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BEHAVIORAL TREATMENT OF CHILDREN WITH PHONOLOGICAL DISORDER: THE EFFICACY OF VOCAL IMITATION AND SUFFICIENT-RESPONSE-EXEMPLAR TRAINING

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This study examined whether sufficient-response-exemplar training of vocal imitation would result in improved articulation in children with phonological disorder, and whether improved articulation established in the context of vocal imitation would transfer to other verbal classes such as object naming and conversational speech. Participant 1 was 6 years old and attended first grade in a regular public school. Participant 2 was 5 years 4 months old and attended a public kindergarten. Both participants had normal hearing and no additional handicaps. A multiple baseline design across behaviors (target sounds or blends) was employed to examine whether the vocal imitation training resulted in improved articulation. Results showed that both participants improved articulation once training was implemented, and that the improved articulation transferred from vocal imitation to more natural speech such as object naming and conversational speech. Improvement established during training was maintained posttraining and at a 6-month follow-up.

DESCRIPTORS: generalization, phonological disorder, sufficient response exemplars, transfer, verbal imitation, vocal imitation

Children who fail to use speech and sounds appropriate for the individual's age and dialect may receive a diagnosis of phonological disorder. Phonological disorder is among the most prevalent speech disorders, affecting approximately 10% of the preschool and school age population (National Institute on Deafness and Other Communication Disorders [NIDCD], 1994). The disorder is more common in boys than in girls (NIDCD). It is characterized by inappropriate sound production and use, such as when substituting unmastered sounds by other similar mastered sounds in words (e.g., *wed* for *red*), or when omitting unmastered sounds in words (e.g., *back* for *black*). In severe cases, articulation may be impaired to the extent that children experience social difficulties and difficulties making basic needs known. In most cases, children present with normal hearing and IQ, and the specific cause or causes of the articulation problem is unknown. In some cases, a detectable organic base can be found (Gierut, 1998). A genetic component has been suggested as an etiological variable. Other contributing factors may be low socioeconomic status and coming from a large family (NIDCD).

Traditional treatments for children with phonological disorder involve a variety of interventions, although most typically arise from a motor-oriented framework (Klein, 1996b). Techniques include the use of mirrors, tongue depressors, oral-motor exercises, sensory motor training, modeling and imitation of speech and speech sounds, shaping via successive approximations, and chaining. Phonologically based therapy, a more recent approach to the treatment for phonological disorder (Creaghead, 1989; Fey, 1985), contrasts to the more traditional approaches in

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several ways. Whereas traditional approaches focus on teaching the child to articulate given words or sounds correctly, the phonological approach focuses on having the child change his or her rule system, using cognitive techniques such as semantic images (Klein, 1996a).

Behaviorally, phonological disorder may be characterized by a deficient development of the *echoic* repertoire. Echoic behavior is defined by its point-to-point correspondence between the preceding verbal stimulus and the verbal response (Skinner, 1957) such as when a person is imitating (echoing) what others say. Children with phonological disorder appear less able than same-age peers to display accurate point-to-point correspondence between words heard and words said. Accordingly, treatment may focus on improving the echoic repertoire. This can be achieved through vocal imitation training (Lovaas, 2003; Risley, Hart, & Doke, 1972). In vocal imitation training, children are taught to repeat sounds and words emitted by the therapist, using procedures such as shaping, chaining, and prompting. After the child has acquired correct articulation in this way, efforts are made to generalize the item across personnel, stimuli, settings, and verbal classes. This is necessary because the vocal imitation training alone may not produce such generalization (McReynolds, 1981). To program generalization across personnel, different therapists teach the same label using the same training stimuli. To program generalization across stimuli, the therapist varies the stimulus materials during training, and to program generalization across settings, training is conducted in different environments, such as at school, at home, and in the community (e.g., Sarokoff, Taylor, & Poulson, 2001). Finally, to program generalization across verbal classes, articulation of particular words may be trained when they are used in different functional contexts such as imitation, object naming, and conversation.

To optimize the effects of training, an important programming goal in vocal imitation training is to establish transfer of correct articulation from trained words to untrained words. Such transfer may be established through sufficient-response-exemplar training (Carr, 1988; Horner & Albin, 1994; Osnes & Lieblein, 2002; Stokes & Baer, 1977). After teaching correct articulation of one response exemplar, say *black* (if the child has difficulties articulating the */bl/* blend), tests for transfer to untrained words containing the same blend is conducted (e.g., *blue, blink, blind, blanket,* etc.). If no or insufficient transfer occurs, another word containing the */bl/* blend is taught, and so on, until transfer during probes is achieved.

