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EFFECTS OF MODELING, VIDEO MODELING, PROMPTING, AND REINFORCEMENT STRATEGIES ON INCREASING HELPING BEHAVIOR IN CHILDREN WITH AUTISM

by

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Abstract

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SHARON A. REEVE

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Individuals with autism are typically severely impaired in their social development, particularly in their ability to engage in prosocial behavior. Prosocial behavior includes responses involved in helping, cooperating, sharing, care-giving, turn-taking, affection, empathy, and sympathy. The purpose of the present study was to assess the extent to which children with autism could be taught to engage in prosocial behavior, and the extent to which such behavior generalized. A multiple-baseline across-participants design was used to accomplish this. The participants were four children with autism between the ages of 5-6 years. Verbal and nonverbal helping responses were taught in the presence of multiple exemplars of verbal and nonverbal discriminative stimuli drawn from four experimenter-defined categories of helping behavior (e.g., locating objects, carrying objects, putting away items, setting up an activity) through the use of video modeling, prompting, and reinforcement strategies. Data were collected during training trials, probe trials, and pre- and post-intervention session trials to determine the extent to which these responses were learned and emitted under both trained and novel conditions. With the successive introduction of the teaching procedure, all four children learned to emit appropriate combined verbal and motor helping responses in the presence of nonverbal and verbal discriminative stimuli from all four of the training categories. There was, however, no difference among children in the number of trials needed to learn the combined verbal and motor helping responses and the separate motor and verbal helping components. Generalization of the combined verbal and motor helping responses was observed in the presence of untrained discriminative stimuli during the probe trials. Finally, the pre- and post-intervention measures showed that the frequency of verbal and motor helping responses also increased in the presence of novel stimuli, in a novel setting, and with a novel instructor. These outcomes benefit a child with autism because engagement in prosocial behavior may increase the likelihood of that child becoming more socially rewarding to others, providing the child with additional access to social reinforcement, and thereby increasing the likelihood of his/her engaging in additional social behavior.

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EFFECTS OF MODELING, VIDEO MODELING, PROMPTING, AND REINFORCEMENT STRATEGIES ON INCREASING HELPING BEHAVIOR IN CHILDREN WITH AUTISM

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Most children with autism exhibit severe and persistent deficits in social behavior as evidenced by their extreme social isolation, inappropriate affect, and absent or delayed social smile (Rutter, 1978; Wing, 1988). Volkmar, Carter, Sparrow, and Cicchetti (1993) have documented abnormalities in the areas of social relationships, recognition and comprehension of emotion in others, lack of sensitivity to the needs of others, eye-to-eye gaze, impoverished play, lack of cooperative play, and lack of initiation of contact to peers and to adults. In addition, Baron-Cohen, Leslie, and Frith (1985) have reported that the social skills of children with autism are so severely impaired that they tend to "treat people and objects alike" (pg. 38).

Included among these broad deficits in children with autism is a more specific type of social skill, referred to as prosocial behavior. In a broad sense, prosocial behavior consists of responses associated with helping, cooperating, sharing, care giving, taking turns, friendliness, affection, empathy, and/or sympathy (Eisenberg & Fabes, 1998; Rheingold & Hay, 1980). Children with autism typically have a deficit in prosocial behavior (Bemporad, Ratey, & O'Driscoll, 1987; Gillberg, 1992; Gillberg, 1993; Harris, Handleman, & Alessandri, 1990; Honig & McCarron, 1988; Kohler, Strain, Hoyson, Davis, Donina, & Rapp, 1995; Morrison & Bellack, 1981; Rogers & Pennington, 1991; Sigman, 1998; Strain, Kerr, & Ragland, 1979; Yirmiya, Sigman, Kasari, & Mundy, 1992). In addition, they have difficulty attending to or discriminating situations in which prosocial behavior would be appropriate. Such deficits may contribute to the development of poor social relationships among this population (Harris et al., 1990; Lovaas, 1981; Lovaas, Koegel, & Schreibman, 1979; Strain et al., 1979). Because of this, it is important to develop techniques that will ameliorate these deficits.

Toward A Definition of Prosocial Behavior

In general, researchers have been inconsistent in specifying the behavioral repertoire that constitutes prosocial behavior. Psychologists and researchers from both traditional developmental and cognitive orientations, as well as behavior analytic orientations, have proposed various definitions. It is important to examine all of these definitions to determine the antecedent and consequential stimuli that are important in determining a teaching technique for the acquisition, maintenance, and generalization of prosocial behavior (Novak, 1996). In addition, once defined, behavior that can be called prosocial can be treated as a specific type of operant behavior that is established and maintained by contingencies of reinforcement in the environment, such as in social communities (Schlinger, 1995).

When defining prosocial behavior, many researchers have relied on highly inferential theoretical constructs. Eisenberg, (1992), for example, defined prosocial behavior as an intentional act that is usually motivated by the desire to benefit another. Traditional developmental psychologists have also discussed the effects that external rewards and inner-motivational states have on the frequency with which individuals engage in prosocial behavior (e.g., Eisenberg, Fabes, Carlo, Troyer, Speer, Karbon & Switzer, 1992; Grusec & Redler, 1980; Szynal-Brown & Morgan, 1983). The debate concerning whether prosocial behavior is maintained by intrinsic or extrinsic reinforcement, however, has not been resolved.

When the term *prosocial behavior* is used by traditional developmental psychologists, such behavior is generally labeled as *helping, cooperating, sharing, care-giving, turn-taking, friendliness, affection, empathy,* and/or *sympathy* (Eisenberg & Fabes, 1998; Rheingold & Hay, 1980). These distinctions, however, can be ambiguous and Rheingold and Hay (1980) acknowledge that their definitions of prosocial behavior "represent a combination of those given by the dictionary, those proposed by others, and those based on our own intuitions" (p. 94). When defining prosocial behavior, Rheingold and Hay take the approach of defining a category of prosocial behavior rather than attempting a broad definition. For example, Rheingold (1982) defines helping as an act that contributes to the completion of a task, or the taking part in an activity, in the absence of request for assistance. Thus, the definitions of Rheingold and Hay are based solely on the observable behavior of the child and not on hypothetical internal intentions, emotions, or motivations.

In contrast to Rheingold and Hay (1980), many developmental researchers often do not provide the operational definitions of each category of prosocial behavior (e.g., helping, cooperating and sharing). From a behavior analytic perspective, it is important to specify the topography, the function, and the discriminative stimuli that set the occasion for each category of prosocial behavior. This would provide the opportunity to reinforce or prompt prosocial behavior emitted by a child in the presence of the appropriate discriminative stimuli. Doing so may facilitate the training used to increase the likelihood that such behavior would be appropriately emitted.

Prosocial Behavior in Children of Typical Development and How it is Learned

Before one can address strategies to ameliorate deficiencies in prosocial behavior in children with autism, it is helpful to examine studies that have addressed how and when prosocial behavior is observed in the repertoires of children of typical development. Many of these studies have been conducted by developmental psychologists from non-behavior analytic perspectives. Prosocial behavior has been observed in children of typical development as early as 1½ -3 years of age (Eisenberg, 1992). Such children are reported to appropriately attend to other children or adults who are exhibiting distress or pain. They will, for example, offer to help another person who is injured by offering a toy or trying to comfort (Eisenberg & Fabes, 1998). In addition, more specific sharing and helping behavior has been observed in young children (Zahn-Waxler & Radke-Yarrow, 1982). Rheingold, Hay, and West (1976), for example, found that 18-month-old infants shared a variety of objects with their parents, often without prompting. Young children have also been observed assisting their mothers in caring for their infant siblings (Dunn, Kendrick, & McNamee, 1981) and assisting with household chores without being requested (Rheingold, 1982). As children become older, these prosocial responses may become more complex, but they can still be characterized as serving the same function of benefiting another. For example, in the presence of someone in need, school-age children are likely to share objects or snacks and to provide physical and verbal assistance (Eisenberg, 1992).

Children of typical development may acquire such prosocial behavior by observing an adult's or peer's model of appropriate prosocial behavior. For example, a study by

Elliott and Vasta (1970) showed that children who viewed a "generous" or "helpful" model emitted a greater number of "generous" or "helpful" responses than those children exposed to a control condition in which the model did not exhibit such behavior. In another study, Rheingold (1982) found that mothers' modeling of helping behavior, such as participation in household chores with other family members, increased the likelihood that 1- and 2-year-olds would help their mothers.

In contrast to children of typical development, Honig and McCarron (1988) found that observing typical children engaging in prosocial behavior did not increase the likelihood that children with autism would engage in prosocial behavior. Specifically, Honig and McCarron investigated initiations of prosocial actions by 15 mainstreamed preschoolers who were of typical development or were multiply handicapped and autistic. Children were observed for 80 minutes per child over a 6-week period. Six types of prosocial behavior were operationally defined. These included: sharing, helping, nurturing, cooperating, and sympathizing. The results of the observations indicated that children of typical development were significantly more likely than children with multiple handicaps or autism to initiate prosocial behavior. The children of typical development, however, initiated prosocial behavior directed at other children of typical development as much as they did to children with handicaps. It was concluded that contact with children of typical development alone does not build the prosocial skills that children of atypical development need to emit if they are to be successfully integrated into enriching social environments with their peers.

Importance of Prosocial Behavior in Peer Relations of Children of Typical Development

Because prosocial behavior is appropriate in many social contexts, it is not surprising that children's prosocial behavior is often correlated with both formal and informal indices of socially appropriate behavior. For example, children who engage in prosocial behavior tend to be viewed by adults as more socially competent (Eisenberg, Fabes, Karbon, Murphy, Wosinski, Polazzi, Carlo, & Juhnke, 1996; Peterson, Ridley-Johnson, & Carter, 1984) and are also more likely to frequently engage in positive social interactions with peers (Farver & Branstetter, 1994; Howes & Farver, 1987), and in cooperation (Dunn & Munn, 1986). It has also been found that the more frequently preschoolers engage in prosocial behavior, the more likely they are to have many close friends and a best friend (Coie, Dodge, & Kupersmidt, 1990; Farver & Branstetter, 1994). Further, social rejection of a child by peers in early elementary school is predicted by the occurrence of low levels of prosocial behavior (Vitaro, Gagnon, & Tremblay, 1990). Finally, a child's skill at comforting another predicts whether he or she is rejected, neglected, or accepted by peers (Burleson, 1985). Thus, children who engage in prosocial behavior are more likely to have positive relationships and interactions with peers than those children who do not.

The Importance of Prosocial Behavior in Children with Autism

In contrast to children of typical development, who typically acquire prosocial behavior, most children with autism do not. This deficit may contribute, in part, to the strained social relationships of children with autism. Specifically, this lack of prosocial behavior towards others can be a source of frustration and distress to those individuals who interact with a person with autism (Harris et al., 1990). Lovaas, Koegel, Simmons, and Long (1973), for example, reported that parents express great despair over their children's failure to engage in prosocial behavior with them. As a result of the children's failure to initiate interactions with others, parents, peers, and teachers are discouraged from attempting to interact with the children. This, in turn, further lessens the opportunities for learning for these children. (Lovaas et al., 1973). Sigman (1998) also describes the importance of prosocial behavior in peer relations. She states that children who do not cooperate with others, assist others when they need help, or share with others, are unlikely to have friends or even sustained interactions with peers. Thus, children who engage in limited prosocial behavior may be perceived as less socially competent and have additional difficulties in peer relations.

These perceptions, however, may not be specific to autism alone; they may also extend to children with other developmental disabilities. In a study conducted by Center and Wascom (1986), teachers of socially normal and learning disabled populations were asked questions pertaining to perceptions of their students. The results indicated that teachers perceived the social behavior of the learning disabled students as inferior to that of the socially normal students. These perceptions, regardless of whether they are valid or based on biased expectations, could affect student-teacher interactions. As a result, a major programming emphasis relative to social behavior should be the development of prosocial skills in learning disabled students (Center & Wascom, 1986).

Given the impact of prosocial behavior by children with autism on their perception by others, and their interaction with others, it would be beneficial if these children could acquire skills that would make their presence more reinforcing to peers, parents, teachers, and supervisors. To that end, teaching children with autism to engage in prosocial behavior should increase their opportunity for reinforcement, thereby increasing the likelihood that they will participate in additional social situations (Lovaas et al., 1973).

Studies Identifying Deficits in Prosocial Behavior Among Individuals with Autism

Before addressing methods to increase prosocial behavior in children with autism, it is important to identify the specific behavioral deficits that may lead to deficits in prosocial behavior. One such deficit may be a lack of attention to the non-verbal and verbal behavior of others in social situations. Parents who have provided retrospective accounts have indicated that these deficiencies appear very early in life. Parents report that during the first months following birth, infants with autism do not make normal eye contact (Mundy & Seligman, 1989b) and do not seek physical contact with parents (Kanner, 1943). During the first year of their life, even before they are diagnosed as having autism, young children with autism tend to have less eye contact and imitate less than children of typical development (Osterling & Dawson, 1994). Children with autism may also fail to engage in simple reciprocal games such as pat-a-cake or peek-a-boo. There are also reports that children with autism are less likely to recognize emotional responses of other people (Volkmar et al., 1993).

Yirmiya et al. (1992) conducted a study that investigated a child's ability to discriminate among various emotional states, to take the perspective of another regarding emotional states, and to respond to the emotional responses of others. They compared the skills of 18 high-functioning (defined as having IQ scores above 75) children with autism between the ages of 9-16 years to 14 children of typical development between the ages of 9-14 years. The children were all given the Feshbach and Powell Audiovisual Test for Empathy. This test consists of videotaped segments displaying stories about children experiencing different events and emotions. After watching each segment, the children were requested to identify the emotion of the children in the videotapes, to report their own emotions, and to report how they would respond to the children in the videotapes. The task was designed to provide a measure of the child's empathy and emotional responsiveness.

The results indicated that, as a group, the children with autism performed less well than children of typical development on labeling the emotions of others, taking the role and perspective of others, and responding empathetically to others. The individual data indicated that although some children with autism did not differ from the children of typical development on any of these tasks, most of them continued to show serious problems in peer interactions. Yirmiya et al. (1992) concluded that it was not surprising that children with autism demonstrated both cognitive and social-affective impairments. The authors were surprised, however, by the near normal social understanding and responsiveness that some of the children with autism displayed because these individuals continued to display severe deficits in prosocial behavior.

Another study by Sigman (1998) corroborates the findings that some children with autism are able to discriminate the emotions of another person, yet continue to display deficits in prosocial behavior. According to Dissanyake, Sigman, and Kassari (1996), children with autism are rated as less empathetic in the presence of a distressed person. Dissanayake et al. (1996) and Sigman (1998) also report that children with autism attended to an experimenter who showed visible distress. These children also appeared more empathetic when an experimenter showed distress than when her affect was more neutral. This finding was stable 8-9 years later within the same group of children. This indicates that the lack of empathy exhibited by children with autism, as compared to children of typical development, is not necessarily due to an inability to discriminate the observable emotional indicators of others.

Sigman (1998) theorized that the deficit in prosocial behavior in children with autism may be due to a lack of interest in the responses of others. In addition, this lack of interest may be the result of deficits in (a) joint attention or representational play, (b) an innate disruption in the mechanism underlying attentional and affective sharing, or (c) in understanding metarepresentations (Baron-Cohen et al., 1985; Hobson, Ouston, & Lee, 1988). From a behavior analytic standpoint, such deficits could be explained as a lack of appropriate stimulus control by the situational stimuli. That is, the situational stimuli are not functioning as discriminative stimuli that occasion responding in a prosocial fashion. This may be due to a failure to attend to the situational stimuli or to the extinction of prosocial behavior in such a situation. Rather than invoking internal mechanisms to explain this inattention to situations that should set the occasion to engage in prosocial behavior, however, one could alternatively increase the salience of the relevant features of the discriminative stimuli. This should increase the likelihood that a child with autism will attend to them. Once the child attends to these relevant discriminative stimuli, the child could then be taught (e.g., by using systematic prompting strategies) to engage in prosocial behavior in the presence of a variety of relevant discriminative stimuli. The appropriate engagement in prosocial behavior can then be reinforced, thus increasing the likelihood that these prosocial responses will be emitted again in the future.

Another predictive factor for a deficit in prosocial behavior is a child's lack of social interactions. Sigman (1998) states that 1- to 5-year-old children with autism who initiated and responded to social interaction were more helpful to the experimenter at follow-up (8-12 years later) than were children with autism who showed fewer of these social skills. Thus, prosocial behavior is predicted by early characteristics, in that children who engage in more social interactions at a young age are more likely to help others and are more socially engaged with peers during the mid-school years.

Theories That Account for Deficits in Prosocial Behavior

Researchers have proposed various accounts for deficits in prosocial behavior observed in individuals with autism. Those from a social-cognition perspective have postulated that various cognitive deficits and underlying mechanisms can result in decreases in prosocial behavior in children with autism as compared to children of typical development. For example, Baron-Cohen, Leslie, and Frith (1986) theorize that the underlying social and communication problems observed in children with autism may result from their "inability to interpret the inner mental states of other people" (p. 114). The ability to infer another's hypothetical inner mental state is held to be present in most children of typical development as early as age four (Wimmer & Perner, 1983). This ability, which is referred to as a "theory-of-mind," is believed to be a crucial component of social skill acquisition (Baron-Cohen et al., 1985, p. 38).

Leslie (as cited in Baron-Cohen et al., 1985) proposed that social deficits in children with autism are caused by a cognitive inability to form "second-order representations."

According to Baron-Cohen et al. (1986), second-order representations, or metarepresentations, are cognitive constructs necessary for the development of a theory of mind. Hobson and colleagues (Hobson, 1986a, 1986b, 1993; Hobson et al., 1988) agree with the suggestion that children with autism might have less than optimal theory-of-mind skills, but propose that a basically affective problem underlies this deficit. Specifically, Hobson (1986a) postulated that skills in discriminating facial expressions may serve as a prerequisite for the "individual's recognition of other people as beings with their own feelings and mental states" (p. 322). Hobson et al. (1988) have documented that children with autism have difficulty discriminating facial expressions and, because of this difficulty, may fail to develop adequate theory-of-mind skills. As a result, children with autism have difficulty engaging in prosocial behavior.

According to Rogers and Pennington (1991), there is an early deficit in imitation in children with autism that disrupts other early developing interpersonal processes. Their suggested model integrates an imitation deficit with two previously described theories: the affective deficit hypothesis proposed by Hobson (1986a, 1986b) and the metarepresentational deficit hypothesis proposed by Baron-Cohen et al., (1985). In addition, these authors suggest a way of viewing current neuropsychological findings concerning executive function deficits in autism that is consistent with the social deficits observed in autism. The authors propose three early social capacities that seem to be primarily and specifically deficient in autism: (a) imitation of another's body movements, (b) emotion sharing (limited understanding in children with autism that other people are subjects of experience with whom things can be shared) (Hobson et al., 1988), and (c) theory of mind. Rogers and Pennington suggest that these three deficits involve forming and coordinating social representations of self and others at increasingly complex levels. In addition, they suggest that certain connections to and within the prefrontal cortex do not function normally and thus prevent the specific physical, affective, or mental coordinations seen in imitation, affect sharing, and theory of other minds. They suggest, however, that other connections in the prefrontal cortex, as well as the functions of the posterior cortex and reciprocal connections with the limbic memory systems, are preserved. This allows the child with autism to develop complex primary representations, as opposed to the metarepresentations needed to have a theory of mind, to make interconnections among them, and to store them in long-term memory. These preserved abilities account for the presence of social and nonsocial capacities and, in a few autistic individuals, remarkably advanced skills.

Bemporad et al. (1987) argue, from an ethological viewpoint, that deficits in prosocial behavior in individuals with autism are a result of an interaction between deficient innate structures, which play a role in the processing of emotional input, and a lack of social experience. Bemporad et al. (1987) described the symptoms of autism as resulting from an innate inability to communicate inner emotional states through the use of facial expressions and empathy. They speculate that a type of aphasia for this form of information exchange may account for many of the symptoms observed in individuals with autism. They further speculate that a person with autism lacks the ability to discern meaning from normal social exchanges. According to Bemporad et al. (1987), social situations are perceived by individuals with autism as chaotic and confusing. That is, a child with autism has an inability to discriminate emotional signals from background noise. As a result, the child withdraws, develops a need for sameness, and is fascinated with repetitive and monotonous stimulation. Finally, when children with autism are not exposed to socializing experiences due to withdrawal and isolation, this results in a lack of understanding of basic rules of social conduct, further hampering the likelihood that these children will engage in further social interactions.

Gillberg (1993) theorized that autism is one of a larger group of empathy disorders but is not a basic disturbance of emotions. This problem in empathy occurs as a result of various cognitive deficits, such as those related to failures in theory of mind. Gillberg states that "if you do not understand that other people have, as it were, inner worlds, how can you be expected to show compassion or empathy?" (Gillberg, 1992, p. 835). Gillberg (1992) also suggests that the concept of autism is a non-specific behavioral syndrome blending into other disorders of empathy, such as Asperger syndrome, obsessive-compulsive disorders, and even anorexia nervosa, which as a group show continuity with poorly developed empathy skills in the general normal population. He concludes that by comparing the behavioral profile in cases of autism with different etiologies, one may arrive at a concept of the syndrome. In addition, there may be no such thing as a distinct autistic syndrome, but rather a wide variety of brain problems that reflect in varying degrees and types of autistic behavior.

An alternative view proposed by Morrison and Bellack (1981) accounts for deficits in prosocial behavior as a failure to discriminate and respond to social cues in the environment. Although their account of prosocial deficits was not specifically constructed for individuals with autism, it may be useful in understanding and treating the prosocial deficits seen in these individuals. According to Morrison and Bellack, the ability to discriminate and respond to social cues in the environment is learned through experiences in which an individual learns that certain responses in the presence of specific stimuli will produce reinforcement. In particular, during social interactions children learn to emit socially appropriate behavior in the presence of non-verbal and verbal discriminative stimuli. They also learn that rewarding consequences may possibly follow, contingent upon appropriate prosocial behavior.

Studies of Prosocial Behavior

Increasing Prosocial Behavior Under Specific Training Conditions with No Generalization Measure

Various researchers have investigated methods to increase prosocial behavior under specific training conditions. In these studies, the researchers successfully trained this behavior under specific training conditions. Lacking in these studies, however, were test measures for generalization of prosocial behavior across new situations, settings, and people. For example, Kohler et al. (1995), investigated the effects of a group-oriented contingency on the prosocial and supportive interactions of three preschoolers with autism and six preschoolers of typical development. The design consisted of an ABAB reversal design. During the baseline condition the teacher introduced the play activity to the children but did not have any further interaction with the children. Pre-treatment training was then introduced. This consisted of a social skill training package targeting the following skills: (a) play organizer suggestions, (b) share offers and requests, and (c) assistance offers and requests. Pre-training was terminated when the children exchanged at least four skills within a 6-minute period and when half of the children independently performed 50% of these skills. Treatment consisted of a group contingency. The group contingency consisted of earning tokens for engaging in share, play organizer, and assistance skills. Children received a reward only if they all earned all of their tokens. To increase the effectiveness of the group contingency, the children were taught to verbally remind each other to engage in the three skills. The results indicated that (a) a comprehensive intervention increased the prosocial behavior between children with autism and their peers, (b) preschoolers of typical development exchanged supportive prompts under group contingency conditions only after they received training to do so, and (c) social interactions that contained supportive prompts were longer and more reciprocal in nature than those that did not. In summary, a package consisting of social skills training, teacher prompting, and group-oriented reinforcement increased the prosocial behavior of children with autism and children of typical development in a specific situation. Because there was no measure for generalization, however, it cannot be assessed whether such training would have resulted in the generalization of the prosocial behavior from the training situation to new settings and individuals.

