A Comparison of Articulation Errors of Second Grade Students in Three Speaking Conditions

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A COMPARISON OF ARTICULATION ERRORS OF SECOND GRADE STUDENTS IN THREE SPEAKING CONDITIONS

BY

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B.A., Metropolitan State College, Denver, 1979

THESIS

Submitted in partial fulfillment of the requirements for the degree of Master of Arts: Communicative Disorders in the Graduate Studies Program of the College of Health at the University of Central Florida; Orlando, Florida

Spring Quarter
1981
TO RAY AND DARREN,

FOR THE ENDLESS PATIENCE AND SUPPORT

YOU HAVE GIVEN ME
ACKNOWLEDGEMENTS

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Chapter I

INTRODUCTION

The ability to communicate is basic to human development and interaction and, therefore, it is impossible to exaggerate the significance of communication. Traditionally, communication has been defined as a transfer of information between people using a common sign or a common symbol system (Nicolosi, Harryman, & Kresheck, 1978). Articulation, or the production of phonemes, is one of several interrelated processes by which speech is produced and speech is one of the several modalities of language which is utilized to communicate or transmit information between people (McDonald, 1964).

Although speech pathologists work with a variety of speech disorders, those of articulation are found most frequently. Approximately 80% of the case loads of speech pathologists working in public schools is made up of children who have not successfully or completely mastered the phonology (sound system) of our language - children who erroneously substitute one phoneme for another, or children who omit or distort speech sounds (Van Riper, 1978). Van Riper (1978) classified these children as handicapped because their speech deviates from the norms of our society. Out society depends upon effective communication and frequently demands it.

Articulation can be defined as an incredibly swift and complicated process in which the lips, jaws, palate, and tongue modify or
impede the breath stream in order to produce a vast repertoire of standard speech sounds. An individual performs a series of "valving" movements with the oral apparatus (physiological activity) producing audible events (acoustic signals) which have a shared significance (perception) for a community of speakers. Thus, an articulation error, or disorder, is a non-standard production of one or more speech sounds (Emerick & Hatten, 1974).

Defective articulation can be educationally and/or socially handicapping because a misarticulated communication can be further hindered by the presence of anxiety, guilt, frustration, rejection, and hostility between speaker and listener (Van Riper, 1978). As a general rule, the greater the number of defective sounds exhibited by a person, the less intelligible that person becomes and the greater the penalties and rejection experienced (Van Riper, 1978).

BACKGROUND INFORMATION

Articulation Testing

Articulation tests can be used for a variety of purposes: (a) to determine phonetic proficiency, (b) for purposes of screening, (c) for diagnosis, (d) to assess developmental progress, and (e) for prediction. The primary purpose of the traditional articulation test is the assessment of accurate articulatory productions (phonetic proficiency) in words and the identification of error phonemes. When an articulation test is used to compare one child's articulation with that of the child's peers, it is referred to as a screening test (Winitz, 1969). According to Templin and Darley (1960), an
articulation test is a diagnostic tool when it is used to compare the individual's results with the norms, to analyze the error types (omissions, substitutions, distortions), or to determine the consistency of misarticulations. It can be used diagnostically to determine whether errors can be corrected when stimulated with the correct sound production, to determine resistance to training, to identify those factors which are related to the misarticulations, such as distinctive features of the articulatory errors which are common to several phonemes, or to determine whether there is a relationship between sound errors on the single-word articulation test and sound errors in connected speech. An articulation test can be used to assess developmental progress by noting the age at which the child's defective sounds are mastered by children in normative studies (Winitz, 1969). The aim of prediction is to determine which children will or will not retain early articulation errors without receiving articulation therapy (Winitz, 1969). Carter and Buck (1958) reported that phonemes which can be produced better in imitation than in spontaneous articulation tests will often improve without intervention by the speech pathologist (Carter & Buck, 1958). First grade students who could imitate error phonemes correctly with 80% accuracy did not require therapy by second grade.

Conversation in Articulation Testing

Phonemes are the contrasting sounds of the language and phonotactics is the study of how these phonemes are combined and/or ordered in a particular language or dialect (McKay, 1978). People
may be able to articulate single, individual phonemes correctly but they may have difficulty with the modifications that must take place in context (connected speech) as a result of assimilation. Assimilation is the process by which a sound becomes like an adjacent sound (McKay, 1978). McKay (1978) reported that certain combinations of phonemes can cause problems even if individual phonemes can be articulated correctly in isolation or in other combinations.