The present study was designed to examine whether sufficient-response-exemplar training of vocal imitation would result in improved articulation in children with phonological disorder, and whether improved articulation established in the context of vocal imitation would result in improved articulation during more natural speech, such as during object naming and conversational speech.

METHOD

Participants

Participants were 2 boys who met the criteria of the *Diagnostic and Statistical Manual of Mental Disorders* (4th ed., American Psychiatric Association, 1994) for phonological disorder. Participant 1 was 6 years old and attended first grade in a regular public school. Participant 2 was 5 years 4 months old and attended a public kindergarten. Both participants had normal hearing and no additional disabilities. Assessment of the children's global language competence using the Reynell Developmental Language Scales (Reynell, 1990) confirmed that the children

Table 1
Norwegian Target Words for Each Participant. Words in Boldface Were Explicitly Trained. Words from Set 1 Were Trained and Tested Prior to Words from Set 2

Participant 1	Set 1	/sk/ target:	**skap, sko,** skatt, skal, skog, skummel, skuff, skade, skole, skute
		/st/ target:	**stein,** stol, stille, stige, stue, sti, står, stanse, stork, stable
		/r/ target:	**rød, rev,** riste, rote, ratt, tur, er, lure, bra, tre
	Set 2	/sm/ target:	**smi, små, smile, smule,** smake, smelte, smale, smart, smør,
		/sn/ target:	**snø,** snill, snu, snare, snegle, snekker, snor, snål, snuse
		/kl/ target:	kløe, klappe, klistre, klare, klo, klut, kle, klasse, klype, kloss
Participant 2	Set 1	/bl/ target:	**blå, blink, bløtkake, blokk, blyant, blanke,** blunke, blader, blære, blekksprut
		/kn/ target:	**knut,** kne, knurre, kniv, knise, knuse, knapp, kneipbrød, knokkel
		/dr/ target:	**dra, dro,** drikke, drømme, dress, drage, dronning, dråpe, drue, drible
	Set 2	/sl/ target:	**slo, slåss, slipe, sladre, sløyfe, slange, slips, slutt,** slede, slekt
		/sv/ target:	**svi, svane,** svamp, svein, svelge, sverd, sving, svømme, svart, svikte
		/gr/ target:	gro, gris, grøt, grine, grille, gråte, grave, gryte, greide, grønnsaker

had no significant language deficiencies other than that of articulation.

Both participants were unable to articulate the sound */r/,* and they had difficulties articulating a number of consonant–consonant combinations, particularly those starting with the sound */s/* or ending with the sound */l/*. They substituted unmastered sounds or sound combinations with other mastered ones or they omitted the difficult sounds or sound combinations in words, often making their speech unintelligible.

Setting and Treatment Personnel

The training was conducted in a one-to-one setting in a separate room in the children's school. The treatment personnel were three undergraduate special education students who specialized in behavior analysis. Prior to participation in this study, the therapists had received more than 6 months of hands-on training in behavioral treatment for children with autism. The study was conducted during the therapists' practicum training, and the therapists were supervised by this study's first author.

Speech Target Selection

Speech target selection was based on (a) observations of the children's speech during free play with their peers, (b) data from the Reynell assessment, and (c) data from pretraining assessments. Misarticulated sounds found to contribute most to the child's intelligibility were targeted for training. For each participant, a total of six misarticulated sounds (or blends) were targeted. For Participant 1, the six target sounds were */sk/, /st/, /r/, /sm/, /sn/,* and */kl/*. For Participant 2, the six target sounds were */sl/, /sv/, /gr/, /bl/, /kn/,* and */dr/*. For each target sound, a group of 10 different target words was developed. The 60 Norwegian target words for each participant are listed in Table 1. The 60 target words for each participant were divided into two sets (Set 1 and Set 2) containing 30 words each. This was done to restrict the number of unmastered words the child was exposed to during testing (see below). Set 1 was trained prior to training Set 2, and consequently, training of Set 2 functioned as a replication of the training of Set 1.