In another study, Kamps, Leonard, Vernon, Dugan, Delquadri, Gershon, Wade, and Folk (1992) investigated the use of social skills training for three high-functioning (defined as having IQ scores of 70 or above) students with autism and their non-handicapped peers to increase prosocial behavior in an integrated first-grade classroom. A multiple-baseline across-subjects design was used to evaluate the effectiveness of the social skills training. Baseline conditions were conducted with a group of students consisting of a target student and three non-handicapped peers. The students were provided with two activities and were instructed to stay in the group, be polite to friends, and play with the designated activities. No prompts were given during baseline. It is unclear from the study what, if any, behavior was reinforced. Social skills training was also conducted with the same group of students. It consisted of training students and peers in initiating, responding, and sustaining interactions, greeting others, giving and accepting compliments, taking turns and sharing, asking for help and helping others, and including others in activities. The manner in which this training was provided is also unclear from the study. After the social skill group training, a feedback for social skills condition was introduced. This condition consisted of placing a star next to the student's name on a monitoring form at 1-min observations contingent on his engagement in prosocial behavior. It is unclear how this system maintained behavior (i.e., if the child received a back-up reinforcer for a particular quantity of stars received per session). The dependent measure consisted of frequency of, total time engaged in, and duration of social interactions among target students and their non-handicapped peers. Social interaction was defined as reciprocal social behavior that occurred as a result of an initiation-response sequence. The results indicated that social skills training for students with autism conducted concurrently with non-handicapped peers was an effective procedure for increasing (a) the frequency of social interactions, (b) the amount of time engaged in prosocial behavior, and (c) the duration of each social interaction in children with autism. As a result of the increases in the frequency of initiations and responses by the children with autism, responding of the peers to the children with autism increased as well. These findings support the use of social skills instruction in small-group formats that include non-handicapped peers and students with autism to increase prosocial behavior.

Increasing Prosocial Behavior under Specific Training Conditions with Generalization Measures

In contrast to the studies described in the prior section, various researchers have included a generalization measure for prosocial behavior following its acquisition under specific training conditions. One unfortunate problem that behavior analysts have encountered is that prosocial skills learned under specific conditions rarely generalize to new situations and persons (Horner, Dunlap, & Koegel, 1988). In the following studies, prosocial behavior either did not generalize, or generalized only minimally, beyond the initial training situations. One study that attempted to demonstrate generalization was conducted by Strain et al. (1979). In this study, an ABAC withdrawal-of-treatment design was used to evaluate the effectiveness of two strategies on increasing prosocial behavior in four 9- to 10-year-old children with autism: teaching peers to make social initiations to children with autism, or teaching peers to prompt and reinforce positive social interactions emitted by children with autism. Because there was no return to baseline after the second treatment condition, however, this was an incomplete design (Kazdin, 1982). During baseline conditions the participants were instructed to play together. A peer trainer was present but did not initiate to any of the participants. In the peer-mediated social initiations condition, however, the peer trainer was instructed to initiate play with the children with autism. During the prompting/reinforcement condition, the peer trainer was instructed to prompt and reinforce the positive social interactions emitted by the children with autism. Generalization sessions, which were identical to baseline except that the peer trainer was not present, were also conducted on a daily basis. The results indicated that both intervention techniques increased prosocial behavior for each child with autism. No differences were found in the magnitude of the increases in prosocial behavior between the two intervention techniques. Neither technique, however, produced an increase in prosocial behavior during the generalization sessions. Strain et al. (1979) concluded that prosocial behavior can be taught to children with autism by (a) teaching peers to make social initiations to children with autism, or (b) teaching peers to prompt and reinforce positive social interaction emitted by the children with autism. Because treatment was only conducted in one setting and at one specific time, the authors recommend implementing intervention across time and setting to obtain a generalized repertoire of prosocial behavior.

Another study that attempted to measure generalization of prosocial behavior from training to testing conditions was conducted by Charlop and Walsh (1986). They assessed the efficacy of both time delay, and peer modeling procedures, in increasing prosocial behavior in 6- to 8-year-old children with autism. The children were taught to spontaneously say "I love (like) you" in response to a hug from both a familiar person and their mother. A multiple-baseline across-subjects-and-settings design was used. Baseline conditions consisted of a mother or familiar person hugging the child. No further prompting or reinforcement systems were used. Time-delay training initially consisted of a person hugging the child, waiting an initial 2 s, and then verbally modeling the response "I love you." The delay was increased by 2-s increments contingent on the child emitting two consecutive correct responses at the current delay. Once two of the four children with autism learned the prosocial response, they were used as peer models for the remaining two children with autism. The peer modeling training consisted of the peer modeling the appropriate behavior for the learner (i.e., saying "I like you" to the experimenter in response to a hug) and receiving social reinforcement for engagement in this behavior. Generalization probes were conducted across persons and settings after the completion of training. This condition was identical to the baseline conditions, except that the setting in which the probes were conducted, or the person hugging the child, was different. The results indicated that the time delay procedure was effective in teaching children with autism to respond with "I love (like) you" in response to a hug. When this procedure was used, the target behavior also generalized across settings for all children, and across persons and settings for one child. In contrast, the peer modeling was not an effective procedure for the teaching of this response. Charlop and Walsh (1986) concluded that the efficacy of the peer modeling procedure was difficult to evaluate because the peer models exhibited a lack of stimulus control over the on-task behavior of the children with autism. This lack of on-task behavior may have interfered with the learning of the target response. The authors also reported that the parents were encouraged by their children's prosocial behavior and mentioned spending more time interacting with them. This may, in turn, increase the likelihood that these children will emit more prosocial behavior in the future.

A study by Harris et al. (1990) was successful in demonstrating some generalization of prosocial behavior by children with autism beyond the initial training condition. In this study, three adolescent boys with autism were taught to engage in the prosocial behavior of offering assistance to a person who expressed an inability to complete a task. A multiple-baseline across-subjects-and-tasks design was used. Baseline conditions consisted of the experimenter stating his inability to complete a task and then waiting for 5 s for the adolescent with autism to make a verbal offer of assistance and to provide assistance. Pre-training consisted of teaching each child to verbally imitate the phrase "Can I help you?" When a child met criterion (80% correct for two days) on this task, his motor skills necessary to offer assistance in the study were assessed. To be included in the study, the participants were required to comply with at least six out of fifteen instructions (e.g., "Put the lid on the jar"). Training consisted of the experimenter stating his inability to complete a task (e.g., "I can't get this top off"). If the adolescent with autism did not respond with a verbal offer of assistance, the experimenter verbally prompted the adolescent to ask "Can I help you?" In response, the experimenter replied "Thanks a lot. Please ____ (e.g., "open this jar"). After the completion of the task, the experimenter thanked the adolescent with autism. The results indicated that all three adolescents showed an increase in their offers of assistance as training progressed. In addition, the acquisition of each additional task occurred progressively faster than the previously learned tasks. Generalization measures were conducted across setting, people, and in the presence of novel tasks. These generalization measures consisted of conducting a pre-test prior to intervention and a post-test each time a child met criterion on a specific helping task. The generalization data across people indicated that for all three adolescents offering assistance generalized from the experimenter to a new adult in the training setting. Generalization data across setting and people (i.e., to their mothers at home) showed that although there was some transfer of skills to home for the three participants, these data were more variable. In addition, generalization data across novel tasks revealed some transfer of skills to these tasks, but again the data were variable. Harris et al. (1990) concluded that it is important to teach the young person with autism to attend to and respond to relevant environmental cues that signal prosocial behavior.

They argue that this may be as important as the training of the skill itself. The results of the Harris et al. (1990) study support the notion that increasing the discriminability of relevant social cues may enhance the likelihood that people with autism will emit prosocial behavior under novel conditions.

Even when a child with autism can emit a prosocial response, if the child is unable to discriminate the stimuli that typically should occasion a prosocial response, however, he or she will be unable to respond appropriately (Morrison & Bellack, 1981). This, in turn, would result in a failure of such prosocial responses generalizing from the training situation to new situations. Although Bemporad et al. (1987) conceptualized this deficit as a type of aphasia, the lack of, or variable, generalization data observed in the Strain et al. (1979), Charlop and Walsh (1986), and Harris et al. (1990) studies might also be explained using a learning theory account. Specifically, children with autism may be failing to attend to the relevant stimuli in their environment. This tendency, labeled overselectivity (Schreibman, 1988; Schreibman & Lovaas, 1973), is consistent with the many learning and generalization problems noted in individuals with autism (Lovaas et al., 1979; Schreibman & Lovaas, 1973; Schreibman, 1975; Schreibman, 1988). Because a situation that should set the occasion for a prosocial response can be viewed as a complex stimulus, it is possible that children with autism focus on an irrelevant feature of the stimulus, such as the color of clothing that a person is wearing, rather than their affect, vocal inflection, or verbalizations. Indeed, it has been demonstrated that individuals with autism often attend to an irrelevant component of a complex stimulus (Lovaas et al., 1979; Lovaas, Schreibman, Koegel, & Rehm, 1971). The over selection of an irrelevant feature of a complex stimulus that typically should occasion a prosocial response would make it unlikely that an individual will respond with a prosocial response under relevant complex social stimulus conditions.

Increasing the salience of the relevant features of the complex social stimulus should increase the likelihood that a child will attend to the relevant stimuli, thereby further increasing the likelihood of the stimuli functioning as discriminative stimuli for prosocial behavior. Once a child appropriately attends to the relevant stimuli in a social situation, he/she can learn to discriminate the environmental cues that signal and reinforce appropriate prosocial behavior (Morrison & Bellack, 1981). It is important, therefore, not only to provide new prosocial responses to children with autism, but to teach these children to discriminate the environmental cues signaling that reinforcement is available for emitting such responses.

Variables Associated with Prosocial Behavior that Require Investigation

Although Harris et al. (1991) demonstrated that teaching a prosocial response to children with autism is possible, few additional researchers have attempted to teach these responses. This may be due to the difficulty children with autism may have in discriminating situations that should set the occasion for prosocial responding (Morrison & Belleck, 1981). Further, according to Sigman (1998) and Yirmaya et al. (1992), even when children with autism are able to discriminate affective situations, they are still unlikely to emit appropriate prosocial behavior. Those researchers who have successfully taught a prosocial response have had difficulty teaching a generalized repertoire of prosocial behavior (Charlop & Walsh, 1988; Harris et al., 1991; Strain et al., 1979). For example, much of the research to date has involved teaching prosocial skills to children using only a limited number of exemplars, or teaching in only one context, or with one treatment provider or peer. This typically does not promote generalization of skills to the situation that the child will experience, such as the community, school, and other group contexts (Baer, 1981a). Because the efficacy and functionality of a behavior change is maximized when that behavior is emitted across settings and in various ways (Cooper, Heron, & Heward, 1987), it is important to investigate and develop strategies aimed at teaching children with autism to engage in a generalized repertoire of prosocial behavior.

On way to accomplish this may be to identify the relevant stimuli in situations that typically occasion such prosocial behavior. This includes verbal stimuli and non-verbal stimuli, such as affective stimuli and stimulus materials. Once these stimuli are identified, children with autism can then be taught to attend to these relevant stimuli. Because of the potential problem of overselectivity, it may also be helpful to increase the salience of the relevant dimensions of these social situational stimuli (Lovaas et al., 1979; Lovaas et al., 1971).

To further ameliorate the difficulty in teaching a generalized repertoire of prosocial behavior, several additional research strategies can be investigated. According to Stokes and Baer (1977), one strategy to increase the generalization of target behavior from training to novel situations involves the teaching of multiple exemplars. After different exemplars of prosocial scenarios are identified, a child may be trained to emit appropriate prosocial behavior in the presence of each of the different prosocial scenarios. In this way, the different antecedent contextual features that are present would become correlated with reinforcement for appropriate responding (Balsam, 1988). This should result in the control of responding by the specific combinations of features identifying positive exemplars of prosocial scenarios. When responding has come under the control of the contextual features defining a class of prosocial scenarios, the presentation of new scenarios that share these features should also occasion responding to the same degree as do the training scenarios (Balsam, 1988).

Teaching multiple exemplars of prosocial behavior, however, may be difficult and time consuming, especially if one takes the approach of pre-training the correct motor response for each prosocial situation prior to teaching. One way to ameliorate this difficulty may be to teach students a generalized imitative motor repertoire (Poulson & Kymissis, 1988) such as teaching a child with autism to imitate an adult's actions, regardless of its topography. For example, if an adult is wiping a table, the child with autism can be taught to make a verbal offer of assistance and participate in the task by imitation of the adult's actions alone. This would eliminate the need for pre-training the motor responses needed to engage in the specific prosocial situations. Of course, this approach may not result in the successful completion of a task by the child if the child has not previously demonstrated competence in all areas. According to Rheingold (1982), however, even though a child's assistance may, at times, interfere with the speed and accuracy with which the parents perform their required activities, the participation in the task often allows the child to contact a meaningful social situation. This approach to teaching prosocial behavior may not only be a more efficient teaching procedure but may also increase the likelihood of generalization from training situations to novel ones.

Similarly, modeling is another procedure that has been shown to be effective in promoting the generalization of skills from training to novel situations for children with autism. Specifically, Charlop, Schreibman, and Tyron (1983) demonstrated that modeling procedures involving a loosely structured teaching situation resulted in generalization of receptive labeling skills across settings and persons. Haring, Kennedy, Adams, and Pitts-Conway (1987) suggest that modeling procedures may be enhanced by the use of video and refer to this as video modeling. This is accomplished by filming a person engaging in the correct response and then showing this videotape to a child with autism. These researchers successfully taught generalization of purchasing skills to adolescents with autism through the use of video modeling. They further suggest that video modeling may also be effective in teaching language skills to children with autism.

The purpose of the present study was to determine the extent to which children with autism can learn to engage in prosocial behavior. Because *helping* is a type of prosocial response that results in a longer interaction than other prosocial behavior (Kohler, Strain, & Shearer, 1992), specific helping responses were selected for training in the present study. Multiple categories of helping were taught because multiple-exemplar training has shown to be effective in increasing the likelihood that a child will learn a generalized repertoire (Stokes & Baer, 1977; Balsam, 1988). In addition, multiple exemplars within each experimenter-defined category were taught to increase the likelihood that each child would learn a generalized repertoire of helping. Video models were used to train specific helping responses because it has been shown to be effective in teaching generalization of various verbal and non-verbal skills to children with autism (Charlop & Milstein, 1989).

Additional training strategies that were conducted included the use of verbal and/or motor prompts, and the reinforcement of helping responses in the presence of appropriate stimulus conditions. Overall, this combination of training strategies was expected to increase the likelihood that appropriate stimulus conditions would set the occasion for a child to respond in a prosocial manner. In addition, to increase the likelihood that these responses would occur in novel settings and in the presence of novel adults, training was conducted in two settings and with two instructors. The extent to which the helping responses occurred in novel situations in which there was an opportunity to engage in prosocial behavior was assessed through ongoing generalization probes and pre- and post-intervention measures.

Because helping typically involves both a verbal component (e.g., asking whether a person would benefit from assistance) and a motor component (e.g., engaging in a task with a person), it was determined that the emission of both components was necessary for a child to successfully complete a helping response. A secondary experimental question involved a comparison of the number of trials necessary to learn each of these components in isolation or in combination. It was presumed that each child would be more likely to learn each response in isolation prior to learning them in combination. It was also presumed that the verbal response would be learned more easily than the motor responses given that the requirements to complete the latter were more varied and complex than the former.

Method

Participants

Four children with autism participated in this study. Each child attended classes at the Institute for Educational Achievement (IEA), a private school for children with autism. All children had previously received diagnoses of autism by independent agencies. Prior to the study, the children had used little or no spontaneous prosocial behavior, although all of the children had some oral language.

Irene, who was five-years-old at the onset of the study, had participated in educational classes at IEA for two prior years. Irene used oral language, often using speech to request desired items or activities (e.g., "Can I have a hug?"), to greet others (e.g., "Hi, Sharon"), or to engage in short conversations about preferred activities (e.g., "I love to go to sports world"). The majority of her speech was prompted through the use of her activity schedule (MacDuff, Krantz, & McClannahan, 1993) or by others in her environment. Her spontaneous speech consisted of short requests for preferred items or activities (e.g., "Can I have a hug") and to direct another's attention to a preferred item or activity (e.g., "Look what I have"). Although Irene did not spontaneously engage in prosocial behavior prior to the study, she did, however, comply with directions to assist another when asked to do so if she had prior experience with the task (e.g., "Irene, can you put this on the shelf?"). Video modeling was used as an effective teaching strategy for Irene for the two years that she attended classes at IEA. Specifically, video modeling had been used to teach Irene to talk while playing appropriately with her toys (e.g., learning to play doctor by putting a stethoscope on a doll's chest while saying "boom boom"), to engage in simple gross-motor activities (e.g., sitting down on the floor and placing her feet apart and then her feet together), and to ask questions about unknown items (e.g., upon seeing an unknown object ask "what's that?").

Tom, who was six-years-old at the onset of the study, had received three prior years of educational instruction at IEA. In that time, Tom had acquired some verbal skills. He used speech to request items (e.g., "Can I have an Oreo?"), to greet others (e.g., "Hi Sharon), and to engage in short conversations about preferred items and activities (e.g., "I play golf with my Daddy"). Most of his speech, however, was prompted by others in his environment or by his activity schedule (MacDuff et al., 1993). His spontaneous language consisted of requests (e.g., "Can I have soda?"), or descriptions of events in his current environment (e.g., "Sharon's here"). At the start of the study, Tom did not spontaneously engage in prosocial behavior. If instructed to assist in a specific task, however, he would comply with that instruction if he was familiar with the task (e.g., "Tom, can you throw this out?" or "Go give this to Edward"). Video modeling had also been used to teach Tom a variety of skills in the three years that he had attended IEA. These included teaching Tom to play appropriately with his toys while using contextually appropriate language, (e.g., pushing a car while saying "let's go to the store"), to ask questions about novel items (e.g., when seeing an unknown item ask "what's that?"), and to engage in simple gross-motor responses with his friends (e.g., sitting down on the floor and placing his feet apart and then his feet together).

Eddie, who was six-years-old at the onset of the study, had attended educational classes at IEA for 2 ½ prior years. In that time, Eddie acquired some verbal skills. He used speech to request items (e.g., "I want soda"), to greet others (e.g., "Hi, Sharon), and to engage in short conversations about preferred items and activities (e.g., "I like *Toy Story*"). Most of his speech, however, was prompted by others in his environment or by his activity schedule (MacDuff et al., 1993). His spontaneous language consisted of requests (e.g., "I want hugs"), or one-word utterances about an item in his environment (e.g., "Woody"). At the start of the study, Eddie did not spontaneously engage in prosocial behavior. If instructed to assist in a specific task, however, he would comply with that instruction as long as he was familiar with the task. (e.g., "Eddie, can you throw this out?" or "Go give this to Steven"). Video modeling was also used to teach Eddie a variety of skills in the 2 ½ years that he had attended IEA. These included learning to play appropriately with his toys while using contextually appropriate language, (e.g., pushing a fire truck while saying "off to the fire"), to ask questions about novel items (e.g., when seeing an unknown item ask "what's that?"), and to engage in simple gross-motor responses with his friends (e.g., sitting down on the floor and placing his feet apart and then his feet together).

Nathan, who was six-years-old at the onset of the study, had attended classes at IEA for 1 ½ prior years. In that time, Nathan acquired some verbal skills. He used speech to request items (e.g., "I want soda") and to greet others (e.g., "Hi, Sharon"). Most of his speech, however, was prompted by others in his environment, or by his activity schedule (MacDuff et al., 1993). His spontaneous language consisted of requests (e.g., "I want hugs"), or one-word utterances about an item in his environment (e.g., "Woody"). At the start of the study, Nathan did not spontaneously engage in prosocial behavior. If instructed to assist in a specific task, however, he would comply with that instruction if he was familiar with the task. (e.g., "Nathan, can you throw this out?" or "Go give this to Steven"). Prior to the study, video modeling had also been used to teach Nathan a variety of skills. These included teaching Eddie to play appropriately with his toys while using contextually appropriate language, (e.g., putting a Tarzan doll through the trees while saying "I'll save you"), and to engage in simple gross-motor responses with his friends (e.g., sitting down on the floor and placing his feet apart and then his feet together).

All of the children had displayed low to moderate levels of stereotypic behavior, including eye gazing, tensing, and finger play. Three of the children, Eddie, Nathan, and Irene, also had engaged in disruptive behavior, such as crying and tantrumming. In addition, all children demonstrated an imitative generalized repertoire of basic motor movements and verbalizations. They all had extensive learning in both a discrete-trial format and under incidental teaching conditions. Although the majority of in-school daily teaching sessions for Nathan, Tom, and Eddie were individual sessions (i.e., 1:1 student-to-instructor ratio), the children did work in small group settings (e.g., 3:2 student-to-instructor ratio) for 1-2 sessions per day. Irene spent approximately half of her day in individual sessions and the other half in group sessions. All of the participants were accustomed to using a monetary motivational system for their individual sessions. Prior to the onset of the study, the parents of all the participants gave informed consent for their children to participate in the study.

Setting and Apparatus

Most sessions took place in a small classroom at IEA where the children attended educational classes. The classroom was 3.0 x 10.8 m and had white walls with a gray, carpeted floor. The classroom contained four chairs (each 90 x 45 cm wide), one desk (64 x 41 x 55 cm), two small chairs (59 x 29 cm), a table (116 x 78 x 73 cm), a two-shelf bookcase (74 x 24 x 68 cm), an easel (100 x 63 cm) with a chalk board on one side (55 x 63 cm) and a wipe-off board on the other side (40 x 25 cm), and five 3-4 drawer bins (44 x 39 x 68 cm). The table was placed in the center of the room. The four chairs were placed at each side of it. The desk was placed at the periphery of the room with two small chairs located on two sides of the desk. The shelf and easel were placed against the wall behind the table. The five bins were placed against the wall at the periphery of the room on the opposite side of the desk. A monetary motivational system and data scoring sheets were placed on the table in the center of the classroom. Inside the bins was storage area for various stimuli used in the study. These included cleaning materials (e.g., cloth, spray bottle), art supplies (e.g., paper, pencils, paint brushes, crayons), office supplies (e.g., computer discs, paper clips, coins), curriculum materials (e.g., language master cards, noun cards), and toys (e.g., board games, puzzles). During the study, the various stimulus materials were also placed on the table, bookcase, chairs, desk, floor, and on top of the bins (depending on the response being trained).

The equipment in the session room included a tripod-mounted video camera (JVC© Compact VHS Camcorder, Model No. GR-AXM225U), a 50-cm screen (diagonal) television monitor (General Electric© Model No. 20GT368), and a videocassette recorder (General Electric© VHS Model No. VG-4241). The video camera was placed at the periphery of the room, 3 m from the side of the table, and was used to record the behavior of the child, the behavior of the therapist, and the interaction between the therapist and the child. The monitor and videocassette recorder were used to present video models to the children during training trials in which the children did not correctly emit a helping response when appropriate.

Every two weeks, one experimental session was conducted in the staff room at IEA to promote generalization of helping responses from trained to novel settings. This room contained multiple tables and chairs, office supplies, and the same stimulus materials described above. Also present in the room were other instructors sitting at their tables doing work or eating lunch. To assess generalization of trained responses from the typical classroom used in the present study to novel settings, pre- and post-intervention measures were taken in the children's regular classrooms at IEA. These classrooms, which were larger in size than the typical classroom used in the present study, were occupied by 4-6 additional children and 4-6 additional therapists.

Experimenter and Assistants

The primary experimenter was a doctoral student in psychology who had received training in applied behavior analysis. She conducted most of the baseline and treatment sessions in addition to some of the pre- and post-intervention measures. An assistant conducted baseline and treatment sessions once every two weeks to promote generalization of responses from a trained therapist to a novel therapist. The assistant, who was an instructor at IEA, was a masters student in education with training in applied behavior analysis. Another assistant conducted the remaining pre- and post-intervention measures to assess generalization of responses from a trained therapist to a novel therapist. This assistant, who was also an instructor at IEA, had completed her BA in psychology and had received training in applied behavior analysis.

