Asking relevant questions is also an important part of social conversation skills.

Behavior analysts have not yet attempted to teach individuals to mand for
information using video modeling. However, given the benefits of video modeling as
well as the importance of a mand repertoire, it seems reasonable to attempt to teach
mands for information using video modeling. Sundberg et al. (2002) provided an
interesting technology to contrive the relevant EO for mands for information. Having a
preferred object disappear from the spot in which a client would expect to find it
increases the reinforcing value of information regarding where that object can be found.
Tying together tangible reinforcers and social reinforcers (i.e., information) in this way
increases the reinforcing value of information. When the relevant EO is in place, teaching
this difficult skill to children with autism will be less challenging. Video modeling
would provide an alternative medium with which to instruct clients to mand for
information, potentially minimizing some of the effort currently involved in repeatedly contriving EOs during instruction.

Determining whether video modeling can be used to teach mands for information in the presence of the EO would be an interesting extension to the study conducted by Sundberg et al. (2002). If it is possible to teach this skill using video modeling, the video tape that is created would provide a lasting and durable product that can be used to teach many children with autism to mand for information. In addition, it would add to the body of literature that provides support for the use of video modeling as a mode of instruction for children on the autism spectrum. The purpose of the current study is to employ video modeling to teach mands for information in the presence of the relevant EO.

METHOD

Participants and Setting

Two children with a previous diagnosis of autism provided by area psychologists were included in this study. The participants were Jack and David, two six-year-old males with verbal repertoires including an extensive mand and tact repertoire, generalized vocal imitation, and a limited number of intraverbals. All sessions, with the exception of one follow-up session, took place in a therapy room in 1504 Wood Hall at Western Michigan University. A table and a chair for the child, a computer (for presentation of the video models), and three people sitting in chairs across the room with brown bags behind their back were present in the room during baseline, video modeling, and in-vivo vocal prompting sessions. A single follow-up session was conducted in the participant’s home two weeks after the final intervention session was conducted in Wood Hall. The same
materials described in the baseline and intervention sessions were present during the follow-up session.

Screening Procedures

Both participants were administered the Autism Diagnostic Observation Schedule (ADOS; Lord, Rutter, DiLavore, Risi, 1989), which confirmed that each met criteria for an autism spectrum disorder. The ADOS is a semi-structured, standardized assessment of communication, social interaction, and play or imaginative use of materials with interobserver reliability ranging from 82% to 91.5% (Hill, Bölte, Petrova, Beltcheva, Tacheva, & Poustka, 2001; Lord et al., 2000) and acceptable validity (Lord et al.). The ADOS consists of standard activities that allow the examiner to observe behaviors that have been identified as important to the diagnosis of autism spectrum disorders at different developmental levels and chronological ages.

Prior to participation in the study, Jack and David’s overall level of language was measured using the BLAF. The BLAF is an assessment form used in the Assessment of Basic Language and Learning Skills (ABLLS). The ABLLS is a language assessment package that is based on Skinner’s (1957) analysis of verbal behavior. As a part of this assessment package, the BLAF uses Skinner’s analysis to identify which verbal operants a speaker has already learned or mastered and which still have to be learned. This form is administered in an interview type format, with an examiner asking a parent questions about his/her child’s current language level. The BLAF does not have normative values that can be used to compare a learned to other learners at his/her own age, but instead provides a descriptive picture of the operants learned by a given speaker. Jack’s BLAF indicated that he had a well developed mand and tact repertoire and a developing
intraverbal repertoire. His mother also indicated that Jack had a very well developed verbal imitation repertoire, a prerequisite to the use of video models to teach skills to children with autism. David's BLAF was similar to Jack's. His mother also indicated that he had a well developed mand and tact repertoire, a developing intraverbal repertoire, and a well developed vocal imitation repertoire.

Measurement

The primary dependent measure was whether the participant asked the relevant question at each contrived opportunity to do so. That is, for each trial, it was recorded whether the question “Who has my toy?” was asked (see Appendix 1). Additionally, the total duration of attention to the video model in seconds was recorded using a timer during video modeling.

A second trained observer collected interobserver agreement (IOA) data for a portion of trials across all phases of the study. IOA was also collected on attendance to the video model, which was defined as the participant’s eyes being directed toward the screen of the laptop, during a portion of video modeling trials. Agreement was calculated using total agreement, meaning that an agreement was scored when two independent observers recorded that a target question was emitted during a particular trial. The secondary data for question asking was collected via review of videotape and the secondary data for the attention measure was collected live given the potential difficulties of observing eye gaze from video footage. IOA for question asking was calculated using total agreement where agreements are divided by agreements plus disagreements and that number is multiplied by 100%. IOA for total duration was calculated by dividing the
smaller total duration of attending by the longer total duration of attending and multiplying by 100%.

