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A review of studies dealing with the general intelligence level of children with speech defects and the comparison of their verbal and nonverbal intelligence scores has been presented. Evidence that articulatory defective children perform inferiorly to normally speaking children in the areas of language ability, grammatical complexity, vocabulary development and oral and silent reading has also been cited.

The purpose of this study was to compare the verbal intelligence scores of children with functional articulation disorders with verbal intelligence scores of a matched group of children with normal speech. It was hypothesized that, when matched with normally speaking children on sex, chronological age, and nonverbal intelligence scores, children with functional articulation disorders would achieve significantly lower scores on verbal intelligence tests.

Forty subjects, thirty boys and ten girls, were selected from the fourth grades in four elementary schools in rural North Carolina. Twenty of these were judged, according to scores on the Templin-Darley Screening Test of Articulation, as having functional articulation defects and formed the experimental group. The remaining twenty demonstrated normal speech and were the control group. The

matched groups were administered the Verbal Battery of the Lorge-Thorndike Intelligence Test, and the resulting verbal scores were compared and analyzed.

Application of the *t* test to differences in verbal scores between groups resulted in a *t* value of -11.78, significant at the .05 level of confidence. Thus it was demonstrated that children with functional articulation defects did score significantly lower on verbal intelligence tests than a matched group of children with normal speech.

It was recommended, on the basis of these findings, that both verbal and nonverbal measures be utilized in evaluating the intellectual function of articulatory defective children.

AN EXPERIMENTAL STUDY OF VERBAL AND NONVERBAL INTELLIGENCE SCORES OF CHILDREN WITH ARTICULATION DISORDERS AS COMPARED WITH NORMALLY SPEAKING CHILDREN

by

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APPROVAL SHEET

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CHAPTER I

INTRODUCTION

In recent years researchers have shown interest in the intelligence scores of speech defective children as compared with scores of children with normal speech. Study has been devoted to the general intelligence level of children with speech defects and to comparison of their verbal and nonverbal intelligence scores.

Powers states that evaluation of the intellectual functioning of a child with a speech defect should be a part of the basic diagnostic examination.[1] Information concerning intelligence is helpful not only in diagnosis, but also as an aid in planning therapy.

Because children with speech problems are often tested along with normally speaking children in the public schools, it is important that not only speech pathologists but also those involved in the general education of children have some knowledge of possible relationships existing between estimates of intelligence and speech defects in children.

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[1] Margaret Hall Powers, "Functional Disorders of Articulation--Symptomatology and Etiology," Handbook of Speech Pathology, Lee Edward Travis, editor (New York: Appleton-Century-Crofts, Inc., 1957), p. 748.

Since the most frequent speech problems found among public school children are classified as articulatory disorders,[2] most studies have involved subjects having functional articulation disorders. A functional articulation disorder is defined as substitution, omission, addition, or distortion of speech sounds for which no organic or physiological cause can be discovered.

Several studies have compared the intelligence level of children having defective speech with that of normally speaking children. Carrell administered the Kuhlmann-Anderson Intelligence Test to a group of school children and found that the speech defective children, taken as a group, showed lower intelligence than children with normal speech, and among these, those with articulation errors showed the greatest deficiency.[3]

Beckey found that children with retarded speech usually demonstrate inferior scores on verbal intelligence tests when compared with those with normal speech. The use of a verbal test, in this case the Revised Stanford Binet, with children having retarded speech was questioned by the

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[2] Ibid., p. 711.

[3] James A. Carrell, "A Comparative Study of Speech Defective Children," Archives of Speech, 1(June, 1936), p. 186.

psychologist who administered the tests. She termed many of the subjects with retarded speech as "indeterminable" as to intelligence.[4]

Everhart compared 110 children with articulation disorders with a group of 110 children with normal articulation in grades one through six. Results on the California Short Form of Mental Maturity demonstrated that children with normal articulation show favorable difference in intelligence when compared with children with defective articulation.[5]

Other studies have been conducted to determine whether there is a correlation between intelligence scores and articulation. A review of this literature is presented by Winitz, who found two types of correlational studies: (1) between the status of articulation and intelligence, and (2) between intelligence and articulation improvement.

