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Imitation and its reciprocity in the treatment of autism

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Imitation and its Reciprocity in the Treatment of Autism

by

Roxana I. Nedelcu

A thesis submitted in partial fulfillment
of the requirements for the degree of
Master of Arts in Applied Behavior Analysis
College of Graduate Studies
University of South Florida

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contingency testing.

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Dedication

I want to dedicate my thesis to my mother who encouraged and supported my professional endeavors throughout the years and who has been a model through her care and concern for others. I also want to dedicate my work to my grandparents who contributed so much to who I am now.

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ABSTRACT

This study examined, within a multiple baseline design, the development of generalized imitative repertoires and the occurrence of contingency testing in children with autism. Generalized imitation refers to an imitative response class maintained by a conditioned reinforcer: similarity. In the case of imitation a response class is established by reinforcement of sufficient exemplars of different imitations; the results is a general repertoire of imitating novel responses on their first presentation. Generalized imitation was facilitated through reinforcement procedures involving shaping and fading. Multiple experimenters and multiple settings have been involved to promote the generalization of imitation. Contingency testing, which has been noticed to naturally occur in typically developing children when imitated, was targeted in the examined treatment, by employing a procedure where the experimenter imitated the child. It was hypothesized that the imitation training leads to generalized imitation and that the imitation of the child by the therapist leads to the occurrence of contingency testing. The results of the study show that the shaping and reinforcement procedures determined an increase in participants' trained imitative responding but no corresponding increase in novel, probed imitative responses. The data indicate the emergence of an imitative repertoire in need of

further training. Additionally, the results suggest that generalization of skills across therapists and settings has occurred.

Imitation of the child by the therapist was employed for a very small number of sessions. Notwithstanding, the results yielded an increase in the contingency testing behaviors for both participants.

Chapter One

Introduction

What is autism?

Autism is generally described as a pervasive developmental disorder characterized by qualitative impairments in social interaction, in communication and by restricted patterns of behavior, interests, and activities (American Psychiatric Association, Diagnostic and statistical manual of mental disorders, 2000). There have been several research attempts to identify one primary deficit in autism which, once targeted for intervention and corrected, would lead to widespread improvements (Lovaas, Koegel, Simmons and Long, 1973). Unfortunately, up to now, nothing of the kind has been discovered. However, researchers have identified core deficits (impaired social interaction and communication, repetitive behaviors), which guide the diagnosis of the disorder, and related deficits (sleep disturbance, eating problems, and tactile defensiveness), which often occur in persons with autism, but do not constitute a criterion for diagnosis and account for the great variability of symptoms (Mash & Barkley, 1996).

A great number of different approaches and interventions for autism have been developed. One type of intervention which has consistently been found to improve the functioning of children with autism is behavioral treatment (Schreibman, 2000).

The behavioral approach to the treatment of autism

The behavioral treatment of autism distinguishes itself from traditional and other current approaches by conceptualizing autism as a set of specific behaviors, rather than as a diagnostic entity (Lovaas & Smith, 1989). Lovaas and Smith (1989) described the theoretical underpinning of the behavioral approach to autism, outlining its four tenets: (1) the behaviors of children with autism can be understood and explained by the laws of learning, (2) children with autism have many separate behavioral deficits best described as developmental delays, (3) in certain environments, children with autism can learn as much as other human beings, and (4) their deficits indicate a mismatch between a deviant nervous system and typical environments, rather than a disease.

The fact that the behaviors of children with autism are consistent with the laws of learning has been demonstrated by the acquisition curves that these children show when behaviors are reinforced (Lovaas & Smith, 1989). Also, one of the paradigms developed in learning theory, known as discrimination training, proved to be very useful in developing effective interventions for children with autism. One type of discrimination training, which has been shown to be particularly useful as it provides the basis for teaching many behaviors, is imitation. Imitation is a prerequisite for teaching language, social skills and other important behaviors. Typically developing children readily learn many complex behaviors through imitation (Bandura 1969) but children with autism do not learn as readily (Lovaas & Smith, 1989).

The imitation deficit in autism

Autism affects multiple areas of the child development (social, linguistic, affective and cognitive) and this fact makes it difficult to understand and treat (Mash &

Barkley, 1996). The impairments in the social area refer to deficits in sharing a focus of attention with another person, in social imitation, in the understanding of other persons' emotions, and in pretend play.

Many studies suggested that imitation deficits are a hallmark of autism (Dawson & Adams, 1984; DeMyer et al., 1972; Stone, Lemanek, Fishel, Fernandez, Altemeier, 1990). DeMyer et al. (1972) found that children with autism have specific impairments in their ability to imitate the actions of others, in particular body movements and actions with objects. The authors compared imitative performance of 12 children with either autism or early schizophrenia with the performance of 5 children with either mental retardation or minimal brain damage. The participants with autism showed poorer imitations of body movements than the control groups, less deficient imitations of actions on objects, and equivalent spontaneous use of objects.

Dawson and Adams (1984) examined the imitative abilities of 15 children with autism with ages between 4 and 6. Prior to the implementation of the experimental conditions of the study two standardized tests (Uzigiris–Hunt object permanence scale and imitation scale) had been administered to assess participants' performance on object permanence and imitation. It was noted that most of the participants showed developmentally appropriate object permanence skills, whereas 7 of the 15 participants showed severe impairments in imitation. This led the authors to conclude that imitation is one of the most severely impaired abilities in children with autism. As a result of the Uzigiris-Hunt imitation assessment the participants were grouped into two different categories: children with low imitative abilities and children with high imitative abilities.

Three different experimental conditions were employed to further assess participants' imitative repertoires. These conditions were: simultaneous imitation (the imitation of the child by the therapist), familiar imitation (where actions which were in the child's repertoire were modeled by the experimenter), and novel imitation (where new behaviors were modeled, not previously observed as being part of the child's repertoire). The results showed that the participants categorized as low imitative emitted a significantly higher number of correct imitations of the models presented during familiar condition, than they did on responding to the novel imitations. The highly imitative participants performed at the same level on all conditions. This suggested that imitation might be facilitated and improved in children with autism if familiar behaviors, which are in the child's current repertoire, are first introduced.

The fact that imitation, which plays such an important role in the child's social and cognitive development, is impaired in children with autism calls for intervention to remedy the deficit. There are a number of behavioral interventions which have demonstrated that imitation can be taught and shaped in children with autism (Lovaas, Freitas, Nelson & Whalen, 1967; Metz, 1965; Young, Krantz, McClannahan & Poulson, 1994).

Behavioral interventions which focused on imitation

Metz (1965) demonstrated the possibility of developing imitative skills in two children with severe autistic behaviors such as a long history of mutism, social isolation, stereotyped behavior and resistance to change. The children were taught to imitate certain behaviors by using reinforcement and shaping procedures. The responses undergoing treatment were interspersed with imitative models which, if imitated by the child, would

lead to no reinforcement. The data presented in this study showed not only that the participants learned to imitate the trained behaviors but also that imitation generalized to similar but novel tasks, on which no training was given (generalized imitation), and maintained. However, the study provided no control (no experimental manipulation of variables) to prove that the increase of generalized imitative behaviors was specifically the result of the training procedure employed. Also, subjective observations noted that as appropriate learning occurred, inappropriate motor and emotional behavior such as ritualistic behaviors and tantrums disappeared.

Lovaas, Freitas, Nelson, and Whalen (1967) taught 11 children with autism, ranging in age from 4-13 years, non-verbal imitations and then more complex behaviors which would facilitate their social and cognitive development. The authors hypothesized that imitation was a prerequisite for the acquisition of functional social and intellectual behavior. They started by teaching a number of imitations through reinforcement and shaping procedures. The children were positively reinforced for closer and closer approximation of the behavior demonstrated by the experimenter. The behaviors selected for training were chosen from a pool of 60 behaviors (actions with objects, body movements) to be imitated ranging from easy (placing pegs on a board) to complex (imitating the arrangement of a sequence of pieces with different shapes). The pool was comprised of tasks which the experimenter hypothesized would have some positive value to the child and would lead to appropriate play. The tasks also presented both auditory and visual cues which might have facilitated the child's attention to them. The training was conducted 5 days a week, 1 hour per day. Each behavior was trained until the child reached the criterion for mastery: five consecutive matches of the behavior modeled by

the adults. The procedure involved extensive initial prompting, putting through procedures and continuous reinforcement. They progressed to fading of prompts and to intermittent schedule of reinforcement. Food was the main reinforcer used. The results of this training procedure showed that all 11 children acquired non-verbal imitation according to the criterion proposed by the study (imitating without prompts 10 of the last 20 of the total 60 imitations modeled during one session).

From here the researchers progressed to teaching more complex useful behaviors, based on the imitative repertoire established in each of the 11 participants. The behaviors chosen for further training were divided into five groups of useful skills: personal hygiene and self help, games and learning to follow rules, appropriate gender role behavior, drawing and printing, and non-verbal components of interpersonal communication involved in greetings. The experimenters taught these behaviors through imitation and then shifted the stimulus control from that of the attending adults' behavior to following instructions or verbal commands. The imitative repertoire already established proved very useful in teaching these new behaviors and was easily enhanced with new imitations that served the same purpose.

Young, Krantz, McClannahan, and Poulson (1994) employed a multiple baseline across behaviors to investigate the development of imitative repertoires in children with autism. Four children with autism, between 2 and 4 years old participated in this study. They showed no evidence of imitative behavior when they entered the program even if they received preliminary training in vocal imitation, as they were all enrolled in the Princeton Child Development Institute Education Program. The procedures employed consisted of modeling imitations and reinforcing the correct matching of those which

were selected for training. The children were presented with three different response types: vocal, toy play, and pantomime. These responses were selected because each type represents typical deficits in the repertoires of children with autism. Following the presentation of each model correct imitations were reinforced with praise, food and physical contact; no consequence was delivered for non-matches and no physical guidance was provided. The experimenter also presented probe models which were never reinforced. The results showed steady increases of imitative responding with the implementation of training. When reinforcement was delivered for imitations which were part of one of the three response types, imitative responding increased within that specific response type for both trained imitations and for probes. Imitation generalized within specific response topographies.

Generalized imitation

Behavioral interventions endeavor to teach generalized imitation whereby more is learned than directly taught. With the display of generalized imitation, children imitate new responses that have not previously been part of treatment. (Lovaas, 2003). Imitation is commonly referred to, in the behavioral literature, as generalized imitation because it has been proven that when some imitative responses are reinforced other imitative responses increase in probability, although they were never directly reinforced.