McKay (1978) stated that speech is a dynamic, ever-changing process. During speech, the articulators must be in a state of constant movement. Frequently, the articulation of one speech sound (phone) must be initiated before the articulation of the previous speech sound has been completed. A speaker is sometimes one or two full segments ahead in articularatory preparation of subsequent sounds. As a result of this phenomenon, sounds are modified by the context in which they occur (McKay, 1978).

Emerick and Hatten (1974) placed limitations on the effectiveness of single-word articulation tests. These tests are designed to elicit single-word naming responses. But even the most taciturn of persons rarely speaks in single words only. Speech flows and it is a dynamic, overlapping, incredibly swift activity. It may be possible to listen carefully enough to distinguish separate speech sounds in single-word utterances. But, in connected, conversational speech, each phoneme is influenced by the phonemes which precede and follow it. This process is called co-articulation and can extend across as many as four or five speech sounds. Therefore, a complete and
accurate picture of a child's articulation must include spontaneous, conversational speech (Emerick & Hatten, 1974).

Speech sounds do not exist in isolation. What precedes and follows a sound affects the production of that sound. Therefore, attention should be given to the production of speech sounds in connected speech. Faircloth and Faircloth (1970) found that analysis of connected, conversational speech describes a person's habitual articulation behavior better and more appropriately than does single-word testing. A connected-speech analysis enables a speech pathologist to identify the physiological movement patterns which control the individual's language system at both the phonetic and syllabic level.

Conversation in Articulation Therapy

Wright, Shelton, and Arndt (1969) compared articulation performance on single-word imitative speech production tasks (SPT) with articulation performance on talking tasks (TT) and reading tasks (RT) following speech therapy. Each subject received two 30-minute therapy sessions per week for ten weeks. Subjects improved their articulation of imitative, single-word tasks. Subjects made less improvement on the reading tasks than on the single-word imitative sound production tasks, and even less improvement on the talking tasks (Wright, Shelton, & Arndt, 1969). The relatively poor performance found on the talking tasks and the reading tasks indicated that, for spontaneous speech, none of the subjects established consistent, correct use of the phonemes taught. Wright, Shelton, and
Arndt (1969) concluded that acquisition of a new articulatory pattern involves perceptual elements as well as deliberate execution of the skill. Following acquisition, a new articulatory pattern is fixated through practice and then automated through additional practice under different conditions. Articulation change due to articulation therapy must also provide opportunities for automatic, correct usage of the newly learned phonemes regardless of the phonetic context and regardless of the speaking environment.

There is a tradition in speech pathology of performing articulation therapy according to a sequence of sounds-in-isolation, then words, then sentences, and then up through conversation. In order to generalize about a child's articulation ability, speech pathologists must have baseline data from each of these levels (Wolfe & Goulding, 1973). Since articulation is a series of overlapping, ballistic movements, articulation therapy should include practice in spontaneous speech (McDonald, 1964).

For the purpose of articulation assessment and therapy, it is generally considered to be good practice to obtain a sample of the child's speech by means of eliciting spontaneous speech from the child. If the child is asked to repeat the words spoken by the examiner, words might not be articulated in the child's habitual way. As a result, errors that would ordinarily occur in spontaneous speech might be missed when attention is directed less to how certain words or sounds are being produced and more to what is being said (Curtis, 1967). Sloane and MacAulay (1968) regard the establishment
of spontaneous and conversational speech as the most significant and useful therapeutic procedure for children in articulation therapy.

In a study which compared imitated and spontaneous speech samples, Snow and Milisen (1954) found that children produce fewer articulation errors when imitating the examiner's speech than when the speech was more spontaneous. From this study, it would appear that spontaneous speech samples have more value in articulation testing and therapy than imitative speech samples because they give a truer estimate of the child's natural articulation patterns (Curtis, 1967). Also, the procedure by which spontaneous speech is elicited is probably more interesting to the child and need not be any more time-consuming. Winitz (1975) placed great importance on the use of conversational speech in articulation therapy. He recommended that when some success is achieved in words and phrases, the degree of transfer to conversational speech should be assessed.

