1957

A Study of the Correlation Between Articulation Development Scores and Reading Test Scores

Viola K. Hallock
Eastern Illinois State College

A STUDY

of the

CORRELATION BETWEEN ARTICULATION DEVELOPMENT SCORES

and

READING TEST SCORES

by

VIOLA K. HALLOCK
B.S. in Ed., Eastern Illinois State College, 1955

Submitted to the Department of
Education and the Faculty of
Eastern Illinois State College
in partial fulfillment of the
requirements for the degree of
Master of Science in Education.

Adviser

May, 1957

ACKNOWLEDGMENTS

The writer wishes to thank Dr. Wayne L. Thurman, whose interest in speech problems led her to make this study, and Dr. Donald L. Moler for his valuable guidance and assistance.

The writer is also grateful to Supt. C. J. Dintelman, Mr. G. J. Johnston, Mrs. Rosina Conville, the principals, the teachers, and the students who cooperated in providing the information and opportunity for this study.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

CHAPTER I

INTRODUCTION TO THE PROBLEM

It was the purpose of this investigation to examine the relationship betwe n articulation development and reading development in a population of second to sixth grade children with articulation defects.

Within the past twenty-five years interest has grown in the speech problems of public school children. Wendell Johnson, until recently the director of the speech clinic at the State University of Iowa, and one of the United States' leading authorities in speech problems, writ s,

> This awareness of and interest in the needs of the speech handicapped grew primarily out of publicity given to the findings of the 1930 White House Conference on Child Health and Protection,[1] which brought into sharp focus the pressing nature of the problem... [2]

The findings of this conference, still considered by at least one authority[3] as the most comprehensive survey of speech defects, cited an average incidence of 5 per cent in the total

---

[1] White House Conference on Child Health and Protection, Report of the Committee on Special Cases (New York: D. Appleton-Century Co., 1931)

[2] Wendell Johnson, Ph.D., Speech Problems of Children (New York: Grune and Stratton, 1950), p. xix.

[3] C. Van Riper, Speech Correction, Principles and Methods (New York: Prentice-Hall, Inc., 1947), p.ii.

school population. One of the more intensive surveys of a city school system[4] showed over 10 per cent to have speech defects. At any rate, two or three million school persons are handicapped in speech, and they are receiving more attention than formerly.

Johnson[5] points out further,

> The ability to speak clearly and understandably is basic to living useful, happy lives in our society. Without this ability to communicate with our fellow man, we are restricted in countless ways. As the interdependence characteristic of our community and national life has grown, so the role of communication of ideas has increased in importance, highlighting the problem of defective speech throughout the nation.

Reading problems, too, have been recognized for some years. As early as 1936 Emmett Albert Betts, director of the Betts Reading Clinic at Haverford, Pennsylvania, and author of numerous works on reading problems wrote,

> Teachers everywhere are confronted with the problems of pupils who are retarded in reading. During the past ten years a tremendous and growing interest has been evidenced in this phase of education, which has been reflected in the large numbers of investigations reported. All teachers are concerned with the problem because reading difficulties retard general educational progress.[6]

---

[4] A. Mills and H. Streit, "Report of a Speech Survey, Holyoke, Massachusetts," Journal of Speech Disorders, Vol. VII (1942), p. 161 ff.

[5] Johnson, loc. cit.

[6] Emmett Albert Betts, The Prevention and Correction of Reading Difficulties (Evanston, Illinois: Row, Peterson and Co., 1936), p. vii.

The relationship between speech and reading problems is an area which has been recognized by some writers, but has not been thoroughly explored and described. Betts more recently wrote:

> Since speech and reading are facets of language, speech patterns contribute to or impede the development of reading ability. When the child mispronounces words (such as jist for just), he is piling up learnings that interfere with rather than facilitate his learning to read. When a pupil slurs over his words and runs them together, he is likely to have difficulty in making visual discrimination during reading.[7]

Agreeing with Betts and expanding his theories on this relationship, Marion Monroe, co-author and consultant for the Scott Foresman and Company, writes,

> Learning to read involves speech and language as well as vision and vis al perception. The child must be able to nderstand and use the speech symbols which are to be associated with the printed symbols. The factors which affect speech may therefore also affect reading.... Inaccurate articulation may directly affect reading by presenting a confusion in the sounds of words to be associated with the printed symbols. A child who has an articulatory defect hears the word as spoken by others in one way and as spoken by himself in another way. Either of the two memories may be aroused on presentation of a printed word.... The child may therefore develop confusions in reading in both mechanics and comprehension which would not have been present if his articulation were accurate.[8]

---

[7]Emmett Albert Betts, Foundations of Reading Instructions (Chicago: American Book Co., 1946), pp. 317-318.

[8]Marion Monroe, Children Who Cannot Read (Chicago: The University of Chicago Press, 1932), pp. 91-93.

The Department of Elementary School Principals of the National Educational Association has this to say concerning speech in the elementary school:

> A child who is handicapped in speech is also limited scholastically. Reading and spelling depend in part upon an ability to associate the written symbol with the correct oral symbol. The child who says "tat" for "cat" is confusing the sounds t and k, and is therefore confused in both reading and spelling any words containing these sounds.[9]

David H. Russell, Professor of Education, University of California, and author of numerous articles on reading aids, states: "Research indicates that speech difficulties are related to reading difficulties in both oral and silent reading."[10] He refers to the research of Clyde W. Dow and Stephen Papp[11] and of Gertrude H. Hildreth[12] particularly. The latter, Hildreth, is very frequently mentioned in books and articles on this subject. She wrote:

> The child's command of speech largely controls his initial success as well as his ultimate development in reading.... Oral

---

[9]National Education Association, The Role of Speech in the Elementary School (Washington D.C.: The Dept. of Elementary School Principals, 1946-1947), p.46.

[10]David H. Russell, Children Learn to Read (Chicago: Ginn and Company, 1949), p.90.

[11]Clyde W. Dow and Stephen Papp, "The Relation of Reading Ability and Language Ability to Speech Ability," Speech Monographs, Vol. X (1943), pp.107-108.

[12]Gertrude H. Hildreth, "Speech Defects and Reading Disability," Elementary School Journal, Vol. XLVI (Feb., 1946, pp. 326-332.

> reading requires the ability to pronounce words at the sight of the word symbols, and the ability to pronounce unfamiliar words calls for the ability to differentiate words into their sounds. Successful oral reading also requires smoothness in enunciation, proper inflection, and pleasing intonation and expression. In view of these facts it is obvious that factors which delay or interfere with speech are almost certain to interfere with oral reading.

Thus we see that a number of authorities in reading feel it is important to recognize that there is a relationship between reading problems and speech problems, but few, if any, have done anything conclusive about describing this relationship from research material. A number of articles are to be found, some being reports of research projects, in which the authors have considered certain factors in the relationship of speech development and reading problems, but their findings are not conclusive. Such a study was reported by E.A. Ryan[13] in "A Series of Units Correlating Remedial Reading and Speech in Nashua Jr. High School, Nashua, New Hampshire." In this study remedial reading and speech correction were administered as one program and taught by one teacher. No relationship was drawn between the nature and extent of the reading problem and that of the speech problem. Improvement in speech was measured only by the judgmental process rather than by an objective evaluation of any type and was in no way compared to reading improvement.

