Investigation of psycholinguistic and articulatory skills of a selected group of elementary school children

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AN INVESTIGATION OF PSYCHOLINGUISTIC AND ARTICULATORY SKILLS
OF A SELECTED GROUP OF ELEMENTARY SCHOOL CHILDREN

By

Valerie S. Cole
B.A. Montana State University, 1962

Presented in partial fulfillment of the requirements for the
degree of Master of Arts

UNIVERSITY OF MONTANA
1966

Approved by:

Richard M. Buchalter
Chairman, Board of Examiners

Date

SEP 6 1966
ACKNOWLEDGMENTS

The author expresses gratitude to Dr. Richard M. Boehmler for his direction, encouragement, and understanding during the course of this study.

Appreciation is also extended toward the Superintendent of Missoula School District #1, and to the principals and teachers for their assistance in obtaining subjects for this study and for their permission to carry out this study in the public schools.
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CHAPTER I

INTRODUCTION

The child with a functional articulation problem has been widely discussed in both diagnostic and descriptive terms. Studies on phoneme type and articulatory skills in children,¹ articulation related to other developmental factors,² and diagnostic tests of articulation,³ have been reported. Misarticulations are often analyzed according to the defective sounds, the type of errors, and the articulatory location of these errors. Such information is essential in understanding articulation problems both academically and therapeutically. However, such a detailed analysis of articulation should be made with an awareness that articulation is not an entity in itself. It is related to many parameters of speech and language. The relationship of articulation to other psycholinguistic abilities has not been completely defined.

A model of psycholinguistic abilities was used by McCarthy and Kirk⁴ in the construction of the Illinois Test of Psycholinguistic Abilities.

It was postulated that each of the dimensions: 1) levels of organization, 2) psycholinguistic processes, and 3) channels of communication specifies a given psycholinguistic ability.

Two levels of organization of psycholinguistic abilities identified as being important for language acquisition and use were:

1. Representational Level - This Level is sufficiently organized to mediate activities requiring the meaning or significance of linguistic symbols.
2. Automatic-Sequential Level - This Level mediates activities requiring the retention of linguistic symbol sequences and the execution of automatic habit chains.

The Illinois Test of Psycholinguistic Abilities (ITPA) has been published in an experimental edition, with the recognition that subsequent theoretical and clinical work would result in future revisions. The final test battery was standardized on seven hundred children, ranging in age from 2.5 years to 9.0 years. Three psycholinguistic abilities are investigated at the Representational Level and three at the Automatic-Sequential Level.

Subtests of the ITPA at the Representational Level include those which test; 1) ability to comprehend visual and auditory symbols, 2) ability to relate visual or auditory symbols in a meaningful way, and 3) ability to put ideas into words or gestures. Subtests of the ITPA at the Automatic-Sequential Level include those which test; syntactical and inflectional habits, ability to reproduce a sequence of symbols previously seen, and ability to reproduce a sequence of symbols previously heard. An outline of the ITPA is given in Appendix C.

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5Ibid., 1-21.
6Ibid.
If we consider articulation as one type of linguistic skill, it seems likely that it is at an Automatic-Sequential level rather than at a Representational level. From an infant's spontaneous use of phonetic elements, automatic and sequential patterns begin to emerge which are not significant on a meaningful level.

Bateman\textsuperscript{7} reports that the ITPA has been used for a number of studies including; statistical, remediation, and language disorder studies. Of these, two have been directed toward the area of articulatory defects and cite statistical evidence that children with functional defects of articulation scored significantly lower than children without these defects on three subtests of the ITPA at the Automatic-Sequential Level.

Foster\textsuperscript{8} explored the relationship between psycholinguistic abilities and persistent articulatory defects. Eighteen children, showing no significant improvement on the Templin-Darley Articulation Test Form after sixteen months of speech therapy, performed significantly lower than controls (raw mean scores) on all subtests of the ITPA. However, the significance of these findings was questioned by Bateman because of what she feels was inadequate matching.\textsuperscript{9}

In another study, Ferrier\textsuperscript{10} investigated psycholinguistic factors associated with functional defects of articulation. Forty elementary

\begin{flushright}
\textsuperscript{7}Barbara Bateman, The Illinois Test of Psycholinguistic Abilities in Current Research (Urbana: University of Illinois, 1965), 1-37.
\textsuperscript{9}Bateman, 34.
\end{flushright}
school children with articulation defects, chronological ages 6-7 to 8-7, were given diagnostic tests including the ITPA. One of the major findings was that children with functional defects of articulation scored significantly lower than children without these defects on the three Automatic-Sequential Level subtests of the ITPA.

