DOCUMENT RESUME

ED 062 097 RE 004 097

AUTHOR Rubin, Rosalyn; And Others
TITLE The Relationship of Speech Articulation to Reading and Related Language Skills: A Review. Interim Report 12.
INSTITUTION Minnesota Univ., Minneapolis. Dept. of Special Education.
SPONS AGENCY Office of Education (DHEW), Washington, D.C. Bureau of Research.
BUREAU NO BR-6-1176
PUB DATE Feb 72
GRANT OEG-32-33-0402-6021
NOTE 27p.

EDRS PRICE MF-$0.65 HC-$3.29
DESCRIPTORS *Articulation (Speech); *Language Development; Oral Reading; Reading Ability; *Reading Development; Reading Readiness; *Reading Research; Retarded Readers; Retarded Speech Development; Silent Reading

ABSTRACT

An extensive review of the literature on the relationship of speech articulation to reading and other language skills has revealed few studies in which relevant variables were clearly defined and carefully controlled. Results of past investigations fail to provide conclusive data due to the lack of consistency in defining disability groups, lack of adequate control groups in studies of intervention techniques, and lack of comparability among measures of educational outcomes (for example oral vs. silent reading tests) used in different studies. Evidence has been found of a small but definite relationship between articulation and other language skills: reading, vocabulary, and other lexical and grammatical errors. Relationships are stronger when oral tests are used to measure the language function (oral reading, reading readiness). Relationships also tend to be stronger when younger children are used as subjects, partly because oral tests must be used when dealing with very young children. There is a great deal of overlap in reading achievement between groups of children with articulation difficulty and those with normal speech. Further research is recommended. References are included. (AL)

INTERIM REPORT #12

Project No. 6-1176

Grant No. OEG-32-33-0402-6021

THE RELATIONSHIP OF SPEECH ARTICULATION TO READING AND RELATED LANGUAGE SKILLS: A REVIEW

February, 1972

U.S. DEPARTMENT OF

HEALTH, EDUCATION, AND WELFARE

Office of Education

Bureau of Research

Interim Report #12

Project No. 6-1176

Grant No. OEG-32-33-0402-6021

The Relationship Of Speech Articulation To Reading and Related Language Skills: A Review

Rosalyn Rubin, Orcena Lyle, Bruce Balow

Department of Special Education
University of Minnesota
Minneapolis, Minnesota

February, 1972

The Research reported herein was performed pursuant to a grant from the Office of Education, U.S. Department of Health, Education, and Welfare. Contractors undertaking such projects under Government sponsorship are encouraged to express freely their professional judgment in the conduct of this project. Points of view or opinions stated do not, therefore, necessarily represent official Office of Education position or policy.

U.S. DEPARTMENT OF

HEALTH, EDUCATION, AND WELFARE

Office of Education
Bureau of Research

TABLE OF CONTENTS

The Relationship Of Speech Articulation

To Reading and Related Language Skills: A Review

THE RELATIONSHIP OF SPEECH ARTICULATION TO READING AND RELATED LANGUAGE SKILLS: A REVIEW

I. INTRODUCTION

The assumption of a background of neurological dysfunction is implicit in attempts to relate articulatory and reading disabilities. Due to the diffuse effects of most neurological dysfunction (Brain, 1965), neurological deficit would be expected to exert a generalized inhibitory effect upon various aspects of language development.

However, it is necessary to establish the parameters of the reading-speech disability relationship prior to seeking to identify common neurological bases for these disorders. The following studies represent efforts to delineate the relationships between articulation and visual language skills such as reading and spelling.

II. READING AND SPEECH ARTICULATION

Previous reviews of empirical investigations concerned with the relationships between defective speech articulation and retarded reading have neglected to differentiate among studies involving different reading skills and levels. Thirty years ago Gaines (1941) criticized investigators for their failure to specify the types of reading involved in their studies, but many subsequent researchers and reviewers have not heeded such advice. For example, in one of the more recent surveys of research in this area, Winitz (1969) arranged all articulation/reading investigations in chronological order by date of publication rather than classifying studies

according to the substantive reading areas to which they addressed themselves (e.g., reading readiness, silent reading, and oral reading).

