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Imitation therapy for non-verbal toddlers

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Abstract
When imitation skills are not present in young children, speech and language skills typically fail to emerge. There is little information on practices that foster the emergence of imitation skills in general and verbal imitation skills in particular. The present study attempted to add to our limited evidence base regarding accelerating the development of speech/language in young children who have failed to achieve expected language milestones. Imitation therapy (Zedler, 1972) was utilized for five non-verbal 18–19-month-old children to determine if imitative behavior in the form of sound production could be initiated and increased. Treatment was administered until children reached criteria for consistent imitative sound productions. Following 8–9 weeks of therapy, all five children exhibited significant increases in both the number of vocalizations and the variety of phonemes produced, and they demonstrated regular spontaneous verbal imitation and emergence of phonetically consistent forms. Imitation therapy appears to be a promising practice that merits further investigation.

Keywords
imitative utterances, joint attention, phoneme development, phoneme repertoire, late bloomers, sound emergence, verbal imitation, vocalizations

1 Introduction

The notion that human experience and human language is grounded in its shared nature is one whose significance has long been recognized. Specifically, the development of joint attention has been accepted as an integral prerequisite for the emergence of language by communication researchers for several decades (Tomasello and Todd, 1983; Carpenter and Nagell, 1998; Mundy and Arca, 2006). Developmental theorists further noted that at the age of 12 months an important milestone

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emerges in the development of children's communicative repertoire, that is, children actively begin to monitor and direct adults' attention by intentionally using communicative gestures (Adamson and Bakeman, 1985). Often these actions involve simple imitation of the adult's gestures. This is soon followed by understanding and use of linguistic communication skills (Tomasello et al., 1993). Joint attention and imitation skills typically involve the child, the adult and some third object or event to which the participants share attention. The process whereby joint attention and imitation evolve into language occurs naturally as the child develops. While considerable data have been offered regarding the typical development of language, little is known about why the acquisition process fails to occur for some children, and even less is known about how to facilitate its emergence.

In the typical development of language, children's vocalizations emerge on a predictable schedule by which, at 16 weeks of age, a clearly identifiable vocal play, e.g. production of consonant and vowel sounds, begins (Stark, 1986). Canonical babbling, in which full syllables are repeated, such as 'dada' or 'bububu' follows by 6–9 months of age (Oller, 1986; Oller and Lynch, 1992). Subsequently, when sound combinations are imbued with meaning, they are referred to as proto-words (Halliday, 1975) or phonetically consistent forms (PCFs; Dore et al., 1976). True words, whose phoneme combinations sound similar to the target word, begin their emergence by the age of 12 months. By 19 months of age, most children's production repertoire includes at least 50 words (Nelson, 1973). Additionally, most children around the age of 18 months – or when they have achieved the 50-word production stage – begin a rapid acquisition of more words, sometimes called the word spurt (Bloom, 1973; Nelson, 1973; Benedict, 1979), in which another 22 to 37 words are added in each ensuing month (Goldfield and Reznick, 1990). The 50-word vocabulary sets are believed to be a prerequisite for the later development of word combinations seen in children by the age of 24 months.

Children who fail to achieve the milestones of vocabulary development are labeled late talkers, or late bloomers (Rescorla, 1989). Some of these children seem to catch up later, although many of these children will ultimately have life-long language disorders and will be labeled as having a specific language impairment, a condition affecting 7% to 8% of preschool and school-age children (Leonard, 1991).

Whether a child will be language disordered or simply a late bloomer is difficult to determine with certainty, although risk indicators have been suggested. Hamaguchi (2001) reported that two of the signs that indicated a risk for language disorders were failure to babble by 12 months and lack of interest in imitating gestures. Leonard (1991) suggested that half of the children who fail to acquire 50-word vocabularies and 2-word productions by 24 months of age will have persisting language problems. Although it is difficult to determine which children need it, intervention should be undertaken if a child's language does not seem to be emerging as expected, particularly if the following factors are present: limited babbling, lack of imitative skills, lack of PCF production at 12 months, and lack of a 10–50-word vocabulary set by the age of 18 months. Hedge and Maul (2006: 59) advise that 'wait and see' is a risky policy for such children. Further, Leonard (1991: 68) reports that if 'sustained and effective instruction' is not offered to children with language disorders, the SLI will persist.