Baer, Peterson, and Sherman (1967) employed a within-subject reversal design to demonstrate that imitation generalizes from familiar, trained responses, to new, non-trained responses with different topographies. The authors taught three children with mental retardation, who initially showed no imitative behavior, a series of diverse motor and vocal imitations using shaping and fading procedures. The experimenter modeled

imitations preceded by the verbal prompt “Do this.” On each occasion during the initial training, matches of the responses demonstrated were reinforced with food and praise. After the initial training, when the participants reliably demonstrated imitation of the responses modeled by the experimenter, a number of responses which, if matched, were not followed by reinforcement, were presented. These served as probes for the establishment of a generalized imitative repertoire. The children in the study demonstrated imitations of the probes modeled by the experimenter even if no reinforcement was delivered for those imitations. The authors hypothesized that even though not directly reinforced, these responses were reinforced by their topographical similarity to the behaviors modeled by the experimenter, thereby showing characteristics of a response class. It was concluded by the authors that imitation of the models in itself acquired a reinforcing function. This was consistent with previous findings by Baer and Sherman (1964) who showed that topographical similarity between the model’s behavior and the observer’s behavior involved in imitation may be the functional variable producing the observer’s imitative responding.

Baer and Sherman (1964) employed an imitation training procedure that consisted of teaching four different imitative behaviors (nodding, mouthing, talking, bar pressing) of which only three (nodding, mouthing and talking) were reinforced by a talking puppet. The participants in the study were typical preschool children. In fact the talking puppet operated the procedure: she presented the imitative models (which had very different topographies) and delivered verbal praise for correct imitations of the three responses. For the bar pressing imitations there was no consequence delivered. The results of the study demonstrated an increase in the imitative bar pressing responding for all the

participants. This was directly attributable to the direct reinforcement of other responses (mouthing, nodding, and talking) even though these four responses had very different topographies. Essentially, they were similar by all being imitative of a model's behavior, indicating that similarity of responding per se was a functional dimension of the child's behavior.

The covariation between reinforced and non reinforced imitative responding suggests that imitation is a functional response class. A response class refers to a set of topographically different responses whose probability of occurrence varies together, even though only some of the responses are directly controlled by an effective stimulus.

In the case of imitation, the evidence indicates that a response class can be established by reinforcement of sufficient exemplars of different imitations; the result is a general repertoire of imitating new responses on their first demonstration (Garcia, Baer, & Firestone, 1971).

"Imitation, however, is not necessarily a large response class" (Baer & Deguchi, 1985, pp.184). Garcia, Baer, and Firestone (1971) and Young et al. (1994) suggested that imitation might be comprised of distinct subclasses which are defined by the topography of the reinforced imitative responses. Young et al. (1994) found that imitation generalized within response types undergoing training but not across them. Garcia et al. (1971) investigated potential subclasses of generalized imitative responses using a multiple baseline design across four types of responses: short vocal, long vocal, small motor, large motor. Four children with developmental delays (8-14 years old) were sequentially trained to imitate three of those different response types (small motor, large motor, short vocal). Some modeled responses were presented as non reinforced probes to assess generalization

within each response type. The results of the study showed that probe imitations increased just for the response type which was undergoing treatment. For example, during large motor training, large motor probe imitations increased but there was no increase in vocal or small motor probes. Given the fact that imitation might not generalize across maximally broad topographies unless all the different response types are targeted for training (or all different subclasses), interventions should target different imitative subclasses in order to achieve broad generalized imitation. In this the research can successfully guide the practice.

Generalization

Another important tenet of the behavioral approach to autism is that children with autism have many separate behavioral deficits that need to be corrected one by one, rather than a central one which if corrected, would lead to widespread changes (Lovaas & Smith, 1989). Lovaas, Koegel, Simmons and Long, (1973) conducted a study on maintenance and generalization of behavioral treatment gains for children with autism. The study analyzed follow up data on twenty children who had been treated with behavior therapy at some point during the 7 years previous to the study. The follow up study was conducted after 1-3 years of treatment. The treatment effects were assessed along three dimensions: stimulus generalization (the extent to which behavior changes that occurred in the treatment environment transferred to situations outside the initial environment), response generalization (the extent to which changes in a limited set of behaviors effected changes in a larger range of behaviors) and maintenance over time of treatment effects. The children in the study were children who either lived with their parents or in state hospitals. They had been in treatment for 12-15 months and returned

for follow up measures 1-3 years after the initial treatment concluded. In order to assess response generalization of behavior change the authors used a multiple response recording and results on the Stanford-Binet and Vineland scales. The multiple response recording involved recording of duration and frequency of certain behaviors: self stimulation, echolalic speech, appropriate speech, social non-verbal behavior and appropriate play. The multiple response recoding assessed the response generalization across many behaviors that had been monitored but not specifically taught during treatment (e.g., social non-verbal and play). Stimulus generalization was assessed by placing and observing the child in a room with toys, separate and not associated with the training situation across three different conditions: child alone, child with an unfamiliar adult who was just watching the child but not initiating interaction with him, and child with an adult who was playing with him and gave simple instructions. The children who after treatment were discharged to a state hospital lost all their gains in social non-verbal behaviors and appropriate verbal and play behaviors. The children who stayed with their parents (receiving some training in how to continue treatment) maintained their gains in appropriate play, social non-verbal and appropriate behaviors, and improved further. This last finding suggests that stimulus generalization was obtained. Training the parents to become therapists for their children led to stimulus generalization. With regard to response generalization this seemed very limited. However, there were untargeted positive changes in the sleeping and eating patterns of the participants, children who never slept normally throughout the night began sleeping for 10 hours without interruption, children who were chronic toe-walkers began to walk normally. In spite of that, there was a failure to isolate a pivotal response, or a failure to find a certain key

behavior that once altered would lead to widespread changes. The findings of this research on stimulus and response generalization suggested that these gains can occur when there is a direct attempt to program generalization, as it happened with the children whose parents had been trained to become therapists, whereas the children who were discharged to hospital lost the gains made in treatment.

Thus, in order to transfer children's gains from one behavior to the other and from one environment to the other, therapists need to program for generalization of skills across settings, behaviors, and trainers (Stokes & Baer, 1977, 2003). Individuals with autism need to be taught to generalize (Lovaas et al, 2003).

Stokes & Baer (1977) describe generalization as "the occurrence of relevant behavior under different non-training conditions (i.e. across subjects, settings, people, behaviors and /or time) without the scheduling of the same events in those conditions. Thus generalization may be claimed when no extra-training manipulations are needed for extra-training changes; or may be claimed when some extra manipulations are necessary. But their cost is clearly less than that of the direct intervention." (p.350)

Imitation of the child by the therapist

Equally important to teaching and developing imitative repertoires in children who have deficits in this area is to examine the reciprocal nature of imitation. In a multiple baseline design, Gladstone & Cooley (1975) demonstrated the reinforcing function of imitation of the child by the therapist. The authors used the term behavioral similarity, referring to similarity between the therapist's behavior and the child's (the therapist's imitation of child) and not vice-versa as it had been used in the literature. The authors employed a procedure called subject modeled trials, which involved following

the child's lead and imitating him. The participants acted as models in demonstrating a behavior sequence: operating a bell, a horn and a cricket clicker. If the child selected a toy to play with, the experimenter imitated the child's play with the toy. Certain responses (operation of the three toys) had been selected to be imitated by the experimenters prior to the implementation of the procedure.

The dependent variable was the number of times a child modeled a response (operation of a noisemaker) that the experimenter would imitate. The results show an increase in each participant's modeling of the response which produced imitation by the experimenter and a corresponding decrease in his non-imitated responses.

Tiegerman and Primavera (1984) used imitation of the child as an effective procedure to increase frequency and duration of eye-gaze in children with autism. The authors targeted eye-gaze for change as it seemed a crucial variable in increasing learning in both the natural and therapeutic environment by permitting the child with autism to gaze at the results of his action on people and objects. Even the simplest tasks or interactions cannot be presented by a clinician if the child averts his gaze. Therefore, the experimenters in this study employed a procedure that aimed to increase the frequency and duration of eye-gaze. The experimenter and the child were seated at the table with various duplicate objects on it, opposite from one another. The procedure consisted of the experimenter's imitation of the child's actions with an object, using the duplicate object, for the same interaction time. This was compared with two other procedures to assess effectiveness. The second procedure involved manipulation of the same object as the child did, for the same amount of time, but performing a different action on the object than the child. In the third procedure the experimenter never produced a performance

that was an imitation of the child's manipulation. Observations of frequency and duration of eye gaze were made during each session and an analysis of variance was computed for frequency and duration of object manipulation. The results showed that both in the first and second procedure there was a gradual increase in the frequency and duration of eye-gaze. Their findings suggest that imitation of the child by the therapist is an effective way of modifying the disordered gaze behavior observed in children with autism.

In a similar study, Tiegerman & Primavera (1981) implemented reciprocal imitation procedures to increase frequency and duration of object manipulation/ play in children with autism. The authors employed three types of procedures to assess their success on increasing play with objects. The experimenter and the child were seated at the table with various duplicate objects on it, opposite from one another. Each experimental session was 30 minutes long and during one session two of the three procedures, were presented for 15 minutes each. The order of the presentation of the experimental procedure was counterbalanced across sessions and their order within sessions was randomized. The first of the three procedures consisted of the experimenter's imitation of the child's actions when manipulating an object. The second procedure involved manipulation of the same object as the child did, for the same amount of time, but performing a different action on the object than the child's. In the third procedure the experimenter never produced a performance that was an imitation of the child's manipulation. A two factor analysis of variance for repeated measures on each factor was computed separately for frequency and duration of object manipulation. The results of the study showed that the first procedure, where the experimenter imitated the child, led to a significant increase in the frequency and duration of appropriate object manipulation and

it was the most effective of all three. However, increasing the duration and frequency of object manipulation does not mean automatically increasing appropriate play with the object, which is one of the major deficits in autism. Increasing the manipulation repertoire might be a first step in expanding the child's interaction with the environment. It seems that imitation of the child provides the child with an experience of control over the environment and functions as a reinforcer leading to increases in the level of interaction with the physical and social environment. This is reflected in improved eye contact, increased object manipulation/exploration and higher rates of shifting and changing activities.

Contingency testing.