Since available evidence indicates that the relationship between articulation and reading is in part a function of the specific aspect of reading under investigation, we have found it appropriate in the present review to summarize research findings under the topical headings of (a) reading readiness, (b) silent reading, and (c) oral reading.

A. Reading Readiness

Several investigations have found problems of speech articulation to be related to low scores on measures of reading readiness. FitzSimons (1958) compared 70 beginning first graders who showed "diffuse nonorganic articulation problems" with 70 normal-speaking first graders matched for CA, IQ, sex, and school locale. A significantly greater proportion of the articulatory defective children were (1) "below average" on the MRT, (2) earned "unsatisfactory grade equivalent scores" on the Metropolitan Achievement Tests administered at the end of grade one, and (3) received "unsatisfactory" report card grades in reading.

Weaver et al (1960) reported a relationship between articulation and reading readiness in first grade children who were divided into experimental (N = 475) and control (N = 163) groups on the basis of a directed and spontaneous speech articulation test administered at the beginning of the school year. Significantly more subjects with articulation errors scored below the median for the total N on the Gates Reading Readiness Test than did the subjects without articulation errors. The correlation between articulation errors and reading scores

was -.20. Although mean scores on the Gates tended to decrease as articulatory errors increased, the authors pointed out that the relationship was not strong, since the two measures had only 4% common variance. They nevertheless hypothesized that the skills and capacities measured by the Gates were related to the early acquisition of adequate speech.

Winitz (1969) reexamined Weaver's data (1960) and found indications of a curvilinear relationship between the measures of articulation and reading readiness. While subjects with few or no articulation errors tended to have higher readiness scores than subjects with many articulation errors, the relationship between articulation errors and readiness scores was near zero for those in the middle of the range of articulation errors.

B. Silent Reading

Despite the positive relationships reported between articulation and measures of reading readiness, results of a number of research studies indicate that such relationships do not carry over into the area of silent reading.

Articulatory defective children were found to be equal to normal-speaking children in three silent reading studies (Hall, 1938; Everhart, 1953; and Moore, 1947) which remain among the most frequently cited in the literature.

A well-designed early investigation (Hall, 1938) found no difference in reading achievement between 21 speech defective children aged 7 - 13 and 64 normal-speaking children matched on sex, CA, and IQ (each speech defective child was paired with 2 - 5 control group children.) The Detroit Articulation Tests were used to identify speech

defects while reading achievement was measured by a test appropriate to the child's grade level (Gates Primary Reading Test for grade 2, Gates Silent Reading Test for grades 3 - 5, and Iowa Silent Reading Test for grade 6). No consistent or significant differences were found between the means of the speech defective and normal groups on any of the silent reading measures.

Everhart (1953) reported some tendency for elementary school boys with normal speech articulation to obtain higher scores on the Gates Silent Reading Test than those with articulation difficulties, although differences fell short of statistical significance. One hundred and ten subjects with one or more deviations of consonant sounds were matched on sex, grade and race with an equal number of children with normal articulation. It was concluded that "If larger sample sizes had been available, a significant relationship might have been observed between reading and occurrence of inferior articulation....." (p. 336). However, it could be argued just as convincingly that a relationship must be very weak or nonexistent, if it cannot be demonstrated between two groups of over 100 subjects each.

It should be noted that Winitz, in a review of articulation and reading, mistakenly stated that Everhart had found that normal-speaking children performed significantly better on measures of silent reading than did articulatory defective children (1969, p. 210).

Moore (1947) found that 123 children with articulation problems who were about to enter high school averaged the same in reading ability as did normals. On the Iowa Silent Reading Test the mean

grade equivalent score of articulatory-problem subjects was 9.6 which was virtually identical to the 9.4 average for the previous four classes entering the same high school. However, in this study results were obscured by the presence of subjects with "oral inactivity" and "foreign dialect."

Kelly (1932) conducted a study of the relationship between speech and reading disability at the adult level. Defective speakers were 101 college freshmen who fell in the lowest decile on a rating made of the speech of entering college freshmen. The silent defective speaker group fell very nearly at the median for all entering freshmen, leading the author to conclude that there was no relationship between the two variables.

