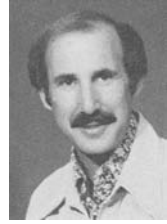


An Intervention Procedure for Children with Persistent /r/ Errors

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This paper describes a diagnostic teaching procedure for use with children who have persistent /r/ errors. Rationale for the procedure includes (1) a two-category typology of children with persistent /r/ errors; and (2) an analysis of the articulatory gestures associated with a child's attempts to say /r/ correctly.

For several years, I have met with speech-language clinicians in schools to discuss children with persistent /r/ errors—or more colloquially, “tough /r/ kids”. The consulting pattern in each case has been fairly similar. A clinician has become concerned about a third to sixth grade child who has not made progress after months, or even years, of speech services. Typically, in response to the clinician's request for another opinion, I have visited the child's school to do some diagnostic teaching and conferred with the clinician to formulate a management program based on assessment results.

This clinical report develops a rationale from which to view the needs of children with persistent /r/ errors and describes an intervention procedure that follows from this rationale.

Description of the Children

Children with persistent /r/ errors usually have not experienced academic or interpersonal difficulties in school. Most, in fact, seem to be among the more creative and lively children in their class; they talk easily and readily. Persistent difficulty with /r/, however, is just beginning to have adverse consequences. As the child approaches middle school years, parents, teachers, the clinician, and the child become increasingly anxious to clear up the /r/ distortions.

The speech patterns of children with persistent /r/ errors may be divided into two types: for ease of reference, a Type 1 error pattern and a Type 2 error pattern.

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Children with a Type 1 error pattern misarticulate only /r/, /ɜ:/, and /ə/. These sounds may be either derhotacized (reduced *r* coloring) or replaced by a mid- or high-back vowel. Slight to pronounced lengthening of these sounds, exaggerated lip protrusions, jaw lowering, tongue bunching, or combinations of these behaviors accompany attempts to say /r/. These children also may have vowel distortions, but only in /r/ syllables, especially in post-vocalic /r/ syllables such as /or/ and /ɔr/.

Children with a Type 2 error pattern have two other classes of errors, in addition to those just described for children with a Type 1 error pattern. First, they may have substitutions or distortions of vowels/diphthongs—typically, on back vowels. These errors occur in both CV and VC contexts other than /r/. Second, these children may have errors on the other three semivowels, /w/, /j/, and /l/. On one or more of these sounds, usually on /w/, the child has slight to pronounced lip protrusions, jaw lowering, or tongue bunching. Children with a Type 2 error pattern then, in addition to errors on /r/, have errors on one or more vowels/diphthongs, errors on one or more semivowels, or errors on sounds in each of these classes.

Rationale for an Intervention Procedure

The intervention procedure proposed here follows both from a taxonomy of response development described in detail elsewhere (Shriberg, 1975; Janzen and Shriberg, 1977) and from additional observations of children with persistent /r/ errors. Briefly, whether response development is approached by phonetic context, by movement from a sound already established in a child's repertoire, or by evoking the sound in isolation, response development is viewed as a motor skills learning task. Informal reports from colleagues indicate that a response evocation program described several years ago (Shriberg, 1975) evokes good /r/s from most but not all children with persistent /r/ errors. On-going analyses of children who have not been successful on this and other response development programs have been provocative. In addition to the two error patterns just identified, two other observations warrant examination here.

The first observation addresses the exaggerated lip-jaw-tongue gestures accompanying attempts at good /r/ production by children with persistent /r/ errors. For the child with either a Type 1 or a Type 2 error pattern, these gestures may have three possible origins: they may have emerged (a) during the child's earliest attempts at /r/ production, (b) during later speech development as self-corrective behaviors, or (c) during intervention to correct the /r/ in response to well-intentioned cues by parents, teachers, clinicians, or others (for example, "be sure to round your lips for /r/"). Although each singly or in combination is a possible antecedent, alternative (c) seems most probable or at least most salient in the present context.

