An Investigation of the Maturation of Articulation of Elementary School Children

Thomas D. Marshall

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AN INVESTIGATION OF THE MATURATION OF ARTICULATION OF ELEMENTARY SCHOOL CHILDREN

by

Thomas D. Marshall

A thesis presented to the Faculty of the School of Graduate Studies in partial fulfillment of the Degree of Master of Arts

Western Michigan University
Kalamazoo, Michigan
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CHAPTER I

THE BACKGROUND AND PURPOSE OF THE STUDY

Introduction

Developmental studies of speech (12, 13, 24) have indicated that the growth of articulation skills in children follows a definite pattern, with the vowels being first mastered, then the consonants, and finally, the consonant blends. Studies generally agree that the normal child acquires essentially adult articulation by eight years of age. It may be expected, then, that in the early elementary grades, immature articulation skills are not unusual in normal children, and that at higher grade levels, immature articulation skills are relatively less common. Mills and Streit (11), in a survey of speech defects of a sample of 4685 children from schools not offering speech therapy, found that 28.9 per cent of the first grade, 22.2 per cent of the second, and 22.1 of the third grade children had functional articulation disorders, while only 0.9 per cent of the children in the grades above third had functional articulation disorders. Roe and Milisen (15) reported similar findings, and indicated that the yearly decrease in the number of arti-
culation errors produced by elementary school children was not significant beyond the third grade.

One of the major problems confronting speech therapists, particularly in the public school environment, is the overwhelming number of first and second grade children with articulation errors. Powers (14, p. 711) listed the results of seven studies of speech defective children and concluded that the incidence of functional articulation disorders represented between 75 and 80 percent of the speech problems in the schools, and that most of these disorders are found in the lower elementary grades.

Many first grade children, by the time they reach the third grade, will have eliminated their articulatory errors without special help, because their articulation has followed a normal maturation pattern. To include these children within a speech therapist's caseload means that the therapist has less time to spend with the children who have a genuine need for speech therapy. It might also mean that some children, because of the focus of therapy, would take more time to overcome their articulatory errors than they would have if no attention had been called to their speech.

Some children who have articulation errors in the first grade, however, do require speech therapy in order
for them to develop mature articulation. These children fail to follow a normal maturation pattern and the persistent errors in their speech become more difficult to eliminate when the children have a greater length of time to stabilize their immature articulatory habits. Thus, if one waited until third grade before initiating speech therapy, the children who had not overcome their errors spontaneously might have developed more handicapping problems which might be less responsive to treatment.

Van Riper (28) has been attempting to define measures which will differentiate between those first grade children with articulation errors who will need speech therapy, and those who will not. Toward this end, a Predictive Screening Test of Articulation is being developed in which various techniques believed to have prognostic value are tested to determine if differentiating factors are measurable between children who overcome their articulatory errors without speech therapy and those children who retain their errors.

The Purpose of the Study

The purpose of this study was to examine the responses of third grade children to a group of articulation test items administered two years previously to investigate differences between the responses of children who had re-
tained articulation errors without speech therapy and those who had eliminated their errors without therapy. Data from the preliminary investigations of the Predictive Screening Test of Articulation were used for this study.

Review of Related Studies

Several of the developmental studies (6, 12, 13, 24) made note of the presence of articulation errors as a normal trait among first-grade children. Roe and Milisen (15), in an examination of an unselected sample of 1989 children from the Indiana public schools, examined the maturation effect on articulation development. None of the children had had speech training. They were given a modified version of the Detroit Articulation picture test with no oral stimulation. The results showed significant decreases in the mean number of articulation errors between grades one and two, two and three, and three and four, implying the presence of the maturation factor. The largest number of errors were on the fricatives, with the most commonly misarticulated phonemes in descending order of frequency being /z/, /s/, /t/, /l/, /l/, /l/, and /r/. The authors found that children could often correctly articulate a phoneme in the context of a consonant blend when they had previously misarticulated that consonant as a single.
In an examination of sex differences among articulatory defectives, Roe and Milisen found no significant differences between the boys and girls in mean number of errors. The authors also examined the types of misarticulation. They found that phoneme substitutions were the most common error and that the frequency of substitutions decreased in number as the grade level increased. Few omissions were made in comparison to other types of error. The tendency for distortion errors increased with grade levels. They concluded that the type of error a child produced for a phoneme indicated his level of maturation in his development of a correctly articulated phoneme. Errors, then, could be analyzed in terms of a continuum, with the maturation pattern going from omissions to substitutions to distortions, and finally, to the correctly articulated phoneme.