---

[13] E.A. Ryan, "A Series of Units Correlating Remedial Reading and Speech in Nashua Jr. High School, Nashua, N.H." (unpublished Master's thesis, Boston University, Boston, Mass., 1951)

In another study made by Moore[14] data was compiled from records of 236 speech cases on which reading and arithmetic scores were available. These pupils had been given the Iowa Silent Reading Test and Bruecker-Van Wagenen Arithmetic Test just prior to their entrance to high school. Their speech disorders existed at the time they took the reading tests. These cases were grouped into as few categories as possible: articulation problems--sound omission and substitution, lisping, oral inactivity and foreign dialect; voice quality--dysphonias, rhinolalias; special organic group: maxillo-facial, cleft palate nd chorea. By comp ring the reading median of the speech defective group with the medians of 4,564 freshmen taking the Iowa Silent Re ding Test during the past four years, he concluded that the speech defective group averaged the same in reading ability and a little above average in arithmetic ability as the school group. No information as to degree of speech difficulty was given.

In his article, "Some Common Factors In Reading And Speech Disabilities", George A. Kelly[15] considers stuttering, word blindness, breathing curves, breathing irregularities of reading disability cases, speech rhythm defects, relation of silent reading difficulty to cerebral dominance, and relation of transient sensory aphasia

---

[14]Charles E. A. Moore, "Reading and Arithmetic Abilities Associated with Speech Defects", Journal of Speech and Hearing Disorders, Vol. XII (1947), pp. 85-86.

[15]George A. Kelly, "Common Factors in Reading Speech Disabilities", Psychological Monographs (University of Iowa Studies in Psychology, edited by Christian A. Ruckmick and Lee Edward Travis, Vol. XLIII, Iowa City, Iowa, 1932), pp. 175-201.

to silent reading disabilities. No consideration of developmental order in speech and development of reading was given.

In still another article Chester C. Bennett[16] compared 50 pairs of children in grades two through four. The groups were equated as to sex, grades, and class grouping. The variable factor was that of reading ability. The one factor which stood out in the physical area as most clearly associated with reading retardation was a history of speech defects. Nine of the parents of poor readers had problems connected with speech. Thirteen of the children had such problems. Nineteen children had experienced either personal or parental contact with speech problems. In the control group no parents had speech problems. Six children had formerly stuttered, but did not at the time the study was made. This study did not classify the speech difficulties, did not compare the reading development and articulation development, and relied mainly on the memory and judgment of the parents in classifying the speech defectives.

A. Sterl Artley[17] says in his article, "A Study of Certain Factors Presumed to be Associated with Reading and Speech Difficulties", that "it would be presumed that some degree of relation-

---

[16]Chester C. Bennett, "An Inquiry Into the Genesis of Poor Reading," (Teachers College Contributions to Ed. No. 755, New York: Bureau of Publications, Teachers College, Columbia University, 1938)

[17]A. Sterl Artley, "A Study of Certain Factors Presumed to be Associated with Reading and Speech Difficulties," Journal of Speech and Hearing Disorders, Vol. XIII (1948), pp. 351-360.

ship should exist between difficulties in speech and difficulties in reading." He cites the opinions and investigations of several interested people, but gives no research or test data to confirm his statement.

Thus, we see that a number of writers agree that there is a relationship between speech problems and reading problems, but very little, if any, experimental work has been done which supplies evidence to that effect.

In an effort to add some information in this direction, the writer undertook to compare speech development and reading development in a group of articulatory defective children. The following hypothesis formed the basis for the investigation: There is a strong positive relationship between articulation development and reading development in grade school children with articulation defects.

CHAPTER II

PROCEDURE

Subjects.--Forty-five articulatory defective children in grades two through six in the Charleston (Illinois) elementary schools were used for the study. Both articulation and reading test scores were readily available. The writer, a speech correctionist in the school system, had worked with each of these children at some time during the previous two years and administered all the speech tests. Each child in the group, was receiving speech therapy at the time the tests were made. There were 23 boys and 22 girls, whose ages ranged from 7 years 5 months to 13 years 1 month.

Development of a Speech Score.--Both the Bryngelson and Glaspey Speech Test[18] and the Diagnostic Picture Tests by Stoddard[19] were used to determine the articulatory ability of each child for each of 25 sounds. These tests were chosen because they are comprised of pictures, can be used with younger as well as older pupils, and

---

[18]Bryng Bryngelson and E. Glaspey, Speech Improvement Cards (Chicago: Scott, Foresman and Co., 1941)

[19]Clara B. Stoddard, Sounds For Little Folks (Boston, Boston Expression Co., 1940)

prevent repetition of sounds. The tests were given as a routine part of the speech program in the school system. Ordinarily, a speech correctionist makes a record of speech errors and a subjective judgment of the severity of the child's articulation disorder. In this case, however, it was necessary for the writer to arrive at a speech evaluation having a numerical value for each sound in order to measure quantitatively the articulatory ability of each child.

Such an index has not been satisfactorily achieved by researchers in the field, though several attempts have been made. Mildred Templin[20] produced a refinement of the usual survey-type test but designed it to cut testing time. The result was a short form which could be used in non-diagnostic screening. She used percentage scores to check the reliability of her short form but no numerical weighting procedure was employed.

Margaret L. Anderson[21] designed a test which would "elicit spontaneous and natural speech from a child in a standardized situation". The sounds were listed in the rank in which they were most frequently missed, but, here again, no numerical weighting procedure was employed.

---

[20]Mildred Templin, "A Non-Diagnostic Articulation Test," Journal of Speech and Hearing Disorders, Vol. XII (1947), pp. 392-396.

[21]Margaret L. Anderson, "Standardization of Diagnostic Tests for Articulatory Cases" (unpublished Master's thesis, University of Iowa, Iowa City, Iowa, 1933)

Kenneth Scott Wood,[22] then Professor of Speech and Director of the Speech and Hearing Clinic, University of Oregon, used a method for the quantitative description of a person's ability to articulate consonant sounds correctly. An articulation index was developed "for the purpose of measuring the progress of corrective procedures and subjecting such measures to statistical treatment." The speech correctionist is trained to analyze speech in terms of consonant components as they appear in continuous speech. By counting the number of consonant phonemes a person produces correctly in a stream of speech, he can derive a rough numerical evaluation of his articulation ability. In counting, however, Wood felt that to produce sounds in isolation, in syllables alone, or in words alone, is not enough to indicate a person has an auditory concept of them or real mastery of them. He observed that the final test is whether or not those sounds are consistently produced correctly in the stream of spontaneous speech. Since the relative frequence of occurrence of consonant phonemes is known, Wood applied percentage values to each phoneme, thereby weighting each one according to its relative importance in the normal flow of speech. Numerical expressions of articulation ability was then subject to statistical treatment the same as any other quantitative data. Wood based his articulation index on the relative values which Travis[23]

---

[22]Kenneth Scott Wood, "Measurement of Progress in the Correction of Articulatory Speech Defects," Journal of Speech and Hearing Disorders, Vol. XIV (1949), pp. 171-174.

