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PARENT-LED IMITATION THERAPY FOR NON-VERBAL CHILDREN WITH SUSPECTED AUTISM

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ABSTRACT

This study examined the results of Imitation Therapy conducted by parents of non-verbal children. Fifty-six parents were taught to engage in a specific form of imitation therapy with their child by speech-language pathologists (SLPs) who were familiar with the therapy. The SLPs oversaw the therapy via Zoom conferences and consultation with the parents. Parents who completed the study worked with their child for thirty minutes a day, five days a week, for four weeks. Measures of speech and language production were taken throughout the intervention period to determine progress. The children, ages two to five and a half, made significant increases in the number of different phonemes and the frequency of speech sounds they produced as well as their instances of imitation. Eighty-five percent of them increased their word production. Most of the parents reported that the therapy had been effective in increasing their children's language and imitation abilities. Children with mild autism symptoms showed more progress than those with severe symptoms. Some of the children who received fewer than the recommended twenty sessions progressed and those who received only two to three sessions did not demonstrate significant changes. Imitation therapy appears to provide an opportunity for parents to assist in children's development of the sounds and imitative behaviors that are essential to language acquisition. Parent-led imitation therapy may offer an effective alternative when the availability of consistent speech therapy services is limited.

KEYWORDS

Imitation; parent-led therapy; non-verbal preschoolers.

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INTRODUCTION

The ability to imitate is an essential skill for learning, socialization, and language acquisition (Ingersoll, 2011; Meltzoff & Moore, 1977; Sigman & Ungerer, 1984; Stern, 1985; Uzgiris, 1981). However, many studies have shown that children with autism may not spontaneously imitate others (Penney & Schwartz, 2019; Radhakrishna, 2010; Rogers, 1999; Rogers & Pennington, 1991). In fact, Williams et al. (2004), reviewed over 200 studies that reported delayed imitation development in children with autism, although the severity of the imitation difficulties varied among children (Janson et al., 2019).

Contaldo et al., (2016) noted that the imitation of children by adults leads to increased social skills and behaviors, especially in younger children. Several methods that utilize imitation have been found to be effective in increasing imitation skills. These include “Imitative Interaction” (Heimann et al., 2006), “Reciprocal Imitation Training” (Ingersoll, 2007), and an imitation therapy proposed by Zedler (1972). The imitation therapy introduced by Zedler, is a specific four-step intervention that has been shown to be effective in the clinical setting (Gill et al., 2011; Lomeli & Gill, 2022). It involves providing sets of identical toys which the adult uses to copy the child’s actions and verbalizations. In addition, studies have shown that parents may serve as the interventionists. When taught how to perform different types of interventions with their children with autism or other disabilities, parents have been found to be successful and readily available teachers (Dawson et al., 2004; Ingersoll & Schreibman, 2006). Additionally, parents can provide interventions when they do not have access to professionals who can help their children (Bindlish et al., 2018).

MATERIALS AND METHODS

The current study sought to determine whether the speech, language, and imitation skills of non-verbal children with suspected autism would increase when imitation therapy (Zedler, 1972) was implemented by the child’s parent or caregiver for four weeks. Flyers explaining the study were distributed by email to preschools, elementary schools, speech-language pathology clinics, and parent organizations in the state of Texas. Parents who had any interest in the study were invited to contact the researchers if they wanted more information. When the parents contacted the researchers, they discussed what imitation therapy was and how parents might implement it. If the parents decided to participate or get more information, they signed a consent form and met with the researchers. The speech-language pathologist (SLP) observed the child in play with the parent and filled out section 4 of the *Autism Screening Instrument for Educational Planning-Third Edition (ASIEP-3)* (Krug, D., Arick, J., Almond, P., 2008). This is the Autism Behavior Checklist Form, which can be completed in consultation with the parent. The ASIEP-3, section 4, is a checklist that compiles the child’s behaviors and verbalizations in order to help differentiate between children who are “not likely” to have autism, “possibly” have autism, and those who are “very likely”. If the child scored as “possibly” or “very likely” to have autism, the SLP tallied the number of vocalizations then and one and two weeks later to determine if the pre-treatment baseline was stable. Parents were taught how to conduct imitation therapy if they wanted to participate and had a child who a) was non-verbal or minimally verbal (had just a few words), b) did not spontaneously imitate, and c) demonstrated symptoms consistent with autism. The trainings were conducted via Zoom meetings by SLPs. They included explanations of the steps and activities, videoed examples, and a post-training questionnaire to ensure participants’ understanding of the method.