**Oral Reading**

By utilizing controlled conversation in articulation testing, the child is able to give only marginal attention to articulation and must give more attention to content and action. Powers (1971a) stated that oral reading is an excellent method of obtaining an articulation sample of connected speech. Emerick and Hatten (1974) also recommended reading as one of the most useful methods for obtaining a sample of connected speech.

Milisen (1971) reported, however, that reading should not be used alone to identify articulation errors because the orthographic
representation of the phoneme could facilitate correct articulatory production by serving as a visual cue.

It is possible that defective articulation might impair the learning of reading which requires the discrimination and use of speech sounds. If educational delays or retardation in academic subjects can be correlated with articulatory deficits, this finding would suggest that an articulation deficit reflects an underlying language and educational disability. However, the articulation deficit itself may be a variable which impairs or delays learning. Because of this difference in attitudes toward articulation deficits and reading, Winitz (1969) suggested that it is important to understand the relationship between the two.

Powers (1971b) reported that educators have regarded articulation problems as a cause of reading problems. Since both reading and articulation are language-related functions, they assumed a deficiency in one is related to a deficiency in the other. This possibility of a causal relationship between reading and articulation should be of interest to educators and speech pathologists alike.

An Adequate Test of Articulation

Powers (1971a) suggested several methods for describing and analyzing articulation. The speech pathologist should listen to the child's articulation in various contexts of communicative behavior in an effort to answer the following question: Does articulatory intelligibility vary with the speaking situation, or with the listener, or with the type of speech engaged in? Observation and
analysis of articulation with respect to these variations results in a better understanding of the problem as a whole and a better prognosis for therapy. The speech pathologist should observe articulation in conversational speech and oral reading (Powers, 1971a).

Conversational speech. The speech pathologist should engage the child in a conversation. This enables the speech pathologist to evaluate articulatory intelligibility under normal speaking conditions and to evaluate how conspicuous and handicapping the deficit actually is.

Oral reading. The speech pathologist should require the child to read continuous material orally which is at a suitable reading level and offers no problem in word recognition. The speech pathologist needs to determine whether the orthographic representation which serves as a visual cue produces any articulatory improvement over conversational speech.

Articulation should be assessed both before and after articulation therapy at the word level, in oral reading, and in conversational speech. McCabe and Bradley (1973) reported that this procedure would enable the speech pathologist to determine the effectiveness of therapy, the cost of therapy, and to predict changes in articulatory behavior more accurately.

Articulation consistency in connected, conversational speech may vary considerably from articulation consistency in oral reading. Comparison of Single-Word Production and Connected Speech Analysis

Traditionally, the task of analyzing the articulation of persons
with speech production problems has been accomplished through the use of single-word articulation or word inventory tests which test speech sounds in the initial, medial, and final positions in words and in blends. However, due to the influence of co-articulation, assimilation and suprasegmental features (stress, rate, rhythm, and intonation) on articulation, the theoretical concept of initial-medial-final sound production has little or no validity for actual speech production. Faircloth and Faircloth (1970) reported that many speech pathologists continue to formulate diagnostic impressions, make prognostications, and plan therapy on the basis of single-word tests, apparently assuming that a systematic analysis of articulation in connected speech would not provide new or valuable information.

Faircloth and Faircloth (1970) investigated the articulatory behavior of a speech-defective child as it occurred in connected speech and in isolated word productions. They found significant differences between words produced in connected speech and the same words produced in isolation. The isolated word responses were also consistently judged to be more intelligible than the connected speech sample. Faircloth and Faircloth (1970) cited this data as support for the need for connected, conversational speech analysis and concluded that to assess articulatory behavior adequately for the purpose of developing an efficient therapy program, the speech pathologist must first be able to describe a child's habitual articulatory behavior. Analysis of the child's conversational speech best describes this habitual articulatory behavior. A conversational
speech analysis would enable a speech pathologist to describe the physiological movement patterns which influence the child's language at the phonological level.