The research that Asendorpf, Warkantin, & Baudonniere (1996) conducted with typical children led to results which are similar to Tiegerman & Primavera's (1981) study. They found that when an adult imitated typically developing 18-months-old children the majority of the children demonstrated a higher rate of changing activities as means of testing the contingency between the behavior and the behavior of the adult (contingency testing behavior). The authors employed three different procedures to determine the relationship between recognizing oneself and noticing others, as reflected by the results of rouge test (for self-recognition), correlated with procedures where the experimenter modeled actions to be imitated by the child and where the experimenter imitated the child. The first procedure was similar to the mirror test but with a couple revisions and looked at mirror self-recognition; the second experiment consisted of an experimenter presenting the child with a set of pairs of toys and modeling actions to be imitated; and, with the third procedure, the experimenter imitated the child's actions,

posture and vocalizations . They investigated the effect this had on the children with regard to testing the contingency between his and experimenter's behavior (identified whenever children rapidly varied activity with one object of the pairs for an extended period of time, while paying close visual attention to the experimenter, particularly after changing activities). The results showed that the majority of children involved in the third experiment showed at least one testing sequence and that there was a high rate of varying activities per minute (5- 21 activities) which indicated to the researchers that the children were aware of and tested the social contingency in this situation.

Dean and Stokes (2003) conducted an empirical study where they employed reciprocal imitation procedures. The authors examined the reinforcing function of being imitated by the therapist. The participants in the study were 11 children and they were divided into two different groups for the period of the study. In the first group there were 5 typical children, with no physical or developmental impairments and in the second group there were 6 children with physical and/or developmental impairments who also demonstrated social or communication delays. The mean age was 42 months. Three of the children in the second group were diagnosed with autism.

The treatment sessions were 20-25 minutes. Each child participated in a number of sessions that ranged from a minimum of 6 to a maximum of 12. The treatment sessions consisted of structured and unstructured periods. The structured period involved the therapist imitating the child's behaviors for the first half of the interaction period (5 minutes). The therapist matched or mirrored the verbal and motor behaviors presented by the child. (e. g., if the child clapped twice, the therapist clapped twice). This was followed by 5 minutes of assessment of imitation that consisted of presentation of

imitative models. The unstructured or play period consisted of interaction with toys. The child was presented with pairs of toys and the therapist imitated the child's use of toys for 5 minutes. As the child selected a toy and began to manipulate it, the experimenter took the other toy in that pair and imitated the actions, posture and vocalization of the child. The child's activities were imitated even if he was not using the toys. After 5 minutes of imitation, the assessment period began when the child was presented with imitative models, without being specifically requested to imitate. The target behaviors of this study were social responsiveness (defined as eye contact and positive affect), imitative behaviors (defined as child behavior temporally following and topographically similar to that presented by the therapist), and contingency testing (shifting/repeating activities by the child). A multiple baseline design across participants was employed. Taken as a whole, the data demonstrated that imitation of the child improved social responsiveness, as demonstrated by significant increase in positive affect, and improved imitative skills, as demonstrated by an increased level of matching the imitative models presented in both groups. Also, imitation of the child functioned as a reinforcer for the child's behavior as reflected in the higher rates of shifting and changing activities (contingency testing behavior). If we look at the individual data, two of the three children who at the beginning of the study had the diagnosis of autism showed less imitative behavior than the rest of the participants.

Dean and Stokes (2003) addressed in their discussion this difference between the children with autism and the rest of the participants and reported that, based on the body of research on autism, this was expected, and cited Rogers (1999) who asserts that motor imitation deficits may be one of the primary deficits in autism. The data for the third

participant with autism was similar to the one for the less impaired group. The authors reported that at the end of their study the child had undergone a comprehensive evaluation from an independent agency and the autism diagnosis was not supported anymore.

Purpose of this study

The proposed study investigated the development of a generalized imitative repertoire in children with autism by teaching a number of imitations through shaping and prompting procedures. The study targeted imitation because this was a prerequisite for acquiring new behaviors. The learning phenomenon involved in generalized imitation, more behavior generated than directly taught, is extremely relevant to the emergence of language and social communication in infants and children (Baer, Guess, & Sherman, 1972) and it is very important as part of the techniques for teaching communication skills to children who have developmental or learning disabilities, such as autism or mental retardation. (Baer, Peterson & Sherman, 1967; Lovaas, 2003; Young et al, 1994)

It is difficult to teach all the complex behaviors needed to function in society. It is much easier to teach the student complex behaviors by helping him/her learn to imitate the behaviors of typical individuals. In this way, other people serve as models, demonstrating the many complex behaviors that an individual needs to master. (Lovaas, 2003)

The imitation procedure employed involved teaching a number of motor and vocal imitations. The imitations taught were interspersed with novel imitations which were not reinforced upon correct matching. The research (Baer, Peterson & Sherman, 1967; Lovaas et al, 1967; Metz, 1965) reported that as the training progresses it becomes

progressively easier to obtain correct matched imitative responses for the demonstrated models, on their first presentation, owing to the reinforcing function which the similarity between the student's and the therapist's behavior acquires.

All the previous empirical studies which targeted generalized imitation in children with autism used food as the primary reinforcement for desired responses. The proposed research examined an intervention that used natural consequences: affection in the form of touch and praise and preferred toys or play activities (spinning, bouncing on a ball, holding a preferred toy for 3 seconds) to reinforce the desired/correct imitative responses in the shaping procedure. According to Lovaas et al. (1973) the use of primary reinforcers (mainly food), rather than everyday natural ones, causes loss of treatment gains once the child returns to his/her natural environment. For the maintenance of treatment gains it is important to use natural reinforcers during treatment so as to smooth the transitions between treatment and post-treatment environments.

To insure the generalization of imitation across maximally broad topographies, responses with very different topographies were selected for training (fine motor, gross motor, and vocal) as the findings of Garcia et al. (1971) and Young et al. (1994) suggested that generalized imitation seems to be restricted to the type of response for which imitative behavior has been reinforced and not to all responses modeled by the experimenter.

Also, given the limited response and stimulus generalization of behavior changes in children with autism (Lovaas & Smith, 1989) the proposed study programmed for generalization of imitative behaviors across people and settings, by involving multiple

therapists in the intervention and conducting the intervention both in home and in the clinic.

Along with the research in imitation, this study assessed the effects of the therapist's imitation of the child on the occurrence of contingency testing.

The research studies on reciprocal imitation procedures, or on the effects that the imitation of the child by the therapist has, are very few and their results seem inconclusive. For example, Tiegerman and Primavera (1981, 1984) employed a procedure where they imitated the child's use of toys. Using statistical analysis of frequency and duration of eye contact they showed an increase in both measures of eye gaze and object manipulation as a direct effect of imitation of the child procedure.

Dean and Stokes (2003) employed a similar procedure with children with physical and/or developmental impairments. The results of the study showed no increase in eye contact from baseline to treatment and small changes in positive affect, which contradicts previous findings. As the authors noted, the small changes might have been due to the short duration of the study (children participated in 6-12 sessions) and the short duration of the imitation of the child episodes: 5 minutes. However, there was an increase in the occurrence of contingency testing during intervention compared to baseline. In baseline there was a stable rate of zero occurrence of this behavior while in the intervention condition the mean of testing behavior was 16%, 15% and 14%.

Because Dean and Stokes (2003) targeted children with various disabilities they emphasized the need for further research with specific categories of children: only autism or only language delays the current applied their technique only to children with autism.

The hypotheses of the proposed study were:

1. Generalized imitative repertoires can be established effectively in children with autism through behavioral analytic procedures that involve shaping and prompting techniques.
2. The imitations acquired during treatment generalize across settings and people.
3. Imitation of the child by the therapist is effective in producing the emergence of contingency testing behaviors in children with autism.

Chapter Two

Method

Participants

Two preschool children with autism participated in this study. The participants were 4 years old. They had no physical impairments, are able to respond to simple verbal commands, made some vocal sounds and had little imitative behavior. They displayed some perseverative behavior involving walking around in circles, clapping, covering ears, and low volume vocalizations.

Settings

This study involved review of treatment sessions conducted within the Psychological Services Center of the University of South Florida. The primary treatment of imitation took place in a room 4m by 3m. The room was furnished with a child-size table, three child-size chairs and an adult-size chair. There were clinic toys (plates, plastic cookies, babies, xylophone, markers, cup, stuffed animals, and phones) on the table used for the imitative interactions. During clinic sessions the experimenter and the child were seated at a table on chairs facing each other. All the sessions were videotaped in a manner consistent with the usual procedures at the Psychological Services Center.

The second room, in which assessment of generalization across people (from therapist to the mother) was conducted, was a family therapy room 6 m by 3 m. This

room contained two sofas and a coffee table on the side, with a large area in the center that was used for play and parent-child interaction.

Treatment

The current study examined two phases of a concluded treatment: imitation training and imitation of the child by the therapist. The treatment consisted of one-hour individual appointment for each child in the clinic and one hour at home, per week. There was also another hour of family therapy at the clinic. The one-hour individual appointment with the children was dedicated to various therapeutic activities focusing on interventions such as teaching sitting and attending skills, social interaction and responsiveness, imitation and compliance and the other hour with the family focused on current needs or concerns expressed by the parents. These were all interrelated aspects of the treatment.

Two graduate students in clinical psychology and two graduate and undergraduate students in applied behavior analysis, together with a licensed clinical psychologist and USF professor served as the therapists.

Treatment was carried out with procedures added sequentially as appropriate. Initially, a baseline assessment for imitative behaviors was conducted. Imitation training was the second condition. The last imitation teaching sessions also served as baseline for contingency testing followed by the implementations of imitation of the child procedures.

The imitation training involved teaching a set of successive discriminations through use of reinforcement, prompting and shaping. A list of 30 behaviors (body movements, actions with objects and sounds) was generated across several topographies based on research and prior observation of behavioral repertoires of children with a

similar condition. The list of vocal imitations was compiled at the suggestion of another therapist who had been working on language development with one of the participants. The sounds, body movements and actions with toys selected for training were age appropriate, functional play behaviors for the target population. These behaviors were numbered from 1 to 30 and a table of random numbers was consulted in order to create two different lists of imitative behaviors. The first 15 numbers were assigned to list A and the second 15 numbers to list B. Each list contained five behaviors which were selected to serve as probes (imitations which would be presented only once during each session and there would be no consequence delivered for matching or not matching them), by consulting a table of random numbers as well. The first 5 numbers generated in the table were assigned as probes in list A and the next 5 numbers as probes in list B (Appendix A). Only 10 of the 15 imitations from each list served as training trial models. A total of 20 imitations were taught throughout imitation training.

The therapist's imitation of the child involved imitating his/her appropriate actions, behaviors and vocalizations for 10 minutes.

In all conditions the therapist was consistently positive in his interactions with the child and delivered descriptive praise for behaviors such as sitting and looking at the therapist to support the child's general participation.

Dependent variables

The dependent variables were: the percentage of mastered imitations, defined as a match of a model on its first presentation or two consecutive matches of same model on any of the subsequent presentations, the number of trials required to demonstrated mastery and the percentage of intervals in which contingency testing behavior occurred.