Discriminative Stimuli and Response Definitions

Two methods were used to obtain common examples of helping behavior for the present study. In one method, parents of children of typical development were asked to list examples of helping behavior in which their children engaged. In another method, preschool and kindergarten children of typical development were observed in their classrooms at a local elementary school. During the classroom observations the children of typical development were engaged in a number of activities including art, snack, story time, and free play. In total, 24 parents were surveyed and 25 children between the ages of four and six were observed. The most prevalent examples of helping behavior obtained included "assisting a teacher setting up for an activity," "performing classroom jobs," "cleaning up activities," "assisting around the house," and "offering assistance to siblings and classmates."

In the present study, *helping* was loosely defined as a child with autism engaging in a problem-solving activity with an adult. More specifically, for each problem solving activity, three different stimulus components were used to signal to the child that a specific helping response should be emitted. These consisted of particular non-verbal, verbal, and affective discriminative stimuli that are described below.

General description of discriminative stimuli. Eight possible experimenter-defined response categories for helping were used in the present study. These categories, which are listed in the first column of Table 1, include cleaning, replacing broken materials, picking up objects, sorting materials, locating objects, carrying objects, putting items away, and setting up an activity. The second column of Table 1 provides a general description of the discriminative stimuli used in each of the eight helping response categories.

Non-verbal discriminative stimuli. Within each of the eight response categories were five discrete helping responses along with their associated discriminative stimuli. The non-verbal discriminative stimuli are described in the third column of Table 1. These consisted of an assortment of art materials, toys, common objects, and activities that were appropriate discriminative stimuli for each response category. For example, for "cleaning," the five separate non-verbal discriminative stimuli involved wiping either a table, chair, desk, blackboard, or wipe-off board with a dampened rag. Specific operational definitions of these non-verbal discriminative stimuli can be found in table 2. Wiping, for example, is defined as an adult placing a cloth in contact with a surface and engaging in either back-and-forth, or circular, arm movements for a minimum duration of 3 s.

Verbal and affective discriminative stimuli. The verbal discriminative stimuli associated with each of the discrete helping responses can be seen in the fourth column of Table 1. Each verbalization, which was emitted by the experimenter, consisted of two parts. The first part included an exclamation, such as "boy," "oh," "oops," "uh-oh," or "wow." The second part consisted of a comment or description such as "time to clean the blackboard," "this pencil won't work," "I dropped them," or "I can't find the ball."

The fifth column of Table 1 depicts all possible affective stimuli emitted by the experimenter for each of the discrete helping episodes. These affective stimuli included shaking the head, rolling the eyes, sighing, wrinkling the brow, and opening the eyes wide. The experimenter simultaneously emitted the components of the verbal and affective discriminative stimuli for the child. For example, she said "Oops, I dropped them" while opening her eyes wide.

Dependent measures. The dependent measure, which was the degree to which the helping response was emitted by each child, consisted of two components: one motor and one verbal. These are depicted in the last two columns of Table 1. The verbal response was always "May I help?" The motor response consisted of the child imitating the adult's motor movements by simultaneously engaging in the activity with the adult. Specifically, the child was required to continue engaging in the motor movements until the task was completed or until the adult stopped engaging in the motor movements. In addition, the child's topography had to match that of the adult's. Specific operational definitions of topography are included in Table 2. As can be seen in this table, wiping was defined as the child placing a cloth in contact with a surface and engaging in either back-and-forth or circular arm movements until the adult stopped emitting that same motion. For an example of the entire episode, after an adult drops picture cards, says "Oops, I dropped them" while shaking her head, and begins to pick up the cards, the child should request "May I help?" After being acknowledged by the adult saying "sure," the child should assist the adult by picking up the picture cards.

Both a verbal and a motor helping component were used because it was presumed that a child would be more likely to learn each response in isolation prior to learning them in combination. It was also presumed that the verbal response would be learned more easily than the motor responses given the greater complexity of the motor components. It is important to note that the majority of these motor responses were already present in each child's behavioral repertoire. For example, all children had been taught, at some point in their academic histories, to sort objects. Not all of the children, however, had been taught to identify broken objects.

Accuracy of responding by the child was scored immediately following the first presentation of the discriminative stimuli for each episode during a session. A verbal response was scored as correct only if it occurred within 5 s following the presentation of the non-verbal and verbal discriminative stimuli. A motor response was scored as correct only if it occurred within 5 s after the experimenter said "yes" or "sure" following the child's request to help. Data were collected separately for verbal and motor helping responses. All responses were scored by independent observers. Mastery criterion consisted of responding with both a correct verbal and motor response on at least 94% of the total number of training trials per session for four consecutive training sessions.

Additional stimuli. If a child failed to emit a correct verbal and non-verbal helping response appropriate for a given episode, a video model of that specific helping episode was immediately shown to the child. In each video episode, an adult actor (the primary experimenter) presented the correct verbal and non-verbal discriminative stimuli. A child actor then modeled the correct verbal and non-verbal helping responses for that specific episode. For example, in one episode involving replacing broken objects, an adult model began to set up for an art activity, noticed some of the paint brushes were broken, and said "Wow, how did this break?" while rolling her eyes. She then began to pick out all of the broken paintbrushes. Following this, the child model asked "May I help?", waited to be answered by the adult, and began to pick out the broken paintbrushes with her. The average length of each videotaped episode was 30-60 seconds.

Experimental Design

A multiple-baseline across-participants experimental design was used. Baseline was introduced simultaneously for all four children. Intervention was introduced for the four children successively across the legs of the design after the mastery criterion was met for each child and stability of performance was demonstrated.

Procedure

Assignment of response categories and training/probe trials. Of the eight possible experimenter-defined helping categories, four different categories were used during training for each child. Four training categories were used to increase the likelihood that generalization of helping occurred from trained to novel categories. The assignment of categories to each child was partially counterbalanced such that no two children were exposed to more than two of the same training categories. As can be seen in Table 2, for example, Tom's training categories were *cleaning, replacing broken materials, picking up objects*, and *sorting materials*.

In addition, for each child, two of the possible eight categories were assigned as non-trained categories. Trials from the non-trained categories were used to assess generalization of helping from trained to non-trained helping episodes. The assignment of these categories was counterbalanced such that no two children were exposed to any of the same non-trained categories. As can be seen in Table 2, for example, Tom's non-trained categories were *locating objects* and *carrying objects*.

Within each child's four trained response categories, four of the five non-verbal discriminative stimuli were randomly selected for use as training trials. These non-verbal discriminative stimuli can be seen in the column titled *Non-verbal Discriminative Stimuli* in Table 1. This resulted in a total number of 16 training trials in each experimental session. This number of training trials was used to promote generalization of helping from the trained stimuli to novel stimuli within a particular helping category.

In addition to the training trials described above, two different types of probe trials were presented within each session. The first type of probe trials, referred to as trained-category probe trials, consisted of the remaining motor-helping responses from each of the four trained categories. Thus, four probe trials of this type were presented per session. Trained-category probe trials assessed the degree of generalization of helping from the trained stimuli to novel stimuli within a particular helping category used during training. The second type of probe trials consisted of one trial drawn at random from each child's two non-trained categories. These are referred to as non-trained-category probe trials. This resulted in the presentation of two additional probe trials, for a total of six probe trials in all per session. Non-trained-category probe trials assessed the degree of generalization of helping from the trained categories to novel helping categories. In total, each experimental session contained 22 trials. Each participant's specific combination of training and probe trials is depicted in Table 3. For the 22 trials used for each child, five different orders of trial presentations were created using a controlled-randomization procedure to reduce the likelihood of any potential order and/or sequence effects. Specifically, the 22 different trials were randomly assigned to trial position in each session with the exceptions that (a) no session ever began or terminated with a probe trial and (b) two probe trials were never presented consecutively within a session.

General format. At the start of each experimental session, the participant was brought into the classroom and seated at a table. The instructor then initiated the session and the first trial by emitting the nonverbal, verbal, and affective discriminative stimuli for the specific helping episode (e.g., saying "Boy, this table is messy" while rolling her eyes and wiping the table). The instructor then waited for a maximum of 5 s for the child to emit the appropriate verbal and motor responses. What followed next depended on whether the trial type was a training or probe trial and whether the baseline or treatment phase was in effect for that trial (these details will be described in the next paragraph). Trials were terminated by the removal of the non-verbal discriminative stimuli for each specific helping episode. The length of each trial varied as a function of the complexity of the task for each episode and whether the error-correction procedure was used. The inter-trial interval was approximately 30 s. Sessions lasted approximately 30 minutes. Experimental sessions were conducted five days per week, Monday through Friday.

Baseline sessions. Although both training trials and probe trials were presented during baseline sessions, neither trial type was associated with treatment or reinforcement. That is, no video model was used, nor were helping responses emitted by a child explicitly reinforced or prompted. During baseline sessions, whether the child emitted a correct verbal and nonverbal response, an incorrect response, or no response within 5 s of the presentation of the verbal and non-verbal discriminative stimuli, the trial was simply terminated with no programmed consequence. Token reinforcement and verbal praise were provided, however, for on-task behavior only after approximately every 1-2 trials regardless of the correctness of the experimenter-defined helping response. On-task behavior was defined as visually attending to the stimuli and the experimenter. This resulted in 16 presentations of tokens and verbal praise during baseline. The token and verbal praise, however, were only provided after at least 5 s had elapsed from the last incorrect response to ensure that incorrect responses were not inadvertently reinforced. This procedure was used to ensure that token reinforcement and verbal praise used non-contingently for helping responses was not responsible for any observed increases in helping responses. The baseline phase was concluded for each participant when stable performance was observed upon visual inspection of the data for the percentage of trials in which correct helping responses occurred.

Treatment sessions. During treatment sessions, both training and probe trials were also presented. In this phase, however, training trials were associated with the treatment but probe trials were not. During training trials, if the child emitted the correct verbal response ("May I help?") within 5 s of the presentation of the verbal and non-verbal discriminative stimuli used in the trial, the experimenter said "yes" or "sure." If the child then emitted the correct motor helping response within 5 s of the experimenter's verbal response ("yes" or "sure"), the experimenter then provided token reinforcement and verbal praise to the child. This procedure is outlined in Table 4.

An error was defined as a child emitting either an incorrect response, a correct verbal or motor response in isolation, or no response, within 5 s of the presentation of the discriminative stimuli for that trial. If an error occurred, an error-correction procedure was implemented. This consisted of first presenting the video model appropriate for the helping episode in which the correct helping responses were not emitted. If the child did not attend to the video (as evidenced by eye gaze), the child was manually prompted to attend to the video. At the termination of the video, the instructor presented the non-verbal, verbal, and affective discriminative stimuli for that trial a second time. If the child now emitted a correct verbal and motor helping response, the instructor provided token reinforcement and verbal praise and the training trial was terminated. If the child did not emit the correct verbal and motor response, the instructor then verbally prompted the correct verbal response (e.g., "Say 'May I help?'") and/or manually prompted the child to emit the correct motor response. Following this, the verbal and non-verbal discriminative stimuli were presented again by the experimenter. If the child emitted the correct verbal and motor response, token reinforcement was provided along with verbal praise and the training trial was terminated. If the child still did not emit the correct verbal and motor helping responses, the correction procedure was introduced again with a second presentation of the video model for that trial. The error-correction procedure was continued until the child independently emitted the correct combined verbal and motor helping responses within 5 s of the presentation of the non-verbal, verbal, and affective discriminative stimuli. This correction sequence was used to ensure that the motor and verbal helping responses emitted by the child immediately followed the experimenter-presented discriminative stimuli and, therefore, came to be controlled by the presentation of the discriminative stimuli and not the video model and/or the experimenter's manual and verbal prompts.

In addition to training trials, six probe trials were presented during each treatment session. These were used to assess the generalization of helping both within trained categories and across non-trained categories. During probe trials, the nonverbal and verbal discriminative stimuli were never associated with the teaching procedure or reinforcement. During the probe trials, the instructor presented the non-verbal, verbal, and affective discriminative stimuli, waited a maximum of 5 s for a response to occur, and terminated the trial by removing the stimulus materials. No token or verbal reinforcement was provided for correct responses, nor was the correction procedure ever used during probe trials.

To promote generalization of helping behavior from training to novel settings and instructors, treatment sessions were also conducted in two different settings, and were taught by two different instructors. Once every eight sessions, training was conducted in the staff room; once every 10 sessions, training was conducted by a secondary experimenter.

Measures of Non-Contextual and Contextual Helping

Because the correct verbal response for each helping episode was "May I help?", it is possible that the children may learn to emit this response in the presence of all non-verbal, verbal, and affective stimuli presented by an adult, whether related to helping or not. To ensure that the children were discriminating stimuli that should set the occasion for a helping response from stimuli that did not set the occasion for a helping response, two different measures were obtained. One measure was quantitative and one was anecdotal.

For the quantitative measure, 10 *non-helping* episodes were interspersed throughout each experimental session. These episodes included the presentation of several of the same words used as verbal discriminative from various helping episodes. During these non-helping episodes, however, these words should not serve as discriminative stimuli to engage in a helping response. Examples of these non-helping episodes include saying: "Wow, isn't this a cool toy" while holding up a toy or saying "Boy, this is really neat" while looking at an item. Table 5 describes the complete set of non-verbal and verbal discriminative stimuli used for all participants during non-helping episodes.

The experimenter initiated a non-helping episode by holding up an item and verbally commenting about the item. The experimenter would then wait a maximum of 5 s. If the child emitted a non-helping response (e.g., saying "yes"), the experimenter provided verbal reinforcement. On infrequent occasions, a child did emit a helping response (e.g., saying "May I help?") during these non-helping episodes. When this occurred, the experimenter paused for 5 s and then re-presented the non-helping discriminative stimulus. At this time, if the child emitted an appropriate non-helping response, the experimenter provided verbal reinforcement and continued with the session. At no time in the experiment was there an occasion in which a child re-emitted a helping response after the implementation of this extinction procedure. Data were collected on the percentage of non-helping trials in which the child emitted a verbal helping response in the presence of the non-helping verbal and non-verbal discriminative stimuli.

To further assess whether the children were producing non-contextual helping responses, instructors that typically taught each child during regular school classroom sessions were asked to record whether the child engaged in any non-programmed helping responses during teaching sessions in regular classrooms. The instructors were also asked to note whether the helping response was contextually appropriate or inappropriate.

Pre- and Post-Intervention Measures

Several measures were used to assess whether correct helping responding occurred in the presence of both the trained and non-trained discriminative stimuli when presented in a novel setting and/or by a novel instructor. Three pre-intervention sessions were conducted before intervention was introduced for all participants. Three post-intervention sessions were conducted after all participants had achieved a mastery criterion. For all pre-and post-intervention measures the instructor presented the verbal and non-verbal discriminative stimuli, waited a maximum of 5 s for a response to occur, then terminated the trial by removing the stimulus materials. Token or verbal reinforcement was never provided for correct helping responses, nor were the teaching or error-correction procedures ever used. Because all pre- and post-intervention trials were interspersed within the child's regular academic programming, however, reinforcement was available for other responses. In addition, when these trials were conducted in the child's regular academic classroom, other children and therapists were present.

During the pre- and post-intervention sessions, data were collected on the number of occasions a child emitted a helping response either contextually or non-contextually.

Pre- and post-intervention sessions were conducted twice a day for five days a week for the duration of this measure. Sessions lasted from 15-30 minutes, depending on the number of trials per session.

Seven different types of pre-and post-intervention measures were conducted for each participant. These consisted of different combinations of probes derived from non-trained, trained, and novel helping categories that were presented in a novel setting by a novel instructor. These combinations included (a) non-trained category, novel category, novel setting, and novel instructor, (b) trained category, novel setting, and novel instructor, (c) novel setting and novel instructor, (d) non-trained category, novel category, and novel setting, (e) trained category and novel setting, (f) novel setting, and (g) novel category. These different combinations were chosen because it was not known to what extent the trained helping responses emitted by the children would also be occasioned under these novel situations. The order in which these seven pre- and post-intervention measures was presented to each child was randomly determined. The orders used can be seen in Table 6. The specific description of each of these measures follows below.

Non-trained category, novel category, novel setting, and novel instructor. This measure contained six trials. Two trials were the same two non-trained-category probe trials taken from each child's daily experimental session probes. The remaining four trials were selected at random from the two helping response categories (two trials from each) to which the child was never previously exposed. Thus, these trials were drawn from novel categories for each child. The assignment of novel categories was counterbalanced across children, as can be seen in Table 7. For this pre- and post-intervention measure, the six trials were all presented in a classroom that was never associated with experimental sessions by an instructor who was also never associated with experimental sessions.

Trained category, novel setting, and novel instructor. This pre- and post-intervention measure contained four trials consisting of the four trained-category probes, taken from each child's daily experimental sessions. The four trials were all presented in a classroom that was never associated with experimental sessions by an instructor who was also never associated with experimental sessions.

Novel setting and novel instructor. This measure contained another four trials. They consisted of one training trial randomly selected from each of the four trained categories used during each child's daily experimental sessions. The four trials were all presented in a classroom that was never associated with experimental sessions by an instructor who was also never associated with experimental sessions.

Non-trained category, novel category, and novel setting. This measure consisted of six trials. These were selected in the same manner as the six trials selected for the non-trained category, novel category, novel setting, and novel instructor measure described previously. One exception was that the four trials drawn from the two novel categories for each child were different from the four used in the non-trained category, novel category, novel setting, and novel instructor measure. The six trials were all presented in a classroom that was never associated with experimental sessions by the primary experimenter.

Trained-category probe and novel setting. This measure consisted of the four non-trained-category probe trials taken from the child's daily experimental sessions. The four trials were all presented in a classroom that was never associated with experimental sessions by the primary experimenter.

Novel setting. This measure contained four trials. They consisted of four training trials, one from each trained category, taken from each child's daily experimental sessions. The trainings trials were different from those used in the "novel setting and novel instructor" measure. The four trials were presented by the primary experimenter in a classroom that was never associated with experimental sessions.

Novel category. This measure contained 10 trials. They consisted of the five trials drawn from each of the two novel categories for each child. They were presented by the primary experimenter in the room used for experimental sessions.

Social Validity Measures

Two social validity measures were obtained in the present study. The purpose of one measure was to determine whether the participants' helping behavior was viewed as more appropriate following intervention as compared to before intervention. To accomplish this, 10 videotaped helping episode pairs were drawn from each participant's recorded experimental sessions. For each child, 10 episodes were drawn from the first four baseline sessions. The same 10 episodes were drawn from the last four sessions of treatment. Thus, the 10 episodes were matched pairs in that the discriminative stimuli presented were identical in the baseline and treatment trials. The 10 specific helping episode pairs were comprised of all six probe trials used in daily experimental sessions along with four training trials, one each randomly selected from each child's four trained categories. This resulted in a total of 20 videotaped episodes per child for a total of 80 videotaped episodes. On the videotape, the order of presentation of paired helping episodes was randomly determined across all children. In addition, within each helping episode pair, the order of baseline or treatment episode was counterbalanced.

The videotape was then shown to a group of 18 undergraduate students enrolled in a child psychology class at a local university. Each college student was asked to answer the following question for each pair of helping episodes: "In which of the two video-taped episodes (the first or the second) did the child appear to engage in more prosocial behavior?"

The purpose of the second social validity measure was to determine whether the helping responses taught to the children with autism were rated as being similar to those emitted by their age-matched peers. One-half of the 80 videotaped episodes used contained the four children with autism who participated in the present study. The same 10 helping episodes drawn from the last four sessions of treatment. The other 40 of these videotaped episodes depicted four children of typical development engaging in the same helping episodes as the children with autism. The children of typical development were matched within one year of chronological age with the children with autism. The 10 helping episode trials for each child of typical development were obtained by presenting the same discriminative stimuli as those presented to the children with autism.

Prior to filming, the children of typical development were asked to describe how they might help someone requiring assistance. Because the verbal response was scripted for the children with autism, the children of typical development were instructed that if they wished to assist the experimenter they should do so by asking "May I help?" When filming began, the experimenter presented the discriminative stimuli specific to each helping episode to the children of typical development in the same way that they were presented to the children with autism during experimental sessions. On the videotape, the order of presentation of paired helping episodes was randomly determined across all children. In addition, within each helping episode pair, the order of appearance of a child with autism with his or her age-matched peer of typical development was counterbalanced.

This second videotape was then shown to a new group of 20 undergraduate students enrolled in a psychological statistics class at a local university. Each college student was asked to answer the following question: "Was appropriate prosocial behavior used by this child?" For both sets of college students, they were not informed about the purpose of the study prior to viewing the videotaped episodes. They were told the following "You will be presented with a series of videotaped episodes between a teacher and a student. In each episode the teacher will make a comment and then begin to engage in some activity. Please observe the child's response to the teacher. You will always see two versions of the same episode, one after the other. After viewing both of these versions please answer the following question." Following these instructions, the college students were then presented with two practice trials to help familiarize them with the task. During these practice trials the experimenter did not provide any information about the child's responses, but did ask the college students if they had any questions before proceeding with presentation of the videotape.

Data Analysis

For all experimental sessions, data were collected separately for motor and verbal responses emitted by the participants. The percentage of correct motor responses alone, correct verbal responses alone, and correct verbal and motor responses combined, was then calculated for the training and probe trials for each baseline and treatment session for all participants. In addition, the percentage of trials per session in which a child engaged in a non-contextual helping response was also calculated. These were trials in which stimuli that should not set the occasion for helping were presented.

For each of the seven pre- and post-intervention measures, the percentage of trials that contained a correct verbal response alone, a correct motor response alone, and correct combined verbal and motor responses, was calculated. The data for the first social validity measure were summarized as the percentage of videotaped treatment episodes in which the child was rated as engaging in more prosocial behavior than the videotaped baseline episodes. The data on the second social validity measure were summarized as the percentage of videotaped episodes in which each child was rated as engaging in appropriate prosocial behavior. This value was calculated for both the children with autism and the age-matched children of typical development.

Interobserver Agreement

For all experimental conditions, interobserver agreement was obtained for the percentage of trials that contained a correct verbal response alone, a correct motor response alone, or a correct motor and verbal response combined for each child. Interobserver agreement data were also obtained for the frequency of occasions in which a child emitted a helping response during non-helping episodes. Interobserver agreement was also calculated for the number of training and probe trials presented across all experimental conditions for all children. To assess the accurate presentation of the discriminative stimuli across all experimental conditions, data were collected on the accuracy of presentation of the nonverbal, verbal, and affective discriminative stimuli for all trial types across all experimental conditions and children. Data were also collected for all pre-intervention and post-intervention trials collapsed across all pre- and post-intervention sessions. In all cases, percentage of interobserver agreement was calculated by dividing the number of agreements by the number of agreements plus disagreements and multiplying by 100.

To obtain inter-observer agreement, the primary experimenter and another observer independently scored a minimum of 75% of the sessions in each of the baseline and treatment conditions and 100% of the sessions in the seven pre- and post-intervention measures. One observer was an instructor employed at IEA who had received her BA in Psychology and had training in applied behavior analysis. The other observer was an assistant professor of psychology from a local university who had received his Ph D in behavior analysis. Prior to the onset of the study, training for scoring interobserver agreement data was provided separately to both observers. Each was provided with a written definition of the target verbal and non-verbal responses. In addition the teaching and error-correction procedures were explained to the observers and they were provided with a list of all nonverbal, verbal, and affective discriminative stimuli for each helping episode. Training was then conducted by showing a videotape of a pilot experimental session. Observers were asked to score each trial on all dependent and independent measures. Trials that were scored differently by the observers were then reviewed and discussed. Possible refinements for scoring accuracy, including those related to the response definition for the target responses, were made. The observers were trained to a minimum criterion of 80% agreement for a session before they were allowed to score actual experimental sessions. This criterion was achieved after one practice session for all observers.