Johnson et al.\textsuperscript{11} refer to articulation as "the ways in which the speaker produces the speech sounds of his language," and to functional articulation problems as "articulation problems without any apparent anatomic or physiologic basis." For purposes of this study, these same descriptions will be used for "articulation" and "functional articulation problems."

Articulation problems are of major concern to speech therapists in the public schools from the point of view of diagnosis and therapy. Speech therapists in the public schools may have up to 81% articulation problems in their current case loads.\textsuperscript{12} A dilemma is thus created by the relatively large number of children with articulation problems and the limited amount of time available for therapy with these children. Speech therapists often then plan group therapy sessions or conduct speech improvement sessions within classrooms. Perhaps a better solution would be to determine whether or not the articulation problem would be overcome by maturation, and reduce the number of individuals who are in need of special services. Criteria for making such predictions


possible have been reported by Carter and Buck.\textsuperscript{13} They report research which suggests that ability to correct articulation errors instantaneously gives information regarding the degree of speech maturation. The predictive value of articulation variables (such as number of errors and type of errors) at a Kindergarten level was reported by Steer and Drexler.\textsuperscript{14} At the present time, Van Riper and associates\textsuperscript{15} are in the process of a cross validation study of a "Predictive Screening Test of Articulation." The goal of this project is to provide a predictive measure to determine those articulation problems which will or will not be overcome by maturation. The "Predictive Screening Test of Articulation," with its possible predictive and diagnostic implications for the area of articulation, will be of interest to speech therapists in the public schools as well as those therapists in clinical settings. To date, these predictive tests have been based upon articulatory skills alone.

The developmental pattern varies from child to child in most things they learn. Thus, when placed on a continuum, some children learn articulatory skills earlier and others later. Everhart\textsuperscript{16} surveyed the literature of growth and developmental factors in articulatory maturation. He

\begin{flushleft}


\textsuperscript{15}Charles Van Riper, "Predictive Screening Test of Articulation," Test Manual, Experimental Form, (Western Michigan University, 1964), (personal communication to Dr. Charles D. Parker).

\textsuperscript{16}Everhart, 59-69.
\end{flushleft}
reviewed data on chronological age, I.Q., reading, retarded physical development, sex differences, handedness, and race. He concluded that "in the final analysis it is not practicable to relegate articulatory maturation to any one single variate of growth and development." Everhart's conclusions may be valid for such broad factors but may not be true for specific psycholinguistic abilities.

Templin17 has demonstrated that the so-called normal child may need six to eight years to complete the sequence of speech sound development, and more importantly that there is a hierarchy of consonant development. The author questions whether there is a correlation between psycholinguistic abilities at the Automatic-Sequential Level and types of articulatory errors which might be suggestive of significant developmental delay in articulatory maturation.

Because of the hierarchy of consonant development, specific misarticulations at certain ages may be suggestive of a developmental delay in articulatory maturation. Articulation errors on such sounds as /θ/, /ɔ/, /v/, and /j/ at ages 6, 7, and 8, may be judged diagnostically significant and indicative of a need for speech therapy. Errors on /b/, /d/, /k/, and /g/ at ages 6, 7, and 8, may also be judged diagnostically significant and indicative of a need for speech therapy. However, the /b/, /d/, /k/, and /g/ sounds are usually mastered between the ages of 3 and 5, and errors on these sounds at ages 6, 7, and 8 would fall at a different point on a continuum of diagnostic significance of misarticulations since the /θ/, /ɔ/, /v/, and /j/ sounds are usually mastered.

17Templin, 58.
later, between the ages of 5 and 7 years.\textsuperscript{18}

Misarticulations on /b/, /d/, /k/, and /g/ sounds are commonly noted in preschool children. Often these are characterized by interchanging of consonant cognates or inappropriate location of tongue contacts. Differences must exist between children who overcome these misarticulations spontaneously and those children who retain these errors. Variables such as age, intelligence, and environmental speech standards are diagnostically significant in obtaining the total picture of the child with such an articulation problem. If these variables were controlled, other variables might be identified, such as general psycholinguistic abilities, which would differentiate the two groups. Such is the area of concern of this study.