For Jack’s mand for information data, IOA collected across all phases of the study was 100% and was collected on 100% of trials. For David, IOA collected across all phases of the study was 94.9% and was collected on 96.5% of trials. As stated previously, IOA data were also collected on the amount of time participants spent attending to the video. These data were collected on 44% of the video modeling trials for a total of 33% of the total duration of video model presentation across participants. Agreement was 95% for the long video and 73.7% for the short video. Collapsed across the long and short videos, IOA for non-attention to the video was 86.7%.

Procedural integrity was also evaluated for at least 40% of trials and for the video modeling sessions. Because pretraining as well as each condition of the study requires the researcher to engage in several steps, treatment integrity was calculated as the percentage of steps correctly completed by the researcher. An average percentage of correctly completed steps was reported for each condition. An observer in the observation room in 1534 Wood Hall collected primary integrity data and IOA data for treatment integrity data were collected via videotape for at least 20% of the sessions across all phases.

Procedural integrity data were collected across participants and all phases of the study (i.e., preference assessment, pretraining, intervention, follow-up). Across participants, treatment integrity was 99.5% and was calculated on 98% of trials. IOA of treatment integrity was also collected. Across participants, treatment integrity IOA was approximately 96.2% and was collected on approximately 61% of trials.
Design

A multiple baseline design across two participants was used to evaluate the effects of video modeling on acquisition of mands for information. This design assures internal validity by showing a replication of treatment effect (or non-effect) across participants. In addition, phase changes are not introduced until the data within each phase are stabilized. This allows for clear interpretation as to whether a change in level, variability, or trend occurs when a treatment is implemented.

Procedure

Preference Assessment. A multiple stimulus (without replacement) preference assessment was conducted (DeLeon & Iwata, 1996) for each participant. Eight to ten toys (e.g., toy trucks, books, etc.) identified as preferred either in the parent interview or selected from the playroom in 1504 Wood Hall were placed in front of the participant on the table in an array and the child was asked to "pick one." When the child selected an item, he was allowed to interact with the object for 30 s while their selection was recorded on a data sheet. The object was not returned to the array until every other item had been selected or the child stops selecting. The procedure was repeated two more times and the selection ranking for each item was determined by averaging selection rank for the three arrays. The three most preferred items identified during this preference assessment were presented at the start of each session to ensure that the most preferred item was used during mand training.

Pretraining. The purpose of pretraining was to ensure that the child was able to identify the colors red, green, and blue because during intervention the child was told the color of the 12"x12" piece of cardboard worn by the person hiding their toy when they
asked, “Who has my toy?” In order to gain access to the toy, the child had to walk to the person with that color cardboard. Therefore, it was imperative that the child be able to identify the colors worn by these people.

In the first component of pretraining, the child was seated at a table, and three small pieces of cardboard were placed in front of the child. The child was asked to identify a specific color, given the opportunity to respond, and provided with the appropriate consequence (praise or correction). The second component of pretraining required the child to identify a color and walk across the room to the person wearing that color cardboard square. The purpose of this part of pretraining was to ensure that the child could scan an array from a distance and walk across the room to identify the correct color. This procedure was continued until the child correctly identified colors during 80% of trials, with approximately half of trials being conducted during the first component of pretraining and half conducted during the second component of pretraining. Data were collected on the data sheet in Appendix 2.

**Baseline.** During baseline, the child was seated at the table and given access to a toy for a brief period of time. A blanket was then held up between the child and the toy, and the toy was hidden in a bag behind one of three adult assistants. The blanket was removed, and the child was given approximately 3-s to ask, “Who has my toy?” If the child emitted this response, he was answered and given the opportunity to retrieve the preferred toy from the relevant adult. If the child did not emit the relevant mand for information, the scene was reset and the child was given another opportunity to emit the relevant mand for information (i.e., next trial).
Video Modeling. In the video modeling condition, the child placed in the same situation as in baseline. However, if the child did not ask the question when the opportunity was presented a video model was provided followed by another opportunity to ask the question. Specifically, a laptop computer was placed on the table and the child watched a digital video of a model in the relevant scene. The video showed the model playing with a toy for a short period of time. Then, the model was asked to cover his eyes, and the toy was hidden. The blanket was removed from in front of the model and the model said, “Who has my toy?” The model was given the information regarding who had the toy, was allowed to obtain the toy from this person, and was allowed to play with it for a few seconds before the end of the video. In the long video condition, this scene was replayed three times, using multiple toys, with five seconds of a black screen separating each exemplar. The total length of the long video was 89 s. In the short video condition, the scene was played once, followed by five seconds of black screen, and then followed by the model saying, “Who has my toy?” The total length of the short video was 39 s.