Sayler (16) in a related study at Indiana examined the articulation of an unselected sample of 1998 children in grades eight through twelve. He found no significant decreases in the mean number of errors between grades and concluded that the maturation effect was no longer operative.

The inconsistency of misarticulations was noted by Spriestersbach and Curtis (22) who reported on studies at Iowa examining misarticulations of the /s/ and /r/ phonemes. Kindergarten and elementary school children
diagnosed as being defective in the articulation of /r/ or /s/ were tested extensively on those phonemes. The results indicated that nearly all of the children who misarticulated the /r/ could produce it correctly in at least one phonetic context. Children who misarticulated the /s/ produced it correctly more often in consonant blends than in singles.

The method of eliciting responses in articulation testing was examined by Snow and Milisen (20) who investigated the difference in results from oral and pictorial presentation of articulation test items. They examined articulatory defective children in the first, second, seventh, and eighth grades and found that there was a difference in favor of the oral tests. They also found that children in the seventh and eighth grades showed a much greater difference in favor of the oral testing than did the first and second grade children.

In a similar study, Snow and Milisen (21) examined 81 first and second grade children with defective articulation. The children were given an oral and picture articulation test and were retested six months later with no speech therapy in the intervening time. They found that the children made more errors on the picture than the oral articulation test. Those that had the greatest difference between the two tests showed the
greatest spontaneous improvement in the following six month period.

Farquhar (5) explored the prognostic values of tests examining kindergarten children and their ability to imitate only the correct form of their misarticulated phonemes. Spontaneous picture articulation tests scored according to the Wood Index were administered to 300 kindergarten children. The imitative portion of the test was an examination of the child's ability to reproduce after the examiner, the correct form of his misarticulated phoneme in isolation, nonsense syllables, and words. A sample population of 50 children with mild articulatory problems and 50 with severe problems was selected. Children with mild problems could imitate the correct form of a misarticulated phoneme with greater proficiency than children with severe problems.

Steer and Drexler (23) examined 93 kindergarten children who all had at least one articulatory error to see if later articulation abilities could be predicted. The children were divided into two groups: 1) an experimental group of 54 subjects that participated in a 12 week program of speech improvement, and 2) a control group of 39 subjects who were enrolled in the regular kindergarten program. The children were given an articulation test presented mainly with pictures but also containing some
oral presentations. They were retested at the end of the twelve week period and also retested five years later. Four of the children in the control group and 13 in the experimental group received speech therapy in the five year period. The authors noted that the amount of improvement in articulation ability by a child in a 12 week period, independent of the number of errors preceding that period, appeared to be a highly significant indicator of his future articulation abilities. They stated that the most reliable indicators of future articulation problems were 1) total number of errors in all positions within words, 2) errors in the final position, 3) errors of omission in the final position, and 4) errors in the /f/ and /l/ consonant groups.

Carter and Buck (2) investigated prognostic testing with 175 first grade children with functional articulation disorders. The children were divided into two groups, 82 in a control group that received two 30 minute speech periods weekly for a year, and 92 children in the experimental group that received no therapy. Spontaneous, imitative, and nonsense syllable articulation tests were administered to the children at the beginning of their first year, and the spontaneous test was given to them again at the end of the year. The authors found that those children who showed a high percentage of correction
of defective phonemes from the spontaneous to the non-sense syllable test were more successful in achieving normal articulation by the end of the year without therapy than those who showed little or no improvement between the two types of tests.