The purpose of the present study is to investigate the relationships between the psycholinguistic abilities and articulatory abilities of a selected group of elementary school children. It is hypothesized that:

1. Children in the elementary grades who have consistent patterns of misarticulations on the /b/, /d/, /k/, or /g/ sounds will have psycholinguistic abilities which are lower at the Automatic-Sequential Level than:
   a. children with misarticulations on consonant sounds other than (and excluding) /b/, /d/, /k/, and /g/.
   b. children with essentially mature articulation.
2. These children will have psycholinguistic abilities which are not significantly different at the Representational Level.

\textsuperscript{18}\textsuperscript{Ibid.}, 53.
CHAPTER II

PROCEDURE

Selection of Subjects

Meetings were held with the Superintendent of Missoula School District #1, the seventeen school principals in that district, and the Director of Special Education in Missoula Elementary Schools to explain the study and seek their aid in finding subjects.

First, second, and third grade teachers in Missoula Elementary School District #1 were asked, by their respective principals, to give the "Type A, articulation screening test" (See Appendix A) to those children in their classrooms who: 1) were suspected of having speech problems, 2) had no known hearing or visual problems, and 3) had no known history of present or past physical abnormalities. This test was administered using an imitative method and teachers recorded the number of words missed out of a total of twenty-four words.

All of the seventeen schools in District #1 reported the results of their preliminary survey. Additional children were screened in three other elementary schools within seven miles of Missoula.

Subjects identified in the preliminary survey were again given the "Type A, articulation screening test" by the experimenter. The criterion for failure on this test was: one phoneme consistently misarticulated in the initial and medial position by either an omission or substitution, or two or more phonemes consistently misarticulated in either the initial or...
medial position by either an omission or substitution. Four children met the above criterion. None of these children had known hearing or visual problems as reported in the results of school audiometric and visual screening examinations. Further, none of these children had known past or present physical abnormalities as reported in school health records.

The four subjects thus selected were given the Peabody Picture Vocabulary Test. Intelligence Quotients were obtained on the basis of raw scores. The Academic Ability Scale of the Minnesota Occupational Rating Scale was used to classify the occupation of the family breadwinner for each of the four subjects. These four subjects comprised Group A. Subjects in this group were judged to have a severe developmental delay in articulatory maturation.

Four subjects selected for Group B met the following criteria; The subjects made no errors on the /b/, /d/, /k/, and /g/ sounds during the "Type A, articulation screening test." The subjects failed the "Type B, articulation screening test" (See Appendix B). Criteria for failure on this test were: one phoneme consistently misarticulated in the initial and medial position by either an omission, substitution, or distortion, or two or more phonemes consistently misarticulated in either the initial or medial position by either an omission, substitution, or distortion. None of these children had known hearing or visual problems as reported in the results of school audiometric and visual screening examinations, nor did they have any known past or present physical abnormalities as

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20 Donald G. Paterson, Revised Minnesota Occupational Rating Scales (Minneapolis: University of Minnesota Press, 1953), 3-74.
reported in school health records. These subjects were individually selected to be similar to subjects in Group A according to age, sex, race, I.Q., and Level of Academic Ability of the family breadwinner. Subjects in this group were judged to have a moderate delay in articulatory maturation.

Four subjects selected for Group C met the following criteria: No errors on the sounds tested in the "Type A, articulation screening test," and no omissions or substitutions on the sounds tested in the "Type B, articulation screening test." Each of these subjects had scores above the mean for his age and sex on the Templin-Darley Articulation Screening Test. Subjects in this group were judged to have essentially mature articulation. None of these children had known hearing or visual problems as reported in the results of school audiometric and visual screening examinations, and none had known past or present physical abnormalities as reported in school health records. These subjects were individually selected to be similar to subjects in Groups A and B according to age, sex, race, I.Q., and Level of Academic Ability of the family breadwinner. The subjects in Groups B and C were located with the aid of classroom teachers.

The mean chronological age and I.Q. for subjects in Group A was 7-5 and 94. The mean chronological age and I.Q. for subjects in Group B was 7-4 and 95. The mean chronological age and I.Q. for subjects in Group C was 7-4 and 93 3/4. For a listing of subjects according to group, chronological age, grade, socio-economic status and sex, see Table I.