Response Definition and Data Collection

Assessment of mastery. The primary dependent variable was vocal imitation of target words assessed during test sessions conducted in baseline, training, posttraining, and at a 6-month follow-up. Test sessions during baseline assessed accuracy of vocal imitation of target words before training. Test sessions during training assessed (a) accuracy of vocal

imitation of trained target words, and (b) transfer of correct imitation from trained to untrained words that contained a common target sound. Test sessions posttraining and at follow-up assessed maintenance of correct imitation of target words after training was terminated.

Test sessions were conducted whenever the participants had completed training of a new target word (see below). Participant 1 had a total of 12 test sessions, and Participant 2 had a total of 19 test sessions. Each test session assessed all 30 target words in a particular set (i.e., Set 1 or Set 2) in the order in which they appear in Table 1. More specifically, each test session assessed the newly trained target word, the remaining nine words containing the same target sound, and the 20 target words of the other two word groups in the particular set. The latter was done to establish experimental control.

Test sessions were carried out as follows: The therapist, who sat facing the child approximately 50 cm away, emitted a particular target word, allowed the participant 5 s to respond, and provided an appropriate consequence. A correct response was defined as a correct imitation of the word emitted by the therapist within 5 s. All other responses were scored as incorrect. If the participant imitated correctly on the first opportunity of a word, the therapist said, "Good try," noted the response as correct, and moved on to the next word. If the participant did not respond correctly on the first opportunity, the therapist said, "Good try" and repeated the word once (without noting the response as being incorrect). If the participant responded correctly on that second opportunity, the therapist said, "Good try," noted the response as correct, and moved on to the next word in the word group. If the participant responded incorrectly on that second opportunity, the therapist said, "Good try," noted the response as incorrect, and moved on to the next word. Participants were given short access (10 to 15 s) to favorite toys once per minute throughout the test sessions, regardless of their performance. Training resumed after the test session was completed.

Generalization to natural speech. Improved articulation during natural speech was assessed by measuring the participants' articulation during a picture-naming task and while engaging in conversational speech with the therapists. This assessment was carried out pretraining, posttraining, and at a 6-month follow-up. During assessment of picture-naming performance, correct and incorrect articulations were scored while the participant named 30 familiar pictures representing common nouns, verbs, and adjectives. To evoke the child's naming response, the therapist pointed to a particular picture and asked, "What is it?" Any answer (correct or incorrect) was followed by the therapist saying, "Good try." Correct articulation was scored if the child pronounced all sounds and sound combinations for a particular label correctly. Otherwise articulation was scored as incorrect. The assessment was videotaped and scored from the videotapes.

Correct and incorrect articulations during conversational speech were assessed while the child and the therapist were looking in books and magazines of particular interest to the child. The therapist made statements or asked questions regarding the content of the books or magazines. The conversation lasted for 25 min and was videotaped. Correct and incorrect articulations were scored according to the criteria above. To aid the examiners during scoring, all utterances made by the child were transcribed and made available to the examiners while they were scoring the videotapes.

Examiners. The therapists conducted the test sessions. Scoring of the pretraining, posttraining, and follow-up assessments was conducted by three bachelors level special

education teachers who had specialized in behavior analysis and who had received more than 12 months of hands-on training in behavioral treatment for children with autism. They were not informed of the nature or the hypothesis of the study. The videotapes were scored in a random order.

Treatment integrity. To facilitate treatment integrity, at least two of the therapists worked together with the same child during approximately half the training sessions. This helped to ensure uniform training by allowing the therapists to monitor each other and to give each other feedback on training procedures. A central part of treatment integrity in vocal imitation training is the discrimination of what constitutes correct and incorrect responses. Failure to discriminate correct and incorrect articulation will result in incorrect use of differential reinforcement, which, in turn, makes it difficult for the child to acquire correct articulation. To assess whether the therapists concurred as to what constituted correct and incorrect articulation, they scored 60% of the pretests for both participants independently. Agreement was calculated as the percentage of trials on which the observers agreed on their scoring; mean interobserver agreement across participants was 84% (range, 80% to 88%).

Reliability. To monitor interobserver agreement, two observers independently scored 20% of the sessions (probes, picture naming, and conversation) for each participant. Reliability was calculated as the percentage of trials on which the observers agreed on their scoring; mean interobserver agreement across participants was 93% (range, 90% to 97%).