DuBois and Bernthal (1978) and Johnson, Darley, and Spriestersbach (1963) recommended that speech pathologists include both a phonemic inventory from picture naming and a sample of connected speech as a part of the initial articulatory assessment battery. It can be inferred from this recommendation that speech sound productions elicited via single word picture naming may differ from those elicited by connected, conversational speech. DuBois and Bernthal (1978) conducted a study which compared speech sound productions using three different sampling procedures. The three procedures were: (a) Continuous Speech Task (CST) - Responses were elicited via spontaneous, continuous speech, (b) Modeled Continuous Speech Task (MCST) - Responses were elicited via delayed imitation or modeled continuous speech, and (c) Spontaneous Picture-Naming Task (SPNT) - Responses were elicited via spontaneously produced single words. The results of this study are consistent with the results reported by Faircloth and Faircloth that speech sound productions in single words are different than those in continuous speech. A comparison of the scores on the three sampling methods used in the DuBois and Bernthal study revealed that subjects made significantly more errors on the two connected speech tasks than on the picture-naming task. DuBois and Bernthal (1978) suggested several possible explanations for these findings. First, since the phonetic context in the two continuous
speech tasks could not be controlled, there were opportunities in the continuous speech tasks that do not occur in isolated words for the phonetic environment to affect speech sound productions. A second explanation for the differences in obtained scores may have been due to different test behaviors during the picture naming and the continuous speech tasks. During picture naming, the subjects decreased their rate of speaking and produced the stimulus words in a more deliberate fashion. In contrast, during the continuous speech tasks, DuBois and Bernthal (1978) described the subjects as more concerned with the context of the stories than with the accuracy of sound productions.

DuBois and Bernthal (1978) suggested that picture naming tasks may be appropriate for group screenings because administration time is relatively short. However, if a speech pathologist is interested in the assessment of an individual child's articulatory status, the use of picture-naming tasks only would not seem appropriate because individual subjects' performances vary across different sampling tasks.

Johnson, Winney, and Pederson (1980) reported a lack of reliability between articulation skills as sampled by single-word tests and connected, conversational speech. Darley and Spriestersbach (1978) stated that it is not safe to assume that a speaker's articulation of phonemes in the one-word utterances elicited by a single word articulation test is representative of a speaker's articulation competency in various kinds of contextual speech.
Johnson, Winney, and Pederson (1980) compared the productions of thirty-five articulation-impaired children obtained by picture elicited single-word and connected speech sampling methods. The findings of this study were consistent with the results reported by Faircloth and Faircloth (1970) and DuBois and Bernthal (1978). All three studies reported a significantly greater number of errors in conversational speech than in isolated, single-word response testing. These differences might be due to greater articulatory motor planning and timing allocations possible in single-word utterances. Regardless of the reason, the results raise serious questions about the clinical validity of traditional, single-word articulation tests and their ability to sample adequately a child's articulatory proficiency or deficiency in spontaneous, conversational speech. Single-word test results are generally poor predictors of conversational speech errors in terms of both number and type. Johnson, Winney, and Pederson (1980) recognized the need for single-word tests as group screening instruments. In no case did single-word testing fail to identify at least one error phoneme among the thirty-five children tested. They recommended that clinical decision-making, however, be based on conversational speech sampling and analysis. Clinical decisions relating to diagnosis, prognosis, remediation, planning and discharge should be predicated on representative conversational speech samples.
STATEMENT OF PROBLEM

It is the purpose of this study to investigate the error production of /r/ and /s/ phonemes in single-word testing, oral reading, and conversational speech. This study attempts to answer the following question:

Do second grade students make more articulation errors in single-word testing as compared to oral reading or conversational speech?

SIGNIFICANCE OF STUDY

Traditionally, articulation testing has been concerned with the assessment of speech sound errors in the initial, medial, and final position of single words. However, people do not speak in isolated sounds or isolated words; therefore, speech should not be measured in isolated sounds or isolated words. The contemporary approach to articulation testing is to view errors in the contextual setting in which they occur. This requires that speech errors be assessed in larger, connected samples of speech.

Milisen (1971) suggested that the articulation of phonemes in words, oral reading, and conversational speech should be assessed before therapy begins. Results of single-word articulation tests might differ from the results of conversational speech samples (Milisen, 1971).

Many referrals come to speech pathologists from classroom teachers because of what is heard in reading and conversation in the classroom situation. If speech pathologists use only single-word
testing, then the articulation errors which originally prompted the referral may not be identified.