TABLE I.—Four sets of subjects matched according to articulation, age, grade, I.Q., socio-economic status, and sex

<table>
<thead>
<tr>
<th>Articulation</th>
<th>Age</th>
<th>Grade</th>
<th>I.Q.</th>
<th>Socio-economic status</th>
<th>Sex</th>
</tr>
</thead>
<tbody>
<tr>
<td>Severe (Group A)</td>
<td>7-3</td>
<td>One</td>
<td>69</td>
<td>D</td>
<td>M</td>
</tr>
<tr>
<td>Moderate (Group B)</td>
<td>7-5</td>
<td>One</td>
<td>73</td>
<td>C</td>
<td>M</td>
</tr>
<tr>
<td>Normal (Group C)</td>
<td>6-11</td>
<td>One</td>
<td>79</td>
<td>D</td>
<td>M</td>
</tr>
<tr>
<td>Severe (Group A)</td>
<td>7-7</td>
<td>One</td>
<td>89</td>
<td>D</td>
<td>F</td>
</tr>
<tr>
<td>Moderate (Group B)</td>
<td>7-2</td>
<td>One</td>
<td>83</td>
<td>D</td>
<td>F</td>
</tr>
<tr>
<td>Normal (Group C)</td>
<td>8-1</td>
<td>One</td>
<td>86</td>
<td>C</td>
<td>F</td>
</tr>
<tr>
<td>Severe (Group A)</td>
<td>8-4</td>
<td>Two</td>
<td>104</td>
<td>D</td>
<td>M</td>
</tr>
<tr>
<td>Moderate (Group B)</td>
<td>8-1</td>
<td>Two</td>
<td>106</td>
<td>D</td>
<td>M</td>
</tr>
<tr>
<td>Normal (Group C)</td>
<td>8-2</td>
<td>Two</td>
<td>98</td>
<td>C</td>
<td>M</td>
</tr>
<tr>
<td>Severe (Group A)</td>
<td>7-3</td>
<td>One</td>
<td>114</td>
<td>B</td>
<td>M</td>
</tr>
<tr>
<td>Moderate (Group B)</td>
<td>6-11</td>
<td>One</td>
<td>112</td>
<td>C</td>
<td>M</td>
</tr>
<tr>
<td>Normal (Group C)</td>
<td>7-11</td>
<td>One</td>
<td>118</td>
<td>C</td>
<td>M</td>
</tr>
</tbody>
</table>
Reliability Check of Grouping

All subjects were given the Templin-Darley articulation test words for the following phonemes: /b/, /d/, /k/, /g/, /s/, /θ/, /ʃ/, /ʒ/, /j/, and /r/ in the initial and medial positions, and the /l/ and /v/ phonemes in the initial position. This was done with the subjects saying the word after the examiner. The subjects' responses were tape-recorded and placed in random order, then played to two listeners trained in the administration of the Templin-Darley Articulation Test. Both listeners were unfamiliar with the nature of the study. The listeners were asked to place each recording in Group A, Group B, or Group C. Instructions to the listeners are given in Appendix D.

The listeners placed eight of the twelve subjects in the same category as the experimenter. Thus, there was total agreement on eight of the subjects. In all cases of disagreement with the examiner, the subject was placed in an adjacent category. For purposes of this study, the reliability of the grouping was considered adequate on the basis of inter-judge consistency and inter-subject consistency.

Experimental Procedure

All twelve subjects were tested in a room within their respective school buildings. In all instances these rooms were those used by speech therapists, remedial reading teachers, or nurses. Only the examiner and the subject were present in the test situation. Extraneous auditory and visual stimuli were eliminated as far as possible. A table and two chairs were arranged so that the examiner faced the subject directly.

The examiner was a graduate student in the University of Montana Department of Speech Pathology and Audiology, who has a B.A. degree in
Speech Pathology and Audiology, Basic Certification in Speech with the American Speech and Hearing Association, two years of professional work in the field, and all non-thesis requirements completed for a Master's degree in Speech Pathology and Audiology. The examiner met the requirements established for qualification to administer the Illinois Test of Psycholinguistic Abilities, and was judged qualified to administer the tests in this study by staff members of the Department of Speech Pathology and Audiology of the University of Montana.

The Illinois Test of Psycholinguistic Abilities was administered to all subjects. This test was administered according to the instructions as outlined in the Examiner's Manual. Following the administration of the Illinois Test of Psycholinguistic Abilities, a speech sample was elicited using the imitative method. This was tape recorded using a Wollensack Tape Recorder, Model T-1500.

The Templin-Darley Articulation Screening Test was then administered using the imitative method of having the subject repeat the word after the examiner.

All subjects were students in one of eight different schools. Each school was assigned a number at random. These numbers were ranked, from lowest to highest, to determine the order of testing during the two week testing period. The order in which subjects were tested within schools was not predetermined but was influenced by the teachers preference for having them tested.

All of the subjects were tested in the afternoon, with no more than two subjects tested during the same day. All of the diagnostic testing

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22McCarthy and Kirk, 22-59.
was done during a two week period.