Summary and Limitations of the Related Studies

The review of research has shown that children vary in the number and consistency of their incorrect responses, and that they also vary in their responses to different types of articulation testing. Furthermore, the way that they vary seems to have prognostic significance.

Roe and Milisen's (15) and Spriesterbach and Curtis's (22) observations that some children can produce phonemes correctly in the context of consonant blends when those phonemes are produced incorrectly as singles are unexpected, as they conflict with the findings of Templin and Steer (27) and Hahn (6) who report that consonant blends are more commonly misarticulated than singles. These findings suggest the possibility of a prognostic indicator, and no studies have been done to investigate whether the difference in a child's responses to consonant blends and the single elements of those blends has prognostic value.
Snow and Milisen's studies (20, 21) indicated the prognostic value of the difference in a child's responses to oral and picture articulation tests. The fact that seventh and eighth grade children showed the greatest differences in oral and pictorial presentations implies that the difference in scores may measure something other than the maturation effect. Children in the seventh and eighth grades would be, according to Sayler (16), beyond the stage in which the maturation effect is still a factor. Since they waited only six months before retesting the first and second grade children, their results probably reflect only a minimal effect of the maturation factor.

Farquhar's (5) findings were significant in terms of making prognostic judgments of children by examining the severity of their problems. However, the prognostic value concerned how well a child would respond to speech therapy rather than whether he would improve without therapy.

Steer and Drexler (23) followed the children for five years after the original testing. However, they gave no figures concerning the number of children who had eliminated their errors and the number who had retained their errors. They apparently did not differentiate between the oral and pictorial parts of the test. Children, however, tend to have better scores on orally
presented articulation tests. Their findings, as were Farquhar's, were mainly significant in terms of a child's prognosis for therapy.

The results of Carter and Buck's (2) study indicate the importance of stimulability in prognostic testing. Since their study followed the children for only one year, the same criticism can be made that was made for the Snow and Milisen study.

The /r/ and /s/ were indicated (15, 22) as commonly misarticulated and inconsistently misarticulated phonemes. It would seem that the types of responses that children make to these phonemes in different contexts would have prognostic value, but apparently, no studies concerned with finding prognostic measures made such an examination. Steer and Drexler (23) reported that errors on the /f/ and /l/ consonant groups had prognostic significance, but they made no indications as to the types of errors or consistency of errors. The question of whether or not one can make prognostic judgments from an examination of selected phonemes is still unresolved.

Steer and Drexler (23, p. 396) noted that there are generally two ways to measure prognostic ability; 1) to stimulate the child with the correct sound and then observe how many of his errors he can modify or eliminate, and 2) to administer articulation tests at the beginning and
the end of specified time periods and observe how much improvement has occurred. This study has used the latter method.

Statement of the Problem

The primary purpose of this study was to examine the responses of third grade children to a group of orally presented articulation test items administered two years previously to investigate differences between the responses of children who had retained their articulation errors without speech therapy and those who had eliminated their errors without speech therapy. Specifically, the following questions were asked:

1. Does the relative frequency of incorrect responses to an oral articulation test by children who later attain normal articulation differ from the relative frequency of incorrect responses of children who fail to attain normal articulation?

2. Are there differences in the manner of misarticulation of the children who later attained normal articulation and those who failed to attain normal articulation?
   a. Is there a difference in the relative frequency of omission errors?
   b. Is there a difference in the relative frequency of distortion errors?
c. Is there a difference in the relative frequency of substitution errors?

3. a. For the children who failed to attain normal articulation, does the relative frequency of errors on two- and three-part blends differ from the relative frequency of errors on the tested single elements of the blends?
   b. For the children who did attain normal articulation, does the relative frequency of errors on the two- and three-part blends differ from the relative frequency of errors on the tested single elements of the blends?

