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A STUDY OF /r/ ARTICULATORY PROFICIENCY AS A FUNCTION OF SPEECH SOUND DISCRIMINATION SKILL

by

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INTRODUCTION

Auditory discrimination, or more specifically, the ability to distinguish between related sounds, has long held the interest of speech pathologists. With respect to general speech sound discrimination, Weiner's (1967) review of the literature discussed variables which seemed to be of most importance in influencing the results of various studies. These included the design of the tests of auditory discrimination, the definition of an articulation defect and age. The factor of age appeared to be an important variable. Many studies report a positive relationship between auditory discrimination and articulation proficiency with children below the age of nine (Templin, 1943; Kronvall & Diehl, 1954; Wepman, 1958; Cohen & Diehl, 1963), although a positive relationship was not found when subjects with only one or two error phonemes participated (Farquhar, 1961; Aungst & Frick, 1964). Prins (1963) reported mixed results when employing a criterion of three error sounds. However, a positive relationship was discovered when four or more error sounds was the criterion for inclusion in studies by Kronvall & Diehl, (1954), Cohen & Diehl (1963) and Schiffelbush & Lindsey (1958). It is important to note that results among these studies have nonetheless been consistent, even though there has been variation in the methods and procedures employed among the various investigations.

Powers (1971) conducted an extensive review of literature and concluded that the weight of evidence points to a deficit in speech sound discrimination in misarticulators as compared with normal speakers. Moreover, the misarticulators may have speech sound discrimination problems with specific sounds or sound groups. This deficit may be specific for the sounds an individual misarticulates. A speech sound discrimination deficit may exist in the articulatory deficient, but the studies have not been designed to determine the nature of the discrimination problem. In general the studies have explored auditory discrimination and speech sound discrimination in experimental designs too broad to specify the relationship. It has been suggested (Powers, 1971) that articulatory deficient children's discrimination problems may be restricted to their articulation errors, i.e., the sounds they do not produce correctly, they do not discriminate in the same manner as the children who did not exhibit articulation errors. Power's suggestion may have merit. In fact, studies by Prins (1963), Aungst & Frick (1964), Monnin & Huntington (1974) and Wolfe & Irwin (1973) have presented evidence that articulatory deficient children do have discrimination difficulty with the phonemes they misarticulate.

Prins (1963) studied twenty-six children with functional articulation defects who were six years old and in first grade. He observed for evidence of specific relations among articulation

deviations and scores on a clinical measure of speech sound discrimination ability. A group of nineteen normal speaking children with equivalent age, sex and IQ were used as the controls. The subject's articulation errors were analyzed by a detailed method of qualifying and coding of these errors. These coded scores were then converted to proportions for statistical analysis, so that a given score typified a subject's tendency to produce a particular type of articulation error. The Wepman Auditory Discrimination Test was the clinical measure of speech sound discrimination employed.

Results showed that children who made high proportions of phonemic substitutions errors which involved change of only a single articulatory feature and place of articulation in particular tended to have low scores on the Wepman Test. On the other hand, children who had a large number of articulation errors which differed grossly from the intended phonemes in the combined features of manner and place of articulation and voicing did not tend to have poor scores on the Wepman. It was of interest to note that the correlation between the total number of articulatory errors and the sound discrimination scores was not significant. The difference in mean errors between the experimental and control groups favored the former, but was not significant.

Aungst & Frick (1964) reported that findings from other related studies indicated the importance of considering the

specific misarticulated phoneme. They hypothesized that for children age eight and older who misarticulated only the /r/ phoneme, consistency of articulation was more directly related to the ability to judge self production as correct or incorrect, than to the ability to discriminate between paired auditory stimuli presented by another speaker.