[23]Lee Edward Travis, Speech Pathology (New York: D. Appleton-Century, 1931), pp. 223.

gave to each consonant sound obtained when he studied the relative frequency of occurrence of consonant sounds in phonetically recorded speech of children. This index is the sum of the relative values of each consonant sound the person is able to produce correctly in continuous speech. The score is 100 if he can produce all of them. The relative values for each phoneme are prorated equally to the two or three positions in which the phoneme occurs. Most consonants occur in three positions: initially, medially, and finally in words. Six consonants (w, h, y, hw, ŋ, and ʒ) occur in only two positions.

A telling criticism of the Wood index was written by Ernest H. Henrikson[24]. His criticism was not concerned with the validity of using the frequency-of-occurrence index as a measure of progress. Neither did it deal with the problem of whether or not Travis' percentage frequency table was applicable to the group of children tested by Wood. He asked one question: Do sounds occur in children's speech in equal frequency for each position in which they occur? Henrikson felt that Wood assumed this was true, although he presented no evidence to justify the prorating which was crucial to his index. In his investigation Henrikson measured the speech of three individual children, aged 6, 7, and 12 years, one group of 12 third grade pupils whose mean age was 8 years, and one group of 14 eighth

---

[24]Ernest H. Henrikson, "An Analysis of Wood's Articulation Index," Journal of Speech and Hearing Disorders, Vol. XIII (1948), pp. 233-235.

grade pupils whose mean age was 13 years. The frequency of occurrence of each sound in each position was noted (observed frequency) and this was compared with the frequency expected (theoretical frequency) according to Wood's postulate that the total occurrence of the sound can be divided by the number of positions in which it occurs, usually three, in order to determine how often the sounds actually do occur in each position. "Comparison was made on the basis of the hypothesis of equal probability, using the Chi-square test."

Results indicated that most consonant sounds do not occur equally in all positions in a word. For only three sounds (k, t, and ʒ) can the difference observed be assumed to be caused solely by sampling fluctuations and these sounds make up only 5.33% of the total sample. In conclusion, Henrikson said that under the conditions and within the limitations of his study it seemed that (1) the rank order of frequency of occurrence of consonant sounds in children's speech presented by Travis corresponded approximately with the order of occurrence found in his study (2) prorating consonant sounds on the assumption that they occur equally or approximately equally in all positions in a word is not justified, (3) using such a prorating as the basis for constructing an index of progress is not justified, and the value of conclusions drawn from using such an index is correspondingly questionable.

In reply to Henrikson, Wood[25] submitted the results of another study which he had made. Again he based his index on Travis' frequency table. He pointed out the fact that [t] accounts for 12% of children's consonant sounds, for example, while [ʒ] accounts for only .06%. Therefore, he concluded, it is a mistake to give two sounds the same value. From this example he reasoned his prorating system to be reliable.

Gladys Reid[26] used an articulation index in studying the effect of speech training and of maturation on functional articulation defects in the elementary grades. She used "Simonson's scoring method" from an unpublished thesis, University of Wisconsin. This was based on West's[27] order of development. Each sound was numbered 1 to 23 depending on developmental order. If the sound appeared only twice, it was given the full three times subtractive value--otherwise three times the developmental order was portioned one-third to each position. The total possible score was 828.

---

[25]Kenneth Scott Wood, "Parental Maladjustment and Articulatory Defects in Children," Journal of Speech and Hearing Disorders, Vol. XI (1946), pp. 255-275.

[26]Gladys Reid, "The Efficacy of Speech Re-Education of Articulatory Defectives, Functional, in the Elementary School," Journal of Speech and Hearing Disorders, Vol. XX (1947), pp.301-313.

[27]Robert West, Lou Kennedy, and Anna Carr, The Rehabilitation of Speech (New York: Harper and Brothers, 1947), p.59.

After reviewing Reid's (Simonson's) method, the writer decided it was more to the point of this study than Wood's index, because it is tied to development rather than frequency. This does not imply that the Reid index is always a better index of severity, but for the writer's purpose it was.

It was then necessary to decide what developmental order to use. Several authorities differ somewhat. Irene Poole[28] made a study, over a period of three years, of the ability of 140 preschool children to articulate consonant sounds in words. The record of each child's efficiency in articulation was obtained at four-month intervals. She based her developmental order of the 23 consonant sounds she considered in this study on the fact "that different sounds are articulated correctly in normal children at rather well defined limits of chronological age." Her order of consonantal development is as follows: b, p, m, w, h, d, t, n, g, k, ŋ, j, f, v, ð, ʒ, ʃ, l, z, s, r, θ, and hw.

Two leading speech pathology textbooks were consulted. Van Riper[29] lists these 22 consonants in "developmental order": p, b, m, w, h, hw, t, d, n, k, g, ŋ, f, l, r, s, z, ʃ, ʒ, dʒ, and tʃ. West[30] also lists 22 consonants in what he considers developmental order. These are: m, b, p, w, h, n, t, d, k, g, ŋ, j, v, f, l, r, θ, ð, ʃ, ʒ, z, and s.

---

[28]Irene Poole, "Genetic Development of Articulation of Consonant Sounds in Speech," The Elementary English Review, Vol. XI (1934), pp.159-161.

[29]C. Van Riper, Speech Correction, Principles and Methods (New York: Prentice-Hall, Inc., 1947), p.96.

[30]West, loc. cit.

This writer combined the consonantal orders of Poole, Van Riper, and West, using 25 consonants in the following order: p, b, m, w, h, hw, t, d, n, k, g, ŋ, j, f, v, l, θ, ð, r, z, s, ʃ, ʒ, tʃ, and dʒ.

In cases where the consonants appeared at the same position in all three authoritative works there was no question of placement. If they appeared in a given position in two of the three works that was considered adequate. If a consonant appeared in three different positions, an "examination average" was struck. If there was major disagreement among the three authorities, the experimenter drew upon her own experience as the deciding factor.

See Table I, Page 17 for the comparison among the developmental orders of the authorities and that used in the study.

In order to measure the articulatory ability of the pupils, the writer was obliged to give a numerical value to each of the consonant sounds. In agreement with Wood,[31] the writer felt that all sounds should not be given equal value. Also agreeing with Poole[32], who reports that "slightly more than 64% of the sounds that appear most often in the words of children's conversation are articulated correctly by them before the age of 4½ years," the writer felt that a lower value should be given to those sounds which develop early while a progressively higher value should be given to the

---

[31]Wood, loc. cit.

[32]Poole, loc. cit.

TABLE 1

THE CONSONANT DEVELOPMENTAL ORDERS OF POOLE, VAN RIPER, WEST, AND THAT USED BY THE WRITER IN THIS STUDY.