Training

Each training session lasted for 2 hr, and no more than one training session was conducted each day. Training for Participant 1 was conducted on Tuesdays and Thursdays for a total of 15 sessions over a period of 7.5 weeks. Training sessions were conducted in the child's kindergarten between 10:00 a.m. and noon. Training for Participant 2 was conducted daily on weekdays for a total of 21 sessions over a period of 29 days. Training sessions were conducted in the afternoon (1:00 p.m. to 3:00 p.m.) during which the child participated in a public after-school child-care program for regular children.

Articulation training was conducted in a discrete-trial format (e.g., Lovaas, 2003) as follows: During the 2-hr training sessions, eight to 10 articulation training sittings were conducted, each lasting 5 to 10 min. Three- to 5-min breaks were interspersed between each of the training sittings. Approximately 10 to 20 training trials were conducted during each sitting. The number of trials within each sitting (and thus the length of the sittings) varied across sittings because breaks were used as a back-up reinforcer for the token economy (i.e., whenever the token board was full, the child could choose to take a break).

During breaks, the therapist played with the child in the therapy room using play materials available in the school. These play sessions were designed to provide breaks from the articulation training and to function as reward for articulation work. No differential feedback for speech and articulation was provided to the children during these breaks.

During articulation training, the therapist, who sat facing the child approximately 50 cm away, asked the participant to imitate specific target words (e.g., the therapist said to the child, "say cup"). Training of target words was conducted in the order in which they appear in Table 1. Only one target word was trained at a time, but the target word was mixed with other mastered words and sounds to facilitate discrimination between the target word and other sounds and words, and to keep rate of correct responding high. After the child had acquired cor-

rect imitation of the target word (i.e., the child responded correctly on at least nine of 10 consecutive presentations), the target word was presented in various two- and three-word sentences. This was done to ensure correct articulation during imitation when the target word occurred as a part of a more complex unit. Training on a particular target word ended whenever the child responded correctly on at least nine of 10 consecutive presentations of that word when the word was presented as part of a three-word sentence. This defined the onset of a test session, which was conducted to determine whether the target word was mastered. If the participant failed to reach criterion for mastery during the test session, training on the same target word was resumed. If the participant mastered the target word in the test session, training on the next unmastered target word (Table 1) was started.

Prompting, chaining, and shaping procedures. Prompting, chaining, and shaping procedures were used to improve the child's articulation as follows. If the child was able to correctly articulate the individual parts of target words (but not the whole word), the parts were first presented separately and then closer and closer together in time across successive trials until the child could articulate the word as a whole (e.g., */c/* and */up/* were first presented separately and then closer and closer together in time until the child articulated */cup/* when presented as a whole). Difficult sounds were prompted by exaggerating loudness or clarity, for example, by modeling the correct mouth, lip, and teeth position or by repeating sounds (that had been substituted or omitted) several times on consecutive trials before presenting the whole target word (e.g., the therapist would have the child imitate the sound */c/* six times quickly before presenting the whole word */cup/*).

Reinforcement procedure. For each participant, a token economy was used, with access to favorite items or breaks from training as back-up reinforcers. Tokens and praise were provided whenever the imitation occurred within 5 s of the therapist saying the target and if the child's articulation of the target item was judged by the therapist to be correct or was a close approximation. Otherwise, the therapist went on to a new trial without providing any tokens or verbal feedback. To identify back-up reinforcers, the participants were observed during free play. In addition, teachers and parents were asked which toys and activities the children preferred. The participants were allowed to choose their back-up reinforcers, and the token system was established by explaining the contingency between the tokens and the back-up reinforcer. The items used as tokens varied from time to time, as did the number of tokens needed to obtain the back-up reinforcer. This was done to make the training as attractive as possible for the participants.

Design

A multiple baseline design across behaviors (target sounds) was used to evaluate whether the training resulted in an improved articulation of the target sounds. Pre- and posttest data were collected to determine whether improved articulation of target sounds was associated with improved articulation during the naming test and during conversational speech.