Interobserver agreement was calculated for all dependent measures for at least 75% of the total sessions for each child. These data can be seen in Tables 8 and 9. The mean percentage of interobserver agreement for the percentage of trials in which a child emitted a correct motor response alone, a correct verbal response alone, or a correct motor and verbal response combined, was maintained between 94.3% and 100% throughout all conditions for all children. As shown in Table 8, the mean percentage of interobserver agreement for training trials was at least 94.3% and for probe trials at least 95.9% for all baseline and treatment conditions for all children.

To calculate the mean percentage of interobserver agreement for the pre- and post–intervention measures, the data were collapsed across the seven measures and averaged as mean percentage of interobserver agreement for correct verbal alone, motor alone, and combined verbal and motor responding during all pre- and post-interventions. The mean percentage of interobserver agreement was 100% for all pre-interventions and 94.9% for all post-interventions averaged across all children.

To further summarize these data, the mean percentage of interobserver agreement was obtained for each individual participant. For the combined motor and verbal responses for Irene, agreement was 100% during baseline conditions. During treatment conditions, the mean percentage of interobserver agreement for training and probe trials was 98.7% and 97.4% respectively with a range of 94% to 100% and 83% to 100% respectively. During the pre- and post-intervention measures the mean percentage of interobserver agreement on combine verbal and motor responding was 100% for all pre-interventions and 100% for all post-interventions.

The mean percentage of interobserver agreement for Tom's combined verbal and motor responses was 100% during baseline conditions. During treatment conditions, the mean percentage of interobserver agreement was 96.6% with a range from 81% to 100% across training trials. The mean percentage of interobserver agreement for probe trials was 95.9% with a range from 83% to 100% for treatment conditions. During the pre- and post-intervention measures, the mean percentage of interobserver agreement for combined correct verbal and motor responding was 100% for all pre-interventions and post-interventions.

The mean percentage of interobserver agreement for Eddie's combined verbal and motor responses was 100% during baseline conditions. During treatment conditions, the mean percentage of interobserver agreement for training and probe trials was 94.3% and 98.9% respectively with a range from 81% to 100% for training trials and 83% to 100% for probe trials. During the pre- post-intervention measures the mean percentage of interobserver agreement on the combined verbal and motor responding was 100% for all pre-interventions and 100% for all post-interventions.

The mean percentage of interobserver agreement for Nathan's combined verbal and motor responses was 100% during baseline conditions. During treatment conditions, the mean percentage of interobserver agreement for training trials was 98.8% and 96.6% for probe trials. The range was 94% to 100 for training trials and 83% to 100% for probe trials. During the pre- and post-intervention measures the mean percentage of interobserver agreement on the combined verbal and motor responding was 100% for all pre-interventions and 99% for all post-interventions.

Interobserver agreement was also calculated and summarized for the number of trials in which a child emitted a helping response under inappropriate stimulus conditions in the first five baseline sessions and the first ten treatment sessions. As can be seen in Table 9, the mean percentage of interobserver agreement for the first five baseline sessions was 100% for all children. The mean percentage of interobserver agreement for the first ten treatment sessions was 97.5% for Irene 95.5% for Tom, and 100% for both Eddie and Nathan.

Results

The results of the present study will focus upon 11 different measures: (a) combined motor and verbal helping responses, (b) motor responding considered alone, (c) verbal responding considered alone, (d) a comparison of motor responding with verbal responding, (e) combined motor and verbal responding during probe trials only, (f) individual responding as a function of helping categories, (g) effectiveness of video modeling and verbal and/or motor prompts, (h) frequency of non-contextual helping, (i) pre- and post-intervention measures, (j) social validity, and (k) procedural reliability.

Analysis of Combined Motor and Verbal Responding

The purpose of the present study was to determine the extent to which children with autism could learn to engage in appropriate verbal and nonverbal helping responses taught using video modeling and reinforcement. The effectiveness of this procedure was assessed through visual inspection of data showing the percentage of training and probe trials in which the four participants emitted a correct combined motor and verbal helping response, as a function of condition. These data are depicted in Figure 1. The dashed vertical line indicates the point at which treatment was introduced for each participant. The closed circles represent the data obtained for training trial performances and the open circles represent the data obtained for the combined probe trial performances. During the baseline phase, the percentage of trials containing a correct motor and verbal response was 0% throughout all sessions. With the successive introduction of treatment across the four participants, there were systematic increases in correct responding during both the training and probe trials. The increases in the percentage of trials containing a correct motor and verbal response were observed only for participants under the treatment phase. Thus, these data demonstrate that children with autism did learn to engage in appropriate verbal and nonverbal helping responses following an intervention consisting of video modeling, prompting, and reinforcement.

When considering the individual participant performances, it can be seen that the percentage of training trials in which Irene produced a correct motor and verbal response increased from a low of 0% during baseline to an average of 100% during the last four sessions of treatment. A similar increase in correct responding was seen in the probe trials for Irene. Specifically, the percentage of probe trials in which Irene produced a correct motor and verbal response increased from 0% during baseline to an average of 100% during the last four sessions of treatment.

For Tom, the percentage of training trials in which he produced a correct motor and verbal response increased from 0% during baseline to an average of 98.5% during the last four sessions of treatment. Again, this increase in correct responding was also observed during the probe trials for Tom; the percentage of correct motor and verbal responding increased from 0% during baseline to an average of 100% during the last four sessions of treatment.

For Eddie, the percentage of training trials in which he produced a correct motor and verbal response increased from 0% during baseline to an average of 97% during the last four sessions of treatment. During probe trials for Eddie, the percentage of trials in which he produced a correct motor and verbal response increased from 0% during baseline to an average of 100% during the last four sessions of treatment.

For Nathan, the percentage of training trials in which he produced a correct verbal and motor response increased from 0% during baseline to an average of 98.5% during the last four sessions of treatment. A similar effect was seen during the probe trials. The percentage of probe trials in which Nathan produced a correct motor and verbal response increased from 0% during baseline to an average of 91.5% during the last four treatment sessions.

The mastery criterion for the current study was defined as four consecutive sessions in which at least 94% (15/16) of the training trials occasioned a correct combined motor and verbal response. The number of sessions required to achieve a criterion level of performance for each child is presented in the second column of Table 10. As can be seen in this table, all children achieved the mastery criterion within 14 treatment sessions. The mean number of sessions required to achieve this criterion for all children was 9.5. Some variability was seen among the children, with a range from 6 to 14 sessions required for demonstration of mastery criterion. Specifically, Irene demonstrated the fastest rate of skill acquisition, requiring six sessions to achieve the mastery criterion. Eddie and Nathan required 8 and 10 sessions, respectively. Finally, Tom showed the slowest rate of skill acquisition, requiring 14 sessions to achieve the mastery criterion. For all children, once the mastery criterion was achieved, this high percentage of correct responding was maintained with little variability in the correctness of responding.

During experimental sessions, probe trials were used to assess the degree of generalization of the verbal and motor responses from the trained discriminative stimuli to non-trained stimuli. Although no specific mastery criterion was required for probe-trial performance, a post-hoc calculation of the number of treatment sessions required to achieve 100% correct combined verbal and motor responding for two consecutive sessions reveals a similar pattern to that seen for skill acquisition during the training trials. These data are depicted in the third column of Table 10. Specifically, the mean number of sessions required to demonstrate a mastery level of performance during probe trials was 10, with a range of 8-14 sessions. As she did during the training trials, Irene demonstrated the fastest rate of acquisition during the probe trials, requiring eight sessions to achieve a mastery level of performance. Eddie and Nathan both required nine sessions. Finally, Tom again showed the slowest rate of skill acquisition, requiring 14 sessions to achieve criterion performance during the probe trials. Similar to the training trials, once this criterion level of performance was achieved during the probe trials, very little variability was observed in the correctness of responding.

Because it can be argued that the combined motor and verbal helping responses constitute a more complex task than each individual response alone, these responses were also measured separately. To assess the occurrences of the motor and verbal helping components separately, the percentage of trials containing a correct motor response alone and the percentage of trials containing a correct verbal response alone were calculated across both baseline and treatment phases. These data are depicted in Figures 2 and 3.

Analysis of Motor Responding Alone

Figure 2 shows the percentage of trials in which each child emitted a correct motor response alone. The closed circles represent the data obtained for training trial performances and the open circles represent the data obtained for probe trial performances. As can be seen in Figure 2, no correct motor responses were emitted by three of the four children during baseline. Nathan however, emitted one correct motor response during two baseline sessions. The successive introduction of treatment across the four children produced systematic increases in the percentage of both training and probe trials during which a correct motor response occurred. Specifically, for Irene, Tom, and Eddie, the percentage of training and probe trials in which they produced a correct motor response increased from 0% during baseline to an average of 100% during the last four sessions of treatment. For Nathan, the percentage of training and probe trials during which he produced a correct motor response increased from an average of 0.3% and 0%, respectively, during the first four baseline sessions to an average of 98.5% for training trials and 95.7% for probe trials during the last four sessions of treatment.

As previously stated, the mastery criterion for the current study was four consecutive sessions in which at least 94% of the training trials occasioned a correct combined motor and verbal response. For the purposes of this data analysis, the same definition of mastery level of performance was also used for the individual motor responses. Therefore, the number of sessions that each child required to achieve a mastery level of performance for motor responding alone was calculated for each child.

These data can be found in the fourth and fifth columns of Table 10. To obtain a measure of skill acquisition for the performances during generalization probe trials, the same mastery level of performance was used for the motor responses alone as was used for the combined motor and verbal responses. This level was 100% correct responding for two consecutive sessions.

The mean number of sessions required to achieve a mastery level of performance for correct motor responding for all children was 9.0 for the training trials and 9.5 for the probe trials. The range was 6-14 sessions for the training trials and 7-14 for the probe trials. As can be seen in Table 10, these data are similar to those depicting the combined verbal and motor responding. Specifically, during training trials, Irene demonstrated the fastest rate of motor response acquisition, requiring six sessions to achieve this mastery level of performance. Eddie and Nathan required eight sessions each. Tom showed the slowest rate of skill acquisition, requiring 14 sessions to achieve this same level of performance. For the probe trials, Nathan demonstrated the fastest rate of skill acquisition, requiring seven sessions to achieve this mastery level of performance. Next were Irene and Eddie, who required seven and eight sessions, respectively. Finally, Tom again showed the slowest rate of skill acquisition, requiring 14 sessions. Once again, after each child achieved the mastery criterion, there was little variability in the correctness of responding during both the training and probe trials

Analysis of Verbal Responding Alone

Figure 3 shows the percentage of trials in which each child emitted a correct verbal helping response. The closed circles represent the data obtained for training trial performances and the open circles represent the data obtained for probe trial performances. As can be seen in Figure 3, no correct verbal response was emitted by any child during baseline. The successive introduction of treatment across the three children produced systematic increases in the percentage of both the training and probe trials during which a correct verbal response occurred. Specifically, for Irene, the percentage of training and probe trials during which she emitted a correct verbal response increased from 0% during baseline to an average of 100% during the last four sessions of treatment. For Tom, the percentage of training and probe trials in which he produced a correct verbal response increased from 0% during baseline to an average of 98.5% for training trials and 100% for probe trials during the last four sessions of treatment. For Eddie, the percentage of training and probe trials in which he produced a correct verbal response increased from 0% during baseline to an average of 97% for training trials and 100% for probe trials during the last four sessions of treatment. For Nathan, the percentage of training trials in which he produced a correct verbal response increased from 0% during baseline to an average of 100% for the training trials and 95.7% for the probe trials during the last four sessions of treatment.

The number of sessions required to achieve a mastery level of correct verbal responding was also calculated for both training and probe trials. These data can be seen in the sixth and seventh columns of Table 10. The mastery level in this case was the same as that used in the analysis of correct motor responses. The mean number of sessions required to achieve a mastery level of performance for all children was 7.7 for the training trials and 7.0 for the probe trials, with a range of 6-9 sessions for the training trials and 4-9 sessions for the probe trials. As can also be seen in Table 10, less variability and faster skill acquisition were seen for correct verbal responding during the training trials as compared to correct combined verbal and motor responding, and motor responding alone.

As can be seen in the individual data, Irene demonstrated the fastest rate of skill acquisition, requiring six sessions to achieve the mastery criterion for verbal responding. Tom and Eddie each required eight sessions. Finally, Nathan showed the slowest rate of skill acquisition, requiring nine sessions to achieve the mastery criterion. A similar pattern of performance is also revealed in the probe trial data. Specifically, Irene demonstrated a faster rate of acquisition during the probe trials than she did during the training trials, requiring only four sessions to achieve the defined level of performance. Next was Tom, who required six sessions. Finally, Eddie and Nathan showed the slowest rate of skill acquisition, each requiring nine sessions to achieve a mastery level of verbal responding during the probe trials. Once again, for all children, once the mastery criterion was achieved, little variability in the correctness of responding was observed for both the training and probe trials.

Comparison of Motor Responding Alone With Verbal Responding Alone

A further analysis comparing the percentage of correct motor responses with the percentage of correct verbal responses was also made for both the training trials and probe trials. These data are graphically represented in Figures 4 and 5. Figure 4 represents the percentage of correct verbal responses and the percentage of correct motor responses during training trials only, graphed as two separate functions in a multiple-baseline format across children. The dashed vertical line indicates the point at which treatment was introduced for each child. The percentage of correct verbal responses is represented by the closed circles and the percentage of correct motor responses is represented by the open circles.

Figure 4 shows that the largest discrepancy between the acquisition of motor responding and acquisition of verbal responding during training trials is seen for Tom's data. Tom's speed of skill acquisition for the verbal response was faster than it was for the motor responses. Specifically, during the first five treatment sessions, the function for verbal responses is consistently higher than the function for motor responding, with virtually no overlap between these two functions for these five sessions. For the remaining three children, Irene, Eddie, and Nathan, the two functions for motor responding and verbal responding virtually overlap. That is, there is very little discrepancy between the percentage of verbal responses and the percentage of motor responses. As before, after the skill was acquired by each child, the motor and verbal responding for training trials remained similar for the remainder of the treatment sessions.

Figure 5 represents the percentage of correct verbal responses and the percentage of correct motor responses during probe trials only. The percentage of correct verbal responses is represented by the closed circles and the percentage of correct motor responses is represented by the open circles. A comparison between Figures 4 and 5 shows that the discrepancy seen between motor and verbal responding during the training trials for one child (as seen in Figure 4) is similar to that seen in the probe trials (as seen in Figure 5). Specifically, the percentage of correct verbal responses for Tom is again slightly higher than the percentage of correct motor responses. This can be seen throughout the majority of the treatment sessions for Tom. As in Figure 4, the percentage of motor responding and the percentage of verbal responding was very similar throughout the treatment session for Irene, Eddie, and Nathan.

Analysis of Combined Motor and Verbal Responding As a Function of the Two Different Type of Probe Trials

As previously described, during experimental sessions two types of probe trials were presented to assess the degree of generalization of helping responses from the trained to non-trained discriminative stimuli. The two probe types were trained-category probes (four trials per session) and non-trained-category probes (two trials per session). To assess responding during the two types of probe trials, the percentage of trials in which a correct combined verbal and motor response occurred was calculated separately for both trained-category and non-trained-category probes. These data are graphically represented in Figure 6. The percentage of trials in which a correct combined motor and verbal responses occurred is graphed as two separate functions in a multiple-baseline format across children. The closed circles represent responding during the trained-category probes and the open circles represent responding during the non-trained-category probes.

As can be seen in Figure 6, the percentage of trials in which a correct combined verbal and motor response occurred is slightly higher for the non-trained-category probes across the entire treatment condition for Tom, Eddie and Nathan. That is, when an error was made during probe trials, it was more likely to be made during trained-category probes than non-trained-category probes. In contrast, performances during the non-trained and trained-category probes were similar for Irene.

The finding that the percentage of trials in which a correct combined verbal and motor response occurred was slightly higher for the non-trained-category probes was consistent when the data were further analyzed to determine the number of sessions required to achieve a mastery level of performance. Mastery level performance for probe trials was again defined as 100% correct responding for two consecutive sessions. These data can be found in Table 11. Averaging across children, the mean number of sessions needed to achieve a mastery level of performance was 7.7 for the trained-category probes and 5.5 for the non-trained-category probes. Irene, Eddie, and Nathan, required fewer sessions to achieve mastery during the non-trained-category probes than during the trained-category probes. Specifically, Irene required just four sessions for the non-trained-category probes and seven sessions for the trained-category probes. Eddie required five sessions for the non-trained-category probes and nine for the trained-category probes. Nathan required four sessions for the non-trained-category probes and nine sessions for the trained category probes. In contrast to the other three children, Tom required nine sessions for the non-trained-category probes but only six sessions for the trained-category probes.

Analysis of Individual Responding As a Function of Different Helping Categories

In the present study, each child was exposed to trials drawn from six different experimenter-defined categories of helping. To determine whether there were any systematic differences in responding as a function of the different categories, the cumulative number of verbal response errors and motor response errors emitted per category was calculated separately for each child's first 10 treatment sessions. Data were collected from the first 10 treatment sessions only because the minimum number of treatment sessions was 11 for all children. These calculations were made for both training and probe trials. These data are depicted in Tables 12 and 13. The shaded boxes in the tables indicate that a child was not exposed to trials from that category. In addition, in both tables the bottom row lists the cumulative total number of errors made in a category across all children. The far right column lists the cumulative total number of errors made across categories by each child. Trials from each category were used for training trials for two of the children and probe trials for three of the children. In both tables, the categories are arranged such that the category with the fewest errors appears on the far left with categories with increasing errors appearing to the right.

As seen in the bottom row of Table 12, the mean number of errors made per category during training trials was 13.2, with a range of 9 to 18. As seen in the bottom row of Table 13, the mean number of errors made per category for the probe trials was 7.2, with a range of 4 to 11. These differences in the number of errors is not surprising given the greater number of presentations of training trials (16 per session) relative to probe trials (6 per session). When collapsed across errors for all children, the category that occasioned the fewest number of errors was "locating" for the training trials and "cleaning" and "putting away" for the probe trials. The category that occasioned the greatest number of errors was "carrying" for the training trials and "setting up" for the probe trials. The average number of errors made per child for the training trials was 26.7, with a range from 20 to 34. The average number of errors made per child for the probe trials was 14.7, with a range from 10 to 17.

It is interesting to note that for three of four children, the category that occasioned the greatest number of errors differed between training and probe trials. Specifically, Irene made her greatest number of errors during the training trials for the "putting away" category. During probe trials it was "replacing" and "setting up." Tom made his greatest number of errors during the training trials for the "cleaning" category and during the probe trials for "carrying." Nathan made his greatest number of errors during the training trials for "setting up." During the probe trials, his errors were evenly distributed across the categories. Eddie was the only child who made the greatest number of errors for the same category ("setting up") during both training and probe trials.

Analysis of the Effectiveness of Video Modeling

During treatment, when a child did not emit a correct combined verbal and motor helping response, an error correction procedure was implemented. It consisted of three components: a video model, and verbal and/or motor prompts. When an error was made, the video model was always presented first, followed by another presentation of the discriminative stimuli for that helping episode. Verbal and/or motor prompts were not provided unless the video model was ineffective in occasioning a correct combined motor and verbal response following the next presentation of the discriminative stimuli. Table 14 shows the total number of discriminative stimuli presented, the total number of video models presented, the total number of verbal prompts delivered, and the total number of motor prompts delivered for each child. Data were collected from the first 10 treatment sessions. Tom was exposed to the greatest number of discriminative stimuli (209) and video model presentations (60). Irene had the greatest number of verbal prompts delivered (9) and Nathan had the greatest number of motor prompts delivered (10). In addition, the table shows that each child had a much greater frequency of video model presentation than motor and verbal prompts delivered. Thus, the presentation of video models alone was often sufficient to occasion correct combined verbal and motor responding on subsequent presentations of helping episode discriminative stimuli.

To further assess the effectiveness of the video model for each child, the percentage of trials in which a video presentation occasioned a correct combined motor and verbal response on the following presentation of the discriminative stimuli was calculated for the first 10 treatment sessions for each child. These data are presented in Table 15. In the table," n/a" indicates that a child did not emit any errors during that session and, therefore, presentation of the video model was unnecessary. As can be seen across the 10 treatment sessions, as the correct response was acquired, the video model increased in effectiveness. Specifically, during the first treatment session only 46% of the video models occasioned the correct combined verbal and motor response following the subsequent presentation of the discriminative stimuli for Irene. For Tom, the video models were 67% effective in the first session. The models were 40% effective for Eddie and 67% effective for Nathan. By the tenth treatment session, every video model was 100% effective for all children.

These data were further analyzed to determine the number of video models and the number of verbal and/or motor prompts presented as a function of sessions for each child. These data can be seen in Figure 7. Because the error-correction procedure was never programmed to occur, no video models or verbal and/or motor prompts were presented during baseline sessions. When treatment was introduced, a large number of video models and verbal and/or motor prompts were presented. As treatment progressed, there was a systematic reduction in the number of occasions requiring the error-correction procedure. For example, for Irene's first treatment session, video models were presented on 16 occasions and verbal/motor prompts were presented on eight occasions. By the fourth treatment session, a video model was presented only once and verbal and/or motor prompts were never presented. A similar finding can be seen across the treatment sessions for the remaining three children.

Frequency of Non-Contextual Helping

Interspersed throughout experimental sessions were discriminative stimuli that should not have set the occasion for helping. These were presented to measure the degree to which each child discriminated stimuli that should have set the occasion for helping from those that should not. Figure 8 depicts the percentage of trials in which a verbal helping response (i.e., "May I help") was emitted during a trial in which helping was appropriate (contextually) and during those in which helping was not appropriate (non-contextually). Only verbal helping responses were considered because the non-verbal discriminative stimuli presented during trials that should not have set the occasion for helping involved simply holding up an item. As can be seen in the figure, no helping responses were emitted during baseline in the presence of stimuli that should occasion a helping response or in the presence of stimuli that should no for any of the children. During treatment, few helping responses were emitted non-contextually during the first two treatment sessions. For example, Irene emitted a verbal helping response during 10% of the trials and Tom, Eddie and Nathan did not emit a non-contextual helping response. During the first two treatment sessions, the percentage of trials in which the children emitted a helping response contextually was low. As the percentage of trials in which a child emitted a helping response contextually increased, the percentage of trials in which they produced a helping response non-contextually also increased. After approximately 10 treatment sessions had elapsed, the data indicate that the children began to discriminate stimuli that occasion a helping response from discriminative stimuli that should not.

Table 16 shows the total number of occasions in which each child engaged in a non-contextual helping response during the first five baseline sessions, treatment sessions 1-5, and treatment sessions 6-10. As seen in Table 16, there were no non-contextual helping responses emitted during the first 5 baseline sessions by any child. For Irene and Eddie, a non-contextual helping response was emitted on a total of eight and nine occasions, respectively, during treatment sessions 1-5 but never during treatment sessions 6-10. Tom emitted a non-contextual helping response on nine occasions during treatment sessions 1-5 but only once during treatment sessions 6-10. Finally, Nathan emitted a non-contextual helping response on 12 occasions during treatment sessions 1-5 and twice during treatment sessions 6-10. These data show that there was a systematic reduction in the number of non-contextual helping responses as treatment progressed. Also, during all pre- and post-intervention measures, the frequency with which non-contextual helping was emitted was zero for all children.