Poole	Van Riper	West	Hallock
b	p	m	p
p	b	b	b
m	m	p	m
w	w	w	w
h	h	h	h
d	hw	n	hw
t	t	t	t
n	d	d	d
g	n	k	n
k	k	g	k
ŋ	g	ŋ	g
j	ŋ	j	ŋ
f	f	v	j
v	v	f	f
ð	l	l	v
θ	r	r	l
ʃ	s	θ	θ
l	z	ð	ð
z	ʃ	ʃ	r
s	ʒ	ʒ	z
r	dʒ	z	s
hw	tʃ	s	ʃ
			ʒ
			tʃ
			dʒ

more difficult sounds which develop later. A speech index was used similar to that of Reid[33], who used a graduated scale based on the developmental order of sounds rather than on frequency of occurrence as did Wood. The 25 sounds were arranged in the developmental order decided upon with the sounds which develop earliest having the greatest subtractive value from the total speech score. Each position of the sound was given equal value. The total speech score amounted to 325. (See Table II, Page 19)

For the Speech articulation development score for each subject see Appendix A.

Reading Test Scores.--The subjects were given the California Achievement Tests[34] as a routine part of the school testing program. These tests, given the middle of April, were followed within one week by the articulation tests from which the speech scores for this study were derived.

The California Achievement Tests, new editions of the diagnostic-survey instruments formerly called the Progressive Achievement Tests, are published both as an Elementary Battery and separately as the California Reading Test, the California Arithmetic Test, and the California Language Test. They are instruments for "accurately and objectively" measuring pupil achievement in these skills.

---

[33]Reid, loc. cit.

[34]Ernest W. Tiegs and Willis W. Clark, California Achievement Tests, Complete Battery (Los Angeles: California Test Bureau, 1951)

TABLE 2

THE NUMERICAL VALUE GIVEN TO EACH CONSONANT IN EACH POSITION IN WHICH THAT CONSONANT OCCURS IN SPEECH AS USED TO DETERMINE THE ARTICULATION DEVELOPMENT SCORE.

Consonant	Total value of each consonant	Value of each position
p	25	8.3
b	24	8.
m	23	7.6
w (initial and medial only)	22	11.
h (initial and medial only)	21	10.5
hw (initial and medial only)	20	10.
t	19	6.3
d	18	6.
n	17	5.6
k	16	5.3
g	15	5.
ŋ (medial and final only)	14	7.
j (initial and medial only)	13	6.5
f	12	4.
v	11	3.6
l	10	3.3
θ	9	3.
ð	8	2.6
r	7	2.3
z	6	2.
s	5	1.6
ʃ	4	1.3
ʒ	3	1.5
tʃ	2	.6
dʒ	1	.3
TOTAL	325	325.

These tests are standardized, and each item has been selected for its "diagnostic value in measuring achievement in eighty-nine essential elements of reading, arithmetic and language skills sampled in the sub-test sections."[35] Both grade placements and percentile ranks of pupils in relation to the general school population are revealed by these scores.

> Standardization of these Batteries has been based on more than 50,000 cases at each level. Basic information for the age-grade norms has come from approximately one-half million pupils in many of the school districts in twenty different states. The relationships shown in the age-grade norms are real, not hypothetical.[36]

The answers may be written in the test booklet itself, on an answer sheet which can be machine scored, or on a Scoreze answer sheet, one-half of which can be machine scored; the other half is self-scoring and diagnostic for the benefit of the classroom teacher.

> The coefficients of reliability for reading, arithmetic, and language for each form of the California Achievement Tests, Elementary Battery and for the Total Test (Complete Battery) are reported. They have been determined by averaging the inter-correlations of the different forms of the subject tests and for the Complete Battery for a single grade range.[37]

This particular example is for Grade 5, but is typical of that for other grades. The reading coefficients and the standard errors of

---

[35]Ibid., p.2.

[36]Ibid., p.2.

[37]Ibid., p.5.

measurement expressed in terms of grade placement are as follows:

Test	Reliability	S.E. Meas.
Reading Vocabulary	.88	0.50
Reading Comprehension	.93	0.39
Total Reading	.93	0.39

> All forms of the California Achievement Tests, Elementary Battery, possess a high degree of validity. Scores made on these tests show accurately the degree to which the pupil has mastered the fundamental skills measured by the tests.[38]

The items included in these tests have been developed over a period of years and through four editions. A large number of items were tried out in widely separated geographic areas of the United States. Those items which proved their value were selected.

These tests, used throughout the Charleston school system were administered by the classroom teachers. The entire Elementary Battery was given, but only the Reading Tests were considered in this study. They consist of two tests, Reading Vocabulary and Reading Comprehension. The former consists of four sections: Word Form, in which "pupils are tested on their ability to recognize similarities and differences in word forms of these different varieties;" Word Recognition, in which the pupil identifies those words which are pronounced to him; Meaning of Opposites, which the pupil identifies by matching them with words of opposite meaning; Meaning of Similarities, in which the pupil identifies by matching them with words of similar meaning. The Reading Comprehension Test consists of the three follow-

---

[38]Ibid., p.5.

ing tests: Following Directions, which requires the following of specific directions in the ten reading situations given; Reference Skills which test "the extent to which the pupil is familiar with the vocabulary and skills needed for reference work and library research"; Interpretation of Meanings, which provides for the "pupil's ability to comprehend directly stated facts, to select best titles, to make inferences and deductions, and to understand an author's organization of topics." Reading Vocabulary, Reading Comprehension, and Total Reading scores were recorded for each subject.

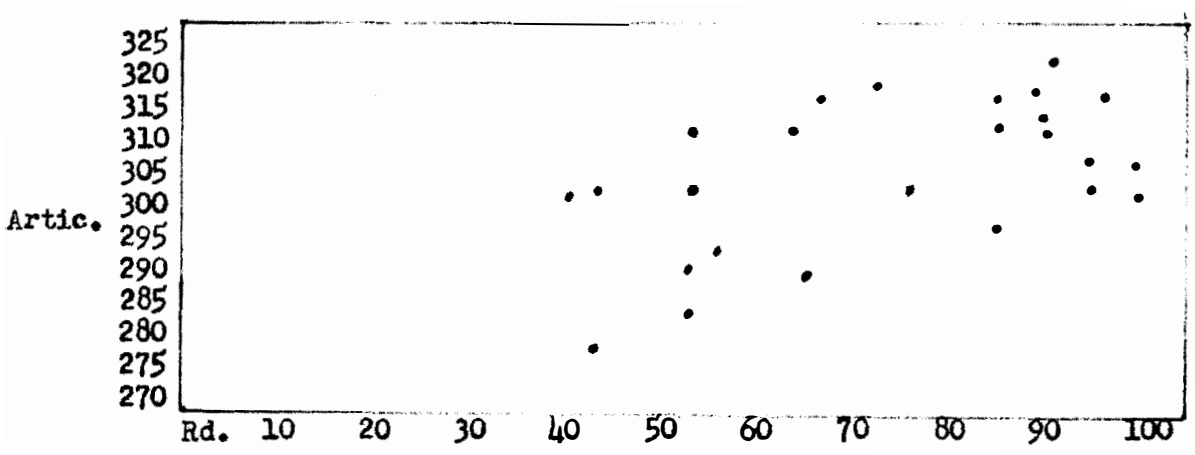
Scattergrams.--The scatter diagram (scattergram) was used to present in graphic form the degree and type of relationship between the articulation scores and reading scores. The x, or horizontal axis, represents the reading score, with the highest score being at the right. The y, or vertical axis, represents the speech score, with the highest score being at the top. Each entry that is recorded by a dot in the proper position represents two numerical values, one (reading) measured on the x axis and the other (speech) measured on the y axis for one student.