Developmental researchers have focused on three ways in which children begin to integrate joint attention and imitation into their social interaction repertoire. These can be characterized as the ability to follow attention, note/produce imitative responses, and engage in linguistic mapping (Snow, 1984; Tomasello, 1995). Scaife and Bruner's (1975) pioneering study observed infants as young as 2 months follow a change in the orientation of an adult's gaze. The purpose of their study was to determine the age at which infants understand that others have intention and interests in which they can be involved. Trevarthen and Hubley (1978) demonstrated how children progress from early dyadic interactions (with a person or object) to triadic interactions in which they share attention toward an object with another person, and subsequently produce imitative responses. Imitative responses often involve the adult's verbal or physical imitation of the child's communication behavior. Linguistic mapping

(Yoder and Warren, 2001) involves adults' verbalizations of what the child's non-verbal communication appears to convey. Various studies have examined when and how children begin to engage in these shared behaviors and how these affect later language abilities (Morales et al., 1998; Yoder and Warren, 2001).

There is also considerable evidence to support the notion that lack of establishment of shared attention and imitative behaviors may result in delayed acquisition of language skills (Tomasello and Todd, 1983; Smith et al., 1988; Tomasello, 1992; Sigman and Kasari, 1995; Mundy and Arca, 2006). Yoder and Warren (2001) suggest that one mechanism to facilitate linguistic skills in children who exhibit language delays is to increase their shared attention and imitation skills. However, there is little information suggesting how to increase imitation skills in children who do not imitate. DeThorne et al. (2009) note the continuing 'void between the literature that emphasizes imitation as a basic strategy for facilitating speech sound production and the skills of young children who do not readily imitate' (p. 134). DeThorne et al. reviewed six strategies that have been offered as possible means of helping non-imitators: accessing augmentative communication devices, producing exaggerated intonation and slowed tempo, augmenting auditory, visual, tactile, and proprioceptive feedback, avoiding emphasis on non-speech-like articulator movements, avoiding pressure to talk, and imitating the child. Support for imitation of the child includes the rationale that 'imitation may serve as a means to model the skill of imitation itself' (p. 137), and the fact that it is a low-pressure strategy (DeThorne et al., 2009).

The current study explored the use of the technique imitation therapy (IT) with young children who failed to develop expressive language. This therapeutic technique, developed by Zedler (1972), is based on the premise that the child's potential for developing language skills can be scaffolded by:

1. creating in the child an awareness of his or her own ability to impact others;
2. providing opportunities for the child to direct others' attention and actions; and
3. providing opportunities to develop shared attention and adult reinforcement of the child's actions.

According to Zedler (1972), the IT routine consists of four stages:

1. The adult serves as an imitator of the child's actions and verbalizations and is at the complete command of the child.
2. The adult is a major imitator and the child imitates for brief periods.
3. The adult is again the only imitator but imitation is limited to behavior involving phonation and movements of the face and speech organs.
4. The adult and child reciprocate imitations of behaviors involving voice, face and mouth.

Each of these stages may last from a few days to several weeks. Although the stages develop in a sequence, they may overlap and the adult may return to an earlier stage if the child shows evidence of anxiety. The current study employed Zedler's IT in an attempt to initiate and increase the quantity and diversity of vocalizations in five preverbal children who did not readily imitate.