Analysis of Pre- and Post-Intervention Measures

Seven pre- and post-intervention measures were conducted to determine the extent to which appropriate helping behavior that was occasioned by the trained discriminative stimuli presented by the experimenter in the experimental sessions classroom would also be occasioned by novel discriminative stimuli, in a novel setting, presented by a novel instructor. These seven measures were (a) non-trained category, novel category, novel setting, and novel instructor, (b) trained category, novel setting, and novel instructor, (c) novel setting and novel instructor, (d) non-trained category, novel category, and novel setting, (e) trained category and novel setting, (f) novel setting, and (g) novel category. The percentage of trials in which a child emitted a combined correct verbal and motor response under each of these seven conditions is presented in Table 17 for Irene, Tom, Eddie and Nathan, respectively. In the table, the sessions conducted prior to intervention are indicated by the prefix "pre" and the sessions conducted at the completion of the study are indicated by the prefix "post." The combined verbal and motor response, verbal response alone, and motor responses alone are represented by the labels "verb+motor," "verbal," and "motor, respectively. The first column, labeled "condition," refers to the type of pre- and post-intervention measure. The column labeled "number of trials" refers to the number of trials presented for that measure. The column labeled "session number" refers to the session number for the pre- and post-intervention sessions.

Collectively, the four tables show that during the presentation of the pre-intervention measures, none of the students emitted a correct combined motor and verbal response, a motor response alone, or verbal response alone. Following the conclusion of treatment, however, the percentage of correct combined motor and verbal responses, motor responses, and verbal responses all increased for all children across all seven post-intervention measures. These data show that following treatment, appropriate helping behavior was occasioned by novel stimuli, in a novel setting, presented by a novel instructor.

Another interpretation of these data can be made by examining the cumulative number of errors emitted by each child. An examination of each child's post-intervention session shows that no child ever emitted more than one error per session. As seen in the fifth column of the table, collapsed across the seven measures, no more than two errors were made by any child for the combined motor and verbal responses during the first post-intervention session. Specifically, Irene emitted no errors, Tom emitted two errors, Eddie emitted one error, and Nathan emitted no errors. For all the second post-intervention sessions, Irene did not emit any errors, Eddie and Tom emitted one, and Nathan emitted a total of two errors. For the all the third post-intervention sessions Irene did not emit any errors, Eddie emitted one, and Tom and Nathan each made a total of two errors.

These data are further summarized in Table 18 as the mean percentage of correct combined motor and verbal responses per post-intervention sessions collapsed across all seven measures. These data were calculated by dividing the totals number of correct trials across conditions by the total number of trials across conditions. For example, Tom responded correctly during 37 of 38 trials for the first post-intervention session. Thus, his overall percentage of correct combined motor and verbal responding was 94.7%. Table 18 shows that the minimum percentage of correct combined motor and verbal responses collapsed across all seven measures for each of the three post-intervention sessions was 94.7%. These data also show that appropriate helping behavior occasioned by the discriminative stimuli used in training also occurred in the presence of novel stimuli, in a novel setting, and presented by a novel instructor following treatment.

Analysis of Social Validity Measures

One social validity measure was conducted to determine whether outside observers scored increases in correct verbal and motor helping responses emitted by children with autism when comparing pre- and post-treatment matched helping episodes. The mean percentage of treatment episodes that were rated by college students as more helpful than the baseline episodes was 100% for Irene. The mean percentage of treatment episodes that were rated as more helpful than the baseline episodes was 99.4% for Tom with a range of 90% to 100%. The mean percentage of treatment episodes that were rated as more helpful than the baseline episodes was 98.3% for both Nathan and Eddie, with a range of 90% to 100%. These data confirm that the children with autism in the present study emitted more appropriate helping behavior following intervention.

To ascertain whether the motor and verbal helping responses of the children with autism were typical of those emitted by age-matched children of typical development, a second social validity measure was conducted. The mean percentage of Irene's videotaped episodes that was scored by college students as containing an appropriate verbal and motor helping response was 99.5% with a range of 90% to 100%. The mean percentage of her age-matched peer's episodes scored as containing an appropriate verbal and motor helping response was 99% with a range of 90% to 100%. A related-samples t test revealed that there was no significant difference between the number of videotaped episodes scored as appropriate between these two individuals, t (19) = -0.56, p>0.05. The mean percentage of videotaped episodes scored as containing an appropriate verbal and motor helping response for Tom was 99% with a range of 90% to 100%. The mean percentage of episodes scored as containing an appropriate verbal and motor helping response for his age-matched peer was 99.5% with a range of 90% to 100%. Again, there was no significant difference between the number of episodes rated as appropriate between these two individuals, t (19) = 1.0, p>0.05. The mean percentage of Eddie's videotaped episodes scored as containing an appropriate verbal and motor helping response was 98% with a range of 80% to 100%. The mean percentage of episodes scored as containing an appropriate verbal and motor helping response for his age-matched peer was 99.5% with a range of 90% to 100%. Once again, there was no significant difference between the number of episodes rated as appropriate between these individuals, t (19) = 1.37, p>0.05. Finally, the mean percentage of Nathan's videotaped episodes scored as containing an appropriate verbal and motor helping response was 97.5% with a range of 80% to 100%. The mean percentage of his age-matched peer's episodes rated as containing an appropriate verbal and motor helping response was 99.5% with a range of 90% to 100%. There was no significant difference between the number of episodes rated as appropriate between these individuals, t (19) = 1.71, p>0.05.

Procedural Reliability

To assure procedural reliability across all experimental sessions, the following measures were calculated: (a) the percentage of trials during which the correct nonverbal stimulus was presented, (b) the percentage of trials during which the correct verbal and affective stimulus was presented, (c) the percentage of trials during which the error-correction procedure was contingently and correctly implemented, (d) the percentage of trials during which reinforcement was contingently delivered, (e) the number of training and probe trials presented per session and (f) the number of tokens delivered per session. These data are presented in Tables 19-21. Table 19 shows the mean percentage of all trials in which the appropriate discriminative stimuli were presented. As can be seen in the table, the nonverbal discriminative stimuli were presented accurately on 100% of the training, probe, pre-intervention, and post-intervention trials for all children. The mean percentage of the accurate presentation of the verbal and affective discriminative stimuli was minimally 94.3% across all trial types and all experimental conditions.

To assess the accurate use of the teaching procedures, the contingent and correct use of the error-correction procedure and reinforcement was assessed. These data are summarized in Table 20. For all baseline sessions, the error-correction procedure was never implemented for incorrect responses nor was reinforcement provided contingently for correct responses. For all treatment sessions, the error-correction procedure was implemented correctly and contingently on the occurrence of an incorrect verbal and motor response on at least 98.9% of the training trials. The error-correction procedure was never implemented for the probe trials for any child. Reinforcement was provided for a minimum of 96.7% of correct training trials and at most for 0.51% of the probe trials. For the pre- and post-intervention measures, neither the error-correction procedure nor reinforcement was implemented during any of the pre-intervention trials. The error-correction procedure was also never implemented on any of the post-interventions trials for any child. Reinforcement was provided for a maximum of 0.002% of the post-intervention trials for Irene and for 0% of the post-intervention trials for the other three children. Thus, these data demonstrate that the reinforcement and error-correction procedures were implemented as programmed.

Interobserver agreement for the accuracy of the number of training and probe trials presented each session for all conditions was also calculated for each child. Agreement was 100% across all experimental conditions and children. These data show that the number of training and probe trials was accurately presented for each child.

For all children, the mean number of tokens provided per session was also calculated across all experimental conditions. These data can be found in Table 21. The mean number of tokens provided varied from 15.8 to 16.0 for the baseline sessions, from 15.4 to 15.7 during treatment sessions, and from 14.8 to 16.0 for all pre- and post-intervention measures. These data show that no particular experimental phase differed from any other in terms of amount of reinforcement provided. As such, any differences in correct helping responses within the different experimental phases cannot be attributed to differences in reinforcement density within that the phase.

Discussion

The purpose of the present study was to determine the extent to which children with autism could learn to engage in appropriate verbal and nonverbal helping responses taught using a video modeling, prompting, and reinforcement treatment procedure. Prior to their participation in this study, the four children with autism engaged in very few or no helping responses. Following the successive implementation of the teaching procedure, video models, verbal prompts, manual prompts, and reinforcement, all four children successfully and rapidly learned to emit appropriate verbal and motor helping responses in the presence of non-verbal, verbal, and affective discriminative stimuli during training trials drawn from four different helping categories. In addition, generalization of these verbal and motor helping responses was observed in the presence of non-trained discriminative stimuli during probe trials drawn from both the non-trained categories and trained-category. Finally, the verbal and motor helping responses also increased in the presence of novel stimuli, in a novel setting, and with a novel instructor, as seen during the seven pre- and post-intervention measures. The implications of each of these findings will be discussed below.

Effectiveness of Treatment Procedure on Combined Motor and Verbal Responding

With the successive introduction of treatment across the four participants, there were systematic increases in correct combined motor and verbal responding during both the training and probe trials. The increases in the percentage of trials containing a correct motor and verbal response were observed only for participants under the treatment phase. Thus, these increases were unlikely to be the result of any historical or external variables (Kazdin, 1982). Rather, the increases in correct helping responses can be inferred to be the direct result of the implementation of the teaching procedure. Specifically, correct responses were modeled and prompted until independent responding occurred in the presence of the discriminative stimuli for each trial. These independent responses were then immediately followed by the delivery of verbal and tangible consequences. The arrangement of training contingencies among the experimenter-presented discriminative stimuli, helping responses, and reinforcement led to the development of a high degree of stimulus control exerted by the discriminative stimuli in each specific helping episode. As such, prosocial behavior in general, and helping behavior in particular, may be viewed as a type of operant behavior. Further, in the natural environment, such behavior may be established and maintained by contingencies of reinforcement in specific social communities (Skinner, 1957). This account of prosocial behavior allows for the identification of the functional relationship among prosocial behavior and specific antecedent and consequential stimuli (Schlinger, 1995). In turn, such an analysis should lead to the development of additional teaching strategies to ameliorate the deficit observed in prosocial behavior among children with autism, rather than to declare it a life-long deficit predicted by the diagnosis of autism.

The appropriate combined verbal and motor helping responses emitted by the children in the present study did not occur only in the presence of the trained discriminative stimuli. Appropriate helping responses were also emitted in the presence of the discriminative stimuli presented during probe trials. This is an important finding because it demonstrates that the effects of treatment during training trials generalized to probe trials in which no explicit teaching or reinforcement was available. Such a generalized repertoire is important because it may increase the conditions under which a child can engage in such behavior, hence increasing the opportunities for a child to engage in the behavior (Sailor, Guess, & Baer, 1973). Additionally, according to Cooper et al. (1987), a behavior change is maximally effective and functional when the behavior is emitted across settings and in various ways.

During training, reinforcement was delivered contingently on correct, independent motor and verbal helping responses that occurred in the presence of these discriminative training stimuli. Therefore, the children learned that these particular stimuli set the occasion for reinforcement. The occurrence of verbal and motor helping responding in the presence of probe stimuli suggests that the helping responses emitted by the children were not under the control of the training discriminative stimuli alone. Rather, these responses were also under the control of stimuli that functionally and/or physically resembled the trained discriminative stimuli (Bijou & Baer, 1961; Catania, 1992). This occurrence is therefore an example of operant stimulus generalization. Such generalization is often facilitated by the use of many training stimuli that are similar along relevant dimensions but different along irrelevant dimensions (Bijou, 1993; Stokes & Baer, 1977). This principle may have contributed to the high levels of generalization demonstrated by the children in the present study because each child was provided with many different exemplars of helping drawn from four different helping categories during training. For example, all the nonverbal discriminative stimuli across different experimenter-defined categories involved the experimenter engaging in particular types of common responses with familiar objects. Essentially, these non-verbal discriminative stimuli provided a model of the motor helping response for the child with autism. The examples drawn from within each experimenter-defined category were similar to one another in that each of these examples involved engagement in a topographically similar response across several different stimuli. For example, all the cleaning trials involved wiping a surface using topographically similar motions (i.e., wiping). The stimuli that required wiping, however, varied (a desk, table, chair, wipe-off board, and blackboard).

The many verbal discriminative stimuli provided by the experimenter were similar across helping episodes in that each contained an exclamation statement followed by a description of what the experimenter was going to do or a comment about what happened. The affective stimuli were also similar across helping episodes in that the experimenter always engaged in some type of frustration response (e.g., sighing or rolling eyes). This use of multiple exemplar training in the present study may have contributed to the high degree of generalization observed for the helping responses in the present study.

Several other factors may have contributed to the high degree of generalization from training to novel conditions. Specifically, there was a high ratio of training to probe trials per session (approximately 3:1). This high ratio was important because it provided a relatively high density of reinforcement. On average, an opportunity for reinforcement occurred during approximately 3 out of 4 trials, thereby reducing the likelihood of extinction of the helping responses. In addition, precautions were taken to intersperse probe trials among training trials throughout a session. Both trial types were also initiated in the same fashion; each began with the presentation of non-verbal, verbal, and affective discriminative stimuli. There was also no indication from the presentation of these stimuli whether reinforcement (and/or teaching) would be provided. Therefore, a child was unlikely to discriminate a probe from a training trial. Collectively, these factors may have contributed to the resulting high degree of generalization of helping responses.

Although each child acquired all 16 of the combined verbal and motor helping responses during training trials, there was individual variability in the speed at which they were acquired. This finding was also consistent during the probe trials. Although it is difficult to speculate as to why these individual differences occurred, one possibility, however, may concern the low frequency of direct instructions used in the present study. For much of their daily school instruction, the children in this study had a great deal of practice complying with direct instructions. Learning to respond in the absence of direct instruction, however, requires that a child first learns to spontaneously attend to various discriminative stimuli that set the occasion for responding. According to Charlop, Schreibman, and Thibodeau (1985), teaching a child with autism to spontaneously engage in a response can be challenging. They define spontaneity as a response made in the presence of nonverbal discriminative stimuli but in the absence of instructive verbal discriminative stimuli, or direct instruction. In the case of helping, an example of a direct instruction would be asking "Tom, can you pick these up for me?" In the present study, no direct instruction was provided to a child prior to the presentation of the verbal and nonverbal discriminative stimuli. That is, there was no "get ready something important is about to follow" signal. The presentation of the non-verbal, verbal, and affective discriminative stimuli occurred whether the child was attending to the experimenter or not. The only consequence to not attending to the instructor when the discriminative stimuli were presented was that the child missed the opportunity for reinforcement. It is possible therefore, that certain children might have needed longer to learn this contingency and to spontaneously attend to the instructor in this type of situation. This, in turn, may have increased the number of sessions required to learn the combined verbal and motor helping responses.

Effectiveness of Treatment On Motor Responding Alone and Verbal Responding Alone

The successive introduction of treatment across the four participants resulted not only in systematic increases in correct combined verbal and motor responses. It also resulted in systematic increases in correct verbal responding and motor responding when each was considered separately. Such a measure was obtained to determine whether any child required a greater amount of training to learn one of these responses relative to the other. It should presumably be more likely that a child would learn each response in isolation prior to learning them in combination. It also seems likely that the verbal response should be learned more easily than the motor responses given that the latter were certainly more varied and complex than the former.

Surprisingly, the results of the present study showed that there was no real discrepancy among the acquisition of the combined motor and verbal response, the verbal response alone, and the motor response alone for three of the four children (Irene, Eddie, and Nathan). Tom was the exception in that he required more sessions to acquire the motor response as compared to the verbal response. Several possible explanations exist for the discrepancy between Tom's acquisition of motor and verbal responding. One possibility may have to do with the level of attention paid by Tom to the completion of the specific helping tasks. Informal observations indicated that Tom was often distracted by the helping-episode items in that he sometimes would not put the objects down. As a result, he was unable to complete the task. This may have resulted in a greater number of sessions required for Tom to acquire the motor responses alone, and therefore, the combined motor and verbal responses.

Combined Motor and Verbal Responding During the Different Types of Probe Trials

The two types of probe trials presented during experimental sessions assessed the degree of generalization of helping responses from the trained to non-trained discriminative stimuli. A high degree of generalization was observed in that the percentage of trials in which a correct combined verbal and motor response occurred approached or reached 100% for both trained-category and non-trained-category probes. Interestingly, the percentage of trials in which a correct combined verbal and motor response occurred was slightly higher for the non-trained-category probes across the entire treatment condition for three of the four children (Tom, Eddie, and Nathan). That is, when an error was emitted during probe trials, it was more likely to be emitted during trained-category probes than during non-trained-category probes. In addition, for three of the children (Irene, Eddie, and Nathan), the number of sessions required to achieve a mastery level of performance was greater for the trained-category probes than it was for the non-trained-category probes.

It can be argued that requiring more sessions to learn the non-trained probes than the trained probes is counterintuitive. Given the functional and physical similarity among helping episodes within an experimenter-defined category (e.g., a wiping arm motion using a rag on a soiled surface), a faster acquisition and greater degree of generalization would be expected for trained-category probes than for non-trained-category probes. Why, then, did the opposite occur? One possibility is that the non-trained-category probes may have been comprised of less complex episodes, and were thus more easily and quickly learned. This argument, however, can be ruled out because the categories from which non-trained-category probes were derived were counterbalanced across the four children. That is, the non-trained-category probes used for two children were the trained-category probes used for the other two children. This implies that the nature of the different probe trial types, rather than the specific category used, led to the small discrepancy in performance. Future research is required to identify what these component trial variables are.

Responding As a Function of Helping Categories

To determine whether there were any systematic differences in responding as a function of the six different categories used during experimental sessions, the cumulative number of verbal response errors and motor response errors emitted per category was calculated separately for each child's first 10 treatment sessions during both training and probe trials. Collapsed across all children, the data showed that the category that occasioned the fewest number of errors was "locating" for the training trials and "cleaning" and "putting away" for the probe trials. The category that occasioned the greatest number of errors was "carrying" for the training trials and "setting up" for the probe trials. This finding suggests that no single category contained systematically more difficult trials than the others. Likewise, no single category contained systematically less difficult trials than the others.

What small differences that did exist in errors per category may be attributed to the prior learning histories that each child had with each type of task during typical home and/or school instruction. For example, all four children were normally exposed to tasks involving locating and putting away items in the full-day activity schedules used throughout their school day. Prior to all academic tasks, the children are prompted through the use of their activity schedules to locate and obtain the stimulus materials required for specific academic activities. Upon task completion, the children are further prompted by their schedules to put away the stimulus materials. Such school instruction may have thus resulted in the reduction of errors occasioned by trials drawn from these categories in the present study. In contrast, the children may have had limited prior exposure to a setting-up task in the school setting. In future research, these prior learning histories should be quantified to determine whether they are associated with correct responding during tasks of this type.

Effectiveness of Video Modeling

During treatment, when a child did not emit a correct combined verbal and motor helping response, the video model, and verbal and/or motor prompts error-correction procedure was implemented. The results indicated that for each child, there was a much greater frequency of video model presentation than motor and verbal prompts. Thus, the presentation of video models alone was often sufficient to occasion correct combined verbal and motor responding on subsequent presentations of the discriminative stimuli for each helping episode. This finding should not be surprising given that video modeling had previously been shown to be an effective procedure for teaching other skills to these participants in their daily school activities. The effectiveness of the video models in the present study, however, does provide an effective demonstration of teaching a generalized skill, in addition to that provided by Charlop and Milstein (1989).

Furthermore, it provides evidence that exposing a child to a video model of a peer of typical development can be effective in teaching a skill to a child with autism. One account for the effectiveness of peer models presented on video may involve the principle of observational learning. According to Novak (1996), observational learning may occur as a result of a history of interaction in which the child has developed a generalized imitative repertoire (Baer & Sherman, 1964; Poulson & Kymissis, 1988). Novak further states that behavior matching a model's behavior is frequently reinforced by the consequences the imitator's behavior produces. In the present study, the children observed the peer model ask to help and subsequently engage in a helping task with the experimenter. When the child then emitted the same helping behavior, this behavior was presumably reinforced by engagement in the task. Thus, a model's behavior is more likely to be imitated when this behavior is a discriminative stimulus for direct consequences to the imitator's behavior.

In the present study, it was never necessary to prompt a child to attend to the video model. In fact, informal observations indicated that all of the children responded very favorably to the videos. Irene, for example, at times said "Wow, cool video." Tom often asked whether he could "see the kids." Thus, there was interest in observing the peer model. Future research might investigate the use of video models of peers of typical development to teach additional prosocial responses, such as sharing or empathy, to children with autism.

Non-Contextual Helping

Interspersed throughout experimental sessions were discriminative stimuli that were not programmed to set the occasion for helping. These were presented to measure a child's discrimination between stimuli setting the occasion for helping and those that do not. The data demonstrated that there was a systematic reduction in the number of non-contextual helping responses as treatment progressed. This indicates that children with autism are able to learn the discrimination between stimuli setting the occasion for helping and those that do not. The data also indicated that after five experimental sessions, the children rarely engaged in a non-contextual helping response. Thus, the discrimination was learned rapidly. These data are important because they imply that deficits in prosocial behavior typically observed in children with autism are not due to an inability to discriminate among helping and non-helping situations. Rather, appropriate training should result in a child's acquisition of this skill.

To acquire the discrimination between helping and non-helping episodes, it was important that the dimensions of the helping episodes were made more salient for the children who participated. This may have occurred over the course of treatment because the trained helping episodes were associated with reinforcement for helping responses. In addition, these trials alone were associated with the error-correction procedure. The non-helping episodes were never associated with reinforcement or the error-correction procedure if a helping response was emitted non-contextually.

In addition, the non-verbal behavior of the experimenter was different in the non-contextual helping episodes than in the training trials. For example, in the training trials after the experimenter presented the verbal and affective discriminative stimulus, she then began to engage in the motor movements specific to that particular helping episode. During the non-contextual helping episodes, after the experimenter presented the verbal discriminative stimulus, the experimenter did not engage in any further motor movements.

Pre- and Post-Intervention Measures

Seven pre- and post-intervention measures were conducted to determine the extent to which appropriate helping behavior was seen in the presence of novel stimuli, a novel setting, and a novel instructor. During the presentation of the pre-intervention measures, none of the students emitted a correct combined motor and verbal response, a motor response alone, or verbal response alone. Thus, no spontaneous helping behavior was present. This finding also confirms the lack of spontaneous helping behavior observed during the baseline phase of the present study. Following the conclusion of treatment, however, the percentage of correct combined motor and verbal responses, motor responses, and verbal responses greatly increased for all children across all seven post-intervention measures. Thus, each child emitted appropriate helping responses in the presence of discriminative stimuli that were never associated with teaching or reinforcement in the present study. In addition, these discriminative stimuli were presented by a novel instructor in a novel setting, both also never having been associated with teaching or reinforcement contingencies for helping.

The high levels of correct responding emitted in the presence of a novel instructor and in a novel setting during the post-intervention measure sessions may be attributed to the specific aspects of the training protocol used. Specifically, training sessions were conducted once every 8 sessions in a second setting that was different from the one typically used during experimental sessions. Once every 10 sessions, these training sessions were also conducted by a second experimenter who was different from the individual who typically conducted experimental sessions. Thus, directly training a response to occur with multiple instructors and in multiple settings increased the likelihood that the response would occur in a setting and with an instructor not previously associated with teaching (Stokes & Baer, 1977).

Further evidence attesting to the effectiveness of the treatment procedure was provided by anecdotal accounts contributed by the children's usual school instructors. These instructors informally reported that all four of the children who participated in the present study periodically emitted the helping responses they learned during treatment in other non-trained school settings, including group and individual teaching sessions. It is interesting to note that none of these instructors had access to any of the actual nonverbal, verbal, or affective discriminative stimuli used during treatment sessions with these children. The discriminative stimuli that informally occasioned a helping response most often by all four children was the dropping of an item by a teacher while he or she made some type of sigh and verbalization such as "oh no, I dropped that." It was also reported that Tom and Eddie emitted a helping response in the absence of verbal discriminative stimuli. It is important that these responses also occurred under natural conditions because this may have increased the children's opportunity to engage in social behavior and to gain access to reinforcement in the natural environment.