See Fig. I, Fig. II and Fig. III, Pages 23, 24, and 25, for Scattergrams representing correlations between the articulation scores and reading percentile scores.

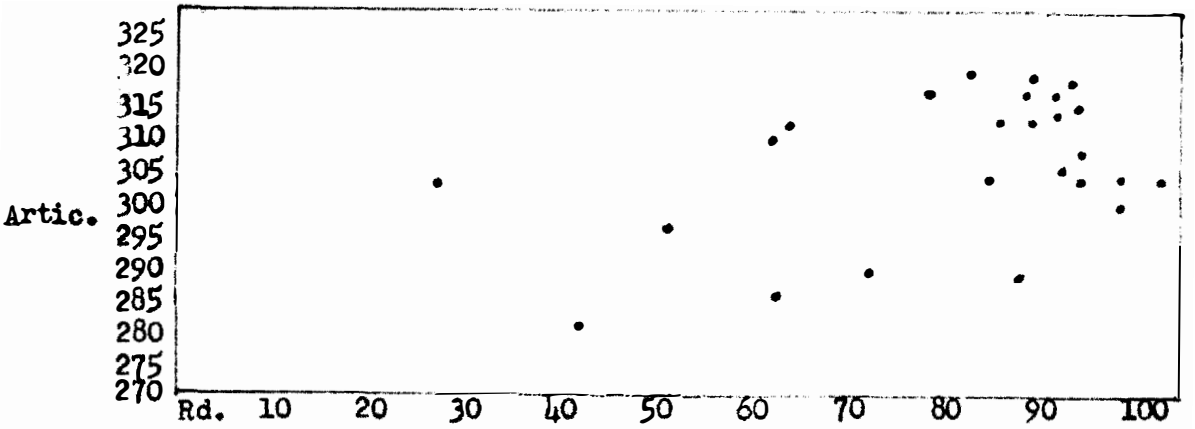
Statistical Procedure.--Pearson's product-moment correlations were calculated after the Guilford[39] method. Reading test scores (total,

---

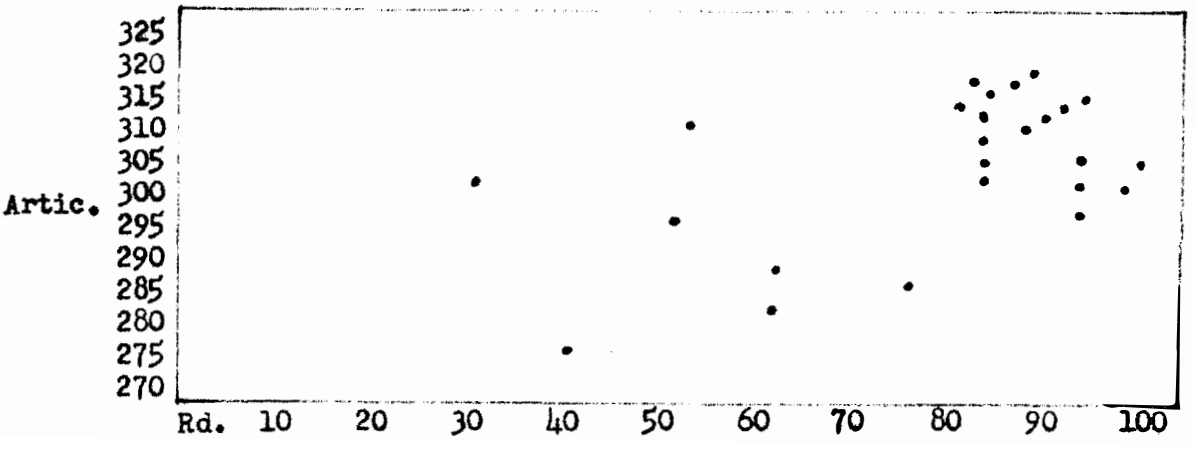
[39]J.P. Guilford, Psychometric Methods, (New York: McGraw-Hill Book Co., Inc.) 1936.



(a)

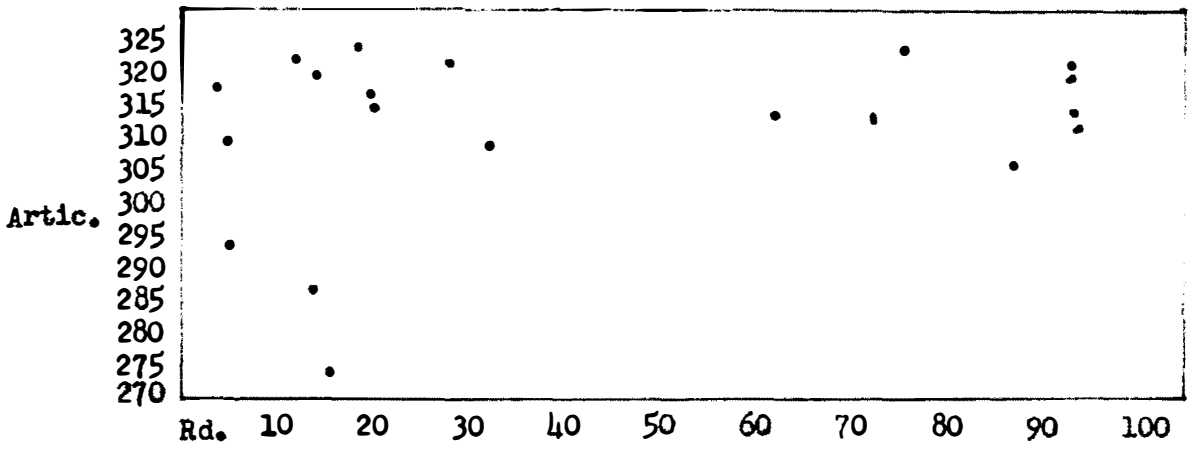


(b)