In order to make the most economical use of therapy time, a speech pathologist needs to know the most accurate way to measure defective speech in order to determine the most efficient method of remediating it. One facet of this problem which can be examined is the relationship between single-word testing, oral reading, and conversational speech.
Chapter II

METHODOLOGY

Description of Subjects

The subjects of this study were 20 second grade children with functional articulation disorders. All subjects had hearing within normal limits and were performing at grade level according to their teachers. All testing was conducted in speech-language therapy rooms of public elementary schools in Brevard County, Florida. The therapy rooms were approximately 8 X 10 feet and were free of auditory and visual distractions. Three subjects did not qualify due to inability to read at the second grade level.

Stimulus Materials

The phonemes /s/ and /r/ were chosen for use in this study because of the frequency with which these sounds are found to be in error. Powers (1971b) identified the /s/ and /r/ phonemes as being among the ten most frequent errors of school-age children.

Ten /s/ words were selected from the core vocabulary word list of the Multiple Phoneme Articulation Approach (Denham, McCabe & Bradley, 1979), which identified 300 most frequently spoken words. The /s/ phonemes in these words occurred in various positions and in blends. The /s/ words chosen for the single-word testing portion of this study were: seven, school, second, same, step, books, dress, house, six, class. Ten /r/ words were selected from the list of /r/
words used in a study by Aungst and Frick (1964). These /r/ words were chosen by Aungst and Frick based on the following criteria: (a) monosyllabic, (b) containing the /r/ sound in different phonetic contexts in each word, (c) could be represented by a picture, and (d) familiar to school-age children. The /r/ phonemes in these words occurred in various positions and in blends. The /r/ words chosen for the single-word testing portion of this study were: rock, roof, fire, car, rat, rake, deer, bear, heart, horse. Pictures of the ten /s/ words and the ten /r/ words used in this portion of the study were taken from the Peabody Language Development Kits (Dunn & Smith, 1965) to assess speech sound errors in single-word productions. The orthographic representation of each word was printed in letters one-half inch high and taped to the pictures. Orthographic representations were added to reduce the ambiguousness of the picture stimuli and to aid in the identification of the expected word.

Two second grade reading passages from the Spache Diagnostic Reading Scales (Spache, 1972) were used in the oral reading portion of this study. The two passages contained a total of 159 words. In the first 100 words of the reading passages, there were eleven words containing the /s/ phoneme and twelve words containing the /r/ phoneme in various positions and blends. The Spache Diagnostic Reading Scales provide standardized evaluations of oral reading skills to determine the proficiency of normal and retarded readers at elementary school levels (Spache, 1972). The validity of the Spache Diagnostic Reading Scales in determining students' appropriate reading
levels was established by the studies conducted and procedures followed during the eight years of development and research prior to its publication. The results of oral reading studies conducted with 2,081 children in 1963 indicate that the Spache Diagnostic Reading Scales yields reading levels which correlate highly with teachers' judgments of their students' reading levels, with the California Reading Test, and also with the Gates-McKillop Reading Diagnostic Test (Spache, 1972).

"I Wonder" pictures from the Peabody Language Development Kits (Dunn & Smith, 1965) were used in the conversational speech portion of this study. These pictures are designed to be used in eliciting conversational speech samples (Dunn & Smith, 1965).

Procedure

Each subject was administered the 20 pictures from the Peabody Language Development Kits containing the /s/ and /r/ phonemes to assess speech sound production in single words. The order in which the pictures were presented alternated between /s/ and /r/ phonemes. The experimenter instructed each subject to read aloud the designated passages from the Spache Diagnostic Reading Scales to assess speech sound production in oral reading. The first 100 words of this oral reading sample were used in the analysis. The experimenter gave each subject one "I Wonder" picture from the Peabody Language Development Kits and asked each subject to tell a story about the picture. Additional pictures were given until an adequate conversational speech sample was obtained. For the purpose of this study, a conversational
speech sample is defined as consecutive words produced by the subject when telling a story about the "I Wonder" pictures. The first 100 words of this connected speech sample were used in the analysis.

One subject was tested at a time. A tape recorder was used throughout the study for later evaluation by the experimenter of all speech samples obtained. The order of presentation of the three test conditions was counter-balanced.