II Method

Participants in this study were a convenience sample of five children, 18 to 19 months of age, brought by their families to two local speech/language clinics due to failure to talk. All children brought to the clinic over a 7-year period who met all the requirements for participation were included in this

study. To be considered for participation in this study, the children had to present the previously-noted characteristics suggesting the need for intervention: limited babbling, lack of imitative skills, lack of PCF production at 12–18 months, and lack of a 10–50-word vocabulary set by the age of 18 months. Specifically, to be included in the study the children had to meet the following criteria at the time of their initial evaluation: the children had to be 18–20 months of age, monolingual, and score below the second percentile on a formal language measure. In addition, the parents must have indicated that the child babbled little, did not imitate sounds, and produced no PCFs or words, but showed normal development in all other areas. A third requirement was that all participants selected for the study had to pass a sound-field audiological screening and an informal cognitive/adaptive behavior review, including evidence of normal social interactions with the exception of language. Additionally, the participants had to have no history of syndromes or significant co-occurring health problems. Finally, candidates had to demonstrate a stable baseline of production of less than 2 phonemes and no instances of verbal imitation over two 60-minute sessions of interactive play in two consecutive weeks following the initial evaluation.

1 Participants

The five participants who met the final selection criteria included one girl and four boys. Two of the children were fraternal twins. An explanation of the proposed treatment, data collection, and potential publication was provided verbally and in written form for the consideration of the parents. All of the parents chose to sign informed consent to proceed with the intervention study.

All of the children demonstrated social interactions that included touching and seeking caregivers, and use of some infrequent gestures to indicate wants, offerings and refusals, but none of the children evidenced verbal imitation during the evaluation or the two subsequent baseline sessions. All of the children passed the sound-field audiological screening. They were described by their caregivers as being very quiet or having no speech, and none of the participants produced any words or phonetically consistent forms during the evaluation and baseline sessions. The parents reported that the children had not undergone any significant pre-, peri- or post-natal health problems. The children had been brought voluntarily to the clinic for speech/language evaluation and treatment, due to the parent's expressed concern over the lack of speech development. Cognitive/adaptive skills of the children were not formally evaluated via an IQ test, but all five children were judged to be functioning within normal cognitive limits. This was determined by utilizing parental input and a set of behavioral observations to rule out cognitive deficits as a primary condition. This included (1) parental report of developmental history, (2) parent checklist regarding occurrence of behaviors, and (3) the SLP's (speech language pathologist's) informal observation of adaptive ability. The children's age of acquisition of developmental milestones, as reported by the parents, fell within expected ages, e.g. all five children sat by 6 months, crawled by 9 months and walked alone by 13 months. On the parental checklist, parents of the participants also checked that their children typically turned to noise, responded to peek-a-boo or hiding games, pointed to needs (showing intentionality), visually anticipated events (e.g. mom picks up keys = leaving), fed themselves (though messy), drank from a cup, stacked 2–3 blocks or objects, and scribbled with a crayon. During the observation and evaluation of the participants, the SLPs further noted that all participants were able to throw a ball, offer toys or objects to a parent, and seek adult help (e.g. to open a jar). The presence of these skills, typical of a normally developing child of 18 months – together with the developmental milestone attainments reported by the parents and the SLPs' evaluation of adaptive abilities – affirmed that the children were demonstrating behaviors consistent with typical cognitive development of children of similar ages (Labinowicz, 1980).

Table 1 Participant's test scores: Preschool language scale scores

Subtest	Raw score	Standard score	Percentile	Age equivalency
Child 1 (age: 19 months; male):				
Auditory Comprehension	17	67	1	10 months
Expressive Communication	14	56	1	9 months
Total Language	31	57	1	9 months
Child 2 (age: 19 months; female):				
Auditory Comprehension	18	68	2	10 months
Expressive Communication	13	54	1	8 months
Total Language	31	57	1	9 months
Child 3 (age: 19 months; male):				
Auditory Comprehension	17	67	1	10 months
Expressive Communication	16	60	1	10 months
Total Language	33	60	1	10 months
Child 4 (age: 18 months; male):				
Auditory Comprehension	17	67	1	10 months
Expressive Communication	14	56	1	9 months
Total Language	31	57	1	9 months
Child 5 (age: 18 months; male):				
Auditory Comprehension	15	65	1	8 months
Expressive Communication	14	56	1	9 months
Total Language	29	56	1	8 months