Imitation was defined as a behavior which follows a model presented by the therapist or parent within 5-7 seconds and which is topographically similar and a clear match to the model presented. To examine the development of the imitative repertoire the therapists presented 30 behaviors to be imitated by the child, 20 training trial models selected for training (Appendix B) and 10 probe models (Appendix C) which were not trained or reinforced. The participant's correct imitation of the models presented was scored as a match in a response per opportunity format. A match or a correct imitation was scored when the child performed the behavior demonstrated by the therapist or the mother, which included responses specified in the list of imitations with definitions (Appendix B and Appendix C).

Contingency testing was defined as initiating or changing activities by the child followed within 5 seconds by head and eye orientation towards the therapist (Dean & Stokes, 2003). To investigate the occurrence of contingency testing the therapists engaged in imitations of the child for 10 minutes. Every minute of each session was divided into four intervals of 15 seconds, where the presence or absence of contingency testing behavior was marked, using a partial interval recording.

Data collection

The primary data collector and the reliability observer were graduate students in the Applied Behavior Analysis Program at University of South Florida. Prior to the study they learned the definitions of each targeted behavior and received training in recording the measurable dimensions of imitative behaviors. Both observers recorded the occurrence of target behaviors retrospectively via videotapes of treatment sessions.

Reliability

Reliability of observation was established by measuring the agreement between two observers. The observers recorded independently: on some occasions they recorded simultaneously but sitting apart and without seeing each other's records and on other occasions they recorded at different times. The interobserver agreement was reported as percentage of agreement between observers. There were two major dependent variables in the proposed study for which two different measurement methods were used: response per opportunity and interval recording. Along with the response per opportunity recording, the number of trials required to emit the imitations at the mastery criterion constitutes was scored. Agreement for response per opportunity recording was established when the two independent observers agreed that the targeted response occurred. Percentage of agreement was computed by dividing the total number of agreements by the total of agreements and disagreements multiplied by 100. Agreement was calculated in the same way for the total number of trials required to reach mastery. Agreement for interval recording was established for those intervals in which both observers scored the occurrence or the nonoccurrence of the behavior. Interobserver agreement was computed by dividing the number of agreement intervals, by the total number of agreement intervals plus disagreement intervals and multiplied by 100.

Interobserver agreement was conducted for the dependent variables at least 30 percent of the sessions distributed across all experimental conditions. The mean agreement scores for Alice's target behaviors were 93 % (range, 50% to 100%) for mastered imitations, 85% (range, 60% to 100%) for the total number of trials required to reach mastery and 100% for probes. The mean agreement for Keith's target behaviors

were 100 % for mastered imitations, 91 % (range, 63% to 100%) for total number of trials, and 92 % (range, 70% to 100%) for probes .

Table 1

Mean interobserver agreement scores across baseline and treatment

Targeted responses	Alice	Keith
Imitations mastered	93%	100%
Total number of trials	85%	91%
Probes	100%	92%
Contingency testing	79%	87%

Experimental conditions

Baseline for imitation. Baseline data was collected on the percentage of correct imitative responses emitted during the assessment part of each individual session. During the baseline condition of the treatment, one therapist verbally instructed the child to imitate (by saying “Do this”, without describing the behavior) and demonstrated each of the 15 imitative behaviors from list A or list B. There was only one trial for each of the 15 behaviors. No consequences were delivered for matches or non-matches of imitations modeled during baseline. Both lists comprised imitations selected for training interspersed with imitations selected to serve as probes. The two lists of imitative behaviors were presented in an alternating sequence throughout the study. Baseline was continued until there was stability in the first dependent variable or a downward trend.

Imitation training. The imitation training consisted of two phases. The first phase was an interim condition which involved intensive training of imitation until the participants reached a criterion of 30%, or higher, imitation of the therapists' models on their first presentation. The second phase included imitation training and assessment of the imitative behaviors acquired. The assessment during treatment consisted of presentation of imitations and delivery of reinforcement for correct responses and was conducted throughout each session.

There were four students who served as therapists during treatment. They presented 10 training trial imitations from the list selected for training. Each therapist evoked the child's attention first by saying his/her name or making sure the child looks in his direction and then modeled an imitation preceded by the verbal instruction "do this". Following the presentation of the behaviors to be imitated, correct or approximations of correct responses emitted by the child within 5-7 seconds received reinforcement in the form of touch, praise and affection. Touch and affection had been selected as reinforcers based on the effect they had on sitting and attending during pre-baseline sessions, when they led to a significant increase in the targeted behaviors. The children were reinforced for closer and closer approximations of the modeled behaviors. Accepted approximations of the imitations taught are to be found in the appendix B together with definitions of correct responses. If the child failed to imitate within 5-7 seconds the model presented he/she was physically prompted and guided through the correct response. In this case, the behavior to be matched was demonstrated and prompted 5-10 consecutive times if necessary before actually presenting a different imitation. However during the interim

phase of the training errorless learning was used as well, the child being guided immediately after the presentation of a model.

In the beginning, the training procedure emphasized physical prompting and guidance through (moving the child through the desired behavior) and employed a continuous schedule of reinforcement. Subsequently fading of prompts and a shift to an intermittent schedule of reinforcement (variable ratio 2) occurred. Because the progress in the trained skills did not reach high and stable levels, a continuous schedule of reinforcement and physical prompting was maintained throughout.

Baseline for contingency testing. Baseline assessment of contingency testing was conducted during the last 3 imitation training sessions.

Imitation of the child. Once the assessment of contingency testing was completed, the imitation of the child procedure begun, and it was conducted for 10 minutes. The therapist imitated for 3-5 seconds the activity, gestures and vocalizations of the child every 15 seconds. The intervention sessions were comprised of 40 episodes of the therapist's mirroring of the child. Sessions had been conducted with one participant at a time. The child was seated at a table, across from the therapist, with various objects (toys) placed at his/her side. Similar toys had been placed next to the experimenter. As the subject manipulated a toy, the therapist manipulated his similar/duplicate toy. The therapist manipulated his duplicate toy only as long as the child manipulated his toy. The therapist also imitated the child's vocalizations. The therapist imitated the child's appropriate behaviors. If the child stood up and walked around the room the therapist would bring him back in the play area, and did not imitate him/her.

Social Validity

Social validity measures are designed to assess the acceptability and viability of a programmed intervention. Client feedback and satisfaction with the treatment goals, procedures and outcomes are the important dimensions that confer social validation to an intervention (Wolf, 1978).

In the present study questionnaires for the parents and other clinicians have been used to obtain social validity data. Two questionnaires using a Likert-scale format (see sample in appendix E) were designed to assess both the client's (participant's mother) and other clinicians opinions related to the goals, procedures and effects of the analyzed intervention . Both questionnaires included an open ended question for free-response comments on what constitute important imitations to teach. The first questionnaire was completed by the mother following the termination of the treatment. At this time, the mother reported satisfaction with the goals and procedures for both participants. However her responses indicated differences in satisfaction with the outcomes for the 2 participants.

The second questionnaire was completed by the mother and other clinicians at the termination of treatment. There was general agreement that the procedures and the goals of treatment were appropriate for both participants and that the participants acquired imitative skills. Mother's and clinicians' ratings are presented in the graphs bellow.

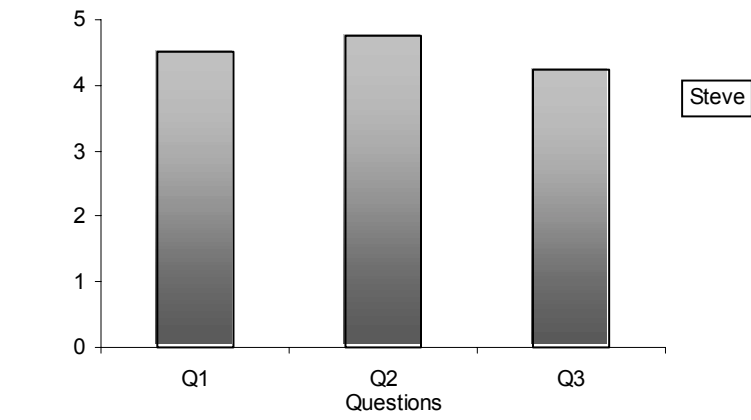
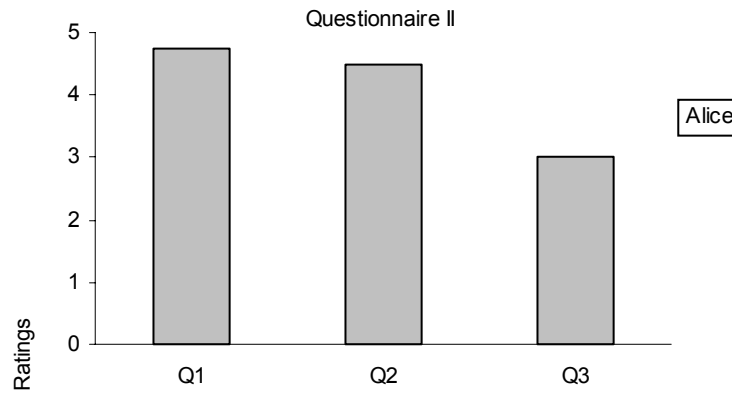
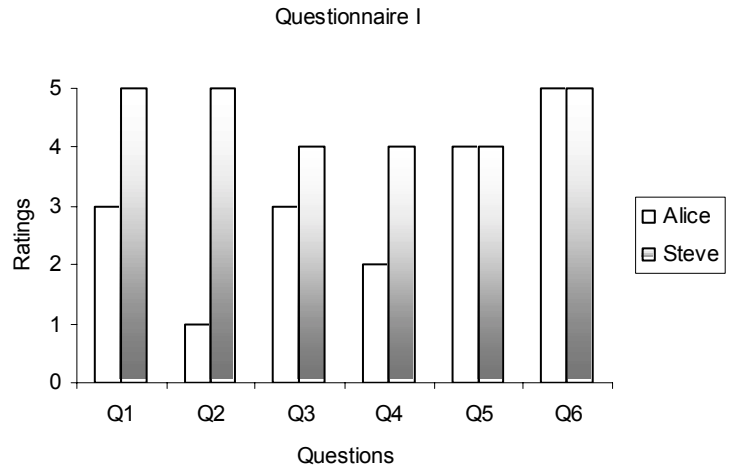


Figure 1. Social validity ratings completed by the mother and other clinicians

The open ended question included in both questionnaires asked the raters to name imitations which they considered important to teach. The mother reported that she wanted the children to learn to imitate everything. Some of the clinicians who completed the second questionnaire listed some of the behaviors which had already been used for teaching, while others emphasized the need for more vocal imitations and a greater emphasis of intensive training on these imitations.