Using college students as subjects undoubtedly biased the results to an unknown degree since young people with reading problems (with or without speech problems) would not be as likely to become college students as would young people without reading problems.

C. Silent and Oral Reading

A relationship was found between articulation and oral reading in two investigations which failed to show an association between articulation and silent reading (Bond, 1935; Yedinak, 1949).

Bond (1935) started with groups of good and poor readers rather than with groups of normal and defective speakers. Sixty-four poor readers at the second and third grade were paired with 64 good readers on IQ, CA, years in school, reading grade and school grade. Poor readers were defined as second graders who were half a year or more below grade level and third graders who were a year or more below grade

level. Speech defects were diagnosed by a naming test and included stuttering as well as lisping, baby talk, nasality, etc., so that speech articulation (as such) was not the sole factor under consideration. Reading skills were measured by the Gates Tests of Silent Reading and of Oral Context.

No speech defects were seen in children who were poor silent readers but non-retarded oral readers. However, speech defects were seen in 35% of the children who were good silent readers while retarded in oral reading. However, the total group of good silent/poor oral readers was so small (14 - 15 cases) that it rendered the finding inconclusive.

There was essentially no difference between poor and good readers in incidence of speech defects, which were seen in 22% of poor readers and 26% of good readers.

Yedinak (1949) concluded that children with functional articulatory defects are significantly inferior in both oral and silent reading ability although she did not provide evidence which supported the claim of inferiority in silent reading. Second grade subjects with IQ's of 76 or above were chosen for the following groups: (1) The Articulation-disability group was made up of 71 children with functional defects identified by the McCarthy Articulation Test. (2) The Reading-disability group was comprised of 67 children who were retarded one school year or more in reading, as measured by the Gray's Standardized Oral Reading Paragraph Test. (3) The Double Handicapped group was made up of 27 children who were defective in both articulation and reading, as judged by the above criteria. (4) The control group was made up of 74 children who had no articulation errors and who were average

readers.

An analysis of covariance with IQ resulted in a "highly significant" difference in oral reading between the articulation-disability group and the control group in favor of the latter. There was no significant difference between the control group and the articulation disability group on a measure of silent reading.

Yedinak concluded that the articulation-disabled subjects were significantly inferior in silent reading for the following reasons: Both the control group and the articulation-disability group were restricted to children whose oral reading was equivalent to at least grade 2.1. If this restriction had not been made, it is "probable" that the control group would have been "even more superior". Since the control group would have been more superior in such a case, it "may be concluded" that there is "little probability that chance factors are responsible" for the superiority in silent reading of the control group. This circularity of reasoning, used to buttress an unfounded claim, mars a study which was well-conceived in many respects.

D. Oral Reading and Speech Defects

In a careful analysis of previous investigations concerned with the relationship between speech and reading, Robinson (1946) concluded that "on the basis of the evidence available, articulation defects may be conceded to be important in oral reading, but of little significance in silent reading" (p. 99). Unfortunately, most of the studies referred to dealt not with articulation alone, but included a wide range of speech defects. Several studies dealt only with stuttering. In at least one instance (Jackson, 1944) no information was given about what

constituted a speech defective problem.

Several frequently quoted studies report positive relationships between oral reading disability and speech defects. Monroe (1932) found that 27% of 415 children whose oral reading was defective also had speech defects, compared with 8% of a control group of 101 cases. In a study of first and second grade children, Gibbons (1934) found that a group of 20 unselected speech cases averaged a year below a control group (matched in CA, MA, and IQ) on the Gray's Standardized Oral Reading Paragraphs Test. The difference was statistically significant.

Moss (1938) examined 36 pairs of normal and speech defective second graders matched for IQ. "Significant differences" in favor of the control group were found in both rate of oral reading (correlation of .36) and number of errors (correlation of .20) on the Gray's Standardized Oral Reading Paragraphs Test. Moss concluded that a speech defect is a retarding factor in oral reading, but pointed out that little relationship exists between reading rate and reading errors and severity of speech defect.

Since Moss's sample of speech defectives included at least four subjects with malformations of jaw or palate, five subjects with foreign dialect, as well as lispers and stutterers and other subjects with other types of speech defects, it is no wonder that a strong differences was seen between groups (no statistical analysis was made of differences between the normal articulation and the speech defect groups).