Subjects for the study were chosen by their scores on the fifty item sentence "Deep Test" of Articulation for /r/ (McDonald, 1959). The group obtained a mean of twenty-seven correct on this test of articulation production. The experimenters constructed three specific tests of discrimination for the /r/ phoneme to measure the ability of the subjects to judge their own speech productions when (1) compared to the productions of another speaker, (2) heard on a tape recording at a delayed time, and (3) immediately after producing an /r/ word. Thirty monosyllabic words, each containing the /r/ in different phonetic contexts were used for each of these three tasks. The judgment required from the subject after each production was "right" or "wrong", referring to the correctness of their production of the word. The correctness of the subjects' judgments was scored independently by the experimenters. The Templin Speech Sound Discrimination Test which requires the subject to respond "same" or "different" to each of fifty pairs of externally produced nonsense words which treat various speech phonemes was also administered. A mean score

of forty-five correct items (normal range) was obtained on this general test of discrimination ability.

The mean errors in self judgment made by the subjects were as follows: (1) comparison with another speaker, 18.1 errors; (2) delayed judgments, 19.0 errors; and (3) instantaneous judgment, 19.6 errors. Correlations between the McDonald "Deep Test" of articulation production and each of the three discrimination tasks were significant at the .01 level of confidence.

Monnin & Huntington's (1974) research was concerned with the relationship of articulation and speech sound identification abilities of children with normal speech and those with functional articulatory defects. They compared the speech sound discrimination abilities of three groups: an experimental group, composed of children with a mean age of six years, who misarticulated the /r/ phoneme in the initial, medial and final positions; a control group, composed of normal speaking children with a mean age of six years; and a third group, composed of articulatory proficient children, mean age five years.

The task employed was one of speech sound identification, consisting of fifteen contrasting word pairs. These pairs differed from each other by one phoneme. The pairs were then divided into four groups in which the /r/ and /w/ phonemes were contrasted in the initial position only, an acoustically similar and then dissimilar group in which the initial consonants but not the medial

and final phonemes were contrasted, and lastly, one in which the medial vowel but not the initial or final consonant was contrasted. These pairs were then submitted to a process of distortion (center clipping for consonants, high pass filtering for vowels) and presented to the subjects on a continuum ranging from no distortion to maximum distortion, to determine whether the speech defective children and their normal controls used the same acoustic cues differently.

Their results showed that when an initial position /r/-/w/ contrast was presented, the /r/ defective group made significantly more identification errors than both the control and the five-year-old group. This same result occurred throughout the relevant listening conditions. On acoustically similar and then dissimilar contrasts, and vowel contrasts, no significant differences were noted between groups. The results of speech signal distortion indicated that as distortion became more severe, the errors in identification increased for all groups. Monnin and Huntington concluded that the /r/ defective group did not have a general deficiency in speech sound discrimination, but a deficiency only for the phonemes they misarticulated.

Wolfe & Irwin (1973) reported a study of specific discrimination ability of school aged.children. Unlike the previous report of specific discrimination ability, these experimenters required a "same" or "different" judgment rather than "right" or

"wrong" judgments. The subjects were twenty first through third grade children and twenty fourth through sixth grade children who misarticulated the /r/ phoneme. Words containing the /r/ phoneme were spontaneously elicited by pictures. Elicitation was immediately followed by playing a taped recording of the same word produced by a normal speaker. The subjects were then asked for their judgments of whether the productions were the same or different. The experimenters recorded the accuracy of each subject's judgment. Following a time lapse of two weeks, the subjects listened to their previously produced words which were immediately followed by the same word spoken by a normal speaker. Again, "same" or "different" judgments were made by the subjects and the judged accuracy recorded. The results indicated that these groups of children were significantly (at the .01 level of confidence) less proficient in making same/different judgments when they produced the /r/ words and immediately compared it to a model than when they were able to listen to a recording of their production followed by a model. Grade level did not appear to be a variable of measurable significance.

Unlike the equivocal results reported by the various investigators of the relationship between general speech sound discrimination ability and articulation proficiency, the data reported by the investigators of the relationship between discrimination ability of a specific phoneme and the proficiency of producing that phoneme appear to exhibit greater rationality. Reports by

Spriestersbach & Curtis (1951) and Powers (1971) suggest that a child who misarticulates a specific sound may show errors in his judgment of the adequacy of his perception of that sound and not exhibit a similar perceptual deficit with other phonemes. The study by Aungst & Frick (1964) tends to suggest that the extent of articulation proficiency of a specific phoneme is related to proficiency in discrimination ability or the perception of that phoneme. Further, the difference in types of listening or speech sound discrimination tasks appear to be minimal. The study by Wolfe & Irwin (1973) tends to confirm Aungst & Frick's (1964) findings with an overlapping age and a younger age group of misarticulating children. The study by Monnin & Huntington (1974) indicated that kindergarten children and younger children who possess intact articulation proficiency do not make as many speech sound discrimination errors as are made by kindergarten children possessing a specific deficit in articulation proficiency.