4. Are there differences between the two groups of children in their incorrect productions of the selected phonemes /r/, /s/, and /l/ examined as singles and blends combined?
   a. Is there a difference in the relative frequency of omission errors?
   b. Is there a difference in the relative frequency of distortion errors?
   c. Is there a difference in the relative frequency of substitution errors?
CHAPTER II

THE SUBJECTS AND PROCEDURES OF THE STUDY

The purpose of this chapter is to describe 1) the subjects of the study, 2) the test used, 3) the administration and scoring of the test, and 4) the treatment of the data.

The Subjects

The subjects for this study were 134 third grade children enrolled in the public schools in the Michigan counties of Kent, Eaton, and Washtenaw. All of these children had been initially examined two years earlier by public school speech therapists, and all had been diagnosed as having functional articulation disorders at that time. No one specified test was used in the initial screening procedures, because it was felt that a more representative sample of the articulatory defects of first grade children in the public schools would be obtained if the local speech therapists were allowed to use their own diagnostic methods.

None of the children had received any speech therapy prior to the initial screening, nor did any of the
children receive speech therapy in the two year period between the first grade and the time these children entered the third grade. No children with observable organic impairments were included in the study. Clinical judgments rather than formal hearing tests were used to eliminate children with hearing loss.

The children were placed into two groups for the purposes of this study. The first group consisted of 71 children who continued to have defective articulation two years after the initial testing. The second group was composed of 63 children who no longer had articulatory errors. There were 40 boys and 31 girls in the Defective Group and 37 boys and 26 girls in the Normal Group.

1 The terms 'Defective Group' and 'Normal Group' will hereafter be used to differentiate between those third grade children who still had articulation errors and those who no longer had errors, respectively.

The Test

From the battery of 135 items compiled by Van Riper (28) in his Predictive Screening Test of Articulation, 38 items were selected for the present study. These items each required that the examinee repeat a single word after it had been presented by the examiner. The 38 words are listed below, and the phonetic elements tested are indi-
Contained in this group of test words are 15 different single consonants, 19 different two-element consonant blends, and two three-element consonant blends. The phonemes which were analyzed in the present study and the frequency with which each was tested, are indicated in Table I.

The Administration and Scoring of the Test

The test was administered to all of the children by one examiner who had had eight years of professional speech therapy experience. The children were tested individually in quiet rooms at their respective schools. Since the items selected appeared in various parts of the Predictive Screening Test, they were not in the consecutive sequence indicated above.
<table>
<thead>
<tr>
<th>Phoneme</th>
<th>As a Single</th>
<th>In a Two-Part Blend</th>
<th>In a Three-Part Blend</th>
</tr>
</thead>
<tbody>
<tr>
<td>/j/</td>
<td>3</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>/z/</td>
<td>4</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>/k/</td>
<td>3</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>/v/</td>
<td>1</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>/θ/</td>
<td>2</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>/ð/</td>
<td>2</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>/r/</td>
<td>4</td>
<td>9</td>
<td>1</td>
</tr>
<tr>
<td>/s/</td>
<td>3</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>/l/</td>
<td>2</td>
<td>4</td>
<td>1</td>
</tr>
<tr>
<td>/3/</td>
<td>1</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>/tʃ/</td>
<td>3</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>/dʒ/</td>
<td>2</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>/s/</td>
<td>2</td>
<td>7</td>
<td>2</td>
</tr>
<tr>
<td>/z/</td>
<td>1</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>/ŋ/</td>
<td>2</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>
The instructions given each child for the 38 items were: "Now, let's see if you can say some words after me. I'll say each word only once, so listen carefully. Here's the first word ..." Only one presentation of the stimulus was given except when the child failed to hear it due to coughing or some other masking noise.

A child's response to a test item was scored with reference to his articulation of the test phoneme(s) in that word. Errors on phonemes not specifically tested were not recorded. The type of error was recorded and, if possible, described. If a child made a substitution error, the substituted phoneme was indicated. If a child misarticulated any component of a blend tested, the total blend was considered an error. For example, if the child omitted part of a tested blend, his response for that blend was scored as an omission.