Whichever their origin, the persistence of exaggerated gestures accompanying attempts to say /r/ suggests that they function as conditioned responses. Observations of these children as they interact with their clinician versus "a visitor" (the author), suggest that these gestures are triggered by discriminative stimuli associated with "speech". That is, these gestures accompanying attempts to say /r/ emerge only in the presence of stimuli associated with "good speech", such as the clinician, the clinician's speech mirror, the clinician's speech cards, or a visitor just identified as a speech clinician. On the other side of the response, a reinforcement schedule of some sort must be maintaining these behaviors. Most likely, a variable ratio schedule of reinforcement is provided by clinicians and others for /r/s that are considered "pretty good" or at least a "good try". Persistence of these gestures, then, may be functionally related to the clinical stimuli that evoke them and to the consequences they generate—they communicate to those concerned about speech that at least the child is still trying to master the elusive /r/.

A second observation concerns clinicians' use of tongue shape and tongue movement cues in continuing efforts to teach the child to say a good /r/. Achievement of proper tongue shape and tongue movement are the necessary and essentially sufficient conditions for acceptable /r/ productions, with lip features being of only secondary import. But the problem is that identifying the "feel" of a good /r/ requires that the child have an auditory percept that reliably can be associated with good /r/ production. Typically the clinician claims to have some stimulus words or contexts that are being used for this purpose because these environments sometimes yield /r/s that are close to acceptable. On close inspection, however, neither the clinician nor the child can identify precisely what subphonemic gestures differentiate presumably better /r/s from those that are clearly incorrect. The extended search for effective evocation cues has engendered a situation wherein tongue shape/movement cues have decreasing value.

If these two observations are correct, what is the likelihood that these children will eventually learn to articulate a good /r/? A behavioral analysis would predict that not only would children not acquire /r/ in this situation, but that their speech might become worse. As suggested earlier, it is concern about growing tensions in a child in just this situation that prompts a clinician to seek consultation. With continued speech management, both the stimuli that evoke exaggerated gestures and the reinforcement schedule that maintains them persist. The situation is somewhat analogous to the accessory behaviors of a disfluent child attempting to remain fluent—the accessory behaviors may increase in magnitude and generalize. Anecdotal reports from clinicians and observations of younger children with /r/ errors suggest that this spread of effect is, in fact, observed for some children with persis-

tent /r/ errors. We would submit also that the distortions observed on other sounds in at least some children with a Type 2 error pattern reflect a generalization gradient based on place-manner features. That is, the distortions originally limited to /r/s have spread to those sounds requiring similar lip and tongue movements, namely the glide /w/ and mid-high back vowels.

One approach that sometimes is used for children with persistent /r/ errors is simply to allow the child to take a “vacation” from speech management. This approach should yield an extinction curve for the exaggerated gestures, but it does nothing positive for the child’s need to discover correct tongue shape/movement cues for correct /r/. The diagnostic teaching procedure presented next actively pursues both objectives. Essentially, the procedure attempts to extinguish all exaggerated articulatory gestures accompanying attempts at good /r/ productions while facilitating the child’s awareness of correct tongue shape and tongue movement for /r/.

An Intervention Procedure

The intervention procedure described here consists of two phases: assessment and diagnostic teaching. Typically, a session including both phases takes no longer than 45 minutes. Stimuli used in both assessment and diagnostic teaching phases are taken from a data grid illustrated in Figure 1. The column and row intersects create CV and VC nonsense words—for example, /mi/, /im/, and so forth. In both phases of the procedure, nonsense words are presented by the clinician for the child to imitate.

Assessment. The goals of the assessment phase are (1) to determine whether a child has a Type 1 or a Type 2 error pattern; and (2) to become closely familiar with the child’s particular array of exaggerated gestures accompanying his or her imitation of stimuli. A grid similar to the one illustrated in Figure 1 is used for taking data, with the child’s responses noted in each appropriate box. During the entire assessment phase, it is important to refrain from commenting about the child’s articulation; all recorded data should be kept from the child’s view.

Step 1

Have the child repeat after the clinician the CV and VC nonsense words made by combining each stop and nasal consonant with each of the vowels. Proceed down the first eight columns saying first the CV, then the VC word for each consonant-vowel combination. Watch the child’s lip and jaw movements carefully, particularly for the back vowels /o/ and /ɔ/. If errors are evident on any vowels or diphthongs, the child is viewed as having a Type 2 pattern of errors.