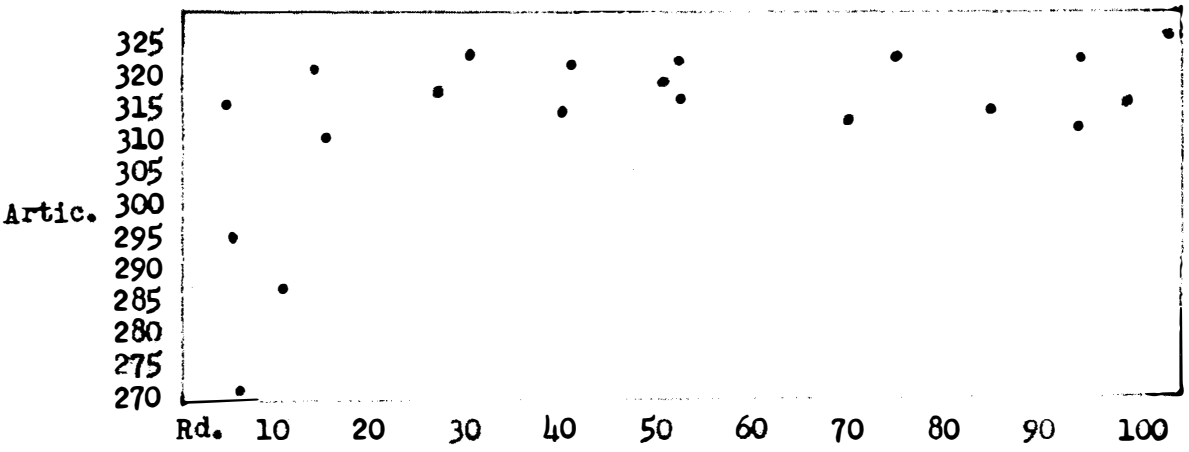


(c)

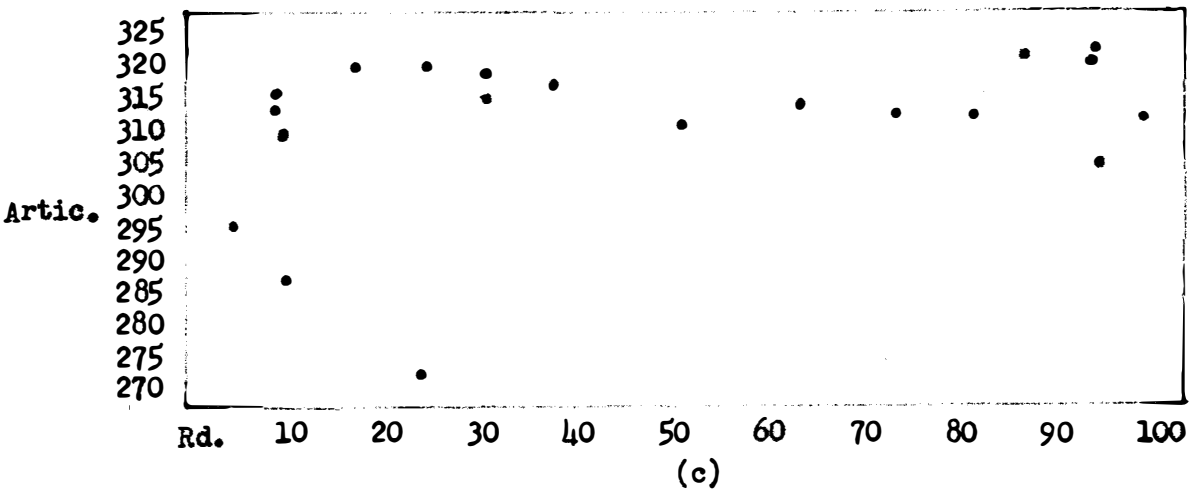
Fig.1.--Scattergrams representing correlations between the articulation scores and reading percentile scores for (a) vocabulary (b) comprehension and (c) the total reading test for 25 subjects in grade 2.



(a)

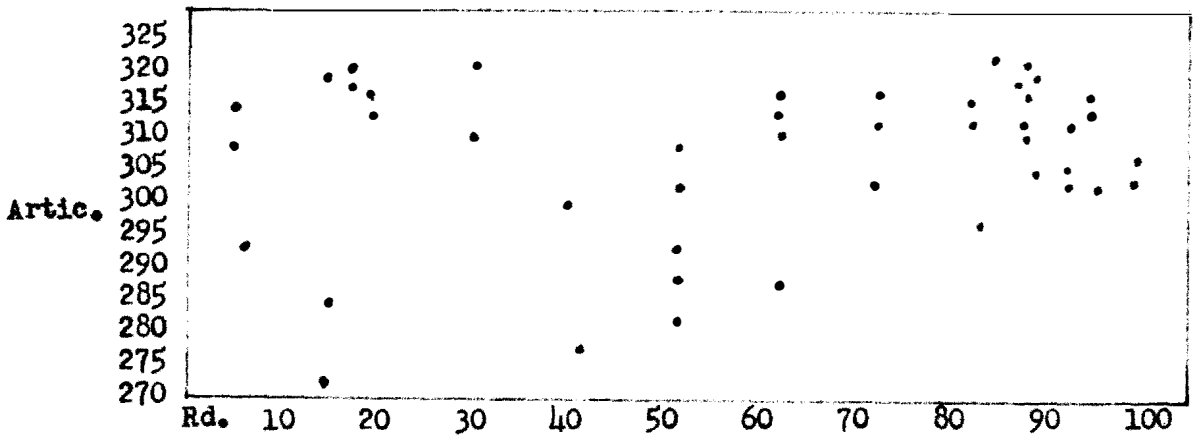


(b)

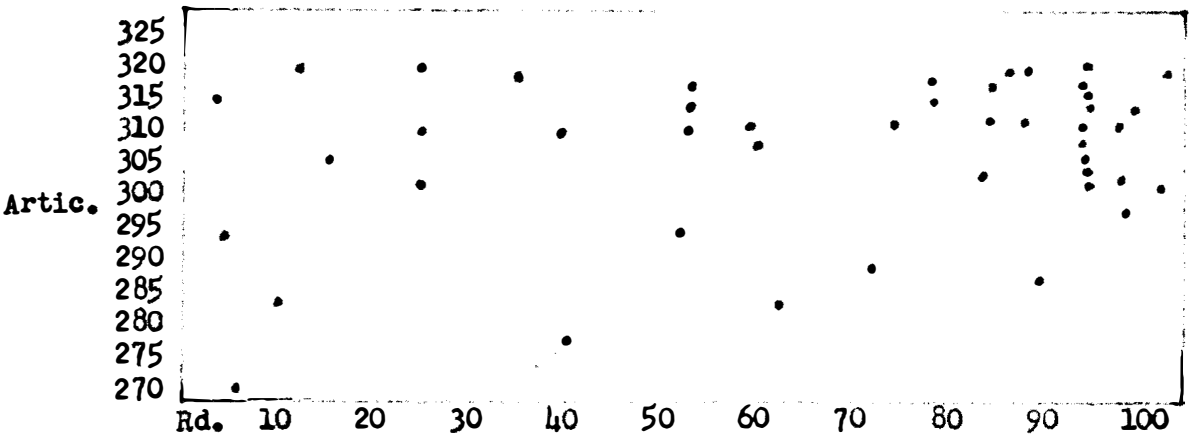


(c)