The Treatment of the Data

The results of the initial testing when all of the children had articulation errors were examined in terms of a comparison of the children in the Defective Group and the children in the Normal Group. T-statistics were computed to test the significance of observed differences between the two groups.
CHAPTER III

THE RESULTS AND DISCUSSION OF THE STUDY

The purpose of this chapter is to report the results of this study and to discuss how these results compare with those of other studies.

Comparison of the two groups on incorrect production of the total items on the test

Question Number One

The first question involved a comparison of the two groups' incorrect productions of all of the 38 test items. As Table II indicates, the 71 children in the Defective Group had 1535 incorrect responses to the items, 35.7 per cent of their total responses. The 63 children in the Normal Group had 611 incorrect responses to the items, 16.4 per cent of their total responses. A t-test\(^1\) to determine the significance of the differences between the two groups produced a ratio of 13.79, statistically significant at the .001 level of confidence.

\(^1\)The t-test, discussed in McNemar (10, p. 52-60), was used to determine the statistical significance of a difference between scores of the groups.
\[ t = \frac{P_1 - P_2}{\text{se}_{\text{dif}}} \]

where \( P_1 = \) the proportion of errors or type of error relative to the total number of responses or error responses of the Defective Group

\[ P_2 = \] the same proportion for the Normal Group

\[ \text{se}_{\text{dif}} = \sqrt{P_c \times (\frac{1}{N_1} + \frac{1}{N_2})} \]

when \( P_c = \) the proportion of errors or types of error in both groups combined

\[ Q_c = 1 - P_c \]

\[ N_1 = \] the total number of responses or error responses for the Defective Group

\[ N_2 = \] the total number of responses or error responses for the Normal Group

**Question Number Two**

Question Number Two compared the two groups' manner of misarticulation on all of the test items. Table II shows the frequencies and relative frequencies of omissions, distortions, and substitutions as error responses. Out of 1535 incorrect responses, the Defective Group had 318 omissions, 20.7 per cent of their total number of errors. The Normal Group had 76 omissions, 12.4 per cent of their total misarticulations. A t-ratio of 4.88 was obtained, significant at the .001 level of confidence.
TABLE II

FREQUENCY (F) AND RELATIVE FREQUENCY (RF) OF OMISSIONS, DISTORTIONS AND SUBSTITUTIONS AS ERROR RESPONSES BY BOTH GROUPS AS ERROR RESPONSES FOR THE 38 TEST ITEMS

<table>
<thead>
<tr>
<th>Subjects</th>
<th>Omissions F (RF)</th>
<th>Distortions F (RF)</th>
<th>Substitutions F (RF)</th>
<th>Total Errors F (RF)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Defective</td>
<td>318 (.207)</td>
<td>135 (.088)</td>
<td>1082 (.705)</td>
<td>1535 (.357)</td>
</tr>
<tr>
<td>N=71</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Normal</td>
<td>76 (.124)</td>
<td>65 (.106)</td>
<td>470 (.769)</td>
<td>611 (.164)</td>
</tr>
<tr>
<td>N=63</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
The Defective Group had 135 distortion errors, 8.8 per cent of their total misarticulations. The Normal Group had 65 distortions, 10.6 per cent of their total misarticulations. The t-test yielded a ratio of -1.38 a statistically non-significant difference.

The Defective Group had 1082 substitution errors, 70.5 per cent of their total errors. The Normal Group had 470 substitutions, 76.9 per cent of their total errors. The t-ratio was -3.20, indicating a statistically significant difference at the .01 level of confidence.

Discussion

The results from testing Question Number One agree substantially with those reported by Steer and Drexler (23) in which the examination of the total number of incorrect responses was found to be the most reliable prognostic measure in judging a child's needs for speech therapy. The extreme difference in the total number of errors for the two groups suggests that the manner of testing with oral rather than pictorial presentations was a significant factor. It appears that those children who had the potential to overcome their articulatory errors responded more positively to the stimulation type of testing than did the children who did not attain normal articulation.