RESULTS

Figures 1 and 2 exhibit results from the test sessions conducted during baseline, training, maintenance, and at a 6-month follow-up for both participants. Correct articulation during baseline was zero or near zero for all target words for both participants. Once vocal imitation training started, both children improved their articulation of the target words, mostly to perfect levels. This improvement was maintained at posttraining for both participants and at a 6-month fol-

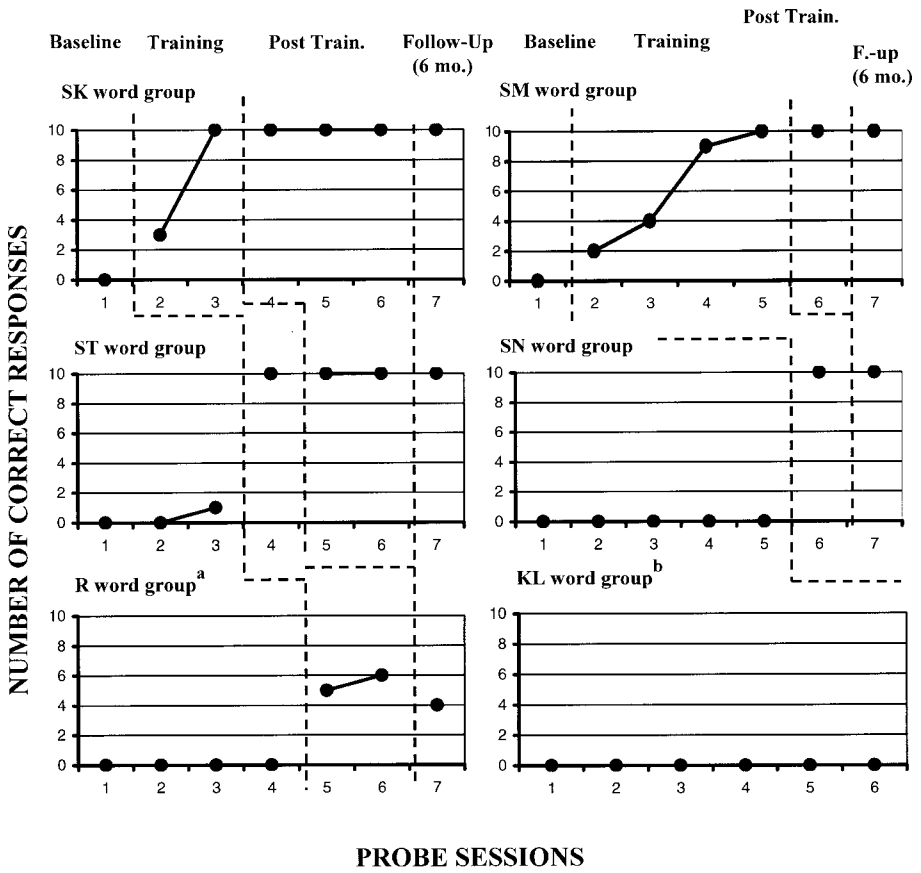

Figure 1. Number of correct responses in the word groups for Participant 1 at baseline, during training and posttraining, and at a 6-month follow-up (a = training not completed; b = training not started).

low-up for Participant 1 (Participant 2 was not available for follow-up assessment). Due to the study's time restraints (the study was conducted during the student-therapists' practicum training), training of the last target sound (i.e., */kl/* for Participant 1 and */gr/* for Participant 2) was never started and thus functioned as an additional control condition. For both participants, performance remained at zero correct throughout the study.

The number of words trained to achieve mastery of each target sound for both participants is shown in Table 1 (see words in boldface). Participant 1 required training on no more than four words and needed no more than four training sessions to achieve mastery on any target sound. Both the */st/* and */sn/* sounds were mastered in only one session after learning only one word. The */sk/* target sound was established in two sessions after learning three words. Due to the study's time restraints, only two words were trained for the target sound */r/,* but the participant correctly articulated six of the 10 words as a result of this training.

The highest number of words taught to achieve mastery of any target sound for Participant 2 was eight (*/sl/*), and these eight words were established in eight training sessions. The */sv/* and */dr/* target sounds were established in two sessions each after learning two words, and the */kn/* target sound was mastered in one session after learning only one word.