Social Validity Measures

Two social validity measures were obtained in the present study. One measure was used to determine whether naïve raters observed a difference in each child's helping behavior after teaching was conducted. The data indicated that the children's responses in the treatment episodes were more helpful than those in the baseline episodes. The consistent scores across the college student raters indicated that the change measured from baseline to treatment was clearly socially valid.

The second social validity measure indicated that there was no significant difference between the prosocial behavior of the children with autism and their age-matched peers of typical development. This finding was consistent across all children participants. It is important, however, to qualify this comparison. As previously described, the children of typical development were told that if they wanted to help the experimenter they should ask "May I help?" Therefore, based on verbal content alone it would not be surprising that the children with autism and typical development were rated as indistinguishable. The only difference in the verbal responses between these two groups of children may have been the manner in which the phrase was verbalized. That is, differences could have existed in the use of inflection, voice volume, affect, and/or eye contact. The motor responses of the children of typical development and children with autism, however, were being directly compared during this social validity measure, as were the situations in which the children engaged in helping behavior.

Future Areas of Research

In the current study, four examples from each of four helping categories were used to teach children with autism to engage in appropriate helping responses. Future research efforts should be aimed at identifying the most efficient manner to teach such a repertoire of helping behavior. Specifically, a parametric variation of the present study could be conducted in which the ratio of training to probe trials, the number of categories, and/or the number of training trials are manipulated. Given that skill acquisition was so rapid in the present study, in seems unlikely that additional increases in acquisition speed would occur by the addition of more training trials or categories, or by increasing the ratio of training to probe trials. This tactic, however, may increase the strength of the generalized helping repertoire by making it more long-term and stable. It is unknown whether reductions in acquisition speed would occur by reductions in the number of training trials and categories or by decreasing the ratio of training to probe trials. In addition, future research should also be aimed at using more natural teaching paradigms, such as incidental teaching (Hart & Risley, 1975), to further facilitate generalization of the prosocial behavior from training to novel situations.

Prior to participation in the present study, all the children had previously acquired some generalized verbal and motor imitative repertoires, as well as some spontaneous language and conversational speech. It is likely that such skills were beneficial for learning to respond correctly during helping episodes. Future research should be conducted to identify the minimum levels of prerequisite skills that children with autism need to have before they are able to consistently engage in prosocial behavior.

In the present study, the children with autism were exposed to peers of typical development as video models. Given proper training, however, peers of typical development have been shown to be effective live models and even “teachers” for children with autism (Kohler et al., 1995; Strain et al., 1979). Peers of typical development can also effectively maintain prosocial responding (Kamps et al., 1992). It would be interesting to determine whether early intervention efforts for children with autism that include prosocial behavior training with peers would produce a generalized imitative repertoire of prosocial behavior. If children with autism could learn a generalized imitative repertoire of prosocial behavior from their peers, and learn to engage in this behavior with their peers, this skill would be more likely to be maintained and further developed.

Finally, future areas of research should include follow-up training and measures of maintenance of the newly acquired prosocial behavior emitted by children with autism. Success in such research, however, may be a challenge. Because young children are not typically as competent or efficient in many tasks in which adults frequently engage (e.g., cleaning or carrying items), adults may often find that they are able to complete a particular task more efficiently and quickly by preventing the child from helping, whether the child has autism or not. As such, it is important to provide adults with training that stresses the importance of consistently providing opportunities for children with autism to engage in helping. The ultimate benefit for both the child with autism and the adult is not the completion of a specific task, but rather an opportunity to engage in reciprocal social interaction (Rheingold, 1982).

Conclusion

The results of the present study suggest that social programs for children with autism should include training in prosocial behavior. Although the children in this study exhibited little or no prosocial behavior prior to treatment, the systematic application of video modeling, prompting and reinforcement allowed these children to learn to use both motor and verbal helping responses in the training situation and in novel situations. Furthermore, the children demonstrated a generalized repertoire of helping behavior as demonstrated by their ability to respond with appropriate helping behavior to novel verbal and nonverbal discriminative stimuli from novel categories of helping. Such skills are beneficial for a child with autism for several reasons. First, children who engage in prosocial behavior tend to be viewed by adults as more socially competent (Eisenberg et al., 1996; Peterson, Ridley-Johnson, & Carter, 1984). Second, teaching a child with autism to engage in prosocial behavior may increase the likelihood of that child becoming more socially rewarding to the adult. The adult may then be more likely to interact with the child with autism (Charlop & Walsh, 1986; Harris et al., 1990). Finally, increased social interactions provided for the child with autism may result in additional access to social reinforcement. This, in turn, should increase the likelihood that the child will engage in additional social behavior (Lovaas et al., 1973; Lovaas, 1981), thereby reducing the deficits in social behavior prevalent in the diagnosis of autism (Wing, 1988).

Table 1

Eight Possible Categories of Verbal and Nonverbal Discriminative Stimuli and the Corresponding Responses.

Response Category	Nonverbal Discriminative Stimuli: General Description	Nonverbal Discriminative Stimuli	Verbal Discriminative Stimuli	Affective Discriminative Stimuli	Motor Response (Dependent Measure)	Verbal Response (Dependent Measure)
Cleaning	Termination of an activity, resulting in a messy surface area. Adult begins to wipe the surface.	1. Wiping a black board 2. Wiping a wipe off 3. Wiping a desk 4. Wiping a chair 5. Wiping a table	1. "Oh, Time to clean the black board." 2. "Boy, how did this get messy?" .3 "Oops, I have to clean this desk." 4. "Uh oh, What a dirty chair." 5. "Wow, this table is messy."	1. Shaking head 2. Rolling eyes 3. Sighing 4. Wrinkling brow 5. Eyes wide open	1. Wiping a black board 2. Wiping a wipe off board 3. Wiping a desk 4. Wiping a chair 5. Wiping a table	"May I help?"
Replacing broken materials	Child at table, teacher begins preparing for an activity that involves the use of various materials. Some materials are broken or unable to be used and teacher searches for unbroken materials.	1. Searching for unbroken paintbrushes 2. Searching for unbroken forks 3. Searching for unbroken pencils 4. Searching for unbroken crayons 5. Searching for non-torn paper	1. "Oh, this paintbrush is broken." 2. "Wow, how did this break?" 3. "Boy, this pencil won't work." 4. "Uh-oh, this crayon won't work." 5. "Oops, this paper is torn."	1. Shaking head 2. Rolling eyes 3. Sighing 4. Wrinkling brow 5. Eyes wide open	1. Searching for un-Broken paintbrushes 2. Searching for unbroken forks 3. Searching for unbroken pencils 4. Searching for un-Broken crayons 5. Searching for non-torn paper	"May I help?"

Table 1 (continued)

Response Category	Nonverbal Discriminative Stimuli: General Description	Nonverbal Discriminative Stimuli	Verbal Discriminative Stimuli	Affective Discriminative Stimuli	Motor Response (Dependent Measure)	Verbal Response (Dependent Measure)
Picking up objects	Adult accidentally drops objects and then picks these objects up.	1. Picking up paper clips 2. Picking up coins 3. Picking up language master cards 4. Picking up picture cards 5. Picking up computer discs	1. "Oops, I dropped them." 2. "Wow, they fell." 3. "Boy, did I make a mess." 4. "Oh, I have to pick these up." 5. "Uh-oh, they're on the floor."	1. Shaking head 2. Rolling eyes 3. Sighing 4. Wrinkling brow 5. Eyes wide open	1. Picking up paper Clips 2. Picking up money 3. Picking up lm cards 4. Picking up noun cards 5. Picking up computer discs	"May I help?"
Sorting Materials	Termination of an activity resulting in a table containing many materials. Adult begins putting these materials into their appropriate containers	1. Sorting scissors & Glue 2. Sorting red & blue Markers 3. Sorting purple & yellow sticks 4. Sorting forks & Spoons 5. Sorting paper & paintbrushes	1. "Uh-oh, what a mess." 2. "Wow, these markers have to be separated." 3. "Boy, these sticks don't go together." 4. "Oh, these don't belong together." 5. "Oops, gotta clean up."	1. Shaking head 2. Rolling eyes 3. Sighing 4. Wrinkling brow 5. Eyes wide open	1. Sorting scissors and glue 2. Sorting blue and red markers 3. Sorting purple & yellow sticks 4. Sorting forks and spoons 5. Sorting paper and paintbrushes	"May I help?"

Table 1 (continued)

Response Category	Nonverbal Discriminative Stimuli: General Description	Nonverbal Discriminative Stimuli	Verbal Discriminative Stimuli	Affective Discriminative Stimuli	Motor Response (Dependent Measure)	Verbal Response (Dependent Measure)
Locating Objects	Adult drops an object and searches for it	1. Searching for a ball 2. Searching for jar of paint 3. Searching for marble 4. Searching for a pencil 5. Searching for a puzzle piece	1. "Oh no, I can't find the ball." 2. "Oops, I lost my paint." 3. "Boy, where did that marble go?" 4. "Oh, where's that pencil?" 5. "Wow, where could that puzzle piece be?"	1. Shaking head 2. Rolling eyes 3. Sighing 4. Wrinkling brow 5. Eyes wide open	1. Searching for a ball 2. Searching for a jar of paint 3. Searching for a marble 4. Searching for a pencil 5. Searching for a puzzle piece	"May I help?"
Carrying objects	Adult picks up many objects and has difficulty carrying them from one end of the room to other	1. Carrying books 2. Carrying puzzles 3. Carrying clothing 4. Carrying board games 5. Carrying see & says	1. "Uh-oh, these books are heavy." 2. "Oh, there are so many puzzles." 3. "Boy, this is hard." 4. "Wow, these weigh a lot." 5. "Oops, I can't carry all of these."	1. Shaking head 2. Rolling eyes 3. Sighing 4. Wrinkling brow 5. Eyes wide open	1. Carrying books 2. Carrying puzzles 3. Carrying clothing 4. Carrying board games 5. Carrying See & Says	"May I help?"

Table 1 (continued)

Response Category	Nonverbal Discriminative Stimuli: General Description	Nonverbal Discriminative Stimuli	Verbal Discriminative Stimuli	Affective Discriminative Stimuli	Motor Response	Verbal Response
Putting items away	Adult begins putting away an activity that has previously terminated by placing items on a shelf.	1. Putting board games on the shelf	1. "Oh no, I have to put these games away."	1. Shaking head	1. Putting Legos on the shelf	"May I help?"
		2. Putting puzzles on the shelf	2. "Boy, these puzzles have to be put away."	2. Sighing	2. Putting cars on the shelf	
		3. Putting video tapes on a shelf	3. "Oops, these videos go over here."	3. Rolling eyes	3. Putting blocks on a shelf	
		4. Putting bricks on a shelf	4. "Oh, these bricks don't belong here."	4. Wrinkling brow	4. Putting color forms on a shelf	
		5. Putting books on a shelf	5. "Wow, there's lots of stuff on this table."	5. Eyes wide open	5. Putting characters on a shelf	
Setting Up an Activity	Adult begins to pass out materials for an activity about to begin.	1. Passing out juice boxes	1. "Uh-oh, I have to pass these juices out."	1. Shaking head	1. Passing out glue	"May I help?"
		2. Passing out cups	2. "Oh, these cups need to be passed out."	2. Rolling eyes	2. Passing out cups	
		3. Passing out napkins	3. "Wow, there are lots of napkins."	3. Wrinkling brow	3. Passing out napkins	
		4. Passing out scissors	4. "Boy, these scissors need to go to everyone."	4. Sighing	4. Passing out pencils	
		5. Passing out paper	5. "Oops, one piece of paper for everyone."	5. Eyes wide open	5. Passing out paper	

Table 2

Operational Definitions of Non-verbal Discriminative Stimuli Presented by Adult and Motor Responses Required by Child.

Response Category	Nonverbal Discriminative Stimuli	Motor Response
Cleaning	The adult placed a cloth in contact with a surface and engaged in either back-and-forth or circular arm movements for a minimum duration of 3 s.	The child placed a cloth in contact with a surface and engaged in either back-and-forth or circular arm movements until the adult stopped making that same motion.
Replacing Broken Materials	In all cases, there were 20 items, half were damaged, the other half were not. The adult picked out all 10 undamaged materials and placed them in a separate pile, basket, or bin.	The child picked out a minimum of three undamaged materials and placed them in a separate pile, basket, or bin.
Picking Up Objects	The adult dropped 20 objects. The adult then began to retrieve these objects and placed them in a basket or container.	The child retrieved at least three dropped objects and placed them in a basket or container.
Sorting Materials	In all cases, there were 20 items intermixed in one container, 10 of one type and 10 of another. The adult separated the items and placed each into its respective container.	The child placed a minimum of two of each item into its respective container.
Locating Objects	The adult dropped one item and began to look for it.	The child located the item, picked it up, and handed it to the adult.
Carrying Objects	There were 5-10 items. The adult picked up all objects and began to walk 3-5 m. After handing some objects to the child, the adult placed the remainder of the objects on a shelf, desk, or table top.	The child held out his/her hands, accepted 2-3 objects offered by the adult by grasping them with arms, walked 3-5 m. and placed the objects on the same shelf, desk, or table top, as did the adult.
Putting Items Away	There were 8-10 items placed on a table, chair, or on the floor. The adult placed each item onto a shelf located approximately 30 cm away.	The child placed at least two items onto a shelf located approximately 30 cm away.
Setting Up an Activity	There were four items and a table with four chairs located around the perimeter. The adult placed a maximum of two items on that table, each in front of a chair.	The child placed a minimum of two items on the table, each in front of a chair.

Table 3

Counterbalanced Assignment of Categories Across all Children.

	Irene	Tom	Eddie	Nathan
Trained	Locating Carrying Putting Away Setting up	Cleaning Replacing Picking Up Sorting	Putting Away Setting Up Cleaning Replacing	Picking Up Sorting Locating Carrying
Probe	Cleaning Replacing	Locating Carrying	Picking Up Sorting	Putting Away Setting up

Table 4

Training and probe trials for Irene, Tom, Eddie, and Nathan.

Child	Response Category	Trial Type	Non- Verbal Stimuli	Verbal Stimuli	Affective Stimuli
Irene	locating	training	searching for a ball	oh no I can't find the ball	shaking head
	locating	training	searching for a jar of paint	Oops I lost my paint	rolling eyes
	locating	training	searching for a puzzle piece	wow where could that puzzle piece be	eyes wide open
	locating	training	searching for a pencil	oh my pencil is missing	wrinkling brow
	locating	trained-category probe	searching for a marble	boy where did that marble go	sighing
	putting	training	putting video tapes on a shelf	oops these videos go over here	rolling eyes
	putting	training	putting books on a shelf	wow there's lots of stuff on this table	eyes wide open
	putting	training	putting bricks on a shelf	oh these bricks don't belong here	wrinkling brow
	putting	training	putting board games on the shelf	oh no, I have to put these games away	shaking head
	putting	trained-category probe	putting puzzles on a shelf	boy these puzzles have to be put away	sighing
	setting up	training	passing out juice boxes	"uh-oh, I have to pass these juices out"	shaking head
	setting up	training	passing out cups	oh these cups need to be passed out	rolling eyes
	setting up	training	passing out paper	oops one piece of paper for everyone	eyes wide open
	setting up	training	passing out napkins	wow there are lots of napkins	wrinkling brow
	setting up	trained-category probe	passing out scissors	boy these scissors need to go to everyone	sighing
	carrying	training	carrying puzzles	oh, there are so many puzzles	rolling eyes
	carrying	training	carrying books	uh-oh these books are heavy	shaking head
	carrying	training	carrying see & says	oops, I can't carry all of these	eyes wide open
	carrying	training	carrying board games	wow, these weigh a lot	wrinkling brow
	carrying	trained-category probe	carrying clothing	boy, this is hard	sighing
	cleaning	non-trained category probe	wiping a desk	oops, I have to clean this desk	sighing
	replacing	non-trained category probe	looking for unbroken pencils	Boy this pencil won't work	sighing

Table 4 (continued)

Child	Response Category	Trial Type	Non- Verbal Stimuli	Verbal Stimuli	Affective Stimuli
Tom	cleaning	training	wiping a black board	Oh, time to clean the black board	shaking head
	cleaning	training	wiping a chair	uh-oh, what a dirty chair	wrinkling brow
	cleaning	training	wiping a wipe off board	boy, how did this get messy	rolling eyes
	cleaning	training	wiping a desk	Oops, I have to clean this desk	sighing
	cleaning	trained-category probe	wiping a table	wow, this table is messy	eyes wide open
	picking up objects	training	picking up lm cards	Boy, did I make a mess	sighing
	picking up objects	training	picking up noun cards	oh, I have to pick these up	wrinkling brow
	picking up objects	training	picking up paper clips	oops, I dropped them	shaking head
	picking up objects	training	picking up money	wow, they fell	rolling eyes
	picking up objects	trained-category probe	picking up computer discs	uh-oh, they're on the floor	eyes wide open
	replacing	training	looking for unbroken paintbrushes	oh, this paintbrush is broken	shaking head
	replacing	training	looking for unbroken pencils	boy, this pencil won't work	sighing
	replacing	training	looking for unbroken forks	Wow, how did this break	rolling eyes
	replacing	training	looking for unbroken crayons	uh-oh, this crayon won't work	wrinkling brow
	replacing	trained-category probe	looking for non-torn paper	Oops, this paper is torn	eyes wide open
	sorting materials	training	sorting paper & paintbrushes	oops, gotta clean up	eyes wide open
	sorting materials	training	sorting purple & yellow sticks	Boy, these sticks don't go together	sighing
	sorting materials	training	sorting red & blue markers	wow, these markers have to be separated	rolling eyes
	sorting materials	training	sorting scissors and glue	uh-oh, what a mess	shaking head
	sorting materials	trained-category probe	sorting forks and spoons	oh, these don't belong together	wrinkling brow
	carrying objects	novel category probe	carrying see & says	Oops, I can't carry all of these	eyes wide open
	locating objects	novel category probe	searching for a puzzle piece	Wow, where could that puzzle piece be?	eyes wide open

Table 4 (continued)

Child	Response Category	Trial Type	Non- Verbal Stimuli	Verbal Stimuli	Affective Stimuli
Eddie	replacing	training	looking for unbroken forks	wow ,how did this break	rolling eyes
	replacing	training	looking for unbroken pencils	boy ,this pencil won't work	sighing
	replacing	training	looking for unbroken crayons	uh-oh, this crayon won't work	sighing
	replacing	training	looking for non-torn paper	oops, this paper is torn	eyes wide open
	replacing	trained-category probe	looking for unbroken paintbrushes	oh, this paintbrush is broken	shaking head
	putting	training	putting books on a shelf	wow, there's lots of stuff on this table	eyes wide open
	putting	training	putting video tapes on a shelf	oops, these videos go over here	rolling eyes
	putting	training	putting puzzles on a shelf	boy, these puzzles have to be put away	sighing
	putting	training	putting bricks on a shelf	oh ,these bricks don't belong here	wrinkling brow
	putting	trained-category probe	putting board games on the shelf	oh no, I have to put these games away	shaking head
	cleaning	training	wiping a chair	uh-oh, what a dirty chair	wrinkling brow
	cleaning	training	wiping a desk	oops, I have to clean this desk	sighing
	cleaning	training	wiping a wipe off board	boy, how did this get messy	rolling eyes
	cleaning	training	wiping a table	wow, this table is messy	eyes wide open
	cleaning	trained-category probe	wiping a black board	oh, time to clean the black board	shaking head
	setting up	training	passing out scissors	boy, these scissors need to go to everyone	sighing
	setting up	training	passing out paper	oops, one piece of paper for everyone	eyes wide open
	setting up	training	passing out napkins	wow ,there are lots of napkins	wrinkling brow
	setting up	training	passing out cups	oh ,these cups need to be passed out	rolling eyes
	setting up	trained-category probe	passing out juice boxes	uh-oh, I have to pass these juices out	shaking head
	picking up	non-trained-category probe	picking up paper clips	oops, I dropped them	shaking head
	sorting	non-trained category probe	sorting scissors & glue	uh-oh, what a mess	shaking head

Table 4 (continued)

Child	Response Category	Trial Type	Non- verbal stimuli	Verbal stimuli	Affective Stimuli
Nathan	locating	training	searching for a marble	boy, where did that marble go	sighing
	locating	training	searching for paint	oops, I lost my paint	rolling eyes
	locating	training	searching for a ball	oh no I can't find the ball	shaking head
	locating	training	searching for a puzzle piece	wow, where could that puzzle piece be	eyes wide open
	locating	trained-category probe	searching for a pencil	oh, my pencil is missing	wrinkling brow
	sorting	training	sorting red & blue markers	wow, these markers have to be separated	rolling eyes
	sorting	training	sorting purple & yellow sticks	boy, these sticks don't go together	sighing
	sorting	training	sorting paper and paintbrushes	oops, gotta clean up	eyes wide open
	sorting	training	sorting scissors and glue	uh-oh, what a mess	shaking head
	sorting	trained-category probe	sorting forks and spoons	oh, these don't belong together	wrinkling brow
	carrying	training	carrying puzzles	oh, there are so many puzzles	rolling eyes
	carrying	training	carrying see & says	oops I can't carry all of these	eyes wide open
	carrying	training	carrying books	oh-oh these books are heavy	carrying
	carrying	training	carrying clothing	boy, this is hard	sighing
	carrying	trained-category probe	carrying board games	wow, these weigh a lot	wrinkling brow
	picking up	training	picking up money	wow, they fell	rolling eyes
	picking up	training	picking up paper clips	oops, I dropped them	shaking head
	picking up	training	picking up computer discs	uh oh they're on the floor	eyes wide open
	picking up	training	picking up lm cards	boy did I make a mess	sighing
	picking	trained-category probe	picking up noun cards	oh, I have pick these up	wrinkling brow
	putting away	non-trained-category probe	putting bricks on a shelf	oh, these bricks don't belong here	wrinkling brow
	setting up (p)	non-trained category probe	passing out napkins	wow, there are lots of napkins	wrinkling brow

Table 5

<u>Teaching and Error-Correction Procedures.</u>

Teaching	Error Correction (Full Procedure)
Presentation of Discriminative Stimuli (non-verbal, verbal, and affective)	Presentation of Discriminative Stimuli (non-verbal, verbal, and affective)
↓	↓
Correct Verbal Response ("May I help?")	Incorrect Verbal and/or Motor Response
↓	↓
Experimenter Response ("yes, sure")	Presentation of Video Model
↓	↓
Correct Motor Response	Re-presentation of Discriminative Stimuli (non-verbal, verbal, and affective)
↓	↓
Reinforcement (token + praise)	Incorrect Verbal and/or Motor Response
↓	↓
End of Trial	Presentation of Motor and/or Verbal Prompts
	↓
	Re-presentation of Discriminative Stimuli (non-verbal, verbal, and affective)
	↓
	Correct Verbal and Motor Responses
	↓
	Reinforcement (token + praise)
	↓
	End of Trial

Table 6

List of Non-Helping Verbal and Non-Verbal Discriminative Stimuli Used for All Participants.

Non-Verbal Discriminative Stimuli	Verbal Discriminative Stimuli
Holding up a Mr. Potato Head	Oh, what a cool potato head!
Holding up a marker	Boy, isn't this a great marker?
Holding up a toy train	Wow, don't you love this train?
Holding up scissors	Wow, these are neat scissors!
Holding up Potato Chips	Oh, I love potato chips!
Holding up a book	Hey, this is a great book!
Holding up an etch a sketch	Boy, this is a tiny etch a sketch!
Holding up an Oreo	Hey, don't you love Oreos?
Holding up a puzzle	Oh, this is a cool puzzle!
Holding up a toy car	Wow, check out this cool toy!

Table 7

Random Presentation Order of the Pre- and Post-Intervention Measures for Each Child.