The Total Language Scores for the participants fell at the first percentile on the *Preschool language scale: 3rd edition* (PLS-3) (Zimmerman et al., 1996) or the *Preschool language scale: 4th edition* (PLS-4) (Zimmerman et al., 2002). The span of time over which the data was collected necessitated the use of the 3rd edition of the PLS for the first two participants and the 4th edition for the last three participants. However, changes from the 3rd to 4th editions were not substantially different at the lower levels of these measures. The first percentile scores correlated to standard scores of 56–60 and age-equivalencies of 8–10 months. Participant's test scores can be seen in Table 1.

2 Setting

Therapy was conducted in a 7.5 m^2 room in which horizontal 1.2 m mirrors were hung 60 cm from the floor on three sides of the room so that the child could easily see himself/herself. The room was arranged so that the child could not exit or endanger himself/herself and so that the therapist did not have to help him or restrain him/her from any of his actions. There was a small table and two small non-stackable chairs in the room. Twelve to 15 pairs of identical toys were placed together around the room. These included pairs of toy stuffed bears, monkeys, dogs, bowls, plates, cups, sets of plastic blocks, nested stackable cups, large beads, telephones, barns, houses, furniture, barn animals, doll families, zoo animals, small towels, pillowcases, pairs of sunglasses, eyeglass frames, gloves, hats, slippers, interlocking tubes, puppets, cars, trucks, trains, photos of family members, 'humming' toys (toys you could hum into), roadway sets, and containers of small amounts of water. These were varied from session to session to maintain interest, but parallel toys were used when possible, i.e. bears used at one session were replaced by monkeys at the next. No electronic, noisy or potentially dangerous toys were used and all toys were everyday objects with no narrowly defined function.

3 Procedures

The therapy utilized for the five children in this study was Zedler's (1972) imitation therapy (IT). Initially, the therapist imitated everything that the child did with the exception of crying or negative acts such as hitting. The clinician's only sounds occurred in direct and immediate imitation of the child, and then in the same pitch, duration and manner as the child. The therapist made no move except in imitation of the child, playing a sort of 'follow the leader' as the child explored the objects in the room. The clinician consistently positioned herself across from the child so that they always had the opportunity for face-to-face interactions. If the child picked up one toy, the therapist picked up its identical mate and conducted the same movements that the child was making. If a child was holding a toy and tried to take the identical toy from the clinician, the clinician simply reached/took the child's toy in the same manner, without any negative emotion. At some point, each child realized that his/her own actions were dictating those of the clinician and he/she intentionally changed an activity and overtly looked to see if the clinician was following. The child's awareness that the clinician was following his/her lead was interpreted as a sign of progress, indicating that the child had become fully aware of his/her power to manipulate the clinician. In fact, for each of the children, there came a point when he/she engaged in a frenzy of activity and waited/watched for the clinician to move in the same way. For the female, this included a set of seated foot movements, which were repeated and stopped many times after checking to make sure the clinician was following. For one of the males, this occurred as a series of rapid positional changes going back and forth from lying down to standing up.

When the child had clearly achieved the goals of stage one, the clinician narrowed her imitations to the child's articulators, hands and vocalizations. The clinician began the session by briefly sitting in front of a mirror and watching herself move the articulators and producing a few soft vocalizations. When the child came to join the clinician, the clinician returned to a limited imitation of the child (only hands, voice and articulators). Thus the clinician became more stationary and did not follow gross motor activities such as jumping or rolling. She continued to position herself so that face-to-face contact was made when possible and she occasionally (1–2 times per session) attempted to draw the child's attention to the mirror and produced a sound such as a 'raspberry' or lip-popping sound. If the child attempted these, the clinician imitated the child and then returned to imitating all the movements and sounds of the child's hands or articulators. As gross motor activities decreased, the child produced additional sounds and the clinician continued in her role as imitator, which seemed to serve as reinforcement of the sounds. Next, following the clinician's imitation of some sound or action of the child, a few seconds later, the clinician emitted that same sound or action and waited to see if the child imitated her. This established a limited reciprocal imitation. At this point, anything produced by the clinician was something within the child's previously-produced repertoire such as clapping or 'uh'. During this stage, imitation and leadership roles were transferred back and forth from the child and clinician.