The significant difference found for the omission
errors also agrees with Steer and Drexler's findings. Roe and Milisen (15) found more omission errors among kindergarten and primary school children than in older children, and they concluded that omission errors are the most deviant and least mature manner of misarticulation. The findings in this study support their hypothesis.

The lack of significant differences for the distortions indicates that an examination of distortion errors will not yield prognostic information if no effort is made to describe the degree of distortion. Roe and Milisen (15) hypothesized that distortion errors represented the most mature type of misarticulation. If that hypothesis were applied to this data, then one should expect to find a greater proportion of distortion errors among the Normal Group. The results of this study do not agree with that hypothesis.

The statistical analysis of the substitution errors revealed a significant difference in favor of the Normal Group, indicating that the Normal Group has proportionally more substitution errors than the Defective Group. Roe and Milisen (15) noted that substitution errors were the most common error of elementary school children, and these findings agree with their results. It should be noted, however, that although the Normal Group had proportionally more substitutions as errors, the relative
frequencies of substitution errors as responses were 22.9 per cent for the Defective Group and 12.1 per cent for the Normal Group.

Comparison of the two groups on incorrect production of the blends, and incorrect production of the tested single elements of the blends.

**Question Number Three**

Question Number Three (a) compared the Defective Groups' errors on blends with their errors on the tested single elements of the blends. (See Table III.) The children had 822 errors on blends, 52.6 per cent of their responses, and 348 errors on the single elements of the blends, 15.3 per cent of their responses. A t-ratio of 23.31 was obtained, significant at the .001 level of confidence.

Question Number Three (b) made the same comparisons for the Normal Group. They had 305 errors on the blends, 23.0 per cent of their responses, and 159 errors on the elements of the blends, 14.0 per cent of their responses. The t-ratio between their scores was 5.29, which is also significant at the .001 level of confidence.

The two groups were compared to see if there were significant differences between incorrect productions of the blends, and also the single elements of the blends.
TABLE III

FREQUENCY (F) AND RELATIVE FREQUENCY (RF) OF ERRORS ON CONSONANT BLENDS AND ON BLEND ELEMENTS TESTED AS SINGLES

<table>
<thead>
<tr>
<th>Subjects</th>
<th>Errors on Blends</th>
<th>Errors on Blend Elements</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>F</td>
<td>RF</td>
</tr>
<tr>
<td>Defective Group</td>
<td>822</td>
<td>.526</td>
</tr>
<tr>
<td>N=71</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Normal Group</td>
<td>305</td>
<td>.230</td>
</tr>
<tr>
<td>N=63</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
A t-ratio of 18.50, significant at the .001 level of confidence was obtained for the difference in blends. The t-score for the difference in the single elements of the blends was 7.33, significant at the .001 level of confidence.

Discussion

Both groups had significantly more errors on the blends than on the single elements of the blends. This agrees with the results of studies by Templin and Steer (27) and Hahn (6) where they found the blends most defective in kindergarten children. However, it disagrees with Roe and Milisen's findings in which children made fewer errors on the blends than on the single elements of the blends.

The most highly significant results were in a comparison of the two groups' production of blends, where a t-ratio of 18.50 was obtained. The fact that the children in the Defective Group tended to have more errors than the children in the Normal Group suggests that errors on blends are a useful prognostic factor in deciding whether a child will need speech therapy.

Comparison of the two groups on incorrect production of items containing the phonemes /r/, /l/, and /s/
Question Number Four

Question Number Four compared the two groups' incorrect productions and manner of misarticulation on the 28 items containing the /r/, /l/, and /s/ phonemes. Table IV indicates the frequencies and relative frequencies of errors and types of error.

The Defective Group had 1021 errors, 46.4 per cent of their total responses, while the Normal Group had 405 errors, 20.6 per cent of their total responses. The t-test of significant differences produced a ratio of 17.20, which is statistically significant at the .001 level of confidence.