More recently, Shearer (1976) studied the specific speech sound discrimination abilities of ten /r/ defective kindergarten children and ten /r/ defective early elementary children with ten normal speaking kindergarten children and ten normal speaking early elementary children used for controls.

Two constructed tests for specific speech sound discrimination tasks were administered, in addition to the Wepman Test of Auditory Discrimination (Wepman, 1973). In the first constructed

task, thirty word pairs were presented. Of these pairs, fifteen were identical and the other fifteen consisted of an /r/ word paired with a non-/r/ word foil. The subjects responded with a same/different judgment. All thirty /r/ words from Task I were used for Task II. During Task II the examiner spoke the stimulus word, the subject repeated the same, and then judged whether his productions were the same as or different from those of the examiner.

The results indicated that for Task I the kindergarten experimental group made significantly more discrimination errors than the kindergarten control group. No significant differences were reported between the early elementary groups on Task I. However, on Task II, both the kindergarten and early elementary articulatory deficient groups scored significantly more discrimination errors than their respective controls. An eighty to ninety percent error rate was noted when comparing the results of the articulatory deficient groups between Task I (comparing two externally produced words) and Task II (comparing externally produced words with self produced words). No other previously cited study has demonstrated such a wide range of scores. No statistically significant differences were reported between either articulatory deficient groups and their respective control groups in regard to Wepman's Test of Auditory Discrimination.

While it is tempting to use this data to support a position

which demands the need for systematic testing of specific speech sound discrimination in articulatory deficient children, it should be pointed out that the Shearer study failed to control for order effects, i. e., the task sequence with each subject was Wepman's Test of Auditory Discrimination, Task I and then Task II. It could be argued that the observed mean differences could have been influenced by the order of administration. That is, the experimental subjects simply became less proficient or fatigued by the tasks, hence a greater error rate on the last task (Task II) than the first task. Second, it might be argued that requiring an instantaneous judgment of same/different after self production impairs the accuracy of the perceptual judgment which compares model production with self production. Both of these possible problems could to some extent be empirically resolved. The question of a possible order effect could be resolved by counterbalancing the tasks within the study. The possible problem of instantaneous comparative judgments of self production could be resolved by the inclusion of a task which involves tape recording the model productions and the subject's productions and having the subject make the same/different judgment at a point delayed in time.

The purpose of the present research was to replicate the Shearer study, including the design modifications and the specific speech sound discrimination task noted above.

METHOD

Subjects

Subjects selected for this study were kindergarten and early elementary aged children, chosen from the public schools of Topeka, Kansas. Forty subjects were divided into four groups according to grade placement and articulatory proficiency. The Photo Articulation Test (Pendergast, et al., 1969) was administered individually to each child and the responses recorded by the author, who is an experienced school speech pathologist.

Criteria for Subject Eligibility. Subjects included in this study were selected on the basis of the following criterion:

1. Passing a pure tone hearing screening test at frequencies of 500, 1000, 2000, 4000 and 6000Hz at 25 dB HTL.
2. Obtaining a receptive vocabulary quotient not more than six months reduced in reference to chronological age on the Peabody Picture Vocabulary Test, Form A (Dunn, 1959).
3. Possessing no known organic involvment which might contribute to impairment of articulatory proficiency.

Control Groups. The kindergarten control group was composed of ten normal speaking children, five boys and five girls, with an age range from five years, two months to six years. The early

elementary control group was also composed of ten normal speakers, five boys and five girls, with an age range from six years, four months, to seven years, nine months. To be included in this group the subjects were required to display correct production for all sounds tested in all positions.