The relationship between articulation disability and reading can only be obscured by including "defects" such as foreign dialects.

Gates et al. (1939) also included foreign accent as a speech defect, and found that the correlation between reading and freedom from foreign accent was .20.

Robinson (1946) conducted one of the more thorough and well-known studies in this area although she did not consider oral reading as such. As part of a search for causal factors for failure in learning to read, she studied 30 children of normal or superior intelligence ranging from 6 to 15 years of age who were severely retarded in both oral and silent reading. Speech defects were determined by a speech pathologist and included stuttering, dyslalia, rhinolalia, etc. Dyslalia was found in seven or 23% of Robinson's 30 reading disability cases. However, 77% of these severely retarded readers showed no speech defects at all.

E. Speech Improvement

Several investigators have attempted to demonstrate an articulation/reading relationship by improving articulation in children and looking for a corresponding increase in reading achievement (Wilson, 1954; Sommers et al., 1961; Irwin, 1963; Jones, 1951). It is possible to improve children's articulation by giving the children speech lessons (Wilson, 1954; Sommers et al., 1961). It is also possible to improve some facets of reading (Sommers et al., 1961; Jones, 1951). However, there is no difference between children with misarticulation and children with normal speech in the amount of reading gain after speech lessons (Sommers et al., 1961). It is also possible that in cases where reading improvement is noted, such improvement may be due to a generalized increase in school work engendered in the

experimental children as a result of the extra attention and interest focused on them in speech lessons in which learning is emphasized.

Wilson (1954) carried out a 12-week speech improvement program with 128 kindergarten children. Controls were 114 children who did not receive speech lessons. Experimental and control groups were matched for age, IQ, and social maturity. A reduction in mean number of articulation errors resulted for sounds not in the lessons as well as for the sounds which were studied. However, differences between experimental and control groups were nonsignificant on the Metropolitan Reading Readiness Test.

Sommers et al., (1961) found that reading comprehension scores for 1st grade children with misarticulations and those with normal articulation were not significantly changed by speech correction procedures, except in a matched group of 25 children with severe articulation problems. Articulation was improved, however.

Speech improvement (ear training and exercises for consonant sounds) and speech therapy (a more intensive and individualized procedure emphasizing the phonemes mispronounced by the children) were carried out for nine months. Articulation improved more after speech therapy than after speech improvement.

As a result of speech improvement (but not speech therapy), reading factor scores were improved for both the experimental group (752 children with misarticulations) and the control group (760 children with normal articulation). Reading factors (Primary Reading Profiles Test) were aptitude for reading, auditory association, word recognition, and word attack.

Irwin (1963) compared 221 first graders with functional misarticulation who received seven months of speech therapy with two control groups matched for CA, MA, SES, and teacher. One control group had misarticulations but received no speech therapy while the second control group had normal articulation. He found no improvement in the experimental group on any of a wide variety of linguistic skills including measures of reading readiness.

Jones (1951) found that reading improvement followed speech improvement in 61 third graders with normal articulation. The subjects were paired with control subjects matched for CA, MA, silent reading achievement, sex, and teacher. Control subjects received no speech therapy. Reading improvement was seen in paragraph comprehension and word recognition.

Jones' "speech therapy" actually consisted of more of a total enrichment program than a speech therapy program. The lessons did not appear to involve articulation per se, although development of speech sound discrimination was mentioned. Emphasis was on speech production (dramatics, choral speaking, leading group discussions), and on worthwhile literature. Emphasis also was on developing "certain aspects of personality" and on building self-confidence. The teacher encouraged pupils to comment upon the improved speech of their classmates. With all this extra attention and instruction (36 1/2 hour lessons in one semester), it is not surprising that the experimental subjects were ahead of their classmates who were left out of the "therapy".

F. Summary and Comments on Reading/Articulation Studies

A small but significant relationship has been demonstrated between articulation disability and retardation in reading. However, research has failed to demonstrate a significant relationship between articulation and silent reading.