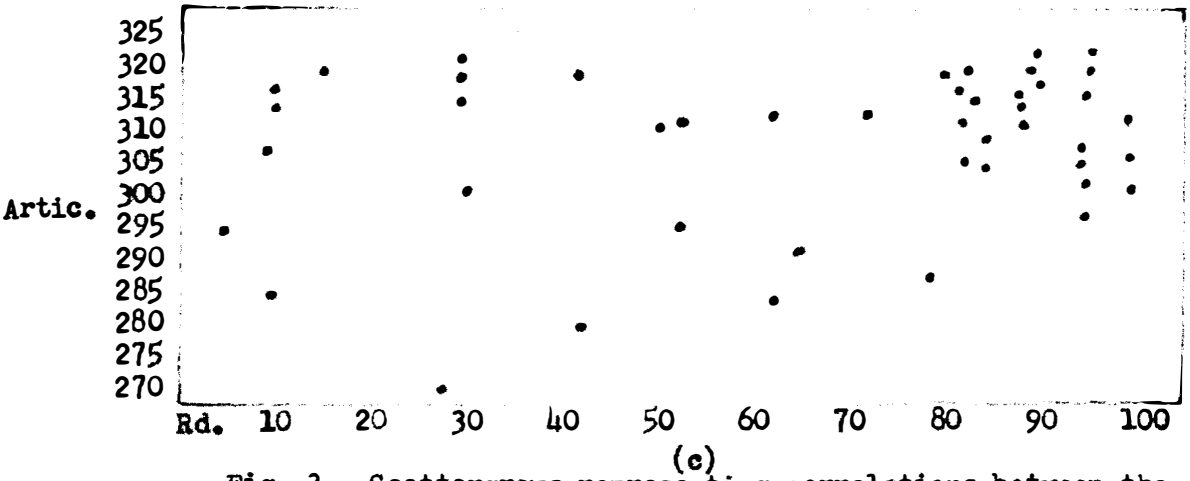
Fig. 2.--Scattergrams representing correlations between the articulation scores and reading percentile scores for (a) vocabulary (b) comprehension and (c) the total reading test for 20 subjects in grades 3 through 6.



(a)



(b)



(c)

Fig. 3.--Scattergrams representing correlations between the articulation scores and reading percentile scores for (a) vocabulary (b) comprehension and (c) the total reading test for 45 subjects in grades 2 through 6.

comprehension, and vocabulary) were correlated with articulation scores for the total group, grade 2, and grades 3 through 6 as a group. According to the recommendations of Guilford the Fisher test[40] of significance was applied to each r. The results are given in Table III, Page 27.

---

[40] Ibid., p.335.

TABLE 3

RESULTS OF PEARSON PRODUCT-MOMENT CORRELATIONS
AND FISHER SIGNIFICANCE TESTS

Pearson r between the Articulation Scores and:	r	Fisher Significant Levels 1%	5%
		.505	.396
Vocabulary Percentiles-Grade 2	.54	(Sig. at 1% l.c.)	
Comprehension Percentiles-Grade 2	.44	(Sig. at 5% l.c.)	
Total Reading Percentiles-Grade 2	.52	(Sig. at 1% l.c.)	
		.551	.444
Vocabulary Percentiles-Grades 3-6	.31		
Comprehension Percentiles-Grades 3-6	.46	(Sig. at 5% l.c.)	
Total Reading Percentiles-Grades 3-6	.33		
		.393	.304
Vocabulary Percentiles-Grades 2-6	.23		
Comprehension Percentiles-Grades 2-6	.27		
Total Reading Percentiles-Grades 2-6	.22		

CHAPTER III

RESULTS

Four Pearson product-moment correlations coefficients of the nine that were computed were found to be significant. Those for the articulation scores--vocabulary percentiles and articulation scores--total reading percentiles of the second graders were both significant at the 1% level of confidence. That for the articulation scores--comprehension percentiles for the second graders was significant at the 5% level of confidence. We can, then, be reasonably sure that the relationships indicated by these coeficients are representative of the "true" relationships existing in the total population.

In the grades -3- through -6 group only the articulation scores--comprehension percentiles coefficient was significant--at the 5% level of confidence. We cannot be certain that the other two statistics for this group are representative of the "true" relationship. Correlations of these sizes could have arisen by accident from random sampling of a totally uncorrelated population. Perhaps the fact that a smaller number of cases contributed to the two nonsignificant r's has a bearing on that fact.

The coefficients for the articulation scores and the three reading percentiles for the entire group, grades two through six,

were not high enough to be significant. We cannot assume that they represent the "true" relationships in the total population. Correlations of these sizes could have arisen by accident in random sampling from a totally uncorrelated population.

The positive, significant correlation indicated between the articulation scores and the three reading percentiles in the second grade group confirm the statements of authoratative writers that there is a positive correlation between delayed articulation development and reading disability.

Perhaps the low correlations shown in the grades -3- through -6 group may be explained in part by the width of sampling. In addition, those students had worked with speech correctionists for two to four years (in some cases). The degree of articulation retardation certainly would not be as high as if such corrective work had not been carried out. Remedial reading work, other than that normally done by the classroom teachers, had in no case been performed. It might reasonably be expected that variations in extent of speech improvement among these students would distort the correlations with reading disability.

The low correlations found in the total group might reasonably reflect the results of speech retraining as just discussed. The influence of the third--through--sixth grade group apparently negated the positive correlations shown by the second grade group alone.

CHAPTER IV

SUMMARY AND CONCLUSIONS

Summary.--Speech disorders and reading disorders are widely recognized and in many cases dealt with in public schools in the United States. Authorities agree the two disabilities are related but research evidence is scarce. This study examined the relationship between articulation defects and reading test results in a group of grade school children.

The Pearson correlation coefficient was calculated between an articulation development score and reading vocabulary, comprehension and total reading percentiles for a group of 45 children with articulation defects in grades -2- through -6. According to the Fisher test none of these correlations was significant.

The same statistic was calculated for the 25 second graders of the population. One correlation was significant at the 1% level of confidence (total reading percentiles) and two at the 5% level of confidence (vocabulary and comprehension percentiles).

The same statistic was calculated for the 20 pupils in grades 3-6 of the population. One correlation was significant at the 5% level of confidence (comprehension percentiles).

Limitations of the Study.--The writer recognizes certain limitations of this study. The articulation test procedure and score probably

have weaknesses. There is no real agreement in the field that the picture method is the best way to administer an articulation test. Nor is there agreement that developmental order is the proper basis on which to evaluate speech progress or to ascertain a speech score. However, these methods seemed to be most appropriate to this study.

The writer recognizes that in achieving an articulation score weighting the three positions (initial, medial, and final) equally may not be entirely defensible. It is the most reasonable method now available.

Also, the group was small, but all available pupils in this grade range with articulation defects were included except those having certain related defects, such as hearing losses, cleft palates, and those who stuttered.