All the raters strongly agreed that imitation was an important goal for therapy.

Design

A multiple baseline design across participants was applied to assess the effects of the imitation teaching and the therapist's imitation of the child procedures. This design allows the sequential application of the experimental variables to one child at a time, so the effects can be examined at the point of intervention and compared to data before and after the intervention. (Budd, 2003; Kazdin, 1982). The effects of the experimental variable, as compared to baseline, were examined and determined before applying the variable to subsequent participants. Visual analysis of data allows us to analyze treatment effects in terms of magnitude of change, variability, and trend of participant data throughout, all conditions of the study (Parsonson, 2003).

Chapter Three

Results

The data analyzed in the current study were obtained by reviewing treatment records, which included observational data sheets and videotapes of sessions. A multiple baseline across participants was used to assess the effectiveness of an imitation teaching procedure and the emergence of a contingency testing repertoire. The reviewed treatment targeted the formation of generalized imitation in 2 children with autism, by employing shaping and prompting procedures.

Imitation training

Figure 2 shows the percentage of mastered imitations demonstrated by Alice and Keith, together with the number of trials required to reach mastery, during treatment conducted in the clinic. The treatment conditions were implemented sequentially across children in a multiple baseline fashion. Alice was the first to receive the intervention after an initial baseline assessment. Alice's baseline indicates a stable rate of imitative responding with very little variability ($M = 4\%$; range, 0 to 10%) and a very small number of trials needed to perform the demonstrated imitations. In baseline each behavior was presented only once, therefore there was only one trial per imitation. With the introduction of imitation training procedure there was a gradual increase in Alice's rate of correct imitative responding up to 40% ($M = 27\%$; range, 0 to 40). While Alice's rate of

imitation shows an upward trend, the total number of trials required to demonstrate mastery follows a downward path.

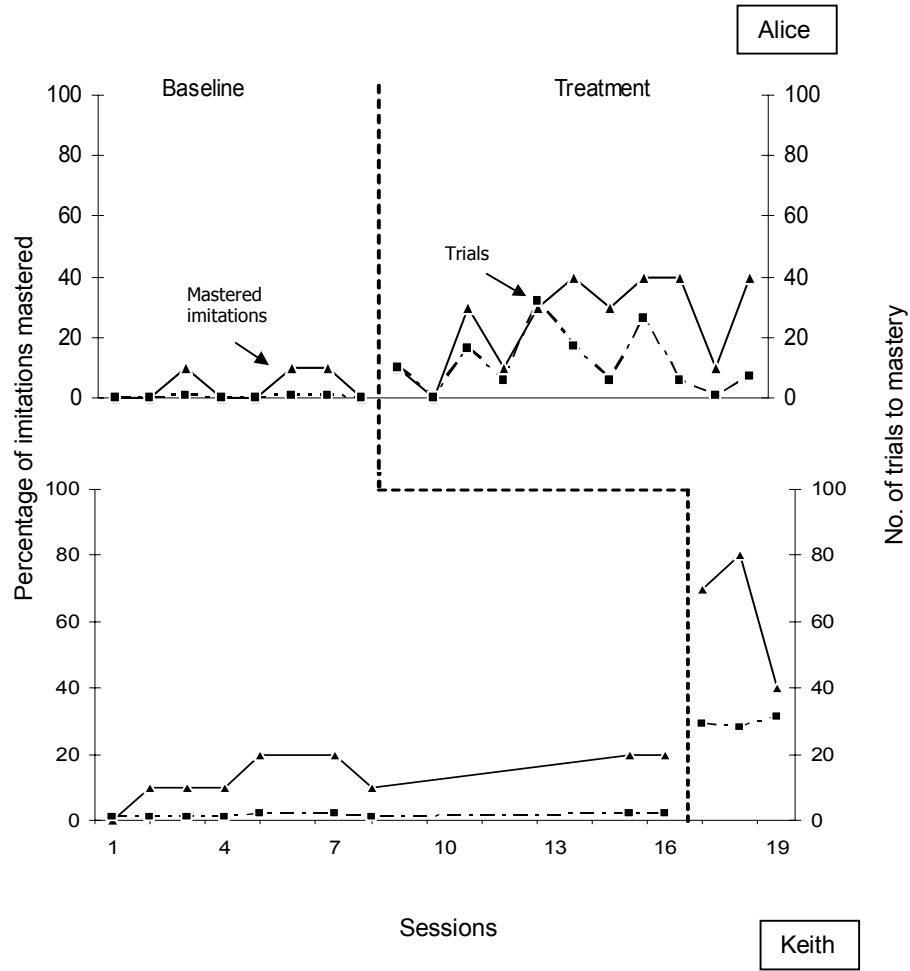


Figure 2. Percentage of imitations mastered and total number of trials required to reach mastery across clinic sessions.

Following a period of intensive training for Alice, baseline continued to be collected for Keith. Baseline observations indicated a slight upward trend in Keith's imitative responding (M = 12 %, range, 0 to 20 %). With the introduction of treatment a drastic increase in the level of correct imitative responding can be observed for taught imitations from 20% in baseline to 70% during the first treatment session, to further increase in subsequent sessions. The treatment contrasts with baseline due to the rapid increase in the level of correct imitations (M = 67 %, range, 40 to 80 %). However there was a decrease in Keith's level of responding in the last session.

Figure 3 shows the percentage of imitative responding to training trial and probed imitations. Alice's responding to probes shows a stable level of 0 % during baseline and a slight increase towards the end of the treatment (M = 10 %, range, 0 to 20 %). Keith's probe data had a mean of 9 % (range, 0 to 40) during baseline and stayed low during treatment M= 20%.

The results show increases in the correct imitative responding to training trial models with the implementation of treatment but no corresponding increase in imitation of probes.

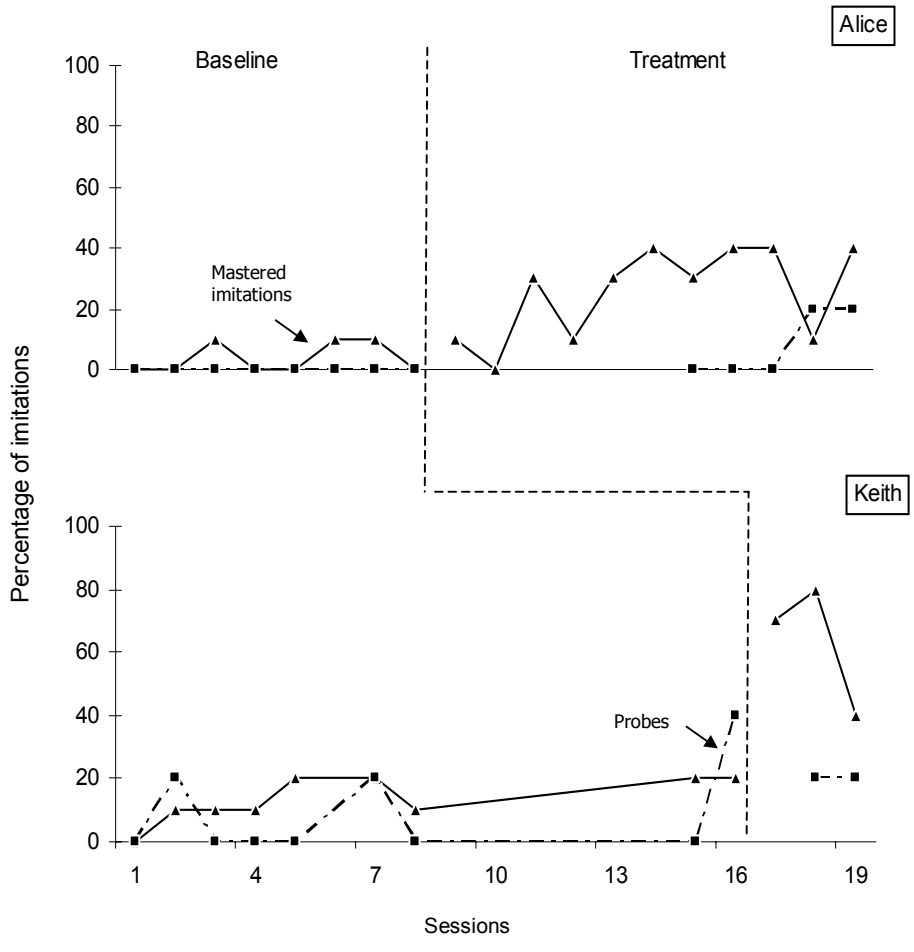


Figure 3. Percentage of mastered and probed imitations across clinic session.

The reviewed treatment also targeted the generalization of the imitative skills across people and settings. Therefore the imitation teaching procedure took place both at the clinic and at home for the most part of the treatment. The same procedures conducted in the clinic were carried out at home, with a smaller number of therapists. In the clinic 3-4 students participated in the imitation training procedures serving as therapists, whereas at home only 2 student therapists conducted the procedures.

Figure 4 displays the percentage of mastered imitations and the total number of trials required to reach mastery for each participant, across baseline and treatment throughout sessions conducted at home. Baseline observations indicate a stable level in Alice's responding to training trial imitations ($M = 5\%$; range, 0 to 10%). Following the implementation of treatment a gradual increase in the level of correct imitative responding of training trial models ($M = 33\%$; range, 0 to 50%) and a decrease in the total number of trials required to meet the mastery criterion can be observed.

Keith's baseline data indicate an upward trend for training trial imitations ($M = 18\%$; range, 10 to 20%). With the introduction of treatment there was an immediate increase in the level of correct imitative responding to training trial models ($M = 75\%$; range, 70 to 80%) and a slight increase in the number of trials.