1. Typical Study

The prescription for investigating the articulation/reading relationship appears to be as follows. Choose subjects with articulation defects and match them (or better yet, pair them) with control subjects on the basis of CA, MA, IQ, SE status, race, sex, school grade, school locale, teacher, method of reading instruction, social maturity, and years in school. Screen out subjects who fall at the extremes in reading. Measure the articulation/reading relationship by comparing reading scores for groups of children with and without speech defects, or by correlations (numbers of errors, reading speed, etc.). If you wish to study other factors (IQ, auditory discrimination, etc.) correlate every factor with every other factor. Extraneous variance has been removed by matching subjects on everything but the two factors under consideration at the moment. Most of the relationship has been removed as well, and what is left is not very helpful in explaining the relationship. Nor does it provide empirical information about the extent of speech defects in reading disabled children and vice versa. The true picture is lost because so many interdependent factors are responsible for success in reading, and these interrelationships cannot be shown in studies which employ matching. In addition, individual differences are unaccounted for. Matching studies can add little to

what we already know about the articulation/reading relationship.

2. Matching Carried to the Limit

One investigator (Yedinak, 1949) went so far as to match the misarticulation group and control group to some extent on oral reading performance. Subjects were late second graders and all subjects were eliminated whose oral reading fell below the early second grade level.

The misarticulation group and control group showed an insignificant difference on measures of silent reading. This is not surprising if one assumes that subjects who are similar on oral reading will also tend to be similar on silent reading.

In spite of the fact that the experimental and control groups had been chosen partly by their oral reading test scores, Yedinak claimed that a significant relationship was found between the experimental and control groups in oral reading performance. However, this significance is suspect for several reasons. The means for the experimental and control groups were 3.1 and 3.6 respectively, with identical ranges. The experimental group was not retarded in reading. Yedinak found the difference to be significant only after "eliminating IQ differences" by an "analysis of covariance." This procedure is suspect on two counts. Firstly, "eliminating IQ differences" would be expected to decrease rather than increase the difference. Secondly, the mean IQs for the two groups were almost identical (the mean IQ difference was 0.1) suggesting that there was little to eliminate in the way of IQ differences.

3. Nature of the Speech/Reading Relationship

Although Hall (1938) concluded that no relationship exists betweer speech and silent reading, most authors assume that the relationship exists and attempt to examine its nature. Some authors believe that speech defects lead to retardation in reading, while others posit a common cause for both disabilities.

Speech defects may adversely influence reading in different ways. Moss (1938) concluded that speech defects are a "handicap" in oral reading. Witty and Kopel (1939) stated that defective speech creates adverse emotional reactions, which contribute to reading disability by causing self-consciousness, embarrassment and antipathy toward all reading-language situations.

Bennett (1938) concluded that, although a speech defect may complicate a language problem, other factors are involved which are prejudicial to reading progress. Hildreth (1946) shared this view and stated that speech defects are an important secondary cause of reading disability, even though not always the sole or primary cause.

Monroe (1932) viewed inaccurate articulation as being a particularly effective factor in retarding reading. Monroe concluded that speech difficulty might be a cause of reading failure, or both speech and reading troubles may result from a common cause. Robinson (1946) also felt that speech and reading disabilities arose from a common cause.

It would appear that in some instances, speech problems may lead to reading difficulties, while in other cases a common cause may underlie both speech (articulation) and reading disabilities.

4. Partitioning of Variance

Hardly ever has the concept of variance been mentioned in the articulation/reading relationship literature. Many of the studies were done during the 30's and 40's, before sophisticated statistical procedures were widely used.

Weaver et al. (1960) appear to be the only authors to have considered variance. In their study of "articulatory competency and reading readiness" in first grade children, they found that the two sets of measures had only 4% common variance. They concluded that there was a possibility "that the G.R.R.T. measures part of an underlying variable causal to the acquisition of both reading and speech" (p. 179).

Large investigations have been made of many factors which contribute to reading disability (for example Hall, 1938; Robinson, 1946). But apparently no one has yet attempted to determine the amount of independent variance each factor (or measure) contributes to the overall variance. Such an approach should be more fruitful than the matching studies described above, since it eliminates the problem of significance being lost by equation of experimental and control groups. In addition, a truer picture should emerge of the variables which retard reading progress.

5. Extremes

A related problem is the information which is lost by not looking more closely at subjects who fall at upper or lower extremes on the measures. This is suggested by the investigations of Weaver et al. (1960) and Sommers et al. (1961).