Child	Presentation Order of Pre- and Post-Intervention Measures						
Tom	1	4	6	2	7	3	5
Nathan	1	7	3	5	2	6	4
Irene	6	2	3	5	7	1	4
Eddie	5	6	2	4	3	1	7

Note: 1 = non-trained category, novel category, novel setting, and novel instructor
2 = trained category, novel setting, and novel instructor
3 = novel setting and novel instructor
4 = non-trained category, novel category, and novel setting
5 = trained category probe and novel setting
6 = novel setting
7 = novel category

Table 8

Counterbalanced Assignment of Novel Categories used During Pre- and Post-Intervention Measures for Each Child.

Child	Category
Tom	Putting Away Materials Setting Up
Nathan	Cleaning Replacing
Irene	Picking Up Items Sorting Items
Eddie	Locating Object Carrying Items

Table 9

Mean Percentage of Interobserver Agreement for Correct Verbal Responding , Motor Responding and Combined Correct Verbal and Motor Responding During Training and Probe, Trials for Each Child and During All Pre- and Post-Intervention Measures for Each Child.

		Experimental Condition					
Child	Response type	Baseline		Treatment		Pre- & Post-Intervention Measures	
		Training	Probe	Training	Probe	Pre Tests	Post Tests
Irene	Verbal	100.0	100.0	100.0	98.4	100.0	100.0
	Motor	100.0	100.0	98.7	98.4	100.0	100.0
	Verbal+motor	100.0	100.0	98.7	97.4	100.0	100.0
Tom	Verbal	100.0	100.0	99.3	97.6	100.0	100.0
	Motor	100.0	100.0	98.1	98.2	100.0	100.0
	Verbal+motor	100.0	100.0	96.6	95.9	100.0	100.0
Eddie	Verbal	100.0	100.0	98.0	98.9	100.0	100.0
	Motor	100.0	100.0	95.2	100.0	100.0	100.0.
	Verbal+motor	100.0	100.0	94.3	98.9	100.0	100.0
Nathan	Verbal	100.0	100.0	100.0	96.6	100.0	99.0
	Motor	100.0	100.0	98.8	96.6	100.0	100.0
	Verbal+motor	100.0	100.0	98.8	96.6	100.0	99.0

Table 10

Mean Percentage of Interobserver Agreement for the Frequency of Occurrences That a Child Engaged in a Helping Response for the First Five Baseline Trials and the First 10 Treatment Trials.

	Baseline	Treatment
Irene	100.0	97.5
Tom	100.0	95.5
Eddie	100.0	100.0
Nathan	100.0	100.0

Table 11

Number of Sessions Required to Achieve a Mastery Level of Performance for the Training Trials (i.e., 94% correct combined motor and verbal responding for four consecutive sessions) Compared to the Number of Sessions Required to Achieve a Similar Level of Performance for the Probe Trials (i.e., 100% correct combined motor and verbal responding for two consecutive sessions) for the Combined Verbal and Motor Responses, the Verbal Responses Alone, and the Motor Responses Alone.

	Number of Sessions Required to Achieve Mastery Level of Performance					
	Combined Verbal and Motor Responses		Motor Responses Alone		Verbal Responses Alone	
Participant	Training	Probe	Training	Probe	Training	Probe
Irene	6	8	6	8	6	4
Tom	14	14	14	14	8	6
Eddie	8	9	8	9	8	9
Nathan	10	9	8	7	9	9
Mean	9.5	10.0	9.0	9.5	7.7	7.0

Table 12

Number of Sessions Required to Achieve a Mastery Level of Performance (i.e., 100% correct combined motor and verbal responding for two consecutive sessions) During Non-trained-Category Probe Trials and Trained-Category Probe Trials for the Combined Verbal and Motor Responses.

Child	Trained-Category Probe	Non-trained-Category Probe
Irene	7	4
Tom	6	9
Eddie	9	5
Nathan	9	4
Mean	7.7	5.5

Table 13

Total Number of Combined Verbal and Motor Errors Made per Category during Training Trials for the First 10 Treatment Sessions for Each Child.

	Category Type								
Child	Locating	Putting Away	Picking Up	Replacing	Setting Up	Sorting	Cleaning	Carrying	Total
Irene	3	7			4			6	20
Tom			4	8		8	12		32
Eddie		3		4	9		5		21
Nathan	6		8			8		12	34
Total	9	10	12	12	13	15	17	18	

Note. Shaded boxes = Child was not exposed to trials from that category during training trials.

Total = The cumulative number of errors made as a function of category across children or as a function of child across categories.

Table 14

Total Number of Combined Verbal and Motor Errors Made per Category during Probe Trials for the First 10 Treatment Sessions for Each Child.

	Category Type								
Child	Cleaning	Putting Away	Locating	Sorting	Replacing	Picking Up	Carrying	Setting Up	Total
Irene	1	1	1		3		1	3	10
Tom	2		1	4	3	2	5		17
Eddie	1	2		2	2	3		5	15
Nathan		2	3	3		3	3	3	17
Total	4	4	5	9	8	8	9	11	

Note. Shaded boxes = Child was not exposed to trials from that category during probe trials.

Total = The cumulative number of errors made as a function of category across children or as a function of child across categories.

Table 15

The Total Number of Presentations of Discriminative Stimuli, Video Models, Verbal Prompts and Motor Prompts During the First Ten Treatment Sessions for Each Child.

Child	Discriminative Stimuli	Video Models	Verbal Prompts	Motor Prompts
Irene	193	24	9	2
Tom	209	60	7	8
Eddie	189	10	3	8
Nathan	208	37	7	10

Table 16

The Percentage of Trials with Video Models in Which the Video Presentation Occasioned a Correct Combined Motor and Verbal Response on the Following Presentation of the Discriminative Stimuli for the First 10 Treatment Sessions for Each Child.

	Treatment Session Number									
Child	1	2	3	4	5	6	7	8	9	10
Irene	46	50	n/a	100	100	100	n/a	n/a	100	100
Tom	67	80	33	75	0	n/a	75	50	n/a	100
Eddie	40	100	0	100	n/a	100	n/a	n/a	n/a	100
Nathan	67	75	83	100	50	n/a	n/a	n/a	n/a	100

Note. n/a = child did not emit errors during that session

Table 17

Total Number of Occasions in Which Each Child Engaged in a Non-Contextual Helping Response Across Baseline Sessions 1-5, Treatment Sessions 1-5, and Treatment Sessions 6-10.

Child	Baseline Sessions 1-5	Treatment Sessions 1-5	Treatment Sessions 6-10
Irene	0	8	0
Tom	0	9	1
Eddie	0	9	0
Nathan	0	12	2

Table 18

Percentage of Correct Combined Motor and Verbal Responses, Correct Verbal Responses, and Correct Motor Responses for all Pre- and Post-Intervention Measures for Each Child.

Child	Condition	Number of Trials	Session Number	Percentage of Correct Responses: Verb+motor Pre	Verb+motor Post	Verbal Pre	Verbal Post	Motor Pre	Motor Post
Irene	Non-trained Category, Novel Category, Novel Setting, and Novel Instructor	6	1	0	100	0	100	0	100
			2	0	100	0	100	0	100
			3	0	100	0	100	0	100
	Trained Category, Novel Setting, and Novel Instructor	4	1	0	100	0	100	0	100
			2	0	100	0	100	0	100
			3	0	100	0	100	0	100
	Novel Setting and Novel Instructor	4	1	0	100	0	100	0	100
			2	0	100	0	100	0	100
			3	0	100	0	100	0	100
	Non-trained Category, Novel Category, and Novel Setting	6	1	0	100	0	100	0	100
			2	0	100	0	100	0	100
			3	0	100	0	100	0	100
	Trained-Category-Probe and Novel Setting	4	1	0	100	0	100	0	100
			2	0	100	0	100	0	100
			3	0	100	0	100	0	100
	Novel Setting	4	1	0	100	0	100	0	100
			2	0	100	0	100	0	100
			3	0	100	0	100	0	100
	Novel Category	10	1	0	100	0	100	0	100
			2	0	100	0	100	0	100
			3	0	100	0	100	0	100

Note. Pre = sessions conducted prior to teaching, Post = sessions conducted at the completion of the study
Verb+Motor = combined verbal and motor responses, verbal = verbal responses alone, motor = motor responses alone

Table 18 (continued)

				Percentage of Correct Responses					
				Verb+motor		Verbal		Motor	
Child	Condition	Number of Trials	Session Number	Pre	Post	Pre	Post	Pre	Post
Tom	Non-trained Category, Novel Category, Novel Setting, and Novel Instructor	6	1	0	83	0	100	0	83
			2	0	100	0	100	0	100
			3	0	83	0	100	0	83
	Trained Category, Novel Setting, and Novel Instructor	4	1	0	100	0	100	0	100
			2	0	75	0	75	0	100
			3	0	100	0	100	0	100
	Novel Setting and Novel Instructor	4	1	0	100	0	100	0	100
			2	0	100	0	100	0	100
			3	0	100	0	100	0	100
	Non-trained Category, Novel Category, and Novel Setting	6	1	0	83	0	83	0	100
			2	0	100	0	100	0	100
			3	0	100	0	100	0	100
	Trained-Category Probe and Novel Setting	4	1	0	100	0	100	0	100
			2	0	100	0	100	0	100
			3	0	100	0	100	0	100
	Novel Setting	4	1	0	100	0	100	0	100
			2	0	100	0	100	0	100
			3	0	100	0	100	0	100
	Novel Category	10	1	0	100	0	100	0	100
			2	0	100	0	100	0	100
			3	0	90	0	90	0	90

<u>Note</u>. Pre = sessions conducted prior to teaching Post = sessions conducted at the completion of the study
Verb+Motor = combined verbal and motor responses, verbal = verbal responses alone, motor = motor responses alone

Table 18 (continued)

Child	Condition	Number of Trials per Session	Session Number	Percentage of Correct Responses: Verb+motor Pre	Verb+motor Post	Verbal Pre	Verbal Post	Motor Pre	Motor Post
Eddie	Non-trained Category, Novel Category, Novel Setting, and Novel Instructor	6	1	0	100	0	100	0	100
			2	0	83	0	100	0	83
			3	0	100	0	100	0	100
	Trained Category, Novel Setting, and Novel Instructor	4	1	0	100	0	100	0	100
			2	0	100	0	100	0	100
			3	0	100	0	100	0	100
	Novel Setting and Novel Instructor	4	1	0	100	0	100	0	100
			2	0	100	0	100	0	100
			3	0	100	0	100	0	100
	Non-trained Category, Novel Category, and Novel Setting	6	1	0	100	0	100	0	100
			2	0	100	0	100	0	100
			3	0	100	0	100	0	100
	Trained-Category Probe and Novel Setting	4	1	0	100	0	100	0	100
			2	0	100	0	100	0	100
			3	0	100	0	100	0	100
	Novel Setting	4	1	0	100	0	100	0	100
			2	0	100	0	100	0	100
			3	0	100	0	100	0	100
	Novel Category	10	1	0	90	0	90	0	90
			2	0	100	0	100	0	100
			3	0	90	0	90	0	90

Note. Pre = sessions conducted prior to teaching Post = sessions conducted at the completion of the study
Verb+Motor = combined verbal and motor responses, verbal = verbal responses alone, motor = motor responses alone

Table 18 (continued)

Child	Condition	Number of Trials per Session	Session Number	Percentage of Correct Responses					
				Verb+motor		Verbal		Motor	
				Pre	Post	Pre	Post	Pre	Post
Nathan	Non-trained Category, Novel Category, Novel Setting, and Novel Instructor	6	1	0	100	0	100	0	100
			2	0	100	0	100	0	100
			3	0	100	0	100	0	100
	Trained Category, Novel Setting, and Novel Instructor	4	1	0	100	0	100	0	100
			2	0	100	0	100	0	100
			3	0	100	0	100	0	100
	Novel Setting and Novel Instructor	4	1	0	100	0	100	0	100
			2	0	100	0	100	0	100
			3	0	100	0	100	0	100
	Non-trained Category, Novel Category, and Novel Setting	6	1	0	100	0	100	0	100
			2	0	83	0	83	0	100
			3	0	100	0	100	0	100
	Trained-Category Probe and Novel Setting	4	1	0	100	0	100	0	100
			2	0	100	0	100	0	100
			3	0	75	0	75	0	100
	Novel Setting	4	1	0	100	0	100	0	100
			2	0	100	0	100	0	100
			3	0	100	0	100	0	100
	Novel Category	10	1	0	90	0	100	0	90
			2	0	90	0	90	0	100
			3	0	90	0	90	0	100

Note. Pre = sessions conducted prior to teaching Post = sessions conducted at the completion of the study
Verb+Motor = combined verbal and motor responses, verbal = verbal responses alone, motor = motor responses alone

Table 19

Mean Percentage of Correct Combine Motor and Verbal Responses Collapsed Across All Pre- and Post-Intervention Measures for Each of the Three Post-Intervention Sessions For Each Child.

	Post Intervention Sessions		
Child	1	2	3
Irene	100.0	100.0	100.0
Tom	94.7	97.4	94.7
Eddie	97.4	97.4	97.4
Nathan	97.4	94.7	94.7

Table 20

Mean Percentage of Trials in Which the Non-Verbal, Verbal and Affective Stimuli Were Accurately Presented During Training and Probe Trials for Baseline and Treatment Conditions and During Pre-Test and Post-Test Trials Collapsed Across All Pre- and Post-Intervention Measures for Each Child.

		Experimental Condition					
Child	Response type	Baseline		Treatment		Pre- & Post-Intervention Measures	
		Training	Probe	Training	Probe	Pre Tests	Post Tests
Irene	Non-verbal	100.0	100.0	100.0	100.0	100.0	100.0
	Verbal	98.8	96.6	99.0	97.9	98.7	99.7
	Affective	97.6	96.6	98.5	96.9	99.7	100.0
Tom	Non-verbal	100.0	100.0	100.0	100.0	100.0	100.0
	Verbal	98.0	94.3	99.0	98.2	99.3	100.0
	Affective	98.0	94.3	99.4	98.2	100.0	99.3
Eddie	Non-Verbal	100.0	100.0	100.0	100.0	100.0	100.0
	Verbal	100.0	100.0	99.6	98.9	99.7	100.0
	Affective	99.7	100.0	99.2	100.0	99.7	100.0
Nathan	Non-verbal	100.0	100.0	100.0	100.0	100.0	100.0
	Verbal	98.6	97.6	99.4	99.4	99.7	100.0
	Affective	98.1	97.6	98.4	99.4	100.0	100.0

Table 21

Mean Percentage of Training and Probe Trials During Baseline and Treatment and the Pre-Test and Post-Test Trials Collapsed Across All Pre- and Post-Intervention Measures in Which the Error Correction Procedure was Provided Contingent Upon Incorrect Responding and Reinforcement was Provided Contingent on Correct Independent Responding for all Children

		Experimental Condition					
Child	Response type	Baseline		Treatment		Pre- & Post-Intervention Measures	
		Training	Probe	Training	Probe	Pre-Tests	Post -Tests
Irene	Error Correction Procedure	0	0	99.8	0	0	0
	Reinforcement	0	0	99.4	0.51	0	0.002
Tom	Error Correction Procedure	0	0	100	0	0	0
	Reinforcement	0	0	98.1	0	0	0
Eddie	Error Correction Procedure	0	0	100	0	0	0
	Reinforcement	0	0	100	0.55	0	0
Nathan	Error Correction Procedure	0	0	98.9	0	0	0
	Reinforcement	0	0	96.7	0	0	0

Table 22

Mean Number of Tokens Provided Per Session During Baseline, Treatment, and Pre- and Post-Intervention Measures.

Child	Baseline	Treatment	Pre-& Post-Intervention Measures
Irene	16	15.7	15.7
Tom	15.9	15.4	14.8
Eddie	15.9	15.7	15.7
Nathan	15.8	15.4	15.2

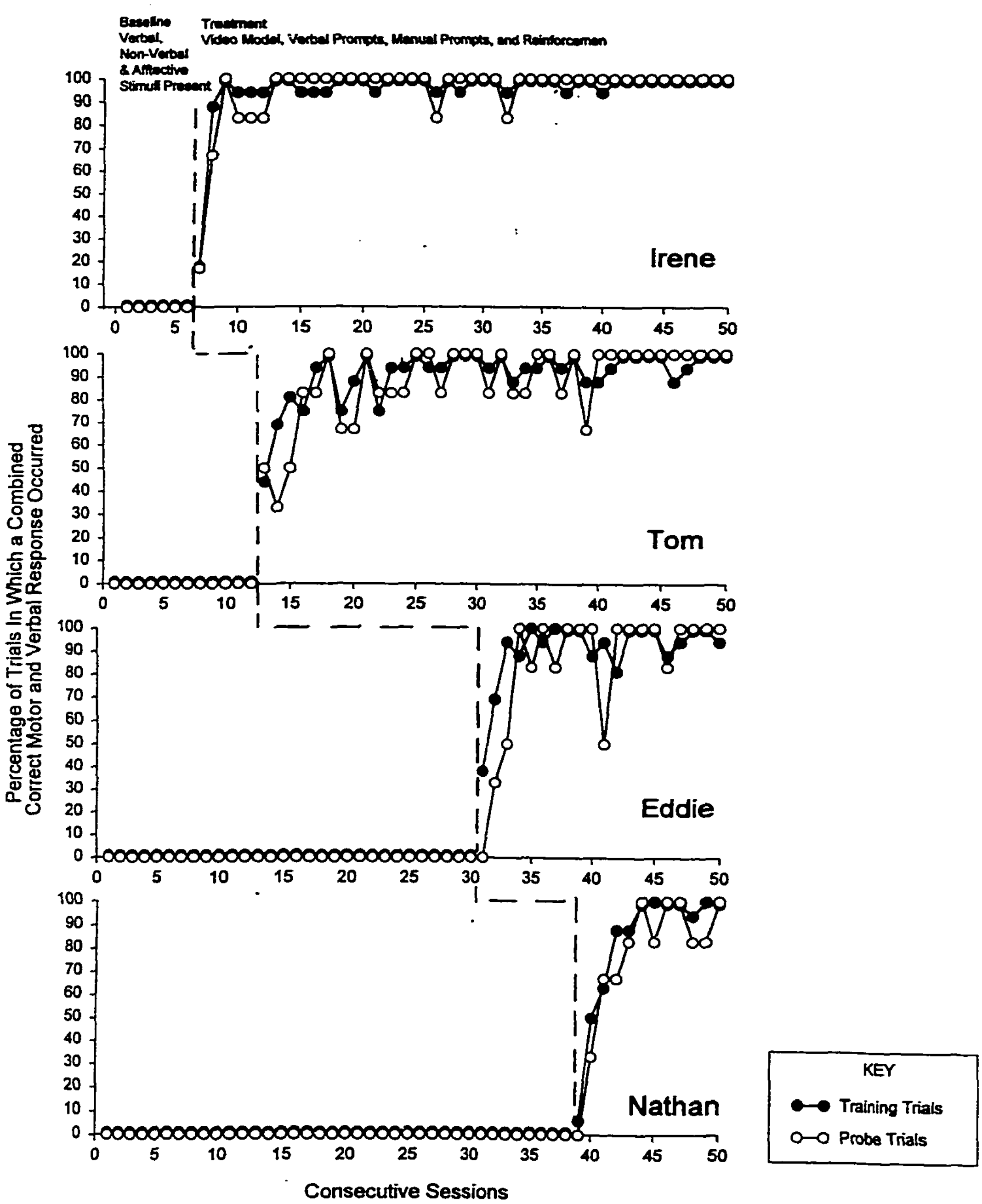

Figure 1. Percentage of training and probe trials in which each child produced a correct combined motor and verbal helping response, plotted as a function of consecutive sessions. Responding during training trials is represented by the closed circles and probe trials by the open circles.

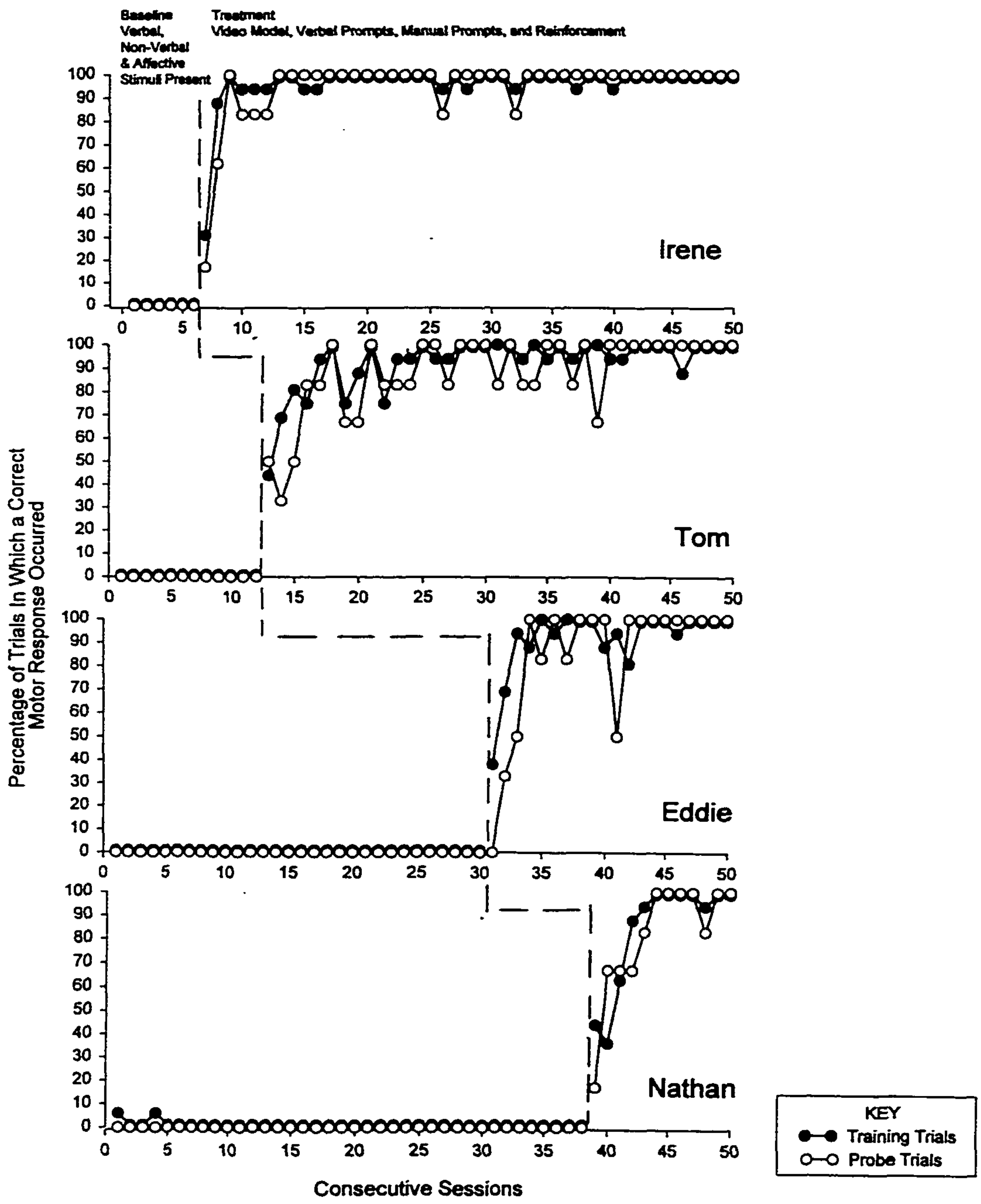

Figure 2. Percentage of training and probe trials in which each child produced a correct motor helping response alone plotted as a function of consecutive sessions. Responding during training trials is represented by the closed circles and probe trials by the open circles.