Figure 3 exhibits results of the naming test pre- and posttraining. Participant 1 im-

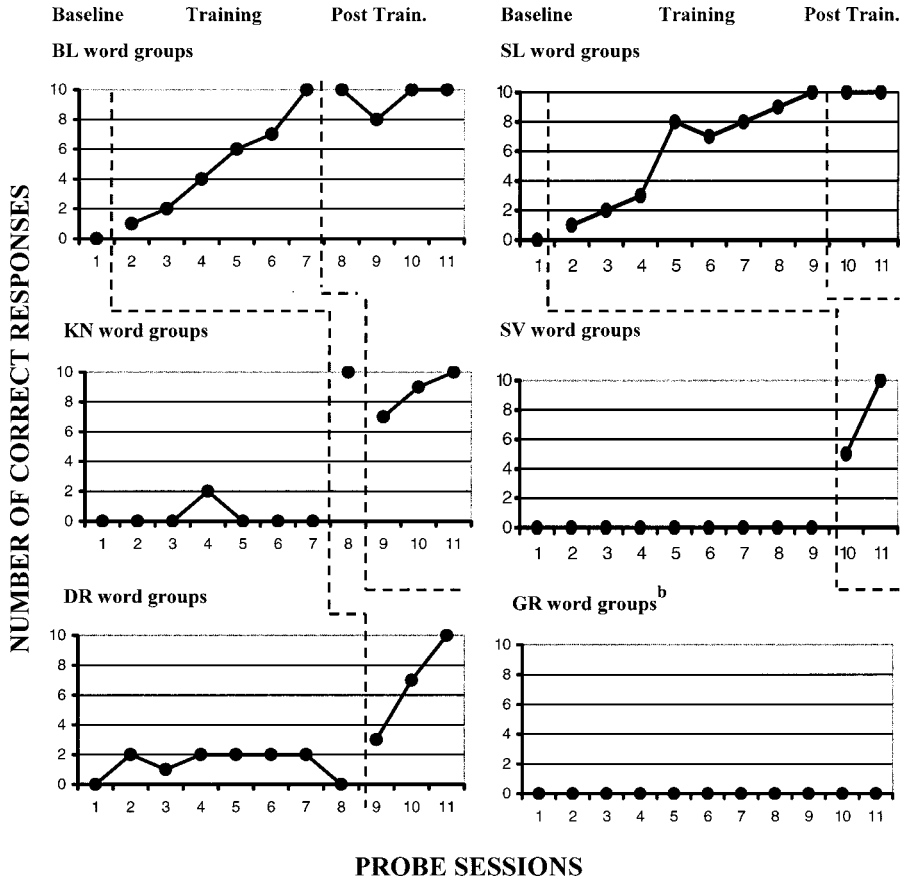

Figure 2. Number of correct responses in word groups for Participant 2 at baseline, during training, and at posttraining (b = training not started).

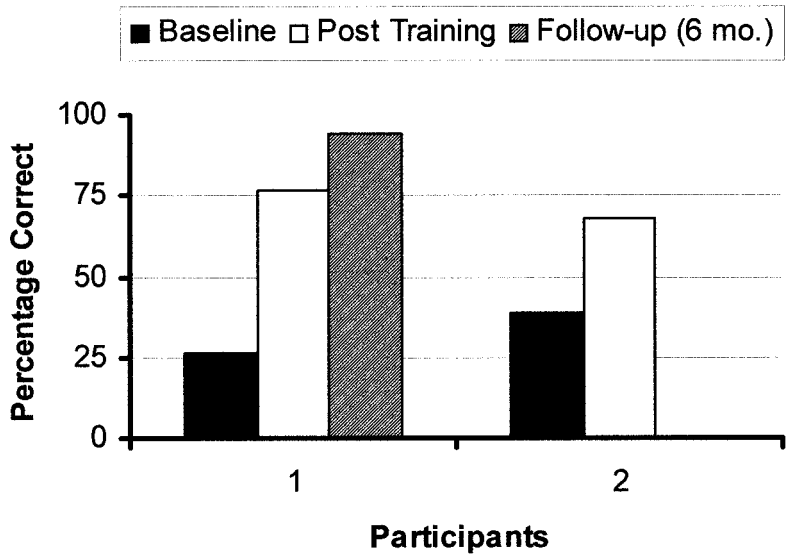

Figure 3. Percentage correct responding during naming tests at baseline, posttraining, and a 6-month follow-up.