After all three portions of the test (single-word production, oral reading, and conversational speech) were completed for all subjects, the experimenter replayed the tape and counted the number of articulation errors produced by each subject in each of the three experimental conditions—single-word production, oral reading, and conversational speech.

The Spache formula for determining reading grade level was applied to the oral reading sample obtained from each subject. Only subjects who passed this test as reading at or above the second grade level were included in the study.

Two procedures were used to assure the accuracy and reliability of the experimenter's judgment in scoring the subjects' responses. First, the experimenter recorded one subject and evaluated that subject's responses in all three conditions. The tape recording and the experimenter's evaluation were reviewed by the Coordinator of the Communicative Disorders program at the University of Central Florida. The inter-rater reliability was determined to be 80% or better in all three conditions. Second, the experimenter evaluated each subject's
responses both live and from the tape recording. The intra-rater reliability was determined to be 95% or better between both methods, live and tape recorded. This second procedure was suggested by McCabe and Bradley (1973) to assure reliability in judging articulation errors.

The data were subjected to a single-factor analysis of variance as described in Statistical Principles in Experimental Design (Winer, 1971), and further analysis was carried out using the Sheffe' Test, also described in Statistical Principles in Experimental Design (Winer, 1971).
Chapter III

RESULTS

The number of articulation errors produced by the twenty subjects in this study were subjected to statistical analysis for the three conditions studied. In each case, the number of errors produced was the judgment of the experimenter. Subjects were their own controls. All subjects received all three conditions and a comparison was made between each subject's performance in the three conditions.

Appendix A shows the number of articulation errors, the number of times the target phoneme occurred, and the percentage of errors for all three conditions - single-word testing, oral reading, and conversational speech - for each of the twenty subjects.

A mean score based on the percentage of errors in each of the three conditions was computed and is shown in Figure 1.

Figure 1. A comparison of the mean scores of percentage of errors in three speaking conditions.
As can be seen in Figure 1, a comparison of these mean scores revealed that the percentage of errors in conversational speech was nearly twice as large as the percentage of errors in either of the other two conditions.

A single-factor analysis of variance was computed using the percentage of error scores. The results are shown in Appendix B. The obtained F ratio of 13.73 revealed the presence of a significant difference. In order to identify the source or sources of the significant difference, the Sheffe' Test was used. This computation is presented in Appendix C. Results of the Sheffe' Test revealed that there was a significant difference between the percentage of errors assessed in conversational speech and those in either single-word testing or oral reading. The analysis revealed no significant difference between the single-word testing condition and the oral reading condition.
Chapter IV

DISCUSSION

Implications for Assessment and Remediation

Results of this study indicated that these subjects produced essentially the same number of errors in single-word testing and oral reading. The same subjects produced more errors in conversational speech. It would appear, therefore, that spontaneous, conversational speech samples give a truer estimate of a child's natural, habitual articulation patterns. While single-word testing or oral reading assessment procedures may represent the more frequently-used test procedures, there is evidence in this study which suggests that the exclusive use of these procedures should be questioned.

The implications of these findings should concern all speech pathologists, particularly those working in public schools. Faircloth and Faircloth (1970) reported that many speech pathologists continue to formulate diagnostic impressions, make prognostications, and plan therapy on the basis of single-word tests. Single-word testing may yield valuable information, but it may not be descriptive of the child's connected, conversational speech. Even the most taciturn of persons rarely speaks in single words only. Speech flows and it is a dynamic, overlapping, incredibly swift activity (Emerick & Hatten, 1974). Therefore, articulation should be assessed in larger connected samples of conversational speech.
These findings might explain why children who are referred by classroom teachers pass the single-word articulation testing procedures used by the speech pathologist.

There are several possible explanations for the findings of this study. Fewer articulation errors could have been produced in both the single-word and oral reading conditions due to the presence of the orthographic representations of the target phonemes. These orthographic representations could have served as visual cues that an /r/ or /s/ was coming, causing the subjects to attend to the production of those sounds. These visual cues were not present in the conversational speech condition.

A greater number of errors might have been produced in the conversational speech condition due to each subject's cognitive involvement in the story-telling task. Attention might have been directed more to what was being said than to how it was being said.