The Illinois Test of Psycholinguistic Abilities was scored on the same day that the test was given to each subject, according to instructions outlined in the Examiner's Manual of the Illinois Test of Psycholinguistic Abilities.\textsuperscript{23}

\textsuperscript{23}Ibid.
CHAPTER III

RESULTS

Twelve elementary school children, selected for this study, were given the Illinois Test of Psycholinguistic Abilities. Raw scores on each of the nine subtests were converted to standard scores using procedures outlined in the Examiner's Manual of the Illinois Test of Psycholinguistic Abilities.24

Criterion measures for this test were the mean of the standard scores for the subtests at the Automatic-Sequential Level and the mean of the standard scores for the subtests at the Representational Level for each subject respectively.

The statistical treatment applied to the data was Lindquist's25 analysis of variance for a Treatments by Levels (Groups) design. This analysis involved two Treatments, the Representational Level and the Automatic-Sequential Level of the Illinois Test of Psycholinguistic Abilities. The analysis involved three Levels (articulation groups): Level A, severe delay in articulatory maturation; Level B, moderate delay in articulatory maturation; and Level C, essentially mature articulation.

24Ibid., 95-128.

The average mean standard scores on the Representational Level and the Automatic-Sequential Level were as follows: Group A -.66 at the Representational Level and -1.02 at the Automatic-Sequential Level, Group B -.34 at the Representational Level and -.61 at the Automatic-Sequential Level, and Group C -.01 at the Representational Level and -.08 at the Automatic-Sequential Level. The group average totals of the ITPA mean standard scores were; -.84 for Group A, -.47 for Group B and .04 for Group C (See Table II). These means are presented in Figure 1. The lines connecting the various means in Figure 1 are merely to guide the eye. They do not represent any interdependence of dimensions along the abcissa.

The results of the analysis of variance are presented in Table III. The Treatment by Levels interaction was not statistically significant. The obtained F ratio was .189 for df=2/18. This ratio is not significant at the 20% level of confidence.

No statistically significant differences were noted between the two Treatments. The obtained F ratio was .3 with df=1/18. This ratio is not significant at the 20% level of confidence.

A statistically significant Levels effect was noted. The analysis of the Levels yielded an F ratio of 2.32 for df=2/18. This ratio is statistically significant at approximately the 13% level of confidence.

An event which could occur by chance 13% of the time is considered significant in this case. The writer would rather risk retaining a null hypothesis that is false than rejecting a null hypothesis that is true. This is done with the realization that the trends noted in this study need further investigation because of the small sample size. The results of this exploratory study are intended to indicate that further investigation
TABLE II.—Mean standard scores on the Illinois Test of Psycholinguistic Abilities (Treatments) for Articulation Groups (Levels)

<table>
<thead>
<tr>
<th>Level</th>
<th>Treatment</th>
<th>Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Representational</td>
<td></td>
</tr>
<tr>
<td>A - Severe</td>
<td>- .66</td>
<td>- .84</td>
</tr>
<tr>
<td>B - Moderate</td>
<td>-.34</td>
<td>-.47</td>
</tr>
<tr>
<td>C - Normal</td>
<td>-.01</td>
<td>-.04</td>
</tr>
<tr>
<td>Mean</td>
<td>-.34</td>
<td>-.43</td>
</tr>
</tbody>
</table>
Figure 1.—Group mean standard scores on the ITPA for Articulation Groups

<table>
<thead>
<tr>
<th>Representational Level</th>
<th>Automatic-Sequential Level</th>
</tr>
</thead>
<tbody>
<tr>
<td>+0.05</td>
<td></td>
</tr>
<tr>
<td>+0.00</td>
<td></td>
</tr>
<tr>
<td>-0.05</td>
<td></td>
</tr>
<tr>
<td>-0.10</td>
<td>Group C - Normal</td>
</tr>
<tr>
<td>-0.15</td>
<td></td>
</tr>
<tr>
<td>-0.20</td>
<td></td>
</tr>
<tr>
<td>-0.25</td>
<td></td>
</tr>
<tr>
<td>-0.30</td>
<td></td>
</tr>
<tr>
<td>-0.35</td>
<td>Group B - Moderate</td>
</tr>
<tr>
<td>-0.40</td>
<td></td>
</tr>
<tr>
<td>-0.45</td>
<td></td>
</tr>
<tr>
<td>-0.50</td>
<td></td>
</tr>
<tr>
<td>-0.55</td>
<td></td>
</tr>
<tr>
<td>-0.60</td>
<td></td>
</tr>
<tr>
<td>-0.65</td>
<td></td>
</tr>
<tr>
<td>-0.70</td>
<td>Group A - Severe</td>
</tr>
<tr>
<td>-0.75</td>
<td></td>
</tr>
<tr>
<td>-0.80</td>
<td></td>
</tr>
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<td>-0.85</td>
<td></td>
</tr>
<tr>
<td>-0.90</td>
<td></td>
</tr>
<tr>
<td>-0.95</td>
<td></td>
</tr>
<tr>
<td>-1.00</td>
<td></td>
</tr>
<tr>
<td>-1.05</td>
<td></td>
</tr>
</tbody>
</table>
TABLE III.—Analysis of variance comparing Psycholinguistic Abilities (Treatments) and Articulation Groups (Levels)