If they consented to and wished to carry out imitation therapy, the parents were asked questions before and after the intervention. These served as a social validity measure.

The three questions were:

- 1) How many times a day does your child imitate something you do or say?
- 2) How many different phonemes (different speech sounds such as “m” or “d”) can your child produce?
- 3) How many words does your child say each day?

Imitation Therapy Summary

Before therapy began, the parents were given mirrors and sets of paired toys and were instructed to hang the mirrors at the child’s eye level (near the floor) and to place the pairs of toys around the room. They then carried out the intervention for thirty minutes, five days a week, for four weeks. The therapist watched the intervention two to three times to ensure that it was being conducted as instructed, followed by phone and Zoom consultations weekly or more often as needed. During the 30 minute sessions, the child wore a vest in which a small audio recorder, was placed. Therapy began in a room that was closed off from other activities and children. The parents started by following the child’s lead, doing exactly what the child did. For example, if the child stacked two blocks, the parent stacked two blocks as soon as possible (almost in tandem). The parent imitated the child’s movements and verbalizations (except for negative sounds such as screaming) and remained physically close to the child. After the child realized that his actions were making the parent act (that he, the child, was in command), the parent occasionally initiated a movement that the child had done previously and looked to him to imitate. The parent put toys near the mirror and waited for the child to look at himself in the mirror. After reciprocal imitation of verbalizations and physical movements, the parent decreased physical movements. That is, he/she did not move around the room but stayed near the mirror and imitated any movements of the child’s mouth or hands and any verbalizations. The parent occasionally initiated a sound sequence that the child had previously produced and verbal reciprocal imitation was established. Finally, the parent paired sounds with their meanings.

Imitation Therapy: Step By Step Details

Twelve to fifteen pairs of identical toys were placed together around the room. These included pairs of identical toys such as stuffed bears, cars, animals, doll families, scarves, and blocks. The four step therapeutic approach was conducted as follows:

Step 1) At the beginning, all of the child’s actions and vocalizations, except for negative ones such as screaming or hitting, were imitated by the parent. The parent attempted to make sounds immediately after the child did, in the same manner, pitch, and duration. The parent moved only in imitation of the child as the child explored or played, in a type of “follow the leader” fashion. The parent made sure to position herself at the child’s level so that the child could see what the parent was doing immediately. The parent picked up the matching toy as the child did and copied whatever movements the child made with that toy. Occasionally, a toy exchange would occur- that is, when the child reached for the toy held by the parent, the parent simply reached for the child’s toy. Progress occurred when the child realized that his own motions were causing the parent to move and then intentionally altered his movements and looked to see if he were being imitated. This would indicate that the child was aware of his power to manipulate an adult, which led to step 2.

Step 2) In step two, the parent reduced her imitations to vocalizations, facial, and hand movements made by the child. That is, the parent no longer moved about the room, but sat near or in front of the mirror and watched herself make some vocalizations. If the child joined the parent, the parent returned to more imitative behaviors to reinforce the child for joining her. Then the parent did not imitate large motor movements such as rolling around, but tried to stay in a position so that the child could see her. Occasionally, there were some exchanges of leadership and imitator roles. As gross motor movements decreased there were increases in sound productions which the parent imitated.

Step 3) In step three, leadership and imitation roles were exchanged frequently. The parent produced new phonemes occasionally, and paired the sounds with meaning, such as saying “rrr” to start a car rolling. The number of toys were reduced and placed next to the mirror.

The parent would wait for the child’s response and then return to imitation of the child’s sounds and facial and hand movements. This resulted in increased frequency of sound productions and an increased number of different phonemes. Instances of the child imitating the parent increased.

Step 4) In the fourth step, the parent frequently took the lead in introduction and production of phonemes. The parent demonstrated sounds paired with meaning, such as “uh-oh” when something fell or “bye-bye” when putting something away. The parent dropped back to imitating the child as a form of reinforcement. These actions led to acquisition of new word forms.

Therapy Adjustments

Parents were coached to make positive changes after they were observed by the SLP on Zoom. For example, initially, several parents engaged in the imitative behaviors at a distance, preventing the child from seeing that he was being imitated. The SLP recommended that the parent get much closer to the child (almost touching or face to face) so that the child could see that he was being imitated.