Immediately following the video-model, the laptop was removed from the table, and the experimenter looked expectantly at the child. He was given three seconds to ask the relevant question. If the child did not ask the question, the relevant EO was reconstrived by representing the child with the toy, holding a blanket between the child and the toy, hiding the toy, removing the blanket, and looking expectantly at the child. The child was again given 3 s to respond. If the child still did not ask the question, the video model was presented to the child again.
In vivo vocal prompt. The in vivo vocal prompt condition replicated the intervention described by Sundberg et al. (2002). During the in vivo vocal prompt condition, the child was given access to the toy for a short period of time. Then, a blanket was placed between the child and the preferred toy, and the toy was hidden in the same way described during the video modeling condition. The blanket was then removed, and the child was given 3 s to ask the question, “Who has my toy?” If the child asked the question, he was given the answer to the question and access to the preferred toy. If the child did not ask the question, he was prompted, “Say, ‘Who has my toy’.” This prompt was later faded.

Follow-up. Follow-up took place in the child’s home and the condition was identical to the baseline condition. Jack’s follow-up occurred in the living room of his home. His mother was at home during the session, but did not participate in the session. David’s follow-up occurred in a playroom at his house. Toys in the room were either removed from the room or covered if too large to remove from the room. His mother was present during the session and acted as one of the people seated across from David was a colored square around her neck.

RESULTS

The results of pretraining indicate that both participants were able to identify the colors red, green, and blue. Jack demonstrated 100% accuracy on each component in 18 trials, the minimum possible. David performed with 78% accuracy on component 1 trials (18 trials required to reach criterion) and 83% of second component trials (12 trials required to reach criterion) with the average meeting the mastery criteria of 80% accuracy across components.
The results for baseline, video modeling, in vivo prompting, and generalization are depicted in the figure. David's results are depicted in the top panel of the figure and Jack's results are depicted in the bottom panel of the figure. Neither participant emitted the relevant mand for information during the baseline phase. The video modeling intervention was implemented for 14 trials for David (long = 4 trials, short = 10 trials) and 13 trials for Jack (long = 10, short = 3 trials) with no evidence of acquisition of the mand for information. The purpose of the shortened video was to decrease extraneous stimuli in the video in an effort to focus the child's attention on the salient response, but no effects were observed. The duration of attending increased from an average of 84 s (94.4% of the video) during the long video to 39 s (100%) for the short video for Jack and increased from an average of 57 s (64.1%) for the long video to 28.1 s (72.1%) for the short video for David. These results suggest good to excellent attention during model. However, in spite of attending to the model, the results were poor.

The in vivo vocal prompt phase was implemented when the video-models proved ineffective resulting in improved performance on the first intervention trial for both participants and completely independent responding within 7 trials for David and 18 trials for Jack. The mand for information partially generalized to the participants' home environments as illustrated by both Jack and David's responding with the appropriate question when placed in the baseline situation in their home environment. However, because this responding did not occur on every trial of the generalization probe, the generalization was only partial. This partial generalization may be explained, in part, by difficulties contriving the relevant EO in the home environment.
Upon arrival at Jack's house, Jack spontaneously requested a different preferred item that could not be located. The researchers attempted to interest Jack in available toys resulting in one successful mand for information (probe 1) followed by resumed requests for the missing toy and refusal to engage with the available toys. Though Jack sat for subsequent trials, he would not ask for information regarding the location of the other toys (probes 2-4). When the missing item was located by the family, it was used in the preparation and Jack immediately began manding for information. These responses suggest that the EO was a critical controlling variable for Jack's mands and provide evidence that naturally occurring events were resulting in unprompted mands for information in the natural environment.

A similar problem was encountered with David, who engaged in the appropriate response the first and third generalization probes. On the third probe, David requested chips and was told by his mother that he could have them at the conclusion of the session. David stopped responding for subsequent probes and happily consumed the chips as the researchers prepared to leave. It is possible that the EO for chips was more powerful than or disrupted (i.e., abolished) the EO for the toy and for information regarding the location of the toy.