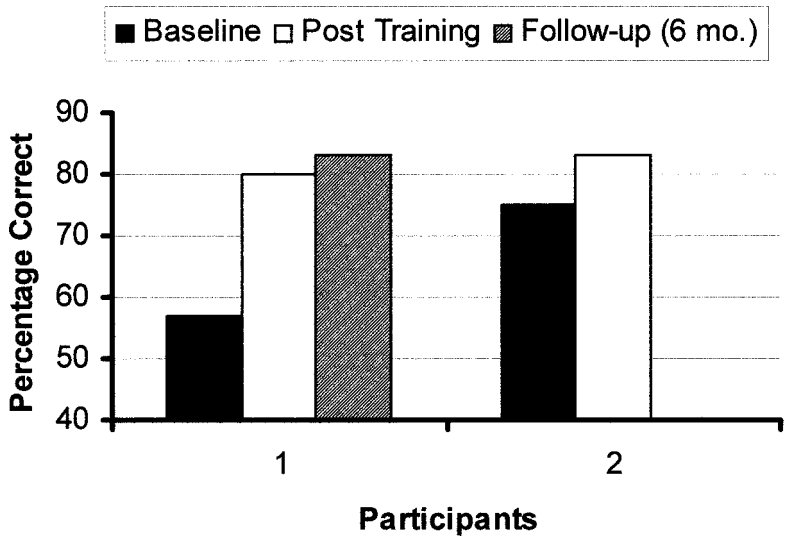

Figure 4. Percentage correct responding during natural conversation at baseline, posttraining, and a 6-month follow-up.

proved his scores from 26% correct articulation pretraining to 77% correct articulation posttraining and 94% at follow-up. Participant 2 improved his score from 39% pretraining to 68% posttraining.

Figure 4 exhibits results of the conversation pre- and posttraining. Participant 1 improved his articulation during a conversation from 57% (246 correct of 431 words) pretraining to 80% (258 correct of 321) posttraining and 83% (466 correct of 560 words) at follow-up. Participant 2 improved his articulation from 75% (472 correct of 622 words) pretraining to 83% (452 correct of 552) posttraining.

DISCUSSION

This study examined whether sufficient-response-exemplar training of vocal imitation would result in improved articulation in children with phonological disorder, and whether improved articulation established in the context of vocal imitation would transfer to other verbal classes such as object naming and conversational speech. Misarticulated sounds (or blends) found to contribute most to the participants' intelligibility were targeted for training. For each target sound, a group of 10 target words was developed. Once a particular target word was acquired, a test for transfer to untrained words containing the same sound was conducted. If no or insufficient transfer occurred, another word containing the same target sound was taught, and so on, until transfer during probes was achieved. Mastery of all 10 words for a particular target sound defined mastery of the target sound, and once a particular target sound had been mastered, the 10 words for the next target sound were trained in the same way.

Results showed that it was not necessary to teach all 10 target words to achieve mastery of the target sounds. For example, for Participant 1, the maximum number of words taught to reach mastery for any of the target sounds was four. For Participant 2, the maximum number of words taught to reach mastery for the target sounds was eight, but three of the five target sounds were acquired after learning only one or two target words. Thus, after acquiring correct articulation of some words containing a particular target sound, other words containing the same tar-

get sound were subsequently echoed correctly without training.

The behavioral process underlying this outcome cannot be sufficiently characterized by the term *response generalization.* Response generalization occurs when in the presence of a *particular* stimulus, responses differ along one or more dimensions from those that have been directly followed by reinforcement. In the present study, not only the responses varied but so did the stimuli evoking the responses; the stimuli varied along some dimensions from those that had been presented when responses were reinforced (e.g., imitation of *black* was trained and imitation of *blue* was tested). In other words, novel stimuli evoked novel responses, and there was a point-to-point correspondence between the stimuli and the responses. This outcome has been termed *generalized imitation,* or generalized *verbal* imitation when vocal behavior is involved, as in the present study (Baer & Deguchi, 1985). In the absence of generalized verbal imitation, point-to-point correspondence will occur only between those stimulus–response constellations that have been explicitly trained, and limited generalization will result.

The type of point-to-point correspondence required to consider an echoed response properly articulated includes more than generalized verbal imitation, however. For example, if the therapist says "red" and the child says "wed" or the therapist says "black" and the child says "back," it may be argued that the child displays generalized verbal imitation (provided that the stimuli and responses were novel), but yet has an articulation problem. Thus, in addition to having acquired the higher order class of generalized verbal imitation, the child must be able (a) to *produce* the vocal topography (i.e., be able to utter the word) and (b) to *discriminate* proper point-to-point correspondence between the verbal stimulus and the vocal response (i.e., be able to discriminate similarities and differences between the word heard and the word said). Whether the sufficient-response-exemplar training of vocal imitation corrected all three prerequisites (i.e., imitation, production, and discrimination) or only some of them because others already had been acquired cannot be determined from the present study. However, based on the fact that the participants had normal language development except for articulation, and based on the theory that generalized verbal imitation is a basic prerequisite for language acquisition (e.g., Horne & Lowe, 1996), it may be inferred that the participants had acquired generalized verbal imitation prior to entering the study. This issue could be examined in future studies.