The subjects used in this study had varying backgrounds in terms of previous articulation therapy. The amount of therapy received differed between subjects as did the type of articulation therapy. While it is probable that the majority of all previous therapy emphasized single-word production rather than oral reading or conversational speech (Faircloth & Faircloth, 1970), the actual extent to which each technique was employed is unknown. This poses a possible threat to external validity with respect to the Selection-X interaction. Regardless, however, of the amount and type of previous articulation therapy, this study clearly shows that significantly
more articulation errors continued to occur in conversational speech than in either single-word utterances or oral reading.

This study demonstrated an efficient and effective procedure for the assessment of articulation at the conversational speech level. This procedure could be used in addition to, or in place of, single word articulation testing.

Implications for Future Research

Possible areas for future research would include the following:

1. Several of the studies cited previously regarding oral reading indicated that reading ability and articulation may be related. It appears obvious that the relationship between oral reading and articulation should be explored in depth. While this study did not identify significant differences in the number of articulation errors between single-word testing and oral reading, the review of the literature discussed in Chapter I indicated that possible relationships do exist. It should be possible to investigate this relationship by comparing the number of articulation errors made at the comfortable reading level (Spache, 1972) with the number of articulation errors made at the instructional reading level.

2. External validity with respect to the Selection-X interaction could be assured if naive subjects who had received no previous articulation therapy could be located. This would permit more generalization to the articulation-disordered population as a whole.

3. A phoneme-by-phoneme analysis of the errors found in single word utterances, oral reading, and conversational speech could be
conducted. This would reveal whether certain phonemes are more vulnerable to error production in different types of speaking conditions.

4. Articulation could be assessed by varying the complexity of the stimulus material in the conversation exchange between the speech pathologist and the subject.

5. Valuable data could be obtained by varying the linguistic function in a matrix of hierarchical conditions. These conditions might include automatic speech, requesting permission, asking questions, role-playing, and story-telling.
Chapter V

SUMMARY

This study was conducted because evidence in the literature indicated that articulation errors identified in single-word testing are not necessarily the same, either in type or number, as those occurring in conversational speech. Therefore, this study was designed to determine whether second grade students make more articulation errors in single-word testing as compared to oral reading or conversational speech.

Twenty second grade students with functional articulation disorders in Brevard County, Florida, served as subjects. A sample of articulatory production was obtained from each subject in single words, oral reading, and conversational speech.

The number of errors each subject made in each of the three conditions was counted. A mean score based on the percentage of errors produced by all subjects in each of the three conditions was computed. The mean for the single word test condition was 25.00%. The mean for the oral reading test condition was 32.85%. The mean for the conversational speech test condition was 63.60%. A comparison of these mean scores revealed that the percentage of errors in conversational speech was nearly twice as large as the percentage of errors in either of the other two conditions. A single-factor analysis of variance was computed for the data based on the per-
percentage of errors in each of the three conditions. The obtained $F$ ratio of 13.73 revealed that a significant difference was present. Application of the Sheffe' Test revealed a significant difference between the percentage of errors assessed in conversational speech and those in either single-word testing or oral reading. These results suggest that conversational speech testing provides a truer estimate of a child's habitual articulation patterns than does single-word testing or oral reading. These results also suggest that speech pathologists should assess articulation errors in conversational speech and utilize conversational speech in the therapy process to a greater extent.
APPENDIX A

THE NUMBER OF ARTICULATION ERRORS, THE NUMBER OF TIMES THE TARGET PHONEME OCCURRED, AND THE PERCENTAGE OF ERRORS FOR ALL SUBJECTS IN THREE SPEAKING CONDITIONS
APPENDIX A

The Number of Articulation Errors, The Number of Times the Target Phoneme Occurred, And The Percentage of Errors For All Subjects in Three Speaking Conditions