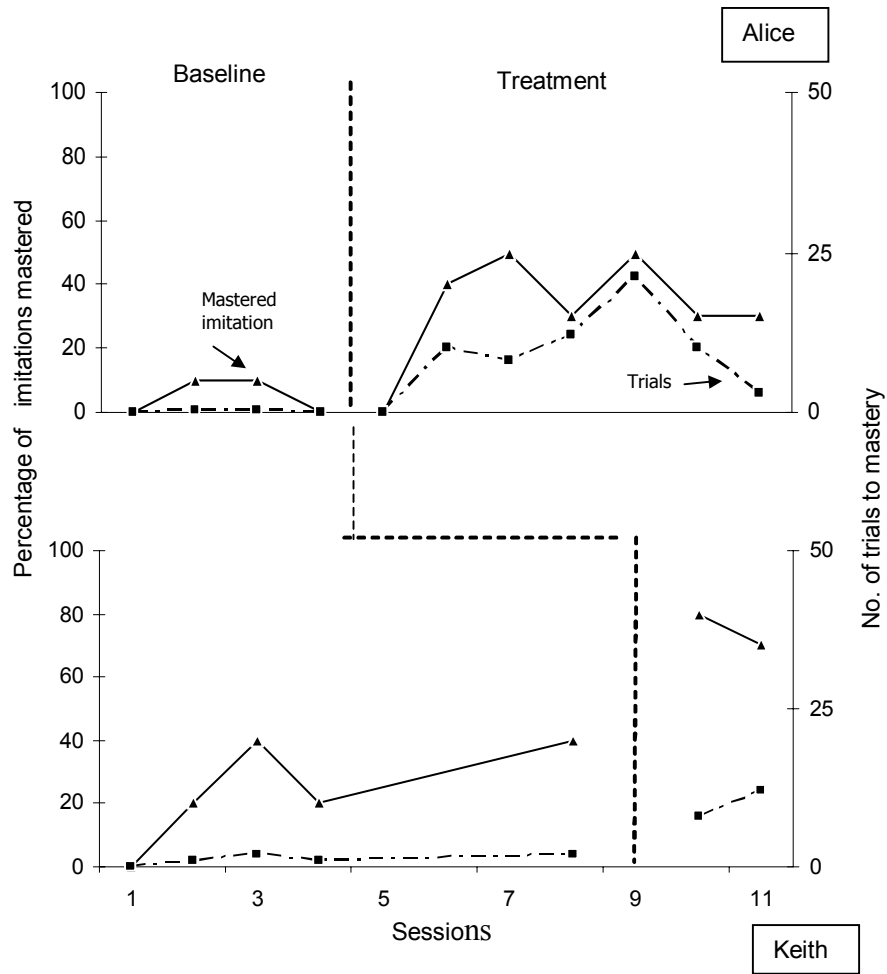


Figure 4. Percentage of imitations mastered and total number of trials required to reach mastery, across home sessions

Figure 5 is the graphic display of imitative responses to both training trial and probed imitations during home session. Alice’s imitation of probes during baseline was 0% and her level of responding to probes remained at this level throughout the treatment with the exception of one last session where there was an increase to 20 % (M = 3%; range 0 to 20). Keith’s imitation of probes during baseline varied very little from 0 to 20 % with a mean of 5 % and maintained at a level of 20 % during treatment (M= 20, range 20).

Table 2

Mean scores for mastered imitations across baseline and treatment sessions

conducted in the clinic (C) and at home (H)

Condition	Alice	Keith
Baseline	C: 4% H: 5%	C: 12% H: 18%
Treatment	C: 27% H: 33%	C: 63% H: 75%

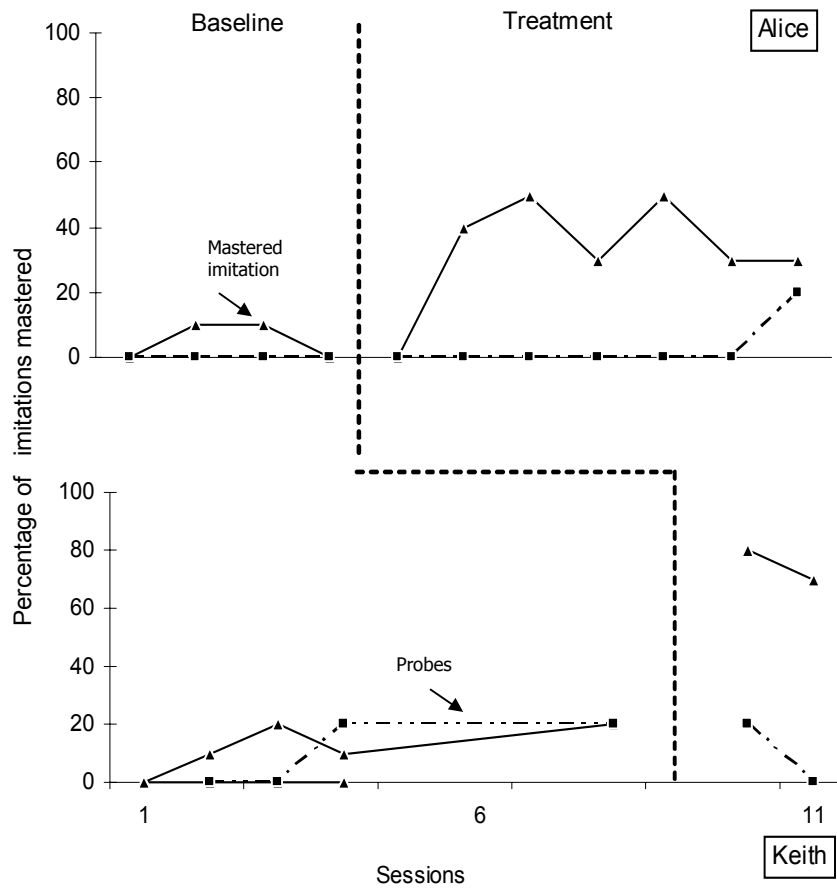


Figure 5. Percentage of mastered and probed imitations across home sessions.

The treatment also targeted the generalization of skills across people across therapists and the mother.

In order to assess the generalization of imitative skills from the therapist to the parent, the mother was invited to present 5 non-trained imitations (probes) 4 times during treatment. Table 3 shows the percentage of correct responding to probes presented by the mother. The level of responding to probes presented by the mother varied from 0 to 20% for Alice and had a stable level of 20% (1 imitation matched out of 5 total) for Keith.

Table 3

Imitation of probes presented by the mother

Condition /Session	Alice	Keith
Baseline:		
S9		20%
S10		20%
Treatment		
S9	0%	20%
S10	20%	20%
S17	20%	20%

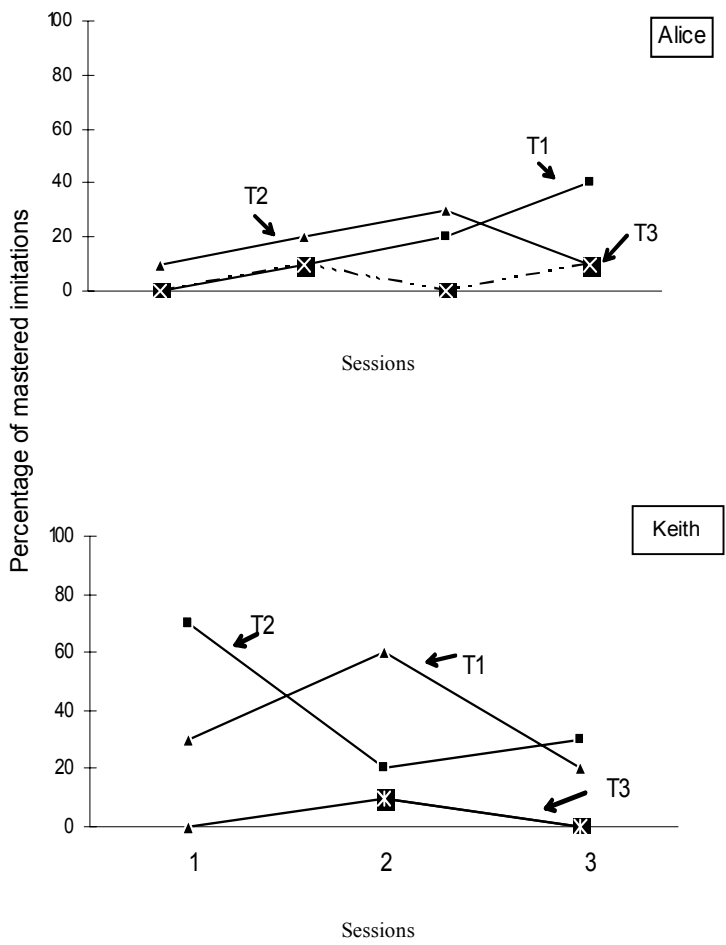


Figure 6. Percentage of mastered imitations across therapists

Contingency testing

Figure 7 shows the percentage of intervals in which testing behavior occurred across baseline and treatment. Baseline observations indicated a slight upward trend for Alice, with a mean of 13.5% (range, 12 to 15) and a stable rate of 0 for Steve. With the implementation of the imitation of the child procedure results indicate an increase in testing behavior for Alice from 15 in baseline to 60% and an upward trend (M= 51%; range, 42 to 60%) and an increase for Keith, from 0% occurrence in baseline to 25% in treatment.

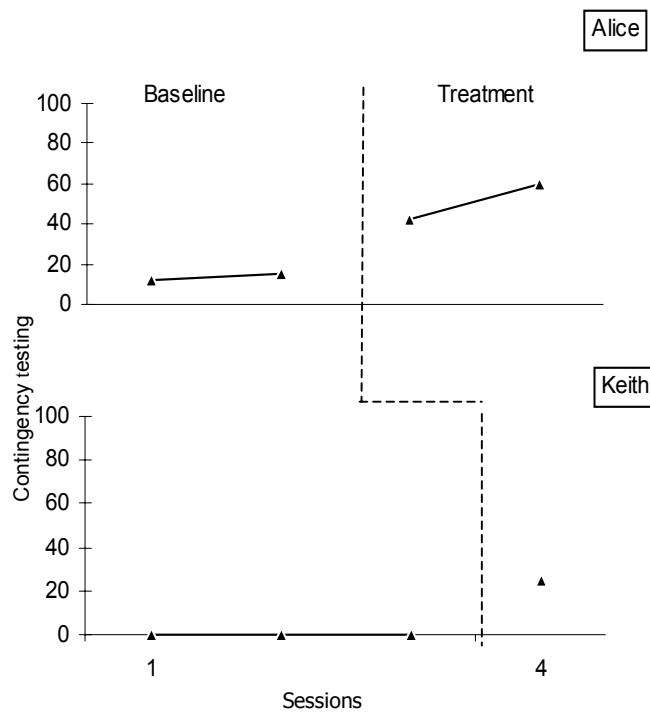


Figure 7. Percentage of intervals in which contingency testing occurred

Discussion

This study examined the effects of an imitation teaching procedure in developing imitative repertoires in two children with autism. The analyzed procedure has been part of a comprehensive treatment package delivered by the USF Psychological Services Center over a period of 6 months.

The current study hypothesized that generalized imitative repertoires can be established effectively in children with autism through reinforcement and shaping procedures. Analysis of the treatment records suggests that the shaping and reinforcement procedures were successful in developing imitative skills for both participants, Keith and Alice. This success is especially demonstrated by the prompt increase, with the introduction of treatment, in Keith's level of imitative responding and to a lesser extent by the small increase in Alice's responding. These changes were observed within an experimentally controlled multiple baseline design.

Alice's average level of correct imitative responding of 27% for clinic and 33% for home sessions and Keith's average imitative responding of 63% for clinic and 75% for home sessions indicate the emergence of an imitative repertoire in need of further training.