Experimental Groups. The kindergarten experimental group was composed of ten children, five boys and five girls, with an age range from five years, one month to five years, nine months. The early elementary experimental group was composed of ten children, five boys and five girls, with an age range from six years, one month to seven years, six months. All subjects in both experimental groups misarticulated the /r/ phoneme in the initial, medial and final positions on the Photo Articulation Test (Pendergast, et al., 1969). According to Templin's (1957) data, eighty-five percent of all five year old children correctly articulate the /r/ in all positions. An /r/ misarticulation therefore would minimally indicate that the subject was in the bottom twenty-five percent of his age group for mastering this sound. If a sound were misarticulated in one position, it was counted as one error. In this manner, the minimum number of errors for any subject in this group was three. (Some subjects also misarticulated other consonant sounds in addition to /r/.) For the kindergarten experimental group the range of articulation errors was from three to twenty-seven, with a mean of 13.9 errors. For the early elementary experimental group the

range of articulation errors was from four to thirty-nine, with a mean of 14.2 errors.

The /r/ section of the McDonald "Deep Test" of Articulation (McDonald, 1964) was administered individually to each experimental group subject to further determine the extent of the /r/ misarticulation. The scores for McDonald's test yield a measure of the consistency of the articulation deficiency in varied phonetic environment. For the kindergarten experimental group the range of /r/ articulation errors was from fourteen to forty-six, with a mean of 37.6 errors. For the early elementary experimental group the range of /r/ articulation errors was from forty-three to forty-six, with a mean of 45.5 errors.

Stimuli

During Test I of this study, the subject listened to pairs of /r/ and non-/r/ words presented live voice by the examiner, then judged whether the words were the "same" or "different". During Test II, the subject listened to an /r/ word presented live voice by the examiner which he repeated, and then made an immediate judgment as to whether his production was the "same" or "different" as the word spoken by the examiner. Test III was a duplication of Test II, except that the entire procedure was tape recorded and the subject did not make an immediate discrimination judgment. Rather the examiner and subject proceeded through the thirty-word task, recorded the entire session, then, upon completion, the subject listened to the recorded playback before making his

discrimination judgment of "same" or "different".

A word list developed by Shearer (1976) was employed for the three tasks of specific speech sound discrimination with the following changes: the roar/your word pair was changed to rake/lake; the rear/rear word pair was changed to reach/reach; and the recite/delight word pair was changed to right/night. These changes eliminated a confusing initial and final position /r/ in the case of roar and rear, when only one /r/ position was to be discriminated in each word. It also eliminated your as a non-/r/ word foil in the roar/your word pair. Recite/delight was changed to right/night because the substituted words would probably be more within the vocabulary of the younger children to be tested.

The stimuli for Test I consisted of the thirty modified word pairs utilized in Shearer's (1976) study. In one-half of these word pairs, the words were identical. In these fifteen identical words the /r/ appeared with equal frequency in the initial, medial and final positions.

The /r/ words selected for the identical pairs were:

Initial	Medial	Final
rung	curtain	bar
rich	morning	snore
ring	largest	air
raise	horses	were
reach	forbid	far

The remaining fifteen words consisted of an /r/ word and a non-/r/ word foil. Again, the /r/ appeared with equal frequency in

the initial, medial and final positions.

The word pairs selected were:

Initial	Medial	Final
round-wound	skating-scaring	single-singer
rate-wait	matching-marching	hanger-hanging
rake-lake	healing-hearing	butter-button
rose-those	firing-filing	eager-eagle
right-night	bowing-boring	better-better (Eastern /r/)

The stimuli for Test II and Test III were the thirty /r/ words contained within Test I. See the Appendix for the data collection sheets for the specific speech sound discrimination Tests I, II, and III which were utilized for this report.

Procedure

Speech rooms or empty classrooms, removed from playground and extraneous noise, provided the space for testing procedures. Total data collection time for each subject was twenty to thirty minutes. The sequence of procedure was alternated to counter-balance for order effect. Operationally, each Test was alternately administered with equal frequency in one of the four possible orders to equal number of subjects. These four order presentation orders were: (1) Wepman's Test of Auditory Discrimination, Test I, Test II, Test III; (2) Test I, Test II, Test III, Wepman's Test of Auditory Discrimination; (3) Test II, Test III, Wepman's Test of Auditory Discrimination, Test I; (4) Test III, Wepman's Test of Auditory Discrimination, Test I, Test II.