<table>
<thead>
<tr>
<th>Source of Variation</th>
<th>df</th>
<th>Sum of Squares</th>
<th>Mean Square</th>
<th>F Ratio</th>
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<tbody>
<tr>
<td>Treatments</td>
<td>1</td>
<td>.20</td>
<td>.20</td>
<td>.3</td>
</tr>
<tr>
<td>Levels</td>
<td>2</td>
<td>3.07</td>
<td>1.54</td>
<td>2.32</td>
</tr>
<tr>
<td>Cells</td>
<td></td>
<td>3.52</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Treatment by Levels</td>
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<td>.66</td>
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of this exploratory study are interpreted to indicate that articulation is related to psycholinguistic skills.
CHAPTER IV

DISCUSSION

The purpose of the present study was to investigate the relationship between psycholinguistic abilities and articulatory abilities of a selected group of elementary school children. It was hypothesized that children in the elementary grades who had consistent patterns of misarticulations on the /b/, /d/, /k/ or /g/ sounds would have psycholinguistic abilities which were lower at the Automatic-Sequential Level than children with misarticulations on consonant sounds other than (and excluding) /b/, /d/, /k/, and /g/, and children with essentially mature articulation. It was further hypothesized that all of these children would have psycholinguistic abilities which were similar at the Representational Level.

The first hypothesis was supported. Subjects with a severe developmental delay in articulatory maturation (i.e. Group A with errors on b-d-k-g sounds) had psycholinguistic abilities which were lower at the Automatic-Sequential Level than subjects with a moderate developmental delay in articulatory maturation (i.e. Group B with misarticulations on consonant sound other than and excluding b-d-k-g). Subjects with a moderate delay in articulatory maturation in turn had psycholinguistic abilities which were lower at the Automatic-Sequential Level than subjects with essentially mature articulation (i.e. Group C with scores above the mean on the Templin-Darley Articulation Screening test).
The second hypothesis, that these children would have psycholinguistic abilities which were similar at the Representational Level, was not supported. Rather the results indicated that the subjects with a severe delay in articulatory maturation had psycholinguistic abilities which were lower at both the Representational Level and the Automatic-Sequential Level than subjects with a moderate delay in articulatory maturation. The subjects with a moderate delay in articulatory maturation in turn had psycholinguistic abilities which were lower at both the Representational Level and the Automatic-Sequential Level than subjects with essentially mature articulation.

On an individual basis there were eight possibilities (two treatments by three levels) of having the mean standard scores of the two Treatments arrange themselves from lowest to highest in the order of Group A, Group B, and Group C. Results show that five out of the eight possibilities were arranged in such an order. There were no reversals of Group A and Group C. The chronological ages of the subjects ranged from 7-0 to 8-4 and the range of I.Q.'s was from 69 to 118. The main trend of the Group effect was consistent across both the age range and the I.Q. range. This gives further support to the strength of the relationship between articulation and psycholinguistic abilities.

Statistical comparisons of the subtests of the ITPA were not made. However, visual inspection revealed that no subtest distinguished the groups. This may suggest that children with a developmental delay in articulatory maturation have a general, rather than specific, psycholinguistic problem.

There is some evidence which suggests that paternal occupational status is significantly related to the early stages of speech
maturation. In low socio-economic groups poor speech standards may characterize the language environment in the home. The language environment in the home may influence articulation, since articulation is learned before it becomes automatic. However, in the present study children were matched according to socio-economic status. It is interesting to note that most of the subjects were in low socio-economic groups. This would seem to indicate that the relationship between socio-economic status and speech maturation is not a simple one and needs to be interpreted with caution.