During the third stage of the therapy, the clinician focused more and more on the child's vocalizations. The clinician reduced the number of paired toys available in the room and added enticements to the mirror, such as a picture taped to the mirror hidden by a cloth. The clinician occasionally inserted a consistent syllable or two such as 'bye' or 'uh-oh' and paired it with an action or toy, but immediately went back to imitating the child if he made no move to imitate the syllables. By the end of this stage, the children had increased both the number of times they produced sounds and the number of different phonemes they produced.

Finally, the clinician became more of the leader in introduction of sounds. In addition to meaningful sound sequences, the clinician added primitive vocalizations – such as growling, tongue-clicking,

or sticking out the tongue – and waited for the child to imitate them. She returned to reciprocal imitation whenever possible and quickly focused on sound–concept pairings. No pressure was placed on the child to imitate, but if he/she did, then he/she was rewarded by the clinician's brief return to being his/her imitator. Imitation therapy was discontinued when the child readily imitated the therapist's vocalizations.

Intervention for Child 1 was provided by a certified and licensed SLP in her own speech/language clinic. Intervention for the subsequent children was provided by four different SLP graduate students under the direction of the initial SLP. The initial SLP trained the graduate clinicians and provided video models of the therapy. The initial SLP observed the therapy sessions directly through a two-way mirror and reviewed them by videotape.

One week following each child's selection as a participant in the study, therapy was initiated. The children participated in 16 to 18 50-minute sessions of IT. Due to spring or fall break, the children did not attend for a week following the 9th session. Three of the children received IT twice a week throughout. The other two children attended four times a week for the first week, then attended twice a week thereafter. Imitation therapy was discontinued when the children spontaneously imitated verbalizations of the therapist at least 8 times in two consecutive sessions. For three of the children, criteria for discontinuation was met at session 16 and for the other 2 children, criteria was met at session 18.

4 Data collection

All therapy sessions were video-recorded and analysed by the clinician who conducted the therapy. One session for each child was also analysed by an additional speech therapist to check for accuracy. Two types of data were collected:

- the total number of all phonemes emitted by the child during the session; and
- the number of different phonemes produced by the child during each session.

For example, if the child said 'uh-oh' 10 times during the session, this was counted as 20 total phonemes produced, and two different phonemes produced (/ʌ/ and /o/).

III Results

Non-parametric statistics were used to determine the efficacy of intervention. Due to the small sample size of the study and limited availability of data on efficacy of imitation therapy, non-parametric statistics yielded greater robustness.

The Wilcoxon signed-rank test is a non-parametric statistical test for the case of repeated measurements on a single sample. Since the current data were collected at specific intervals and involved comparison of differences between these intervals, the Wilcoxon signed-rank test was deemed to be appropriate. The Friedman test, also a non-parametric statistical test and similar to the parametric repeated-measures ANOVA, was used to detect differences in scores across multiple sessions.

A Spearman rho test was conducted to evaluate the relationship between each individual session's total number of phonemes compared to the baseline score ($r = .779$, $p < .01$), between each individual session's number of different phonemes compared to the baseline score ($r = .877$, $p < .01$), and between the total number of phonemes and the number of different phonemes compared to baseline scores ($r = .885$, $p < .01$). This indicates that for all data sets, the intervention was positively correlated with increased scores.