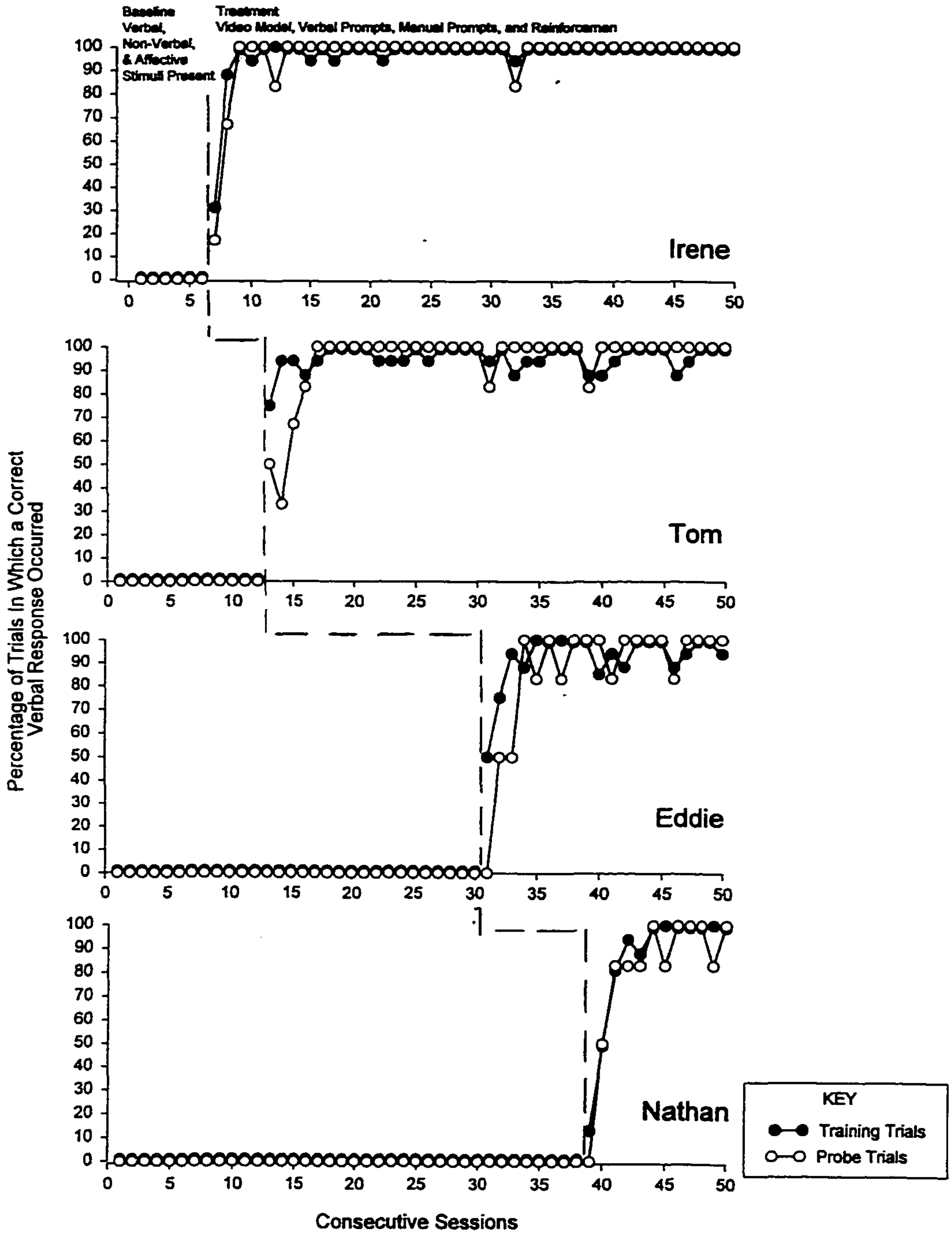

Figure 3. Percentage of correct training and probe trials in which each child produced a correct verbal helping response alone plotted as a function of consecutive sessions. Responding during training trials is represented by the closed circles and probe trials by the open circles.

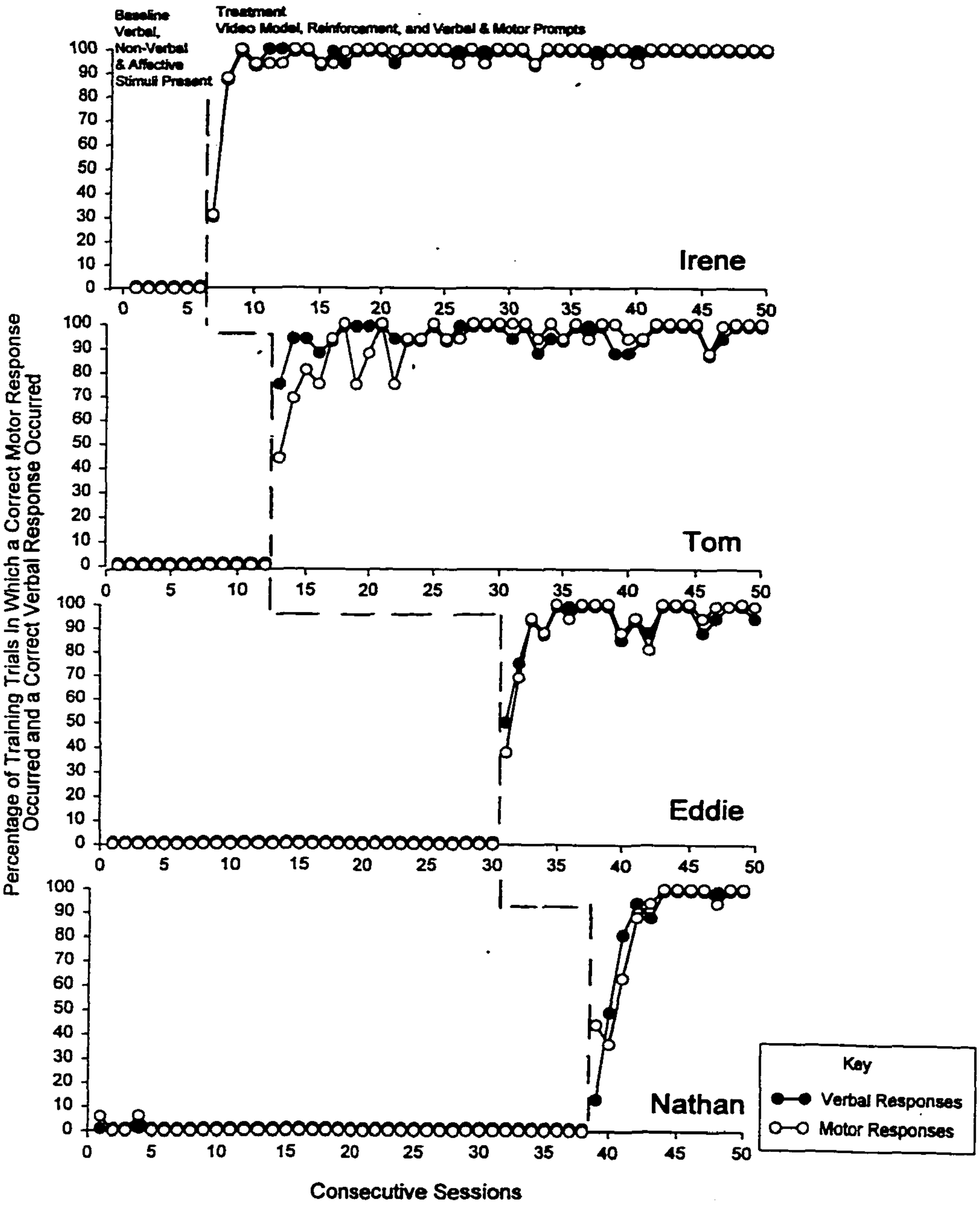

Figure 4. Percentage of training trials in which each child produced a correct verbal response alone and a correct motor response alone plotted as a function of consecutive sessions. Percentage of correct verbal responses is represented by the closed circles and percentage of correct motor responses is represented by the open circles.

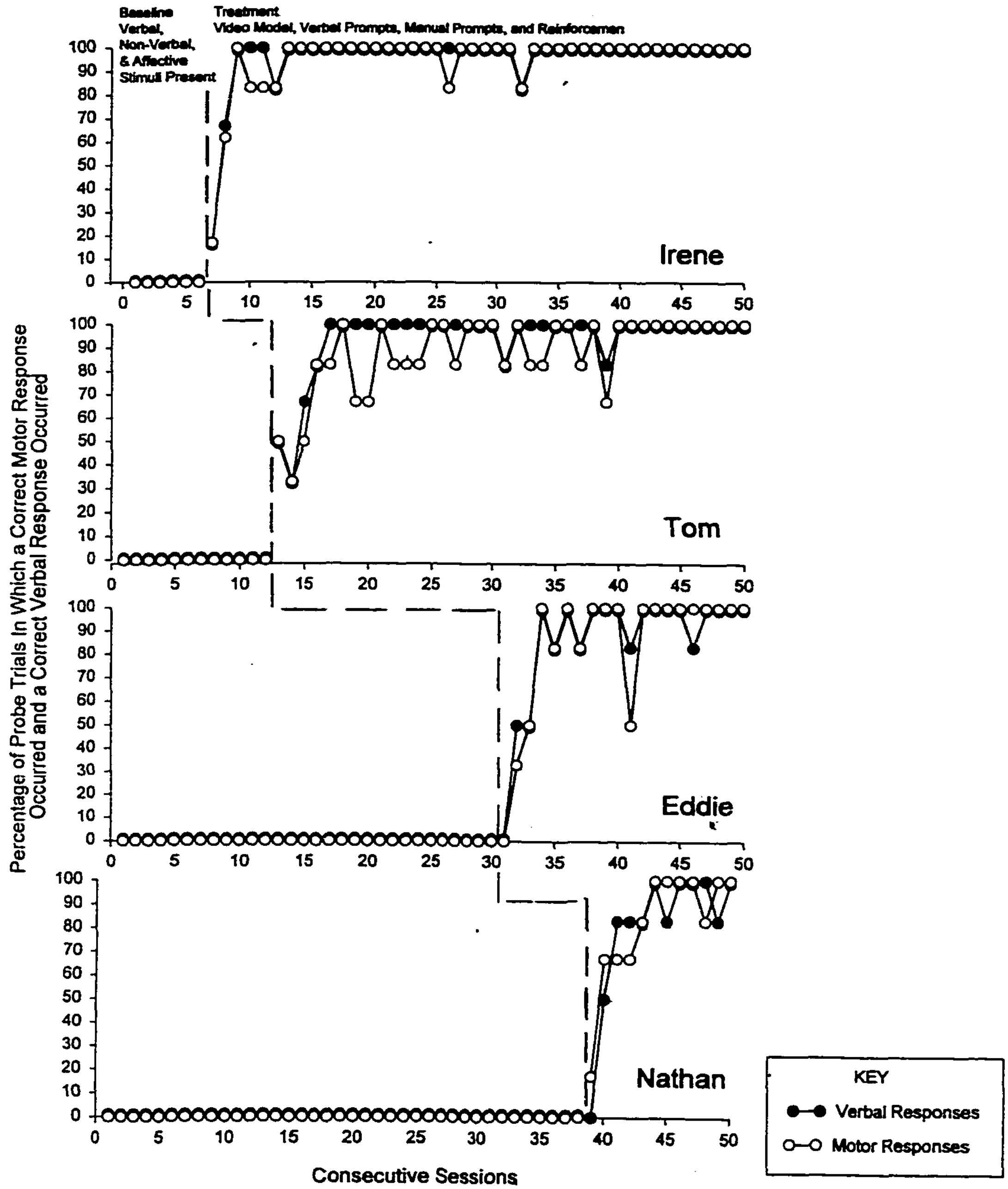

Figure 5. Percentage of probe trials in which each child produced a correct verbal response alone and a correct motor response alone plotted as a function of consecutive sessions. Percentage of correct verbal responses is represented by the closed circles and percentage of correct motor responses is represented by the open circles.

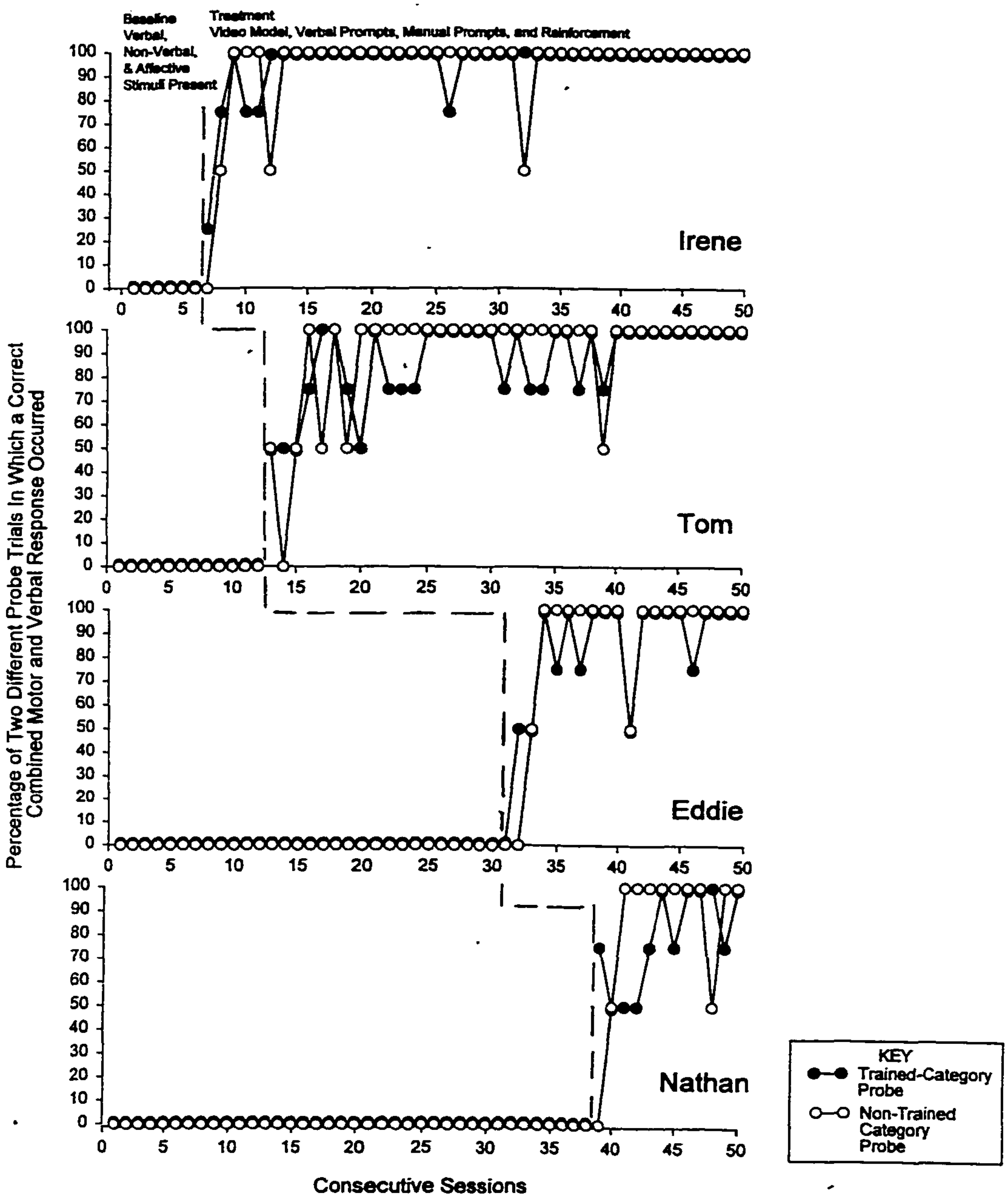

Figure 6. Percentage of trials in which each child produced a correct combined motor and verbal response during the non-trained category probes and the trained-category probes, plotted as a function of consecutive sessions. Percentage of correct trained-category probes is represented by the closed circles and percentage of correct non-trained-category probes is represented by the open circles.

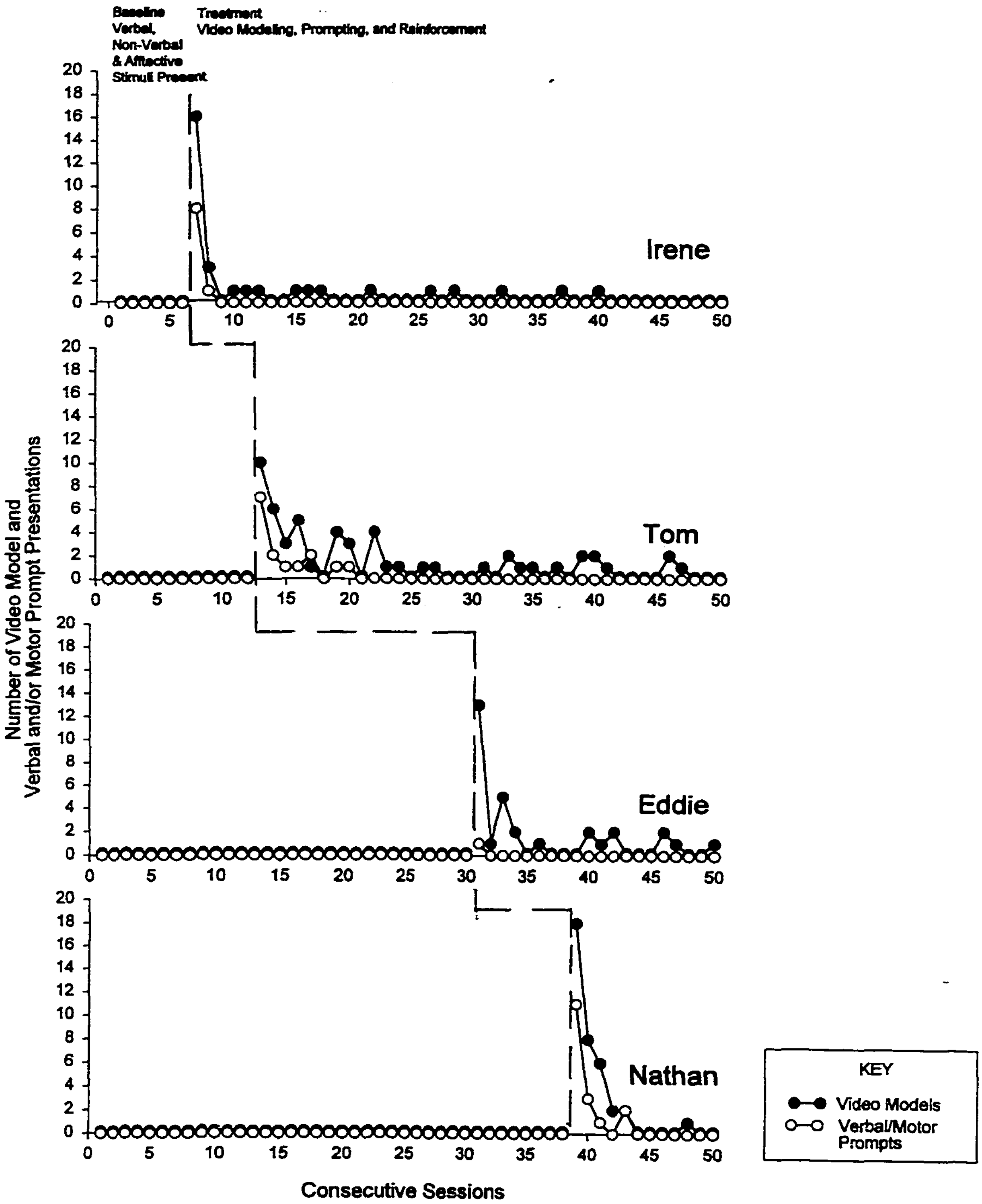

Figure 7. Number of video model and verbal and/or motor prompt presentations, plotted as a function of consecutive sessions. Number of video model presentations is represented by the closed circles and number of presentations of verbal and/or motor prompts is represented by the open circles.

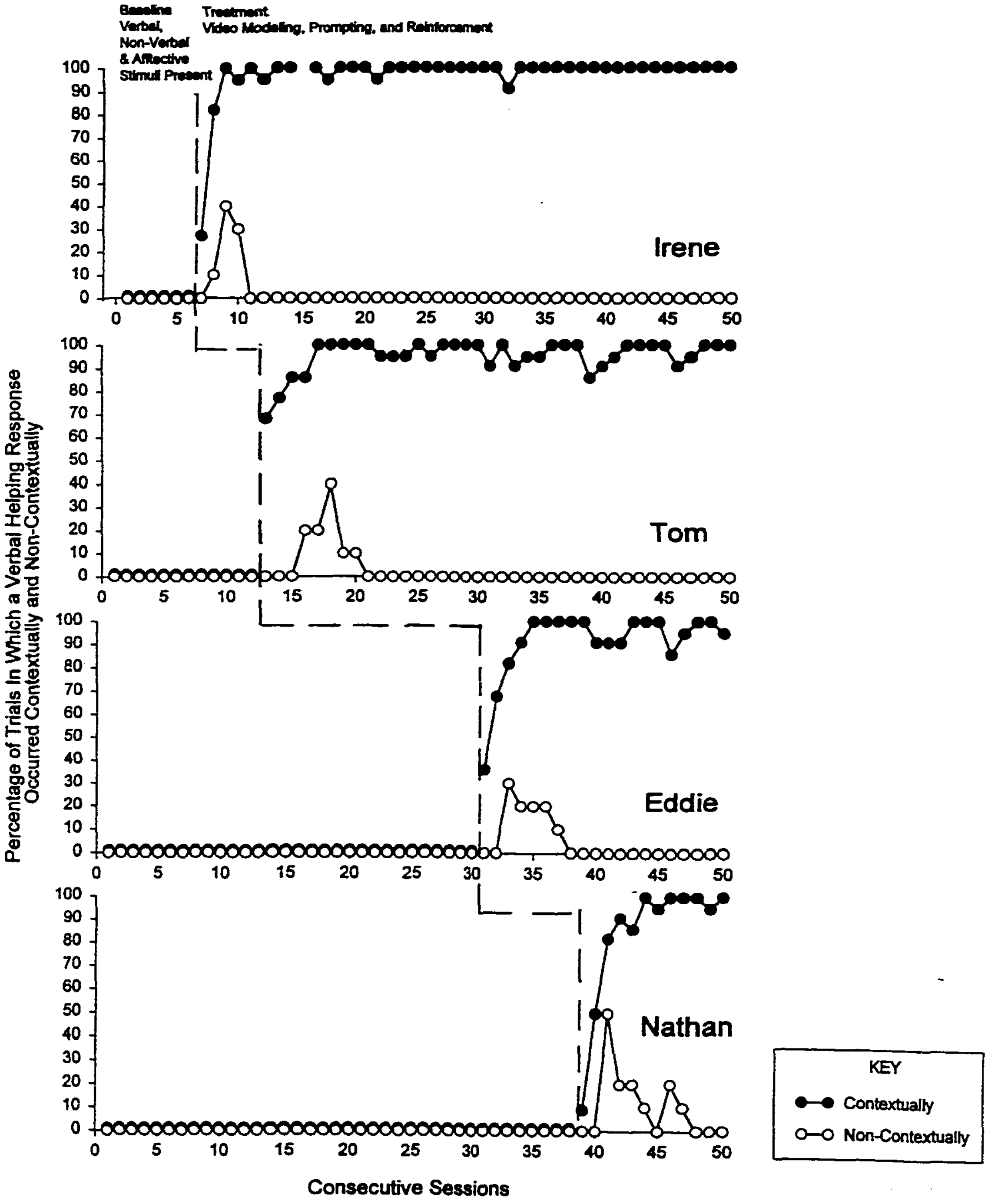

Figure 8. Percentage of trials in which a verbal helping response ("May I help?") was emitted when appropriate (contextually) and when inappropriate (non-contextually), plotted as a function of consecutive sessions. Verbal helping responses emitted contextually are represented by the closed circles while those emitted non-contextually are represented by the open circles.

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