The most revealing and consistent information found in this study was that children with a developmental delay in articulatory maturation have general psycholinguistic problems. This was evidenced by a statistical evaluation of the two levels of psycholinguistic abilities (Representational and Automatic-Sequential) and by visual inspection of all nine subtests. This finding has implications in dealing with articulation problems from the point of view of diagnosis and therapy. It seems important to determine proficient and deficient speech and language modalities in diagnosis which may lead to differential remediation rather than therapy directed primarily towards articulation disorders per se. A program adjusted to specific deficits might result in more stable progress in the acquisition and use of new or improved abilities. Irwin studied the effects of public school speech therapy upon certain linguistic


skills of first grade children with functional defects of articulation. No statistically significant changes were found in any of the linguistic skills measured as a result of speech therapy.

Ferrier\textsuperscript{28} compared standard scores on the ITPA between children with functional defects of articulation and the normative group, finding statistically significant differences between the two groups on the combined Automatic-Sequential subtests and the combined Representational Level subtests. His theoretical explanation for this finding is that when a disability, such as an articulation problem, affects the Automatic-Sequential Level of functioning, there will be some "attendant disability of function in representational operation."\textsuperscript{29} This investigator predicted that the Representational Level would not be as highly related to articulation disorders as would the Automatic-Sequential Level. The lack of a significant interaction effect does not support this view and does support Ferrier's findings.

The most consistent difference found in this study was between Group A and Group C. It is possible that children classified in Group B may have constituted a "borderline" group. If placed on a continuum of articulatory maturation, those Group B subjects whose misarticulations were characterized primarily by distortions would fall close to Group C. Those whose articulations were characterized primarily by substitutions would fall closer to Group A. In the grouping of subjects an attempt was made to exclude children whose articulation was characterized mainly by distortions. However, because of the importance of having the groups

\textsuperscript{28}Ferrier, 33.

\textsuperscript{29}Ibid., 85.
similar according to age and I.Q., the investigator found it necessary to include distortions in judgments of articulatory defectiveness during the matching of groups. Groups A and C seemed diagnostically to be more "pure" than Group B. "Purification" of subgroups would be an important consideration in further investigations.

One weakness of the present study was the small size of the sample. However, the study was strengthened by having controlled the variables of age, sex, grade, I.Q., and socio-economic status. There appears to be value in continuing research where many of the variables are controlled even though the group or sample size is small. Matching small groups as precisely as possible would be preferable to having a larger sample with fewer variables controlled.

The present study supports the hypothesis that articulation is related to psycholinguistic skills. However, because of the small sample size, this hypothesis should be subject to continued and expanded investigation. The present study has implications for further research. It is suggested that future studies include an effort to obtain more "purification" of groups with respect to articulatory skills. The phoneme analysis for grouping in this study emphasized the sequence of development more than the type of usage. A major implication of the study was that both parameters of articulation need to be controlled more precisely in future studies.
CHAPTER V

SUMMARY AND CONCLUSIONS

A preliminary survey was conducted to locate children in first, second, and third grades who had functional misarticulations on /b/, /d/, /k/, or /g/ sounds. Four children, comprising Group A, were found with errors on these sounds and their errors were judged indicative of severe developmental delay in articulatory maturation. Eight additional subjects were chosen. Four had misarticulations on consonant sounds other than and excluding /b/, /d/, /k/, and /g/. These subjects comprised Group B and their errors were judged indicative of a moderate developmental delay in articulatory maturation. The remaining four subjects had essentially mature articulation and they comprised Group C. Subjects in Groups B and C were selected to be individually similar to subjects in Group A on the basis of age, sex, I.Q., grade, and socioeconomic status. Chronological ages of the subjects ranged from 7-0 to 8-4 and the range of I.Q.'s on the Peabody Picture Vocabulary Test ranged from 69 to 118.

The Illinois Test of Psycholinguistic Abilities was administered to all twelve subjects. It had been hypothesized that Group A would have psycholinguistic abilities which were lower at the Automatic-Sequential Level than Groups B and C, and that all children would be similar at the Representational Level. The rationale for this hypothesis was that articulation is related to psycholinguistic skills at the Automatic-Sequential Level.
The performance of the three groups on the Representational Level and Automatic-Sequential Level of the Illinois Test of Psycholinguistic Abilities was compared by an analysis of individual and group mean standard scores. Using an analysis of variance procedure, no statistically significant differences were found between the Representational Level and the Automatic-Sequential Level. The overall means of psycholinguistic abilities for Groups A, B, and C fell in the order that was predicted only for Automatic-Sequential Level. This difference was statistically significant at approximately the 13% level of confidence for df=2/18.