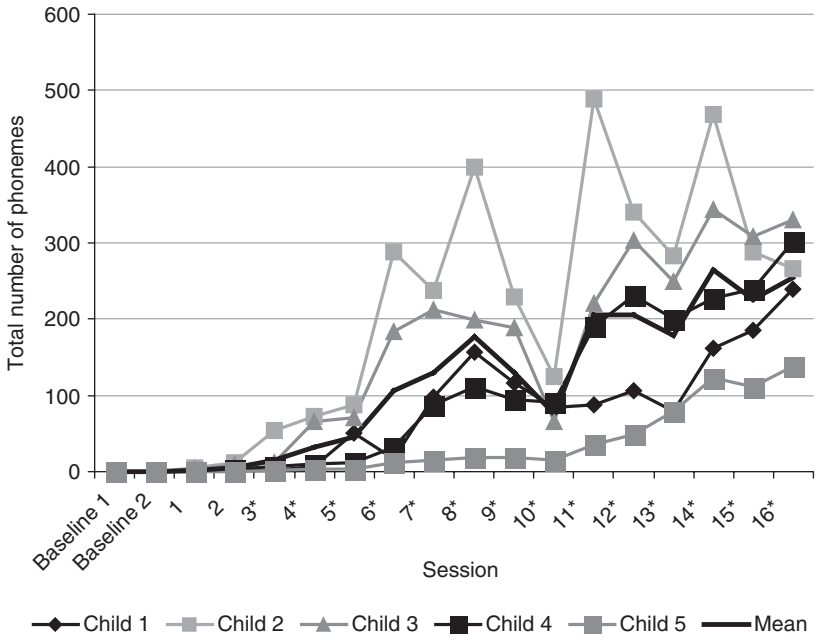

Figure 1 Total occurrences of phonemes produced per session
Notes: * Scores are significantly different from baseline; $p < .05$

Figure 1 shows the total occurrences of phoneme productions per session, illustrating how frequently the participants uttered speech sounds during the treatment sessions. While there was a wide variability in how 'noisy' the children were, all of them increased the frequency of their productions. Four of the five children produced phonemes more than 300 times during at least one of the sessions, while the least 'talkative' of the group produced phonemes only 138 times in the last session. Results of a Friedman's test indicated a statistically significant change in scores over the course of the treatment period ($\chi^2 = 72.33$, df = 17, $p < .001$.). A pair-wise application of the Wilcoxon test indicated that scores significantly differed from baseline, beginning with session 3 ($z = 2.023$, $p < .05$) and continuing throughout the treatment.

As seen in Figure 2, all five children acquired at least 19 phonemes over the course of treatment (range 19–23, mean 21.5). Results of a Friedman's test indicated a statistically significant change in scores over the course of the treatment period ($\chi^2 = 67.547$, df = 17, $p < .001$.). A pair-wise application of the Wilcoxon test indicated that scores significantly differed from baseline, beginning with session 3 ($z = 2.032$, $p < .05$) and continuing throughout the treatment.

IV Discussion

The outcome for the five participants of this study was encouraging. At the beginning of the study, the children fell significantly below expectancy in speech/language production and, three sessions later, showed significant improvement in frequency of sound production and repertoire of phonemes produced. Seven weeks later, all five showed a repertoire of at least 13 phonemes and a production