Consonants

		Nasals		Stops				Glides		Liquids					
		/m/		/n/		/d/		/g/		/w/	/j/	/l/		/r/	
		CV	VC	CV	VC	CV	VC	CV	VC	CV	CV	CV	VC	CV	VC
		Front		Mid		Low		High		Mid		Low		Central	
Vowels and Diphthongs	Front	High	/i/												
			/ɪ/												
	Mid		/e/												
			/ɛ/												
	Low		/æ/												
	Back	High		/u/											
				/ʊ/											
		Mid		/o/											
				/ɔ/											
		Low		/ɑ/											
				/aɪ/											
			/aʊ/												
			/ɔɪ/												
			/ɜ-/												
Central		/ə/													

FIGURE 1. A data sheet for assessment, diagnostic teaching, and management programming of children with persistent /t/ errors.

Step 2

Continue to the /w/, /j/, and /l/ columns, proceeding down each column as before. Listen for distortions of any of these consonants and watch for any associated lip or jaw exaggerations, particularly on /w/. Tongue bunching, of course, cannot be observed, but try to make some analysis of possible shape/movement errors and enter these notes in the appropriate box. Once again, children who demonstrate errors on any of these consonants, on any vowels or diphthongs, or on sounds in both classes, are viewed as having a

Type 2 pattern of errors. Latency of imitation is interesting to observe also. For the child who seems slightly delayed in imitating, try saying some two-syllable nonsense words (CVCV) such as /wawi/, /wolo/, /lowo/, and other forms that tax motor programming for sounds within the same class (semivowels). For the child who indicates some difficulties with such stimuli, try some words like “yellow”, “wallet” to see if slight lip rounding confusions or distortions are evident. If errors are observed in any of the tasks to this point, none of which have involved /r/, /ɜ:/, or /ɝ:/, the child is viewed as having a Type 2 pattern of errors.

Step 3

Proceed to the /r/ column and the /ɜ:/ and /ɝ:/ rows. By definition, all children will have errors on both prevocalic and postvocalic /r/. Proceed down the /r/ columns noting carefully which of the vowels are said correctly and which, if any, are distorted. Generally, the vowels preceding /r/ (VC words) are most affected. The rows for the /ɜ:/ and /ɝ:/ are available for supplementary information. Proceed across the rows using each consonant with each of the vowel sounds. For /ɜ:/, the CV and VC monosyllables are used as before; for /ɝ:/, make up two-syllable nonsense words, with the second syllable unstressed; for example, /mimɝ:/.

With a completed inventory of this type, the clinician should be thoroughly familiar with the child’s error pattern. Lip and jaw gestures associated with vowel type, vowel position, and syllable stress should be well defined. Having the child read a short passage is useful to confirm these data. For most children with a Type 2 error pattern, for example, sentences with words beginning with /r/ and /w/ will evoke repetitions or distortions (“We went right to Robert’s”; “Richard went right toward Warren’s house”). For many children, in fact, the effects are much more pronounced during reading, perhaps because of the additional task of symbol-to-sound processing in oral reading.

Diagnostic Teaching. During the assessment phase, the clinician has been acting more in the role of examiner. This demeanor changes in the diagnostic teaching phase. Just as a clinician might set the environment for relaxation when working with a client with hyperfunctional voice usage, the diagnostic teaching procedure attempts to create a relaxed environment for learning.

The child is seated comfortably facing the clinician. A large mirror is placed to the side, easily accessible to the child. The completed data sheet from the assessment phase is used to select stimuli presented for the child to imitate.

Step 1

Ask the child to repeat some stop-vowel and nasal-vowel CV and VC

words, using only those vowels that the child previously said correctly. After each correct imitation, which should be every imitation, reinforce the child with a “good”. Present 15-20 such stimuli for the child to imitate, saying “good” and nodding “correct” with a calm, well-modulated demeanor. The general idea is to provide the child with a string of successful speech behaviors.