The results of this study indicate that articulation is related to psycholinguistic abilities. This generalization was supported by the trend for psycholinguistic skills, as measured by the Illinois Test of Psycholinguistic Abilities, to increase as articulatory skill increased. This relationship appeared to be independent of age, sex, I.Q., or socioeconomic status. The results of this study support the trends reported in earlier investigations for children with functional articulation problems to have accompanying deficits in psycholinguistics abilities at the Representational Level and the Automatic-Sequential Level.

Continued research is needed to explore further the relationships between articulation and psycholinguistic abilities. It is suggested that "purification" of groups as well as attempts to match subjects as closely as possible should be important considerations in future investigations.

Continued investigations in the area of articulation and psycholinguistic abilities should lead to speculation and theorization of the
importance of these findings in terms of diagnosis, prognosis, remediation, and reassessment, and ultimately to evaluations of restructured programs of articulation therapy.
BIBLIOGRAPHY


APPENDIX A

Type A, Articulation screening test

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<thead>
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<th>Stimulus Words</th>
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APPENDIX B

Type B, Articulation screening test

Stimulus Words

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APPENDIX C

OUTLINE OF THE ILLINOIS TEST OF PSYCHOLINGUISTIC ABILITIES

REPRESENTATIONAL LEVEL

A. Decoding Tests (ability to comprehend visual & auditory symbols)

1. Auditory Decoding
   Tests - ability to comprehend spoken words
   Assessed - controlled vocabulary test

2. Visual Decoding
   Tests - ability to comprehend pictures
   Assessed - picture identification technique

B. Association Tests (ability to meaningfully relate visual and auditory symbols)

3. Auditory-Vocal Association
   Tests - ability to relate spoken words in a meaningful way
   Assessed - analogies test

4. Visual-Motor Association
   Tests - ability to relate visual symbols meaningfully
   Assessed - stimulus picture which is to be related to another

C. Encoding Tests (ability to put ideas into words or gestures)

5. Vocal Encoding
   Tests - ability to express one's ideas into words
   Assessed - describing objects

6. Motor Encoding
   Tests - ability to express one's ideas in gestures
   Assessed - supplying appropriate motion or gesture

AUTOMATIC-SEQUENTIAL LEVEL

A. Automatic Tests (syntactical and inflectional habits)

7. Auditory-Vocal Automatic
   Tests - ability to predict future linguistic events from past experience
   Assessed - sentence completion

-35-
B. Sequencing Tests

8. Auditory-Vocal Sequencing
   Tests - ability to correctly reproduce a sequence of symbols previously heard
   Assessed - digit repetition test

9. Visual-Motor Sequencing
   Tests - ability to correctly reproduce a sequence of symbols previously seen
   Assessed - duplication of sequence of pictures or geometric forms
INSTRUCTIONS - RELIABILITY CHECK - GROUPING

You will be listening to tape recordings of twelve samples of speech.

Each sample contains words in isolation. Each sample will be numbered.

After each sample is played, the tape recorder will be stopped. At this time you will classify the number of the recording you have just heard into either Group A, Group B, or Group C.

Use the following criteria for your classifications:

GROUP A - Articulation Problem
This group will consist of:
1) Any misarticulations (omission, substitution, distortion) on \(/b/, /d/, /k/, or /g/\) sounds.
2) The above may be accompanied by other misarticulations.

GROUP B - Articulation Problem
This group will consist of:
1) No misarticulations (omission, substitution, distortion) on \(/b/, /d/, /k/, or /g/\) sounds.
2) Misarticulations (omission, substitution, distortion) on any of the following sounds: \(/\theta/, /\rho/, /s/, /\ell/, /\ell^/, /k\ell/, /\ell/, /\ell/, /\ell/, /\ell/, /\ell/, \(v\), /r/, or /\ell/. These must be judged by you to be sufficiently deviant enough to be classified as a mild articulation problem.

GROUP C - No Articulation Problem
This group will consist of:
1) No misarticulations on \(/b/, /d/, /k/, or /g/\) sounds.
2) No misarticulations on \(/\theta/, /\rho/, /s/, /\ell/, /\ell^/, /k\ell/, /\ell/, /\ell/, \(v\), or /r/. Or slight distortions on some of these sounds which would not be judged by you to be sufficiently deviant enough to be called an articulation problem.

The twelve tape recorded speech samples will be played twice. The tape recorder will not be re-started until all listeners have classified the sample they have just heard.