The audio data for Test II and Test III was recorded on a

portable cassette tape recorder. The microphone was hand held by the examiner approximately four inches in front of and two inches below the speaker's mouth. The examiner sat directly across the table from the subject and concealed her mouth with a 4" x 6" blank card when presenting the stimuli. Care was taken to present all words alike in regard to pitch, intensity and duration. The words were presented in a pleasant and normal manner. Eye contact was maintained with the subjects during the time examiner produced stimuli presentations.

A pre-test developed by Shearer (1976) to train the same/different response mode was administered prior to Test I. (All subjects responded with 100% accuracy to this pre-test.) The instructions given with Test I were "I am going to say two words. I want you to tell me if the words sound the same or if they sound different." This was followed by four demonstration items, two of which required a "same" response and two which required a "different" response. The demonstrations word pairs did not contain the /r/ phoneme. If a subject responded incorrectly to a demonstration item, he was corrected and the item was repeated. The examiner then proceeded to administer Test I.

Shearer (1976) also developed a pre-test for Test II which was similarly employed in this study, to which the subjects responded with an overall accuracy of 96.5 percent, but all subjects performed at criterion before proceeding to Test II.

The instructions for Test II were "I am going to say a word and I want you to say the same word. Then I want you to decide if the words sounded the same or if they sounded different." Four demonstration words (cat, dog, mouse, table) were then presented with corrections and repetitions of the demonstration word when necessary. The examiner then proceeded to administer Test II.

Test III was administered in the same manner as Test II, with the exception that the entire procedure was tape recorded on a portable cassette tape recorder. After proceeding through the thirty-word task, the items were played back to the subject for his judgments.

Analysis of Responses.

For the Wepman Test of Auditory Discrimination, each "same/different" response was scored as correct (+) or incorrect (-). The scaled ratings derived from the scores were used for statistical analysis for each group.

Test I, which is similar to Wepman's test, except that it focused specifically on the /r/ phoneme, was scored in the same manner, the "same/different" responses were recorded as correct (+) or incorrect (-). The total number of responses scored as incorrect for each subject were used for statistical analysis.

In scoring Tests II and III, the examiner was required to make judgments of whether the subject's production of the stimulus word was a reasonable approximation of that word (normal articulation

vs. misarticulation) and then record whether the subject's judgment was in agreement with the examiner's. Agreement could exist under two conditions: Both the subject and examiner could agree that both word productions were similarly articulated, or conversely, both could agree that both word productions did not match. Likewise, disagreement could also occur under two conditions: The productions of the examiner and the subject did not match, but the subject stated the two productions were the same, or both productions did match and the subject stated the two productions were different. The vast majority of disagreements were of the first type, wherein the productions did not match and the subject stated the two productions were the same. (Test II: total all groups, 316; Test III: total all groups, 268.) The number of disagreements of the second type, wherein the productions did match and the subjects stated they were different was greatly reduced. (Test II: total all groups, 18; Test III: total all groups, 51.) Agreements were scored as correct responses (+) and disagreements were scored as errors (-). The total errors for each subject by group were used for statistical analysis.

To determine examiner reliability, another school speech pathologist with fourteen years of experience randomly selected recordings of twelve subjects and made an independent evaluation of the examiner's scoring. Using Pearsons product-moment correlation procedures, a reliability coefficient was obtained between the experimenter and a second experienced speech pathologist.

There was an observed reliability coefficient of .90.

RESULTS

The purpose of this research was to replicate the Shearer (1976) study concerning the relationship between specific speech sound discriminations proficiency and articulation proficiency, while controlling for possible order effects and adding a third testing condition.