Winitz (1969) inspected the data of Weaver et al. (1960) and

found a suggestion of a zero relationship between the two measures (speech articulation and reading readiness) in the middle of the range. Subjects with few or no articulation errors tended to have better reading scores than subjects with many articulation errors.

Sommers et al. (1961) found that imporved articulation led to improved reading comprehension only in children with severe articulation problems. Children who were merely "defective" in articulation did not improve in comprehension after speech lessons, indicating that the relationship between the two factors was not as strong in the children with mild disabilities.

III. VOCABULARY AND OTHER LANGUAGE MEASURES

Conflicting results have been obtained by investigators examining the relationship between articulation and vocabulary measures. A number of studies involving children at various age levels have failed to find significant relationships between these two variables. Scores on a picture vocabulary test administered to 24 two and a half year old children bore no relation to articulation of single consonants (Wellman et al., 1931). No significant differences were found between a misarticulation group of 2nd grade children and a matched control group on knowledge of word meaning nor on length of response, complexity of remark or mean number of complete remarks (Yedinak, 1949). Carroll and Pendergast (1954) studied slightly older children, aged 8 - 13, and found no significant differences between a misarticulation group and a control group on the Vocabulary subtest of the WISC.

Williams (1937) obtained mixed results when he correlated articulation

scores of 3 and 4 year old children with a variety of language measures. While the correlation with vocabulary was nonsignificant, articulation correlated .57 with the Van Alstyne Test, and the remaining correlations with number of correct words, mean length of response, number of complete sentences, and sentence complexity were all .60 or above.

A more recent study (Templin, 1957) found articulation to correlate significantly with vocabulary as well as with several additional language measures at certain specific age levels. In a normative study, Templin (1957) found that correlations of speech articulation with the Ammons Wide-Range Vocabulary Test were .47, .48, N.S., .41, and .27 for half-year levels from three to five years inclusive. Correlations between articulation scores and the Seashore-Eckerson English Recognition Vocabulary Test ranged from .38 to .46 for ages 6 - 8. Intercorrelations for other measures (length of remark, complexity of remark, and number of different words) were above .60 for age 3 but became nonsignificant by 7 or 8 years of age.

Winitz (1959) using Templin's articulation test, found a .28 correlation for 5 year olds with the Ammons F.R.P.V.T. Correlations were nonsignificant with length of response and number of different words. The correlation with structural complexity was .29. Correlations ranging from .20 to .33 were found for measures in which the subject was asked to rime (sic) or name as many words as possible.

Vandemark and Mann (1965) found that only structural complexity correlated significantly with the Templin-Darley Screening Test for two groups of 50 subjects aged 8 - 13 years. The groups lay one on each side of the 8 year old cut-off on the Templin-Darley Test and were

matched on sex, SE status and age. Measures which showed no correlations were mean length of response, SD of mean length, number of one word responses, mean of the five longest responses, number of different words and type-token ratio.

Schneiderman (1955) assigned each 6 or 7 year old subject to a high, medium, or low group of language ability according to the subject's "combined language score," was composed of spoken vocabulary (Van Alstyne Picture Vocabulary Test), sentence length, and teacher's ratings of language ability. Each group contained 23 or 24 subjects. Articulation errors varied inversely with level of language score, and this difference was significant among groups. However, the difference fell short of significance when subjects of extreme MA's were dropped (4 or 5 from each group), resulting in similar mean CA's and MA's for the groups.

Many of the vocabulary and other language measures used in these studies are <u>oral</u> measures. Some of the tests (e.g., the Smith Vocabulary Test) hardly differ from articulation tests. One would expect a positive relationship to exist between tests with similar content even though they purport to measure different variables. This is supported by results of the reading studies in which articulation was found to be related to measures of oral reading and to reading readiness which involved oral tests. No significant relationship was demonstrated between articulation and silent reading.

There is some tendency for significant correlations to be found more often in studies dealing with younger children. Templin (1957) found that intercorrelations between verbalization measures and

articulation tended to decrease with age, suggesting that interrelationships between language functions may be stronger at earlier (i.e., preschool) ages. An age trend would be accentuated by the use of oral tests at early ages and non-oral tests at later ages.