Data Gathered

After each session, data were gathered from the recordings and analyzed by the SLPs. They calculated the total number of verbalizations and the total number of words/word approximations produced by the child. To determine the inter-observer reliability on the measures, two trained graduate student assistants observed ten minutes of the recorded therapy two times for the participants. During these twenty minutes for each child, they independently tallied the number of sounds and words they heard produced by the child. Both the student observers and the therapists’ counts on the recordings resulted in agreement above 91 percent for all measures.

Following the final session, the SLP asked the parents the same questions that were asked before the initial intervention regarding the number of imitations, different phonemes, and words their child produced.

Participants

Participants were recruited over a 30 month period from the 254 counties in Texas.

Approximately 135 parents were introduced to the intervention and 54 children received imitation therapy conducted by the parent or caregiver. One-third of the parents who completed the study were bilingual and two-thirds were monolingual. The participants were 17 percent female and 83 percent male. Prior to the initiation of treatment, the children all scored as “possibly” or “very likely” to have Autism on section 4 of the ASIEP-3 and they showed typical attainment of physical milestones. The initial observation by the SLP confirmed that the children exhibited no, or very few, verbal or

physical imitations and spontaneous word productions. Children who did not have an initial baseline that was stable were not included in the study reports. Twenty-one participants received the therapy for up to ten sessions, but had to discontinue for various reasons that included family members getting COVID, childbirth, illness, family situations, and lack of time. Twenty-seven of the children received all twenty sessions of intervention over a four week period. The children ranged in age from 23 to 66 months of age.

Research Questions

For children who completed all twenty sessions:

1. What were the changes in the number of words produced by the children?
2. What were the changes in the frequency of speech sounds produced by the children?
3. What were the changes in the parent-reported estimations of their child's daily a) physical or verbal imitations, b) the number of different phonemes, and c) the number of words?
4. What were the differences in outcomes for children with mild versus severe autism?
5. What were the changes in observed imitative behaviors and reciprocal imitations?

For children who completed less than four hours (eight sessions) of intervention:

1. What were the changes in the number of words produced by the children?
2. What were the changes in frequency of speech sound productions by the children?

The overarching question at the base of this research was whether parent-led imitation therapy would correlate with positive changes in the children's speech and language.

RESULTS

Word Production

The first data analysis included the number of word or word forms produced by the 27 children who completed all twenty sessions. Changes in the number of words produced during the thirty minute sessions were calculated over the course of the intervention. Words were counted if they were consistent sets of phonemes used with meaning. That is, they did not have to be precisely articulated, but they had to clearly represent a word. For example, if a child said "da" when he saw his dad that was considered a word. After a stable baseline was established (most had no words at all), data were tabulated for the first, fifth, tenth, and twentieth sessions. Increases in word production were observed in 85 percent of the children who completed the study. Fifteen percent did not produce any words at all. Overall, these children produced an average of one word at the beginning and an average of almost 12 at the end. See Table One for word productions throughout the intervention.

A within-subjects ANOVA was conducted to examine how the number of words produced changed from session 1 to session 20. Overall, there was statistically significant improvement in words, $F(3, 78)=41.74, p<.001, \eta^2 = .62$, from the first to the twentieth session.

Table 1. Average number of words produced during intervention

	Mean	Standard Deviation	N
Words – Session 1	1.00	2.882	27
Words – Session 5	2.30	4.008	27
Words – Session 10	6.07	5.890	27
Words – Session 20	11.56	9.362	27

Frequency of Sound Production

Data were gathered during the intervention from the 27 participants who completed all 20 sessions to determine changes in the children’s frequency of sound production. The frequency of sound production was measured at the first, fifth, tenth, and twentieth sessions. Each speech sound that the child produced was counted. For example, if the child said “Da dog” that was counted as five sounds; if he said “a” “uh” “o” that was counted as three sounds. Sounds such as crying were not counted. One hundred percent of the children in this group increased their frequency of sound production. Some increased dramatically while others increased only slightly. Increases in sound production occurred in 92 percent of the children by the fifth session and in 100 percent of the children by the tenth session. The range of sounds produced by the children was highly variable. The lowest went from three sounds at the beginning to six sounds in the twentieth session while one child changed from 425 sounds initially to 498. (This child made an “uh” sound repeated constantly.)

A within-subjects ANOVA was conducted to examine how sounds changed from session one to session twenty. Overall, there was a statistically significant improvement in frequency of sounds, $F(3, 78)=10.60, p<.001, \eta^2 = .29$. See Table Two for the average frequency of sounds produced.