Shearer tested specific speech sound discrimination of the /r/ phoneme by using two procedures. The first test consisted of listening to word pairs and judging if the members of the pair were "same" or "different". The second test consisted of the experimenter saying a word containing the /r/, followed by the subject repeating the experimenter's production and then judging if the two productions were the "same" or "different". This present research included these two tests and a test similar in different aspects to the two test procedures used by Shearer. This third test involved a tape recorded session where the subject repeated the words spoken by the experimenter, after which the tape recording was played and the subject judged if his word production was the "same" or "different" as compared to the word spoken by the experimenter.

To control for order effect a counterbalanced design was employed. The three constructed tests and the "Wepman" test each

appeared ten times in the four possible positions, i.e., first, second, third or fourth. A statistical analysis for order effect was accomplished by comparing the means for the four positions orders by t-test procedures. The mean errors for the various positions were: first, 6.45; second, 7.23; third, 6.48; and fourth, 6.95. The t-ratio comparison of each mean to each of the other three means failed to exceed 1.00 in every comparison. These data would suggest that the order of test presentation for these test data is not a variable of measurable significance.

On Test I, where two externally produced words were compared, a mean of 4.80 errors was observed for the kindergarten articulatory deficient group, and a mean of 5.70 errors was observed for the kindergarten control group. Statistical analysis by t-tests yielded a t-ratio of .35, which did not statistically differentiate between these groups. The early elementary articulatory deficient group scored a mean of 2.20 errors, while their control group scored a mean of 1.10 errors. The t-ratio of .93 also failed to differentiate between this older group on Test I. However, there was a statistically significant difference at the .05 level of confidence (t=2.36) between the kindergarten control group and the early elementary control group on Test I. A similar t-test comparison between grade levels for the two experimental groups failed to reach statistical significance. (Refer to Table I for a summary of these results.)

Comparison immediately following productions of externally produced to self-produced /r/ words of Test II yielded mean errors of 16.60 for the kindergarten articulatory deficient group, as compared with a mean error of 1.80 for the kindergarten control group. The t-ratio of 6.53 was statistically significant beyond the .01 level of confidence. The early elementary experimental group had an observed mean of 17.40 errors and their control group an observed mean of 0.50 errors on Test II. The t-tests yielded a t-ratio of 10.55 which was statistically significant beyond the .01 level of confidence.

For Test III, the recorded test which was played back to the subject for later comparison judgments, the kindergarten articulatory deficient group had an observed mean error of 15.90, while their controls had an observed mean error of 2.40. These data when submitted to t-test analysis yielded a t-ratio of 4.92, which is beyond the .01 level of confidence. The early elementary experimental group had an observed mean error of 11.90, while their control group scored a mean error of 0.70. The t-tests revealed a t-ratio of 6.46, which statistically differentiated between these groups beyond the .01 level of confidence.

In summary, Tests II and III of this study appear to yield pronounced differences between the articulatory deficient groups and the normal groups, independent of age. Test I did not differentiate between any groups, regardless of age.

This study utilized the Wepman Test of Auditory Discrimination (Wepman, 1973) to determine if there were differences between normal speaking and articulatory deficient children on a measure of general speech sound discrimination. The scaled score ratings, which take into account the age of the subject, were submitted to t-test analysis for each group (kindergarten experimental vs. kindergarten control and early elementary experimental vs. early elementary controls). The t-ratios of less than 1.00 failed to differentiate between any groups, suggesting that, for the groups studied in this report, Wepman's test may not be a tool of critical importance.

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Table 1

Comparison of Mean Number of Specific Speech Sound Discrimination Errors and Standard Deviations for /r/ Articulatory Deficient Children with a Control Group

Group	Grade Placement	
	Kindergarten	Early Elementary
Test I-Comparing two externally produced words		
Articulatory Deficient		
Mean	4.80	2.20
S.D.	9.32	4.85
Control		
Mean	5.70*	1.10
S.D.	5.69	1.37
Test II-Comparison immediately following productions of externally produced to self production		
Articulatory Deficient		
Mean	16.60**	17.40**
S.D.	6.26	6.72
Control		
Mean	1.80	0.50
S.D.	2.71	1.02
Test III-Comparison by tape recording procedures of externally produced to self productions		
Articulatory Deficient		
Mean	15.90**	11.90**
S.D.	10.89	7.19
Control		
Mean	2.40	0.70
S.D.	4.15	1.49

Note: Maximum errors on all tasks = 30.
** significant at the .01 level of confidence
* significant at the .05 level of confidence (between control groups only)

Table 2.