DISCUSSION

Both participants failed to acquire the targeted response during the videomodeling phase of intervention, providing evidence that video modeling is not an effective method for teaching mands for information in the described preparation. This finding is in stark contrast to many published studies in which video modeling has been used to teach young children with autism conversational speech (Charlop and Milstein, 1989), perspective
taking (LeBlanc et al., 2003), and reciprocal play (Nikopoulous and Keenan, 2004) among others. Negative findings can be useful when they indicate skills for which certain interventions should be avoided, which appears to be the case in this instance. Another finding relevant to the video modeling literature is that the video models effectively held the attention of the participants, a measure which has not often been included in previous video modeling studies.

The research base on teaching mands for information to children with autism is still a relatively small one requiring replication. Though this study did not produce the anticipated results, it added to the literature on mands for information by producing a direct replication of the results obtained by Sundberg et al. (2002). That is, this study provided further evidence for the conclusion that contriving establishing operations is an effective methodology for teaching mands for information to children with autism when vocal models (i.e., echoic prompts) are used. Additional replication studies should be conducted and future studies should attempt to empirically determine the verbal and non-verbal repertoires that are pre-requisites for acquisition of mands for information.

One possible explanation for the failed acquisition of mands for information in the video modeling phase is the lack of a clear discriminative stimulus to evoke the relevant response after the completion of the video. That is, immediately following the video, the video was removed and the examiner looked expectantly at the child for a response. When the child did not respond, the examiner recontrived the establishing operation by providing the toy and then hiding the toy to give the child the opportunity to mand for information regarding the location of their toy. The presentation and removal of the toy may have been ambiguous as stimuli compared to an alternative verbal stimulus, “Do
what the child in the video did,” which has been used in previous studies. The utility and role of verbal discriminative stimuli to evoke responses following video models should be investigated in future research.

Some studies using video modeling with children with advanced language repertoires have incorporated rule statements into the creation of the video (e.g., Apple et al., 2005). Instead of relying only on stimulus control, the video provides an instruction and incorporates rule-governed behavior. It is unclear whether providing a rule may have increased the likelihood that David and Jack would engage in the appropriate response because their language was less advanced than that of participants in the Apple et al study. Very little information is available on the role of rule-governance in increasing acquisition of skills during video modeling, and further investigation into this area may be warranted. It seems worthwhile to investigate the possibility that stating a rule during a video may increase responding with specification of the language repertoires required to observe benefits of rule governance.

There are at least two reasons why video models may have their effects. First, a video model can specify a contingency that can subsequently control behavior. A child with rule-governed behavior may state the contingency illustrated in the video (i.e., ask for information about the toy and you can find out where to look and get the toy) and behave accordingly. Alternatively, video models may exert their effects because the stimulus properties in the video are similar enough to real-life situations that real situations evoke a response from the child via stimulus generalization. Perhaps the video model was not effective with these children either because their language repertoires were not sufficiently developed to allow derivation of the rule about the video or because
the stimulus properties in the video were not similar enough to the real life situation to evoke responding from the child. Additional research on the language repertoire prerequisites for rule-governed behavior may clarify which, if either, of these mechanisms contributed to the children’s lack of ability to develop the mand for information.

Both participants exhibited some degree of stimulus generalization of the acquired response to a new environment. Jack engaged in the relevant response (i.e., Who has my toy?) until another item became more desirable and then manded for information in subsequent trials when the other item was incorporated into the preparation. David engaged in the relevant response on two of three probes until a more preferred item became salient and could not be provided. This pattern of responses indicates that these children’s responses were controlled by the relevant EO and provides further evidence for the importance of capturing or contriving the EO when teaching or probing for the acquisition of mands.

One limitation to this study is the possibility that the computer may have temporarily disrupted the relevant EO. Though a preference assessment was conducted and the child’s most preferred toy was selected and used throughout the duration of each session, it is possible that the desire for a novel or more interesting item (the computer) disrupted the EO to a degree that abolished the motivation to mand for information. Future studies might include access to a computer as an item in initial preference assessment to determine the comparative preference for the video and the potential hidden stimuli. Alternatively, using items from a different stimulus class, such as snacks, may decrease the likelihood of the computer disrupting the EO (i.e., hunger).
A second limitation observed in this study is the lack of data on attending to the researcher during the in vivo prompting phase of intervention. This data would have provided an interesting comparison regarding whether children attend more readily to a video model or an in vivo model, though an order effect would have been present. Charlop-Christy et al. (2000) collected data on duration of attending in their comparison of video and in-vivo modeling and their methodology should be replicated in future studies to determine if video models reliably capture the attention of children with autism more effectively than live models.