Perhaps more tests could be utilized in which the subject points to the answer (e.g., the Ammons F.R.P.V.T.) since there is no way to give silent reading tests or paper-and-pencil tests to 3 and 4 year olds. However, this would not help in measuring sentence structure and other language measures involving language production on the part of the child.

IV. SPELLING

There has been no clear evidence indicative of a relationship between articulation and spelling. Phonemes which are misspelled are not necessarily the same ones which cause articulation difficulty.

Carroll and Pendergast (1954) analyzed spelling errors in 33 articulatory defective children aged 8 - 13 and those of a control group matched on the basis of sex, age, intelligence and/or teachers' estimates of academic achievement, personality traits, and home background. They found no relationship between phonetic equivalents of spelling errors and spelling errors and concluded that there was no underlying phonetic disability in the articulatory defective group since the experimental and control groups did not differ on total number of spelling errors nor on word substitution and phonetic errors.

Ham (1958) also failed to find any association between type of spelling error and type of mispronunciation. However, he did report a

significant relationship between frequency of misarticulation and frequency of misspelling in his 40 subjects drawn from 2nd, 3rd, and 4th grades. Spelling and articulation errors were compared for the same words. Fifty-three percent of misarticulated words were misspelled, while 44% of correctly articulated words were also misspelled. The 9% discrepancy hardly represents a practical difference, even if it were to hold up in replications of this study. It would be interesting to determine the results if groups were used which represented different degrees of articulation defect.

Zedler (1956) found that spelling of a list of 40 words improved for second grade children who had 14 weeks speech improvement training. Gain for the group was significantly greater than for a control group who received no training. As explained in the section on reading, children in speech improvement training may improve in different facets of learning merely as a result of the extra enrichment provided by the speech training. Zedler did not report what changes occurred in speech production.

V. SUMMARY AND COMMENTS

An extensive review of the literature on the relationship of speech articulation to reading and other language skills has revealed few studies in which relevant variables were clearly defined and carefully controlled. In some instances "misarticulation" groups included stutterers and subjects with foreign accents.

Results of past investigations fail to provide conclusive data due to the lack of consistency in defining disability groups, lack of

adequate control groups in studies of intervention techniques, and lack of comparability among the measures of educational outcomes (e.g. oral vs. silent reading tests) used in different studies.

Evidence has been found of a small but definite relationship between articulation and other language skills: reading, vocabulary, and other lexical and grammatical measures. No relationship has been demonstrated between articulation and spelling, but few studies have been carried out in this area. The relationship of articulation to other school-related skills has rarely been explored.

Relationships are stronger when oral tests are used to measure the language function (oral reading, reading readiness). Relationships also tend to be stronger when younger children are used as subjects, partly as a function of the necessity for using oral tests when dealing with very young children. There is a great deal of overlap in reading achievement between groups of children with articulation difficulty and those with normal speech.

A need exists for research regarding factors which discriminate misarticulation children who succeed from misarticulation children who are retarded in reading or other language functions. Also needed is a more careful examination of the language skills development of children with clearly-identified articulation problems. Such research must be undertaken if questions regarding the relationship of articulation problems to impairment in reading and other language functions are to be resolved.

References

Bennett, C. An inquiry into the genesis of poor reading. Teachers College Contributions to Education, 1938, No. 755.

Bond, G. The auditory and speech characteristics of poor readers. Teachers College Contributions to Education, 1935, No. 657.

Brain, L. Speech disorders - aphasia, apraxia, and agnosia. (2nd ed.) Chapter 7: The neurology of language. London: Butterworths, 1965

Carrell, J. and Pendergast, K. An experimental study of the possible relation between errors of speech and spelling. Journal of Speech and Hearing Disorders, 1954, 19, 327-334.

Eames, T. 1950. The relationship of reading and speech difficulties. Journal of Educational Psychology, 41, 51-55.

Everhart, R. W. The relationship between articulation and other developmental factors in children. Journal of Speech and Hearing Disorders, 1953, 18, 332-338.

FitzSimons, R. Developmental, psychological, and educational factors in children with nonorganic articulation problems. Child Development, 1958, 29, 481-489.