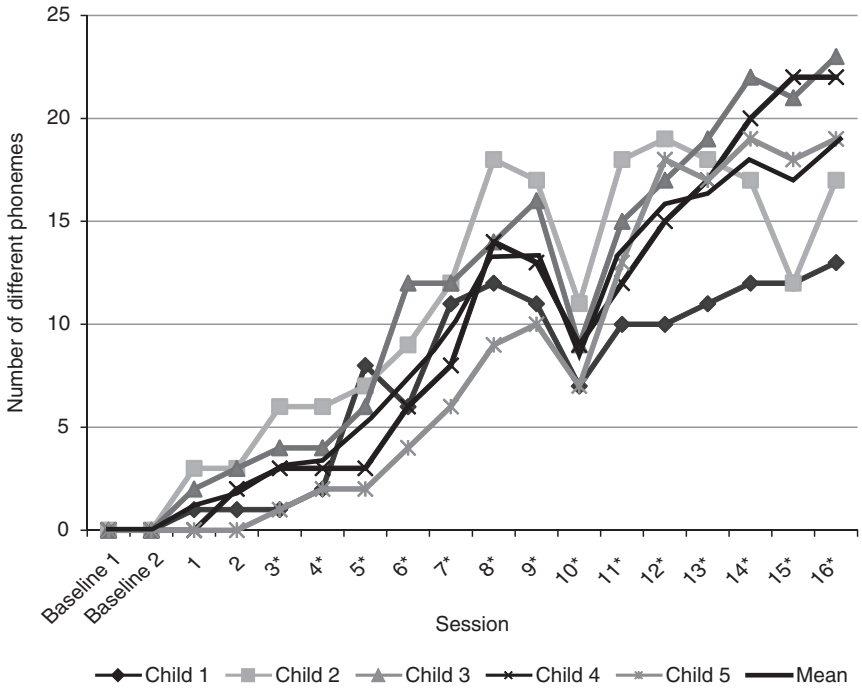

Figure 2 Number of different phonemes produced per session
Notes: * Scores are significantly different from baseline; $p < .05$

frequency of over 100 sounds per session. All five children reached the goal of increasing their total output and number of phonemes, and their ability/willingness to spontaneously imitate emerged and increased.

Although all the participants increased their phoneme repertoire and occurrences of verbalizations, there was considerable variability from child to child and from session to session as seen in Figures 1 and 2. In particular, the female participant (see Child 2 in Figure 1) demonstrated the largest changes in frequency of phoneme production from session to session. The increase in occurrences of verbalizations coincided with acquisition of new PCFs, which she then used repeatedly. For example, when she first produced 'uh-oh' reciprocally, in conjunction with knocking over a block tower, she then used the term an additional 39 times in one session as she manipulated objects to create an unexpected occurrence, e.g. she giggled and said 'uh-oh' again each time she knocked over various toys, drove a car off the table, dropped a stuffed animal, or took off her shoe. Throughout the sessions, this pattern was repeated, making it seem as if she repeated each new PCF until the novelty wore off. While this occurred to a lesser degree with the other participants, it was most apparent in this participant. Child 5's straighter trajectory of phoneme occurrences reflected a quieter child who never entered into a frenzy of word productions. He showed a steady increase in acquisition of new phonemes, but he did not use the new phonemes repeatedly in the same way the other four children did.

The syllable structure of the phoneme productions was often CV or CVCV, such as 'bye' and 'bye-bye' said in conjunction with the toy phone. Occasionally a VC syllable, specifically 'up' was

produced reciprocally. Other examples of verbalizations were 'm' used as a motor noise, 's' used as a scary noise when peeking under items and finding a snake, 'ba' used as tap on the window, 'wawa' for water play, 'dada' for photos of the children's dad, and 'bbb' used with stacking bowls. The 21 phonemes produced by most of the children were nasals, glides, stops (bilabial, lingua-alveolar, lingua-velar), two fricatives and vowels. (For a listing of the phonemes, see Appendix 1.)

Visual inspection of the data also indicates a decline in total verbal output and number of different phonemes (see Figure 1 and 2) following the break that occurred after session 9. Session 10 followed a break of 10 days without therapy. Upon returning to the clinic, the children engaged in very few verbalizations initially, but rapidly accelerated back to the pre-break levels. The fact that the decline occurred in all five participants supports the notion that the IT may be responsible for the changes in phoneme production that occurred in the children, although the small sample size prevents conclusive findings.