Table 2. Average frequency of sounds produced during intervention

	Mean	Standard Deviation	N
Sounds – Session 1	83.07	181.505	27
Sounds – Session 5	99.63	174.753	27
Sounds – Session 10	127.89	195.036	27
Sounds – Session 20	158.81	213.739	27

Word Production of Children With Mild Versus Severe Autism

The next question concerned the effects of imitation therapy (for those who received the full intervention), for children with milder versus more severe autism as determined by the ASIEP. The researchers observed distinct behavioral differences between the groups, e.g, continual movement, lack of attention, or flapping hands for the more severe group, which was consistent with the scoring on the ASIEP. Data showed that both groups had similar increases in sounds produced. However, the more severe group experienced smaller increases in words than did the children ranked as less severe, suggesting that the intervention may not be as effective in increasing words in children with more severe autism. However, none of the children in the severe group had any words at the beginning of the intervention. See Table Three and Four for differences in word production.

Table 3. Word production of children with mild and severe autism during the intervention

	Mean Words Session 1	Mean Words Session 5	Mean Words Session 10	Mean Words Session 20	N
Children with mild ASD	1.368	2.79	7.05	14.10	19
Children with severe ASD	0	1.38	3.38	6.00	8

Table 4. Average of the total number of words acquired by children with mild and severe autism

	Mean Words Acquired over the Course of Treatment	Standard Deviation of Words Acquired Over the Course of Treatment	N
Children with mild ASD	12.6842	7.6815	19
Children with severe ASD	6	6.2335	8
Total	10.704	7.8093	27

To assess the rate of improvement in each group, a one-way ANOVA test was conducted using the total number of new words learned by participants from each group (mild and severe). Overall, the results were considered statistically significant at $p < .05$. These results indicate that the therapy resulted in a significantly greater rate of word learning by the children with mild autism than for those with severe autism.

Observed Imitative Behaviors

Motor (physical) imitations and reciprocal verbal imitations (RVI) were measured for three of the children. This was done from observed Zoom sessions of the parent conducting therapy with the child. From this sample, non-verbal imitations averaged one at the beginning and nineteen at the twentieth session. Reciprocal verbal imitations were also counted. A RVI occurred when the child imitated the parent after the parent had imitated the child on the same word. For example, if the child said “uh-oh” and the parent repeated “uh-oh” and the child then said “uh-oh” again, this was counted as a RVI. The RVI average was zero at the first session and twelve at the last session. This increase, although with a small sample of children, agrees with the parents’ estimation that there were increases in imitative behaviors by the children.

Word Production Changes After Less Than Four Hours of Intervention

Parents were able to complete a varying number of intervention sessions. Thus, the next consideration was whether there were increases in word production in the children who received infrequent or inconsistent interventions which totaled less than ten sessions. Eight children received intervention at various intervals (once a week, twice a week, alternating weeks, and/or for less than thirty minutes per session). Those children received the equivalent of two to seven sessions (i.e., total time in therapy ranged from one hour to three and one-half hours.) In this group, one child increased from one word initially to 23 words at the fifth session. Most of the children had no words at the beginning and three children remained at zero words by their final (second or third session). This suggests that two or three sessions may not be sufficient to create increases in word production for all children, but may occasionally stimulate increased word production for some.

A dependent samples *t*-test was conducted to examine how word approximations changed from the initial to the final intervention sessions. In general, the sample improved from 1.13 words at the first session to 7.00 words at the last. However, the change was not statistically significant, $t(7) = 2.00$, $p = .08$, $d = .71$, possibly due to the small sample size.

Speech Sound Productions After Less Than Four Hours of Intervention

The eight children who received inconsistent intervention for less than four hours made some increases in the frequency of speech sounds they produced. The initial mean was 37 sounds and the mean from the children's last session was 97. Effects of inconsistent intervention schedules may depend on the details (e.g., length, interval frequency, child's skill level) regarding the intervention, but there may be some value to less intense imitation intervention.

The sample size was small for the speech sound frequency measurements ($n = 8$). The mean values improved significantly, although the standard deviations were high. Results were not statistically significant, $p = .14$, likely due to sample size limitations. Larger studies should be conducted to further investigate these effects.

Social Validity

In order to gauge the perceived impact of the therapy in the child's home life, parent estimations of a) physical or verbal imitations, b) number of phonemes, and c) number of words were taken prior to initiation of the imitation therapy intervention and after the final session of the intervention. Parents were asked to estimate how many times a day their child imitated them (verbally or motorically) and how many times a day they said a word. They were also asked how many different phonemes (e.g., /s/, /k/, /m/) their child produced. Parents' estimations of these factors included increases in all three areas, indicating that the parents felt that their child's skills improved. See Table Five for parents' estimations.