A generalized repertoire is established once a certain number of imitations which have been trained are performed correctly and consistently and once it becomes progressively easier to imitate novel responses on their first presentation. In order to

present new imitations, one has to first teach a number of responses with different topographies (motor, vocal) and then introduce novel, probed responses. “Imitation of novel responses emerges without a history of prior reinforcement of those specific imitative responses. Once emitted, these responses are automatically differentially reinforced by the degree of similarity they achieve to the modeled response, as long as some other imitative responses are reinforced by other contingencies” (Kymissis & Poulson, 1994, pg. 390). Similarity becomes a conditioned reinforcer which maintains new imitative responding.

The low level of responding to novel, probed imitations with an average of 10% for Alice and 20 % for Keith suggests that generalized imitation wasn’t established after 6 months of treatment. The similarity between modeled responses and the imitative responding of the child did not acquire secondary reinforcement properties in maintaining new imitative responses. The failure to demonstrate conditioned reinforcement effects entails further analysis of the controlling variables.

Limitations and recommendations for further research

In the discussion of the current findings certain constraints should be considered. For example, the relatively short duration of this study (given the pervasive nature of autism), the small number of sessions and training trials are all variables which limited the development of imitative repertoires. Alice participated in 11 treatment sessions in the clinic and 7 at home and Keith in 3 training sessions in the clinic and 2 at home. Keith’s overall data as presented in Figure 2 and Figure 3 shows great progress in imitative responding after only 3 sessions. The procedures employed were successful in

teaching him to imitate. More sessions for Keith would have entailed higher and more stable rates of imitative responding.

Previous studies (Garcia, Baer & Firestone, 1971; Young et al, 1994) reported thousands of trials and hundreds of sessions for a period of almost a year. For example Garcia, Baer and Firestone (1971) conducted their study for 11 months, 2-4 days a week, 2 sessions of 15-30 minutes per day. Young et al. (1994) conducted 475 sessions to teach a total of 27 imitations. Both studies reported hundreds of trials required to acquire the imitative small and large motor responses and thousands of trials (1000 - 3000) to acquire the vocal imitation of models presented. The complexity of the developmental delays and the pervasive nature of autism require a more intensive and long term treatment in order to overcome the targeted deficits.

There is a consistent difference between the effects of the same treatment procedures on Alice's imitative responding compared to Keith's. Alice's imitative responding did not go past 40% during clinic sessions whereas Keith's reached a level of 80% in the second treatment session. These differences might have been due to their different degrees of impairment. This is noteworthy as the children who participated in the study were part of triplets. There is great variability among individuals with autism in terms of cognitive, emotional and social functioning and apparently this variability goes past genetic endowment. Keith seemed to be a higher functioning child than Alice: he had a vocabulary of 5-10 actual words, while Alice had none; Keith would imitate a great variety of sounds, while Alice would emit just a couple which were not a match to the actual model; Keith had a manding repertoire of 4-5 requests while Alice had none; Keith was interested in toys and would actually spend time playing with puzzles, music boxes,

books, while Alice would just wonder around or watch television. Alice also displayed a number of perseverative behaviors (squeezing, tapping toys or putting everything in her mouth) and stereotypic behaviors involving hand and eye movement, accompanied by a certain sound. Both her perseverative and stereotypic behaviors seemed to interfere with the procedures. There were sessions when Alice would start a certain ritual and would “shut off”. Keith’s perseverative and stereotypic behaviors were less severe (he tended to look at things from a specific angle, and to cover or rub his ears) and they very seldom interfered with the procedures. Besides differences in the level of general functioning between the two participants, Alice also had a long history of non-compliance and escape from demands. Throughout the imitation teaching sessions Alice often displayed an oppositional style. Videotapes of sessions captured the differences in her interaction with the therapists across sessions: sometimes she would be responsive and make an effort to imitate, but most of the time she would do the opposite of what she was “asked” to or refuse to allow physical guidance through the desired response. Imitation of models presented seemed to covary with oppositional and stereotypic behaviors many of which seemed to be escape maintained. This assumption was made based on mother reports, and direct observation of child behavior. The present findings suggest that additional procedures such as extinction of escape maintained behaviors are worth considering in further studies.

By contrast, results during imitation of the child revealed the opposite pattern of data. That is Alice’s contingency testing increased from 15% in baseline to 60% in treatment whereas Keith’s showed an increase from 0% in baseline to 25% in treatment. This may be accounted for by the fact that the reciprocal imitation procedures were less

directive and less intrusive than the imitation training. The procedures used in reciprocal imitation were more under Alice's control and choice and, consistent with her history of reinforcement of non compliance, she was less oppositional.

Further analysis of variables controlling the treatment entails investigation of some of the dimensions of the reinforcement used. Improving the quality of reinforcers (using more potent stimuli) or strengthening their motivational effects by limiting access to them before training sessions might enhance the effects of reinforcement for imitative behaviors. Touch, the selected consequence for imitation, was also provided during guidance efforts from therapists and seemed to have not been a powerful enough reinforcer (potent stimulus) for Alice. A reinforcement assessment was conducted prior to treatment and touch was the only consequence that seemed to have an effect on increasing Alice's targeted behaviors. Touch functioned as a reinforcer in previous sessions where attending skills were taught. Since the potency of the reinforcing consequence might change from day to day, variation in the use of reinforcers may be advisable and may be assessed through a procedure involving forced choice among multiple stimuli.

Other possible constraints lie in the number and the type of responses used for training. A total of 20 to be taught imitations were used, divided into 2 lists of 10 each, which were presented alternatively. For Alice who had a very small repertoire of behaviors and interests selecting only 10 and training until they were performed correctly and consistently enough could have helped.

The imitation lists comprised three different topographical subclasses: large body movements, actions with toys and vocal imitations of two chained sounds. What Alice

acquired were mainly imitations of large body movements. The imitation of play with toy was performed once or twice across sessions, and vocal imitations were performed very seldom and with the great latency. Also a different choice of responses for training and probing, even within the topographical subclasses, might have yielded different results.

Young et al (1994) reported that the imitations of play with toy were the most difficult to acquire for some participants in his study. The authors hypothesized that this happened because it interfered with perseverative behaviors. The procedures of choice to enhance the treatment's effectiveness were to intersperse imitations with high probability compliance requests. In this study, the treatment team did intersperse easy to match imitations, which had already been performed by the participants during baseline or after a few sessions of training, with the ones which seemed more difficult to match. However this did not have an effect on the increase of imitations with toys.

The vocal responses selected for training might have been too high of a goal for Alice because she did not have words or groups of sounds in her repertoire at the beginning of treatment. Selecting only groups of two sounds like: ba-ba, da-da, ma-ma seemed to have been too difficult to start with. Starting with vocal models comprised of one sound seems now more reasonable. The vocal responses selected contained sounds which were already in both participants' repertoire; however it appears that the combination of sounds or the choice of single sounds could have been different for each participant.

The treatment team targeted for training multiple response types (a number of separate, topographically defined response classes) to produce between class generalization. Haring (1985) postulated that multiple class training may control between

class generalization in the same manner that multiple exemplar training might control generalization within a response class. Nevertheless, Garcia, Baer and Firestone (1971) focused on training each response subclass of imitation separately: large motor then small motor, short vocal. Probably training one subclass at a time until all responses are demonstrated to a mastery criterion and then moving to the next subclass would yield better results.

Keith's instruction-following training prior to his participations in imitation teaching seems an important variable. The treatment was conducted as follows: initial training of sitting and eye contact for both participants, while baseline was collected on imitation; then Alice began imitation training, while Keith started his instruction following training. Alice had no instruction following training prior to her imitation training. Keith had 12 sessions of compliance training (6 at the clinic, 6 at home) prior to introduction of imitation training. This might have contributed to his improvement in imitation but his last 2 baseline data (after 8 sessions of compliance training) are at a low level of 20% correct imitation and with the introduction of imitation teaching procedures his responding increased drastically to 70 and then 80%. This indicates the imitation procedures employed are the ones that account for his improvement.

The hypothesis that the treatment effects will generalize across people (across therapists and the parents) and settings has been confirmed partially by the constant demonstration of the acquired imitations across therapists (Figure 6). The therapists involved in the imitation teaching procedure were four students in clinical psychology and behavior analysis programs supervised by a licensed psychologist. Having therapists from different fields and with varied experiences in child therapy has benefited the

treatment. The participants responded very well to all therapists and the treatment progressed from a rigid, somewhat contrived to a more naturalistic style, adjusted to the individual needs of participants, as a result of the collaboration between the two fields.

In order to assess the generalization from therapists to the parents, the participants' mother was invited to present probes every couple of sessions. Apparently this was a double generalization measure: across people and across responses at the same time. The level of responding to probes presented by the mother varied for both participants from 0 to 20% (1 probe matched out of 5 total) with a mean of 15%. In reviewing the treatment, inviting the mother to model probes seems less effective. To assess generalization across people, the same behaviors which had been taught in the clinic should have been used. During the last home session the therapist asked the mother to model taught imitations and the participant's level of responding to her was comparable with their level across therapists in the clinic: 80% for Keith, 30% for Alice.

The generalization of skills across settings was assessed at home. The treatment was conducted twice a week, one session at the clinic and one session at home. The duration of sessions at the clinic varied between 30-60 minutes and at home the sessions were constantly around 30 minutes. At the clinic 3-4 therapists participated in the imitation procedure, and at home there were no more than 2 therapists. Even if the duration of the session and the number of people modeling and teaching imitations was smaller, the level of responding for both participants is higher than in the clinic, with a mean of 33% for Alice versus 27% in the clinic and a mean of 75% versus 63% in the clinic.

This study also examined the occurrence of contingency testing during reciprocal imitation procedures. Both children demonstrated an increase in contingency testing with reciprocal imitation within the multiple baseline design. However, there were some aspects of recording which should be noted. For example, the baseline observations were conducted during the last sessions of imitation training. This made the recording of contingency testing difficult because during imitation training there were sequences of interaction which resembled the description of contingency testing. The impact was that reliability may have been lower because it was more difficult to discriminate precise occurrences of contingency testing within the flow of imitation behavior sequences. In general, the reliability scored on an interval by interval basis was acceptable (M= 83%). However, when a more stringent assessment of reliability, using occurrences, lower and unacceptable reliability was evident. Anecdotally, the observers considered the low occurrence reliability to be a result of insufficient training and experience with the definition. It should be noted that the observers did agree when there was low or higher frequencies of contingency testing.