Step 2

Proceed to the area on the grid where the child first demonstrated errors during the assessment phase. For the Type 2 child, this might be on the back vowels or diphthongs or on the /w/ or /l/ columns. For the child with a Type 1 error pattern, proceed directly to the /r/ column. Whichever the point of entry, have the child imitate CV and VC nonsense words. As the child shows the exaggerated lip or jaw movements for the target sound, try to set up a contrast between the relaxed gestures just used for the successful imitations and these exaggerations. The idea is to point out to the child that lip pursing and jaw lowering do not have to be used to say whatever vowels or consonants were distorted. Show the child that these nonsense words can be said with lips in a neutral position. To make the point, model the concept of “ventriloquist speech”. Show the child that the ventriloquist is able to make correctly the target sounds with no visible movement. Again, the emphasis here is not on “good speech”—rather, it is on the contrast between the relaxed natural gestures for the earlier sounds and the exaggerated gestures on the error sounds.

Step 3

A “ventriloquist’s aide”—the *bite stick*—is introduced.¹ A bite stick is a four to six inch long dowel (10.16-15.24 centimeters) approximately three eighths of an inch (0.95 centimeters) in diameter. A clean, thin pencil will do, although a wooden or plastic dowel is more “authentic”. To demonstrate how the bite stick acts to stabilize the jaw, the clinician clenches one end of it lightly between the bicuspid, as one would a pipe. With the bite stick in place, the clinician demonstrates for the child that now the tongue has to do all the work because the lips and jaw are essentially motionless. Casually say some stops, nasals, and /r/ nonsense words with high vowels in CV and VC forms. The concept again is of easy articulation. Emphasis is on the novel concept that the tongue can do the job, rather than on the good speech that results.

¹Ronald Netsell’s use of a bite block in assessment of individuals with dysarthric speech provided the impetus to try this “bite stick” approach.

Step 4

When the child seems ready (even eager) to try the bite stick procedure, a clean bite stick is provided. Be sure the child inserts the stick so that his tongue is free to move, his lips form comfortably around the stick, and the dowel is not pressing into the very corner of the child's lips. With the stick correctly in place, the child is ready to try some easy stop-vowel and nasal-vowel combinations, again only with high vowels because low vowels would tend to pull the jaw down. The child should adapt to the bite stick readily, but ample practice at this step is important. Be sure that the vowels said with the stick in place are as well articulated as when they are said without the stick.

Step 5

After many successful trials of the easy nonsense words, proceed to error sounds. For the child with a Type 2 pattern of errors, choose the error sound that is least distorted; for the child with a Type 1 error pattern, choose a CV or VC syllable in which /r/ is least exaggerated. This is the critical point in the diagnostic teaching program. Do not give any instructions to the child, but rather let the child try to understand that the tongue by itself can produce good vowels or semivowels (for the Type 2 pattern) or good /r/ (for the Type 1 pattern). On their own, children seem to "get it". The clinician sits back continuing calmly to model the correct sound, refraining from all directions about tongue or lip placement. The mirror is handy to show the contrast between relaxed lips and overly rounded lips, but let the child take the lead. Encourage the child to find for himself or herself the tongue posture that produces a sound that matches the clinician's model.

Evaluating the Outcome. The diagnostic component of each of the steps above is that the child's behaviors indicate whether the bite stick is immediately successful, whether there is some promising change in behavior, or whether nothing has been gained. Variations of this procedure have been tried with over a dozen children; all have modified their gestures rather dramatically, but not all have gone on to produce /r/ correctly in one session. Clinicians report that the procedure does accomplish the dual objectives of altering stimuli that were evoking the exaggerated gestures and providing the child with awareness of tongue movements independent of jaw and lip movements. Moreover, the systematic inventory of phonetic context data has been useful in management programming.

For children who do produce good /r/s with the bite stick in place, a fading procedure is used to fade the stick and correct /r/ is stabilized with other vowels. Once stabilized, standard linguistic programming proceeds from syllable to word, to phrase, to sentence, to cued speech, and to free speech.

Children with a Type 2 error pattern have required a longer diagnostic teaching period to determine whether the procedure is sufficient. These children require contrast drills among all involved sounds, just as is recommended for the younger child with multiple within-class errors. Once again, the data on the assessment protocol provide a guide to the programming steps, with successive approximation to more difficult contrasts.

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