<table>
<thead>
<tr>
<th>Subject</th>
<th>Error Phoneme</th>
<th>Single-Words</th>
<th>Oral Reading</th>
<th>Conversation</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>A&lt;sup&gt;a&lt;/sup&gt;</td>
<td>B&lt;sup&gt;b&lt;/sup&gt;</td>
<td>C&lt;sup&gt;c&lt;/sup&gt;</td>
<td>A&lt;sup&gt;a&lt;/sup&gt;</td>
</tr>
<tr>
<td>1</td>
<td>r</td>
<td>2 10 20</td>
<td>3 12 25</td>
<td>10 15 66</td>
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<tr>
<td>2</td>
<td>r</td>
<td>6 10 60</td>
<td>8 12 67</td>
<td>13 14 93</td>
</tr>
<tr>
<td>3</td>
<td>r</td>
<td>2 10 20</td>
<td>4 12 33</td>
<td>8 11 72</td>
</tr>
<tr>
<td>4</td>
<td>r</td>
<td>3 10 30</td>
<td>3 12 25</td>
<td>11 14 79</td>
</tr>
<tr>
<td>5</td>
<td>s</td>
<td>0 10 0</td>
<td>0 11 0</td>
<td>5 10 50</td>
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<td>s</td>
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<td>4 11 36</td>
<td>9 12 75</td>
</tr>
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<td>s</td>
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<td>0 11 0</td>
<td>3 14 21</td>
</tr>
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<td>s</td>
<td>4 10 40</td>
<td>7 11 63</td>
<td>10 11 91</td>
</tr>
<tr>
<td>9</td>
<td>s</td>
<td>3 10 30</td>
<td>4 11 36</td>
<td>15 18 83</td>
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<tr>
<td>10</td>
<td>r</td>
<td>5 10 50</td>
<td>7 12 58</td>
<td>13 15 87</td>
</tr>
<tr>
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<td>s</td>
<td>1 10 10</td>
<td>2 11 18</td>
<td>4 13 31</td>
</tr>
<tr>
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<td>6 18 33</td>
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<td>3 9 33</td>
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<td>r</td>
<td>8 10 80</td>
<td>11 12 92</td>
<td>16 16 100</td>
</tr>
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<td>r</td>
<td>4 10 40</td>
<td>5 12 42</td>
<td>12 15 80</td>
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<td>16</td>
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<td>s</td>
<td>1 10 10</td>
<td>2 11 18</td>
<td>6 12 50</td>
</tr>
</tbody>
</table>

Note. Three subjects were eliminated due to inability to read at appropriate level necessary for inclusion in the experiment.

<sup>a</sup>Number of errors.

<sup>b</sup>Total possible.

<sup>c</sup>Percentage of errors.
APPENDIX B

SUMMARY OF SINGLE-FACTOR ANALYSIS OF VARIANCE
FOR THREE SPEAKING CONDITIONS
APPENDIX B

Summary of Single-Factor Analysis of Variance
For Three Speaking Conditions

<table>
<thead>
<tr>
<th>Source of Variance</th>
<th>d.f.</th>
<th>SS</th>
<th>MS</th>
<th>F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Between Groups</td>
<td>2</td>
<td>16647.63</td>
<td>8323.82</td>
<td>13.73*</td>
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<tr>
<td>Within Groups</td>
<td>57</td>
<td>34567.35</td>
<td>606.44</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>59</td>
<td>51214.98</td>
<td>8930.26</td>
<td></td>
</tr>
</tbody>
</table>

*p < .01.
APPENDIX C

SHEFFE' TEST OF SIGNIFICANT DIFFERENCES AMONG THREE SPEAKING CONDITIONS
APPENDIX C

Sheffe' Test of Significant Differences
Among Three Speaking Conditions

\[ F = \frac{(\bar{X}_1 - \bar{X}_2)^2}{MS_W(N_1 + N_2)/N_1N_2} \]

**BETWEEN GROUPS 1 & 2**

\[ F = \frac{(25 - 32.85)^2}{606.44(20 + 20)/20(20)} = \frac{61.62}{60.64} = 1.02 \]

**BETWEEN GROUPS 1 & 3**

\[ F = \frac{(25 - 63.60)^2}{606.44(20 + 20)/20(20)} = \frac{1489.96}{60.64} = 24.57 \]

**BETWEEN GROUPS 2 & 3**

\[ F = \frac{(32.85 - 63.60)^2}{606.44(20 + 20)/20(20)} = \frac{945.56}{60.64} = 15.59 \]

\[ F \text{ for d.f. of 2, 57} = 5.01 \text{ (.01 level)} \]

\[ 5.01 \times 2 = 10.02 \]

**BETWEEN GROUPS 1 & 3 (24.57) exceeds 10.02**

**BETWEEN GROUPS 2 & 3 (15.59) exceeds 10.02**
REFERENCES