Gaines, F. P. Interrelationship of speech and reading disabilities. Elementary School Journal, 1941, 41, 605-613. Also in Quarterly Journal of Speech, 1941, 27, 104-110.

Gates, A. I., Bond, G. L., and Russell, D. N. Methods of determining reading readiness. New York: Bureau Publishing Teachers College, Columbia University, 1939.

Gibbons, H. The relation of reading ability to skill in articulation. Proceedings of the American Speech Corrections Association, 1934, 4, 7-12.

Hall, M. E. Auditory factors in functional articulatory speech defects. Journal of Experimental Education, 1938, 7, 110-132.

Ham, R. E. Relationship between misspelling and misarticulation. Journal of Speech and Hearing Disorders, 1958, 23, 294-297.

Hildreth, G. Speech defects and reading disability. Elementary School Journal, 1946, 46, 326-332.

Irwin, O. C. The effects of speech therapy upon certain linguistic skills of first grade children. Journal of Speech and Hearing Disorders, 1963, 28, 375-381.

Jackson, J. A survey of psychological, social and environmental differences between advanced and retarded readers. Journal of Genetic Psychology, 1944, 65, 113-131.

Jones, M. V. The effect of speech training on silent reading achievement. Journal of Speech and Hearing Disorders, 1951, 16, 258-263.

Kelly, G. A. Some common factors in reading and speech disabilities. Psychological Monographs, 1932, 43, 175-218.

Monroe, M. Children who cannot read. Chicago: University Press, 1932.

Moore, C. Reading and arithmetic disabilities associated with speech defects. Journal of Speech Disorders, 1947, 12, 85-86.

Moss, M. The effect of speech defects on second grade reading achievement. Quarterly Journal of Speech, 1938, 24, 642-654.

Powers, M. H. Functional disorders of articulation - Symptomatology and Etiology. In L. E. Travis (Ed.), Handbook of speech pathology and audiology. New York: Appleton-Century Crofts, 1971.

Robinson, H. Why pupils fail in reading. Chicago: University of Chicago Press, 1946.

Schneiderman, N. A study of the relationship between articulatory ability and language ability. Journal of Speech and Hearing Disorders, 1955, 20, 359-364.

Sommers, R. K., Cockerille, C. E., Paul, C. D., Bowser, D. C., Fischter, G. R., Fenton, A. K., and Copetas, F. G. Effects of speech therapy and speech improvement upon articulation and reading. Journal of Speech and Hearing Disorders, 1961, 26, 27-38.

Templin, M. C. Certain language skills in children, their development and interrelationships. Institute of Child Welfare Monograph Series, No. 26. Minneapolis: University of Minnesota Press, 1957.

Vandemark, A. and Bann, M. Oral language skills of children with defective articulation. Journal of Speech and Hearing Research, 1965, 6, 409-414.

Weaver, C., Furbee, C., and Everhart, R. Articulatory competency and reading readiness. Journal of Speech and Hearing Research, 1960, 3, 174-180.

Wellman, B. L., Case, I. M., Mengert, I. G., and Bradbury, D. E. Speech sounds of young children. University of Iowa Studies in Child Welfare, 1931, 5, (2).

Williams, H. M. An analytical study of language achievement in preschool children, Part I. Development of language vocabulary

in young children. University of Iowa Studies in Child Welfare, 1937, 13, (2), 9-18.

Wilson, B. A. The development and evaluation of a speech improvement program for kindergarten children. Journal of Speech and Hearing Disorders, 1954, 19, 4-13.

Winitz, H. Articulatory acquisition and behavior. Chapter 3: Variables Related to Articulatory Development and Performance. Appleton-Century-Crofts, New York, 1969.

Winitz, H. Language Skills of male and female kindergarten children. Journal of Speech and Hearing Research, 1959, 2, 377-386.

Witty, P., and Kopel, D. Reading and the educative process. Boston: Ginn, 1939.

Yedinak, J. G. A study of the linguistic functioning of children with articulation and reading disabilities. Journal of Genetic Psychology, 1949, 74, 23-59.

Zedler, E. Y. Effect of phonic training on speech sound discrimination and spelling performance. Journal of Speech and Hearing Disorders, 1956, 21, 245-250.