In the examination of type of error, the Defective Group had 210 omissions, 20.6 per cent of their errors, while the Normal Group had 57 omissions, 14.1 per cent of their error responses. The t-ratio was 3.02 significant at the .01 level of confidence. The Defective Group had 80 distortions, 7.8 per cent of their responses, while the Normal Group had 47, 11.6 per cent of their error responses. A non-significant t-ratio of -1.69 was obtained. The substitution errors were: 731 for the Defectives, 71.6 per cent of their error responses, and 301 for the Normals, 74.3 per cent of their error responses. The t-ratio was 1.11 which is statistically non-significant.
### TABLE IV

**FREQUENCY (F) AND RELATIVE FREQUENCY (RF) OF OMISSIONS, DISTORTIONS AND SUBSTITUTIONS AS ERROR RESPONSES TO THE 31 ITEMS TESTING THE CONSONANTS /s/, /r/, /l/**

<table>
<thead>
<tr>
<th>Subjects</th>
<th>Omissions F (RF)</th>
<th>Distortions F (RF)</th>
<th>Substitutions F (RF)</th>
<th>Total Errors F (RF)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Defective</td>
<td>210 (.206)</td>
<td>80 (.078)</td>
<td>731 (.716)</td>
<td>1021 (.464)</td>
</tr>
<tr>
<td>Group N=71</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Normal</td>
<td>57 (.141)</td>
<td>47 (.116)</td>
<td>301 (.743)</td>
<td>405 (.206)</td>
</tr>
<tr>
<td>Group N=63</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Discussion

The results obtained in the examination of incorrect productions of these phonemes are even more significant than those obtained for Question Number One. The results in the examination of the manner of misarticulation followed the pattern of the results for Question Number Two, but proved to be less differentiating between the two groups.

Comparison of the two groups for sex differences

Although this was not a stated question, it was felt that an examination of the two groups for sex differences might yield results that would complement the previously discussed questions.

Mills and Streit (11) reported that the ratio of male to female in functional articulation disorders was more than 1.5 to 1.0. Templin (25) indicated that girls, on the average, develop normal articulation a year earlier than boys. It might be expected, then, that an examination of these data would reveal a much greater number of boys than girls with articulatory errors at the initial testing.

Table V indicates the number of boys and girls in the Defective and Normal Groups. Of the children initially examined, 42.5 per cent were girls. After the two year
<table>
<thead>
<tr>
<th>Subjects</th>
<th>Frequency of Errors</th>
<th>Relative Frequency of Errors</th>
</tr>
</thead>
<tbody>
<tr>
<td>Defective</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Boys</td>
<td>932</td>
<td>.392</td>
</tr>
<tr>
<td>N=40</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Girls</td>
<td>637</td>
<td>.348</td>
</tr>
<tr>
<td>N=37</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Normal</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Boys</td>
<td>371</td>
<td>.170</td>
</tr>
<tr>
<td>N=37</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Girls</td>
<td>240</td>
<td>.157</td>
</tr>
<tr>
<td>N=26</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
period, 54.4 per cent of the girls maintained their defective articulation while 56.3 per cent of the boys remained defective.

The number of errors for the Defective boys was 932, 39.2 per cent of their total responses. The number of errors for the Normal boys was 371, 17.0 per cent of their total responses. The errors for Defective and Normal girls were 637 and 240, 34.8 and 15.7 per cent of their responses. T-ratios were found for the differences between the Defective and Normal boys and the Defective and Normal girls. The boys' t-ratio was 15.85 and the girls' t-ratio was 13.64, both significant at the .001 level of confidence.

Discussion

The significant differences in relative frequency of errors found in a comparison of the two groups by sex were similar to the differences found between the two groups as a whole, although the relative frequencies of errors were slightly higher for the boys within the two groups. These findings appear to agree with Roe and Milisen's (15) results which stated that there does not seem to be a sex difference in regard to the mean number of errors. The ratio of the sexes at the initial examination resembled that reported by Mills and Streit (11).
CHAPTER IV

CONCLUSIONS AND RECOMMENDATIONS

The results of this study provide solid evidence to support the hypothesis that there are differences in the articulatory productions of children with articulatory errors who later attain normal articulation without speech therapy and those who do not attain normal articulation.