Comparison of Mean Scaled Scores of Auditory Discrimination Responses and Standard Deviations for /r/ Articulatory Deficient Children with a Control Group as Measured by the Wepman Test of Auditory Discrimination

	Grade Placement	
Group	Kindergarten	Early Elementary
Articulatory Deficient		
Mean	-.3	+.2
S.D.	1.35	1.25
Control		
Mean	+.2	+.7
S.D.	1.08	.78

DISCUSSION

The findings of this research replicate the principle findings of the Shearer (1976) study in that /r/ deficient kindergarten and early elementary children make significantly more speech sound discrimination errors when comparing self-emitted /r/ word productions to a modeled production than a matched group of articulatory proficient children. This significant difference between the groups of children is apparent when the required discrimination judgment is made immediately following the child's word production or when the judgment is delayed through the vehicle of tape recording the model and imitated production and then playing the tape for judgment at a delayed time. Further, when the same groups of children make speech sound discrimination judgments between /r/ words and phonetically similar words, like round-wound, both spoken by another person, a significant difference fails to emerge.

As with the Shearer report and in this study, the Wepman Test of Auditory Discrimination failed to reveal significant differences between groups when compared by articulatory proficiency or school placement level. The constructed test of this research concerned with speech sound discrimination between two externally produced sounds was found to have a statistically significant difference at the .05 level of confidence between the means of the kindergarten and early elementary control groups, but significance was lacking

for the mean differences for the experimental (articulatory deficient) groups. The Shearer study found significant difference on this same test between the two experimental groups, but not for the control groups. With respect to these findings, the only conclusion that appears warranted is that these studies do not provide evidence to support the position that any of the constructed tests are sensitive to grade level placement.

Although the error rate for the self monitoring tests was not as large as that reported by Shearer (1976), the present study nonetheless supports her most significant findings with respect to a deficit in that articulatory deficient children appear to possess a deficit in self monitoring skills for the specific error sound. This conclusion is also in harmony with the findings by Aungst & Frick (1964), Wolfe & Irwin (1973) and Monnin & Huntington (1974). The findings also appear to be consistent with the theoretical position offered by Powers (1971) that articulation proficiency is directly related to specific speech sound discrimination skill.

From a clinical standpoint, it is questionable from this research if the most popular and most frequently used tests of general speech sound discrimination are relevant in the evaluation procedures for an articulatory deficient child. Further, some traditional articulatory training procedures have concentrated on general speech sound discrimination training on the assumption

that if the subject can be taught to hear the differences in the speech of others, this ability would carry over into self-monitoring skills. The comparison results of Tests I and II of this study indicate that it is more difficult for a child who misarticulates the /r/ to discern the difference when he is speaking than when listening to another speaker. Considering the results of Shearer's (1976) study and this present research, it would appear that Test II could prove to be a usable diagnostic tool to determine if a specific speech sound discrimination ability is present and whether or not it needs to be trained for developing self-monitoring skills.

Further research should be directed towards expanding the age range and number of sounds in which this phenomenon may be found. Also, an attempt should be made to reinforce for correct self-monitoring skill and assay the effects of such training on articulatory production.

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A P P E N D I X

Subject_____ Age_____ Grade_____ DOB_____

TEST I

Examiner produces both words, asking for a same or different response from the subject.