Three paired-samples *t* tests were conducted to examine how various parent-reported variables changed from pre- to post- intervention. All three tests were statistically significant, $p < .01$, indicating that the sample improved in imitation, phonemes, and words present. All the effect sizes (Cohen's *d*) were large, $> .80$.

Table 5. Parent estimations of the number of imitations, phonemes, and words produced in a day, before and after the intervention

	Mean	Standard Deviation	N	Standard Error Mean
Imitations – Pre Intervention	4.15	5.143	20	1.150
Imitations – Post Intervention	19.90	15.085	20	3.373
Phonemes – Pre Intervention	6.85	7.329	20	1.639
Phonemes – Post Intervention	16.05	9.605	20	2.148
Words – Pre Intervention	4.10	6.889	20	1.541
Words – Post Intervention	19.70	24.974	20	5.584

DISCUSSION

The limited imitation skills in children with autism, noted in hundreds of studies (Williams et al., 2004) support the need for intervention that promotes imitative behavior. Parent-led imitation therapy implemented in this study was effective in increasing children's imitation skills. The main component of this intervention differed from methods in most therapies to increase language. That is, therapists typically try to get the child to imitate them. However, in the current study, the parent initially imitated the child in an attempt to eventually teach the child to imitate him/her. Data analyses of this intervention confirmed positive increases in imitation throughout the intervention process. Significant increases in word and sound production were noted in children who completed the 20 session parent-led intervention protocol. These data support the findings of previous clinical studies using various imitation therapy methods in clinics (Gill et al., 2011; Lomeli & Gill, 2022) suggesting that parent-led imitation therapy is effective, similar to therapist-led interventions. The findings of this study further confirm the assertion by Contaldo et al., (2016) that adult imitation of children leads to increased language and interactions in young children.

Further, feedback from the parents indicated high satisfaction with their children's improvement in imitation and verbal behaviors. They reported more frequent speech-sounds, different phonemes, and imitations produced by their children following the intervention. Most of the parents reported some increase in word production. These findings support the practicality of teaching parents a procedure that they can implement at home. In addition, involving parents directly in the intervention, and allowing the implementation of therapy in a child's native language, may broaden the child's chances of receiving effective intervention.

Although many parents were unable to complete the recommended 20 sessions of intervention because of the high demand for time and energy, most were pleased by their child's progress. The less rigorous intervention schedule resulted in some positive results, but further study is needed to determine optimal parameters.

A factor that concerned the researchers prior to the implementation of therapy, was the lack of a controlled environment in a typical home setting as opposed to a clinical setting. However, during the course of this study, most parents were able to provide a fairly controlled setting without interference from objects or other people. In general, it appeared that children who were used to their own homes, did attend to the new objects, toys, and mirrors (provided to the parents by the researchers) and were not usually distracted by the furniture or stable objects that they saw on a daily basis in their homes.

Finally, the speed of change in imitation and verbalization was encouraging. That is, highly significant changes occurred within a one-month duration of intervention. Although no comparison was available for the rate of change, a positive step toward language acquisition that occurred so quickly appears to be an affirmative indication for use of parent-led imitation therapy.

CONCLUSION

Parent-led imitation therapy offers an intervention procedure that appears to be effective in increasing sound and language production of many non-verbal toddlers. However, the time requirements may limit its practicality for implementation, and future studies might include a more feasible number of intervention sessions. Parents might be asked to work with their child only two to three times per week and perhaps for only a total of ten sessions, or to alternate with the SLP to provide the child with intensive intervention. Frequent contact by the SLP with the parents to encourage them and to note changes in the child's verbalizations might also be an important step in the imitation therapy process.

Perhaps SLPs in the schools could train the parents of applicable children on their caseload and partner with them in implementation of imitation therapy. Regardless, the feasibility of using a parent-implemented treatment program has expansive implications. Parents have the advantage of being with their children daily and the ability to work with them at whatever time their child is alert and cooperative. Most importantly, for many children who do not have access to speech therapy because of their language, location, or financial limitations, imitation therapy offers a promising alternative. In addition, when therapy may be more practically offered via teletherapy, this intervention can easily be taught to parents who are geographically distant, and the SLP can serve as an occasional consultant.

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