Manipulation of establishing operations are effective for teaching mands but can be somewhat cumbersome and labor intensive on the part of the instructor who is required to capture or contrive the relevant EO on each learning trial. This study attempted to investigate whether a technology based intervention such as video modeling could minimize the need to repeatedly contrive EOs. This particular study was unsuccessful, however, other interventions that are less labor intensive and cumbersome are desirable and might increase the likelihood that mands would be targeted more readily in programming for young children with autism. Whether or not a technology such as this can be developed remains to be a topic for further exploration. It is possible that all technologies may be plagued with the difficulty observed in this study (i.e., possible disruption of the relevant EO), however, it is also possible that there may be a way to circumvent this disruption (i.e., using more potent reinforcers).
REFERENCES


technology: Which is better, “Self” or “Other” as a model? Behavior Modification, 25, 140-158.


Table 1.
Skinner’s (1957) Elementary Verbal Operants (based on Sundberg & Michael, 2001)

<table>
<thead>
<tr>
<th>Operant</th>
<th>Controlling Variable</th>
<th>Reinforcers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mand</td>
<td>Establishing operation</td>
<td>Specified reinforcer</td>
</tr>
<tr>
<td>Tact</td>
<td>Non-verbal stimulus</td>
<td>Non-specific social reinforcers</td>
</tr>
<tr>
<td>Echoic</td>
<td>Verbal stimulus (point-to-point correspondence)</td>
<td>Non-specific social reinforcers</td>
</tr>
<tr>
<td>Autoclitic</td>
<td>Verbal stimulus</td>
<td>Non-specific social reinforcers</td>
</tr>
<tr>
<td>Intraverbal</td>
<td>Verbal stimulus (no point-to-point correspondence)</td>
<td>Non-specific social reinforcers</td>
</tr>
</tbody>
</table>
Figure 1. Mands for Information

Cumulative number of responses emitted by each participant during baseline, video modeling, in vivo prompting, and generalization. The square data points in the in vivo prompting portion of the graph indicate those responses that were unprompted.
## Appendix A

### Mand for Information Data Sheet

<table>
<thead>
<tr>
<th>Trial</th>
<th>Child says, “Who has my toy?” prior to video</th>
<th>Child says, “Who has my toy?” following video</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Yes / No</td>
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</tr>
<tr>
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<tr>
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</tr>
<tr>
<td>6</td>
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<td>Yes / N/A</td>
</tr>
<tr>
<td>7</td>
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<td>Yes / N/A</td>
</tr>
<tr>
<td>8</td>
<td>Yes / No</td>
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</tr>
<tr>
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<td>Yes / N/A</td>
</tr>
<tr>
<td>10</td>
<td>Yes / No</td>
<td>Yes / N/A</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Trial</th>
<th>Child Given Toy</th>
<th>Blanket Held in Front of Child</th>
<th>Toy Hidden</th>
<th>Blanket removed</th>
<th>Researcher Waited 3s for Response</th>
<th>Researcher Provided Answer to Question</th>
<th>Researcher showed child video</th>
<th>Researcher waited 3s for a response</th>
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</thead>
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<td>1</td>
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## Appendix B

### Pretraining Data Sheet

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<th>Prompt/Trial</th>
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<tr>
<td>Find Blue.</td>
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</tr>
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<td>Find Green.</td>
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</tr>
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<td>Find Blue.</td>
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</tr>
<tr>
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### Appendix C

**Procedural Integrity Data Sheet**

<table>
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<tr>
<th>Trial</th>
<th>Cards were placed in front of child</th>
<th>Child was given appropriate prompt</th>
<th>Researcher waited 3s for response</th>
<th>Researcher provided praise for appropriate response</th>
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</table>
Appendix D

Letter of Approval from Human Subjects Institutional Review Board
Date: February 8, 2006

To: Linda LeBlanc, Principal Investigator
    Courtney Dillon, Student Investigator for thesis

From: Mary Lagerwey, Ph.D., Chair

Re: HSIRB Project Number: 06-01-09

This letter will serve as confirmation that your research project entitled “Teaching Children with Autism to Mand for Information Using Video Modeling” has been approved under the full category of review by the Human Subjects Institutional Review Board. The conditions and duration of this approval are specified in the Policies of Western Michigan University. You may now begin to implement the research as described in the application.

Please note that you may only conduct this research exactly in the form it was approved. You must seek specific board approval for any changes in this project. You must also seek reapproval if the project extends beyond the termination date noted below. In addition if there are any unanticipated adverse reactions or unanticipated events associated with the conduct of this research, you should immediately suspend the project and contact the Chair of the HSIRB for consultation.

The Board wishes you success in the pursuit of your research goals.

Approval Termination: January 27, 2007