There were also weaknesses of the reading test procedures. They were administered and scored by the individual classroom teachers and we can only assume that prescribed testing procedures were observed. In some cases the test booklets had been destroyed and only the total scores were available. Therefore, the vocabulary and comprehension scores could not be broken down into their respective parts. Such a break-down may have shed considerable light on the outcome of the correlations.

Conclusions.--Within the limitations above recognized one might

conclude:

(1) That the correlation between articulation development and reading abilities in these twenty-five second grade children is positive and moderately high.

(2) That the correlation between articulation development and reading comprehension in this group of 20 third-through-sixth graders is positive.

(3) That the correlation between articulation development and reading vocabulary and between articulation development and a total reading test result in this group of 20 third-through-sixth graders is not significantly positive.

(4) That the correlation between articulation development and reading vocabulary, reading comprehension and a total reading test result for the entire group of 45 second-through-sixth graders are not significantly positive.

(5) That the results of this study support only in part the original hypothesis, that there is a strong positive relationship between articulation development and reading development.

APPENDIX A

ALL THE DATA, ARTICULATION SCORES AND READING SCORES, FOR ALL THE SUBJECTS USED IN THE STUDY.

Pupil	Grade	Speech Score	Reading Vocabulary Score	Reading Comprehension Score	Total Reading Score
A	2	310.5	85	85	85
B	2	312.4	60	90	80
C	2	316.7	60	90	80
D	2	300.8	95	99	95
E	2	314.	80	75	80
F	2	289.	50	70	60
G	2	318.1	85	85	85
H	2	293.3	50	50	50
I	2	302.4	50	90	80
J	2	282.8	50	60	60
K	2	309.	90	60	80
L	2	306.2	95	90	90
M	2	303.8	70	80	80
N	2	303.8	90	95	95
O	2	300.9	40	25	30
P	2	309.	50	60	50
Q	2	318.	70	85	80
R	2	276.3	40	40	40
S	2	296.7	80	95	90
T	2	286.8	60	85	75
U	2	301.2	90	90	90
V	2	311.8	80	90	85
W	2	314.	90	90	90
X	2	318.	85	80	85
Y	2	312.4	85	85	85

APPENDIX A

Pupil	Grade	Speech Score	Reading Vocabulary Score	Reading Comprehension Score	Total Reading Score
AA	3	318.	90	90	90
BB	3	311.8	90	95	95
CC	3	310.8	70	80	80
DD	3	304.7	85	90	90
EE	5	314.	20	50	30
FF	5	307.	5	15	10
GG	4	310.	60	50	60
HH	4	318.	90	75	85
II	4	320.4	85	99	90
JJ	4	318.	20	50	30
KK	4	314.7	5	25	10
LL	4	270.8	15	5	25
MM	4	318.	30	40	40
NN	4	319.7	15	30	25
OO	6	312.8	20	5	10
PP	6	318.	15	15	15
QQ	6	284.7	15	10	10
RR	6	310.7	90	40	70
SS	6	292.2	5	5	5
TT	6	309.4	30	70	50

BIBLIOGRAPHY

Books

Betts, Emmett Albert. Foundations of Reading Instruction. Chicago: American Book Co., 1946.

_____. The Prevention and Correction of Reading Difficulties. Evanston, Illinois: Row, Peterson and Company, 1936.

Guilford, J.P. Psychometric Methods. New York: McGraw-Hill Book Co., Inc., 1936.

Johnson, Wendell. Speech Problems of Children. New York: Grune and Stratton, 1950.

Monroe, Marion. Children Who Cannot Read. Chicago: The University of Chicago Press, 1932.

Russell, David H. Children Learn To Read. Chicago: Ginn and Co., 1949.

Travis, Lee Edward. Speech Pathology. New York: D. Appleton-Century, 1931.

Van Riper, C. Speech Correction, Principles and Methods. New York: Prentice-Hall, Inc., 1947.

West, Robert, Kennedy, Lou, and Carr, Anna. The Rehabilitation of Speech. New York: Harper and Brothers, 1947.

Periodicals

Artley, A. Sterl. "A Study of Certain Factors Presumed to be Associated with Reading and Speech Difficulties." Journal of Speech and Hearing Disorders, Vol. XIII, 1948.

Dow, Clyde W. and Papp, Stephen, "The Relation of Reading Ability and Language Ability to Speech Ability." Speech Monographs, Vol. X, 1943.

Henrikson, Ernest H. "An Analysis of Wood's Articulation Index." Journal of Speech and Hearing Disorders, Vol. XIII, 1948.

Hildreth, Gertrude H. "Speech Defects and Reading Disability," Elementary School Journal, Vol. XLVI, Feb., 1946.

Kelly, George A. "Common Factors in Reading Speech Difficulties." Psychological Monographs, University of Iowa Studies in Psychology, edited by Christian A. Ruckmick and Lee Edward Travis, Vol. XLIII, Iowa City, Iowa, 1932.

Mills, A. and Streit, H. "Report of a Speech Survey, Holyoke, Massachusetts." Journal of Speech Disorders, Vol. VII, 1942.

Moore, Charles E. A. "Reading and Arithmetic Abilities Associated with Speech Defects." Journal of Speech and Hearing Disorders, Vol. XII, 1947.

Poole, Irene. "Genetic Development of Articulation of Consona t Sounds in Speech." The Elementary English Review, Vol. XI, 1934.

Reid, Gladys. "The Efficacy of Speech Re-education of Articulatory Defectives, Functional, in the Elementary School." Journal of Speech and Hearing Disorders, Vol. XX, 1947.

Templin, Mildren. "A Non-Diagnostic Articulation Test." Journal of Speech and Hearing Disorders, Vol. XII, 1947.

Wood, Kenneth Scott. "Measurement of Progress in the Correction of Articulatory Speech Defects." Journal of Speech and Hearing Disorders, Vol. XIV, 1949.

Wood, Kenneth Scott. "Parental Maladjustment and Articulatory Defects in Children." Journal of Speech and Hearing Disorders, Vol. XI, 1946.

Other Sources

Anderson, Margaret L. "Standardization of Diagnostic Tests for Articulatory Cases." Unpublished Master's thesis, University of Iowa, Iowa City, Iowa, 1933.

Bennett, Chester C. "An Inquiry Into the Genesis of Poor Reading." Teachers College Contributions to Ed. No. 755, New York: Bureau of Publications, Teachers College, Columbia University, 1938.

Bryngelson, Bryng and Glaspey E. Speech Improvement Cards. Chicago: Scott, Foresman and Co., 1941.

Ryan, E.A. "A Series of Units Correlating Remedial Reading and Speech in Nashua Jr. High School, Nashua, N.H., unpublished Master's thesis, Boston University, Boston, Mass., 1951.

Stoddard, Clara B. Sounds for Little Folks. Boston: Boston Expression Co., 1940.

Tiegs, Ernest W. and Clark, Willis W. California Achievement Tests, Complete Battery, Los Angeles: California Test Bureau, 1951.