By the third session for all of the participants, there was a significant increase in the phoneme repertoire. At that point, all five of the children dictated the movements of the therapist intentionally at least once, as evidenced by their enacting a movement and checking to see if the therapist copied, and all were beginning some reciprocal imitation of phonemes. For three of the children, the goal of spontaneous imitation for at least 8 times in two consecutive sessions was achieved in 16 sessions, while the other two children required 18 sessions. The goal of establishing imitative behavior and engaging in it spontaneously was reached for all participants. In addition, at the conclusion of treatment, the children were able to imitate or spontaneously produce an average of 21.5 different phonemes, and were beginning to pair quite a few phonetically consistent forms with meaning, e.g. picking up the phone and saying 'bye-bye' or toppling towers and saying 'uh-oh'. The combination of imitative behavior skills, a generous phoneme repertoire, and the beginning of meaningful word forms suggests a positive step toward acquisition of age-appropriate language skills.

Whether the participants in this study eventually produced normal language is unknown at this time. Initially, the participants scored at the first percentile on a formal language test; however, the rapid change in language acquisition during the treatment regime might be interpreted as suggesting that these children were 'late bloomers' rather than candidates for a language disorder. However, if the changes were due to maturation and not the intervention, it is highly unlikely that the children changed at the same point in their therapy, e.g. all children demonstrated a significant increase in the number of phonemes and the frequency of sound productions during the third session. Additionally, the difference in scheduling contributed to the notion that changes were due to the intervention. That is, the two children who received IT four times in the first week did not differ in acquisition levels from the two children who started the first week with only two sessions, meaning the number of sessions correlated with progress, not the session intervals.

The authors observed that, despite similar outcomes, the children varied in their 'noisiness'. In other words, one of the children never produced sounds as frequently as the other four, but he did learn to imitate and he did increase his phoneme repertoire. Future studies should be mindful that some children may develop an acceptable repertoire of phonemes but not necessarily use them excessively.

Further investigation of this treatment with similar children is warranted, and some consideration of applying this treatment to slightly younger children might be worth investigating. Future studies should also examine the optimal frequency and intensity of IT sessions. While it is not appropriate to draw conclusions without attempting different intervention times and intervals, it is possible that acceleration of the session scheduling might be helpful, perhaps at daily or every-other-day intervals. Anecdotally, 50 minutes for some children seemed too long, as they sometimes seemed to fatigue or lose interest. While a bit of boredom did seem to encourage interaction, too much might be counterproductive. Perhaps 30-minute sessions should be considered.

V Conclusions

Joint attention and imitation are clearly some of the early precursors to language development. The emergence of child–caregiver triads, imitative gestures and imitation of sounds seamlessly transition into speech and language for most children. Why some children acquire this intuitively, while others do not, is a mystery that remains to be solved. For the five children in the present study who did not spontaneously develop these skills, IT facilitated imitative behavior that appeared to scaffold the emergence of initial phonemes/verbalizations and PCFs, thus supporting Yoder and Warren's (2001) suggestion that increased shared attention and imitation facilitates linguistic skills. Perhaps the effectiveness of the IT could be credited to the creation of an artificial setting in which the children were given extensive opportunities to engage in triadic interaction. Further, these opportunities may have allowed the children to internalize intentionality and realize their ability to influence the world by their own behavior and eventually their own verbalizations, as suggested by Zedler (1972).

The small number of children in the study limits its applicability. However, the participants do represent a carefully selected group with similar skill sets, including a shared lack of imitation and sound production in the absence of any other observed deficits. Longitudinal studies concerning speech and language development following IT would help determine the long-term contributions of this technique. IT appears to offer a potential tool to 'jump-start' non-verbal children who are not imitating. Although we cannot at this point ascertain which children are late-bloomers and which are truly language disordered, we are obliged to ensure that we do not miss critical windows in language acquisition. Regardless of the underlying cause, a treatment that might help either group to reach normal language development milestones merits additional investigation.

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Appendix 1 Phonemes produced by most of the children

/m, p, b, w, j, d, n, t, k, ŋ, s, ʃ, o, ɛ, ʌ, ɑ, aɪ, i, u, e, ɪ/