	S	D		S	D
1. curtain-curtain (kɜrtən-kɜrtən)			16. healing-hearing (hilɪŋ-hirɪŋ)		
2. round-wound (raund-waund)			17. firing-filing (fairɪŋ-faɪlɪŋ)		
3. single-singer (sɪŋgl-sɪŋə)			18. largest-largest (lardʒəst-lardʒəst)		
4. rake-lake (rek-lek)			19. reach-reach (rɪtʃ-rɪtʃ)		
5. bar-bar (bar-bar)			20. snore-snore (shɡr-snor)		
6. skating-scaring (sketɪŋ-skerɪŋ)			21. horses-horses (horsəz-horsəz)		
7. wait-rate (wet-ret)			22. raise-raise (rez-rez)		
8. matching-marching (mætʃɪŋ-marʃɪŋ)			23. better-better (bɛtə-bɛtə)		
9. rung-rung (rʌŋ-rʌŋ)			24. air-air (ɛr-ɛr)		
10. rich-rich (rɪtʃ-rɪtʃ)			25. were-were (wɜ-wɜ)		
11. ring-ring (rɪŋ-rɪŋ)			26. eager-eagle (igə-igl)		
12. rose-those (roz-ðoz)			27. right-night (rɪt-nɑɪt)		
13. hanger-hanging (hæŋə-hæŋɪŋ)			28. far-far (far-far)		
14. butter-button (bʌtə-bʌtn)			29. forbid-forbid (fərbɪd-fərbɪd)		
15. morning-morning (mɔrnɪŋ-mɔrnɪŋ)			30. boring-bowing (bɔrɪŋ-bowɪŋ)		

Subject_____

TEST II

Examiner says the word and asks the subject to repeat the word. Subject judges whether his production was the same or different from the examiner's production of the word.

		Subject's Resp.		Examiner's Resp.	
		S	D	S	D
1.	curtain				
2.	round				
3.	singer				
4.	rake				
5.	bar				
6.	scaring				
7.	rate				
8.	marching				
9.	rung				
10.	rich				
11.	ring				
12.	rose				
13.	hanger				
14.	butter				
15.	morning				
16.	hearing				
17.	firing				
18.	largest				
19.	reach				
20.	snore				
21.	horses				
22.	raise				
23.	better				
24.	air				
25.	were				
26.	eager				
27.	right				
28.	far				
29.	forbid				
30.	boring				

Subject_____

TEST III

Directions are the same as for TEST II, except the entire procedure is tape recorded. The subject then listens to a playback of each stimulus item to make a same/different response.

	Subject's Resp.		Examiner's Resp.	
	S	D	S	D
1. curtain				
2. round				
3. singer				
4. rake				
5. bar				
6. scaring				
7. rate				
8. marching				
9. rung				
10. rich				
11. ring				
12. rose				
13. hanger				
14. butter				
15. morning				
16. hearing				
17. firing				
18. largest				
19. reach				
20. snore				
21. horses				
22. raise				
23. better				
24. air				
25. were				
26. eager				
27. right				
28. far				
29. forbid				
30. boring				

A STUDY OF /r/ ARTICULATORY PROFICIENCY AS A FUNCTION OF SPEECH SOUND DISCRIMINATION SKILL

by

CAROLE JEAN MIZE

B. A., Kansas State University, 1964

AN ABSTRACT OF A MASTER'S THESIS

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The purpose of this research was to study the relationship between specific speech sound discrimination for the /r/ phoneme and articulatory proficiency of the /r/ phoneme.

Forty kindergarten and early elementary children were divided into four groups of ten each, according to articulatory proficiency and grade placement. Three specific tests of /r/ speech sound discrimination were constructed and individually administered to the members of these four groups. These specific discrimination tasks included a same/different judgment of two externally produced words and a same/different judgment of an externally produced word and a self produced word, with comparison judgments immediately after the utterance and later after listening to a tape recorded playback. Also, a commercially available test of auditory discrimination was administered to each subject. The results of this research suggested that the two constructed tests which compared an externally produced word to a self production significantly differentiated between the articulatory deficient group and the normal speaking control group at both the kindergarten and early elementary age levels. The other constructed test for specific speech sound discrimination, comparing two externally produced words, failed to reach statistical significance between the articulatory deficient and normal controls at both age levels, but did show a statistically measurable difference between the kindergarten and early elementary controls. The commercially available test of general speech sound discrimination failed to

detect differences between groups by articulatory proficiency or by age level.

The resulting findings were discussed in relation to previous research and proposed implications for articulation evaluation and training and possible areas for further research and development in speech sound discrimination.