The examination of the total number of misarticulations by the children provided the most differentiating measure in indicating whether they would overcome their errors without speech therapy. Since the results of this study can only be discussed in comparative terms, they indicate that there is a need for articulation tests that provide more accurate cut-off scores than are presently available. The method of articulation testing used in this study appears to be a factor in differentiating between the children. This stimulation method of testing should be used when prognostic judgments are desired.

The type of incorrect response that a child makes can be an indication of his need for speech therapy. If omissions are relatively common errors in his speech, then it is very probable that that child will need speech
therapy in order to attain normal articulation.

The examination of substitution and distortion errors in this study did not provide conclusive evidence to indicate whether or not a child needs speech therapy. However, a study that provided a closer examination of distortion errors with some measure of the degree of distortion or the amount of deviancy from the correct articulation might enable a speech therapist to make some meaningful prognostic judgments.

Children who do not overcome their articulation errors through maturation tend to produce more errors on consonant blends than do children who attain normal articulation. Further study examining specific blends is indicated to provide more specific prognostic measures.

The detailed analysis of the selected consonants in different phonetic contexts yielded significant differences between the groups in their incorrect responses. Except for differences between the two groups on omission errors, non-significant differences were obtained when the responses were examined in terms of the type of error. A more sophisticated analysis in which individual phonemes are examined in different contexts would yield more practical results.

There is a need for a more careful control of certain variables in future investigations of this nature.
Although in this study, with a few exceptions, the children were all six years of age, more reliable results might be obtained if the ages of the children were more closely controlled.

A more standardized initial screening examination with the inclusion of formal audiological tests is recommended in future investigations to further nullify the effects of organicity upon the testing.

No check was made of the examiner's reliability in this study. Although Henderson (7, p.355) has indicated that the reliability of an experienced examiner is good in face to face testing situations, a cross validation of the examiner's accuracy would be indicated. Also in this study, more than one phoneme was examined in some of the test words. Scoring would be more accurate if the examiner had to listen for only one error in each word.

Finally, these data need to be reexamined after the children are in the fourth grade, since the maturation factor may still be in effect. Consequently, some of the children in the Defective Group of this study would be in the Normal Group if an examination were made when the children are in the fourth grade.
CHAPTER V

SUMMARY

The purpose of this study was to determine whether or not differences existed in the articulatory responses of first grade children who attained normal articulation without speech therapy by the time they reached third grade and those who did not attain normal articulation. It was felt that the presence of significant differences in the responses of the children would have prognostic value in determining what children would need speech therapy to overcome their articulation errors.

The 134 children examined were selected from the first grade populations of public schools in three Michigan counties. All of the children were originally screened by public school speech therapists and diagnosed as having functional articulation disorders. Of the original group of children, 71 still retained their articulation errors in the third grade, while 63 no longer had errors. A 38-item articulation test, part of the preliminary investigations for the Predictive Screening Test of Articulation was administered to the children at the beginning of the first grade. The test was administered
individually to the children by the same examiner who gave oral presentations of the test items.

The analyses of the data indicated that there were significant differences between the two groups of children in 1) the relative frequency of misarticulations, 2) the relative frequency of omission errors, 3) the relative frequency of substitution errors, 4) the relative frequency of misarticulations on consonant blends, and 5) the relative frequency of errors on the 31 items containing the phonemes /r/, /l/, and /s/ in various phonetic contexts. With the single exception of substitution errors, the relative frequencies indicated above were greater for the Defective Group than for the Normal Group.

It was felt that further investigations of the articulation of children who initially displayed articulation errors would indicate more specific differences that would have prognostic value in determining a child's need for speech therapy.
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13. Poole, I., Genetic development in articulation of consonant sounds in speech. *Elementary English*, 11, 1934, 159-161.