Conclusion

Overall, the results of the empirically examined treatment with controlled procedures contribute to both research and clinical practice in the field of behavior analysis and developmental disabilities. Kazdin (1982) recommends a series of steps which need to be taken in order to reduce the gap between research and practice to improve the clinical work and also to increase its scientific yield. Some of these steps are: to carefully specify the treatment, observe performance over time and bring to bear additional information to rule out possible factors that may explain changes over the

course of the treatment. All these recommendations have been taken very seriously by the investigated treatment in such a way that contributes directly to both the improvement in participant's life and to the scientific knowledge.

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Appendices

Appendix A

Two lists of imitations

Table 4: Imitations: list A

List A- Imitations	Matches “ + “	Non-matches “-“
1. Stretch one arm to the side		
2. Say ma-ma		
3. Put 1 arm up high (P)		
4. Stretch both arms to the side		
5. Dial a telephone (P)		
6. Touch head (P)		
7. Tap knee (P)		
8. Hold phone to ear		
9. Put 2 arms up		
10. Pound fists vertically (P)		
11. Clap hands		
12. Roll car up and down		
13. Feed baby with milk bottle		
14. Put cookie on the plate		
15. Hug baby		

Table 5: Imitations: list B

List B - Imitations	Matches “ + “	Non-matches “-“
1. Hug stuffed animal to chest with both arms		
2. Play xylophone (hit the keys with a stick)		
3. Push car (P)		
4. Fold both arms to the chest		
5. Put hands on ears (P)		
6. Say dah-dah (P)		
7. Stamp one foot (P)		
8. Hug doll		
9. Say eat		
10. Touch nose (P)		
11. Say mi-mi		
12. Tap stomach		
13. Tap table		
14. Say ba-ba		
15. Put crayons in the cup		

Appendix B

Imitations used for training and their operational definition

Imitations : list A

Date _____

Name _____

1. Stretch one arm to the side
Stretch one arm to the side: raise one arm laterally from the trunk to form an angle of 70 to 100 degrees to the side of the body relative to the trunk.
Approximations: arm raised laterally from the trunk starting with 20-30 degrees. Any effort to raise the arm should be reinforced in the first sessions and then only better approximations of the imitation modeled. That is, moving from 20 to 45 degrees as acceptable and then 70 degrees.
2. Say ma-ma
Say ma-ma: sounding out both syllables in succession within 5 seconds of one another.
Approximations: in the beginning making the m sound once, then twice, then saying ma, and then moving to ma-ma.
3. Stretch both arms to the side
Stretch both arms to the side: both arms raised laterally from the trunk to form an angle of 70-100 degrees to the side of the body relative to the trunk.
Approximations: arm raised laterally from the trunk starting with 20-30 degrees. Any effort to raise the arm should be reinforced in the first sessions and then only better approximations of the imitation modeled. That is, moving from 20 to 45 degrees as acceptable and then 70 degrees
4. Hold phone to ear
Hold phone to ear: Bring phone receiver to the ear, so as to touch and cover the ear .
Approximations: bring phone to ear, any part of the ear, in the beginning then placing it in the correct position.
5. Put 2 arms up high
Put two arms up: both arms lifted up reaching towards the ceiling.
Approximations: any effort to put both arms up should be reinforced initially, and then reinforce only better approximations of the behavior.
6. Clap hands twice
Clap hands: bring palms together to make a clapping sound two times .
Approximations: hands in an vertical position, coming together, then palms actually making a sound, then clapping making a sound.

Appendix B (continued)

7. Roll car up and down
Roll car up and down: move car forward on the table and bring it back where it started twice with hand.
Approximation: touch car, move car forward once, bring it back once, move forward and bring it back half of the total distance. (any of the steps described)
8. Feed baby with milk bottle
Feed baby with milk bottle: Put toy milk bottle in toy baby's mouth, the nipple of the bottle touching the lips and held there for 2 consecutive seconds.
Approximations: pick up baby bottle, then put baby bottle close to the baby then in the mouth area, then holding the bottle for a second to the mouth until holding the bottle for three consecutive seconds.
9. Put cookie on the plate
Put cookie on the plate: Move plastic cookie from the table placing it on the center part of the plate, with plate in the normal position.
Approximations: Move plastic cookie closer to the plate; place the cookie on any part of the plate.
10. Hug baby
Hug baby: take toy baby in your arm, bring it to your chest and cross arms over it or hold it to chest with both hands.
Approximations: place hands on the baby, take baby in your arms, bring it to chest, cross one arm over it or just hold it to chest. (Any of the steps described can be reinforced as an approximation)

Appendix B (continued)

Imitations: list B

Date _____

Name _____

1. Hug stuffed animal

Hug stuffed animal to chest with both arms, take stuffed animal in your arms, bring it to your chest and hold it with both arms or cross arms over it.

Approximation: place one hand on the stuffed animal, take stuffed animal in your arms and bring it to chest, cross one arm over it or just hold it to chest. (Any of the steps described can be reinforced as an approximation)

2. Play xylophone

Play xylophone: hit several keys of the xylophone with a wooden hammer or stick

Approximation: take the hammer in his hand, place it on the xylophone, hits one key, hits several keys (2-3).

3. Fold both arms to the chest

Fold both arms to the chest: Bring both arms up to chest and lay one arm or hand over the other while placed on the chest.

Approximation: bring any arm up to the chest level, lay one arm over the other even if not touching or placed on the chest.

4. Hug doll

Hug doll : take doll in your arms, bring it to your chest and cross arms over it or hold it to chest with both hands.

Approximations: place hands on the baby, take baby in your arms, bring it to chest, cross one arm over it or just hold it to chest. (Any of the steps described can be reinforced as an approximation)

5. Say eat

Say eat: sound out the word eat as is phonetically correct.

Approximation: make any sound (except Ya...), make a similar sound once, make the sound correctly once.

6. Say mi-mi

Say mi-mi: make this sound two consecutive times within 5 seconds from one another.

Approximation: make any sound (except ya...), make a similar sound once, and make the sound correctly once.

7. Tap stomach

Tap stomach: give a light noisy blow with entire palm on stomach 2-3 times.

Approximation: touch stomach with hand, or any finger, once, and then touch stomach with entire palm.

Appendix B (continued)

8. Tap table Tap table: give a light but audible blow with palm on the table 2-3 times.
Approximation: touch table, place finger or hand on the table, place it twice on the table, give a light noisy blow on the table
9. Say ba-ba Say ba-ba: make this sound two consecutive times within 5 seconds from one another.
Approximation: make any sound (except ya...), make a similar sound once, make the sound correctly once.
10. Put crayons in the cup Put crayons/markers in the cup: Pick up crayon from the table and place it in the cup in an upright position.
Approximation: pick up crayon, move position on the table, bring it closer to the cup, place it in the cup.

Approximations for vocal imitation that will be reinforced in the first training sessions: if the child looks at the experimenter's mouth and makes any sound (except ya....) immediately after a vocal presentation

For every imitation that involves putting something in or object (on plate, on the table, in the cup, rolling car or pushing car) if the child picks up the object and brings it to mouth or puts it in his/her mouth, this is not considered an approximation and therefore is not reinforced, but removed from mouth silently and calmly.

Appendix C

The list with probes and their operational definitions

Probes: list A

1. Put 1 arm up high Put 1 arm up (P): one arm lifted up, reaching towards the ceiling.
2. Dial a telephone Dial a telephone (P): index finger rotating the dial of the telephone to make a rotation of the dial at least 180 degrees.
3. Touch head Touch head (Probe): raise one arm to touch the top of the head with the palm (not just a finger, and not just any part of the head such as the lateral or back of the head).
4. Tap knees Tap knee (Probe): Give a light blow on knees with both hands two consecutive times within 5 seconds, so as to make a tapping sound.
5. Pound fists Pound fists (Probe): palms clenched to become fists, with one fist on top of the other, touching it 2 consecutive times within 5 seconds.

Probes: list B

1. Push car forward 1. Push car (P): move car forward on the table with one hand (X no of inches = 10-15 cm)
2. Put hands on ears 2. Hands on ears (P): bring hands up to the ear level and cover ears with palms.
3. Say da-da 3. Say da-da (P): make this sound two consecutive time within 5 seconds from one another.
4. Stamp one foot 4. Stamp feet (P): While seated the child needs to strike or thrust the foot on the floor forcibly or noisily downward for two consecutive times within 5 seconds.
5. Touch nose 5. Touch nose (P): bring palms /fingers in contact with the tip of the nose and hold it there for 2 consecutive seconds

Appendix D

Contingency testing recording

Date _____
 Name _____

Observer _____
 Condition _____

CONTINGENCY TESTING to be scored when the following sequence occurs:

- The child initiates or changes behaviors (body movements, actions with toys, words/sounds) and s/he orients head and eyes (or maintains head and eye orientations) towards the therapist’s face or relevant body parts within 5 seconds after the completion of those behaviors. Not scored if the child changes activities because instructed so during imitation training or if the child tries to get up.
- The behavior of interest will be scored in the interval where the sequence defined as contingency testing is completed.

Table 6: Contingency Testing Recording

Min.	15 “	30”	45”	60”	Description of activities
1					
2					
3					
4					
5					
6					
7					
8					
9					
10					

Appendix E

Social Validity Questionnaire 1

Please answer the following questions using the 1 to 5 rating scale as follows.

1. Not at all
2. Occasionally
3. Often
4. Most of the time
5. Always

1. After being part of this treatment, my child has started to imitate or attempt to imitate body movements that I model for him/her when preceded by the verbal instruction: "Do this".

1 2 3 4 5

2. My child imitates sounds I make when preceded by the verbal instruction "Say..."

1 2 3 4 5

3. My child imitates or attempts to imitate actions with objects that I model for him/her.

1 2 3 4 5

4. My child imitates actions or body movements when verbally instructed to do so by other people from his/her natural environment besides me (babysitters).

1 2 3 4 5

5. My child's play has become more diverse, he/she explores more of his/her toys and displays less repetitive behaviors

1 2 3 4 5

6. My child smiles more to me and to other people (familiar/unfamiliar), approaches other or initiates interaction.

1 2 3 4 5

7. What imitations would you like for your children to acquire/what imitations would you like us to teach him/her

Appendix E (continued)

Social Validity Questionnaire 2

Please answer the following questions using the 1 to 5 rating scale as follows.

1. Strongly disagree
2. Disagree
3. Neither agree nor disagree
4. Agree
5. Strongly agree

1. The development of a more elaborated imitation skill was a valuable goal for therapy.

1 2 3 4 5

2. The procedures used in treatment were appropriate for the child.

1 2 3 4 5

3. The child who participated in the analyzed treatment imitates many actions or body movements.

1 2 3 4 5

4. What imitations do you consider important to teach to Alice and Keith?