Previous studies have suggested that vocal imitation training alone may not be sufficient to establish improved articulation in children's overall speech (McReynolds, 1981). It has been argued that vocal imitation training should be accompanied by training on articulation during more natural speech, such as when labeling objects, actions, adjectives, and the like, or when engaging in conversations. Moreover, to optimize the effects of the training, training should be carried out in the child's natural environment, and several different therapists should be involved (McReynolds, 1981). Whether articulation during natural speech improved in the present study was assessed in two ways: First, articulation was assessed during a picture-naming task, and second, articulation was assessed while the participant engaged in a conversation with the therapist. Correct articulation on both measures improved posttraining for both participants and was maintained at a 6-month follow-up for Participant 1. These findings suggest that the improved articulation established during the vocal imitation training generalized across verbal classes, that is, from the more contrived class of vocal imitation in which improved articulation had been

programmed using a sufficient-response-exemplar procedure to conversational speech and picture naming in which articulation had not been taught.

In children with developmental delays, establishing a repertoire of vocal imitation may not be sufficient to produce improvement in overall speech. Indeed, this may be one reason why participants in previous studies have shown limited improvement in overall speech as a result of vocal imitation training. Such children may not have acquired the necessary behavioral prerequisites. What those behavioral prerequisites are is an empirical question outside the reach of this study.

Data varied with respect to how many words needed to be trained to achieve mastery of the target sounds. Some target sounds were acquired after learning one word, and some required several (up to eight). There may be several reasons for this outcome. For example, target sounds that share a common element (e.g., */sk/* and */st/*) may be acquired faster than target sounds that share fewer common elements with previously trained target sounds. Further, target sounds which are positioned at different places in the target word (e.g., beginning, middle, or end) may be more difficult to acquire than target sounds located in one part of the word (e.g., in the beginning). Also, some sounds (e.g., */r/* and */l/*) are by nature more complex than other sounds (e.g., */m/* and */d/*). The target sounds selected for the present study, and the position they had in the target words, were based on an analysis of the specific articulation problem each child displayed.

The intervention period in this study was relatively brief: The training of Participant 1 was carried out in 7.5 weeks. During this time, he received 15 training sessions (2 hr each). The training of Participant 2 was carried out in 29 days, during which he received 21 training sessions (2 hr each). Also, the number of words targeted and trained was relatively low. Participant 1 was taught 10 new words, and Participant 2 was taught 19 new words. However, whether the behavioral training provided in the present study is more effective than other types of speech therapy cannot be determined from this study. Also, the effects of training may have been greater than what was observed if the participants had received additional vocal imitation training, or if articulation during conversational speech had been explicitly trained. This possibility merits further study.

The present study contained some methodological limitations that should be considered. First, articulation during picture naming and conversational speech was examined using pre- and posttest data only. Second, because of the small sample size, the generality of the findings across the population of children with phonological disorder cannot be determined from the present study. The study was exploratory, assessing whether a type of behavioral training could be effective in helping children with phonological disorder, and yielded positive results. Future studies could examine the generality of these findings, refine the training used in the present study, examine the efficacy of the training compared to other treatments, and examine further the basic behavioral processes underlying the effects.

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STUDY QUESTIONS

1. How is phonological disorder characterized and treated from a behavioral standpoint?

2. What is sufficient-response-exemplar training?

3. Describe the articulation difficulties of the 2 participants and how target speech sounds were selected.

4. What behavioral contingencies were arranged during the test sessions?

5. Briefly describe the institutional and motivational components of articulation training.

6. Summarize the results obtained in terms of participant performance on (a) trained words, (b) untrained words having the same target sound, (c) untrained sounds, (d) picture naming, and (e) conversational speech.

7. Why did the authors characterize the obtained results in terms of generalized imitation rather than response generalization?

8. To what did the authors attribute differences observed in the number of words requiring training to produce mastery, and how might one empirically test these possibilities?

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