Findings in the studies reported by Winitz indicated low, but positive, correlations between articulation and intelligence. With the exception of one study, zero-order

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[4]R.E. Beckey, "A Study of Certain Factors Related to Retardation of Speech," Journal of Speech Disorders, 7(September, 1942), pp. 236 ff.

[5]Rodney W. Everhart, "The Relationship Between Articulation and Other Developmental Factors in Children," Journal of Speech and Hearing Disorders, 18(December, 1953), pp. 332 ff.

correlations were obtained for articulation improvement and intelligence.[6] All studies discussed by Winitz included subjects who were within a normal range of intelligence and "...without psychological and organic involvement."[7]

A review of the literature since 1944 reveals two studies comparing verbal and nonverbal intelligence scores of children with speech defects. Hirschenfang administered the Columbia Mental Maturity Scale (CMMS) and the Revised Stanford Binet (L) to forty-five boys and girls having defective speech. When the MA's and IQ's of both tests were compared, they were found to be highly correlated. Hirschenfang concluded that both tests may be used in estimating the intellectual function of children with speech disorders.[8]

In comparing verbal and nonverbal scores of children with functional articulation disorders, Sperling found that these children attained significantly higher performance scores than verbal scores.[9]

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[6] Harris Winitz, "Research in Articulation and Intelligence," Child Development, 35(March, 1964), pp. 267 ff.

[7] Ibid, p. 287.

[8] Samuel Hirschenfang, "Further Studies on the Columbia Mental Maturity Scale (CMMS) and Revised Stanford Binet (L) in Children with Speech Disorders," Journal of Clinical Psychology, 17(April, 1961), p. 171.

[9] Powers, op. cit., p. 749, citing "A Comparison Between Verbal and Nonverbal Test Results of Children with

In discussing the low, positive correlations between articulation and intelligence, Winitz states that there may be a common factor which is measured by both articulation tests and intelligence tests.

> A psychological factor may indicate a common reinforcement contingency. For example, children may be equally reinforced for linguistic activities that may be tested by both an articulation test and an intelligence test.[10]

Spiker and Irwin state:

> That there is a strong relationship, from about the second year of life through adulthood, between various measures of language development and the abilities measured by most tests of intelligence has long been a part of psychological knowledge.[11]

It is, therefore, hypothesized that the intelligence of the child having an articulation problem can be more accurately measured by means of a test in which the linguistic factor is minimal.

The literature contains several studies which support this hypothesis. Schneiderman states:

> Children who are retarded in language development often seem, in the clinical situation,

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Articulatory Speech Defects" (unpublished Master's Thesis, University of Michigan, 1948).

[10] Winitz, op. cit., p. 295.

[11] Charles C. Spiker and Orvis C. Irwin, "The Relationship Between IQ and Indices of Infant Speech Sound Development," Journal of Speech and Hearing Disorders, 14(December, 1949), p. 335.

> to be also those with articulatory errors and children with defective articulation are frequently delayed in the onset of speech and deficient in the ability to use language as a tool.[12]

Schneiderman investigated the relationship between articulation ability and language ability in six and seven year old children and concluded that her study "...offers some further evidence of a relationship between articulation ability and language ability in children."[13]

Menyuk compared the grammar of ten children diagnosed as having infantile speech with ten children having normal speech. She found that at no age level, after the age of two years, did the grammatical structures of children with deviant speech match the grammatical structures of children with normal speech. As they matured, children with normal speech acquired differentiated rules to formulate structures, therefore producing increasingly complex structures. The infantile speech group, including children with articulation difficulties, seemed to be unable to move beyond the use of elementary and generalized rules.[14]

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[12] Norma Schneiderman, "A Study of the Relationship Between Articulatory Ability and Language Ability," Journal of Speech and Hearing Disorders, 20(March, 1955), p. 359.

[13] Ibid., p. 363.

[14] Paula Menyuk, "Comparison of Grammar of Children with Functionally Deviant and Normal Speech," Journal of Speech and Hearing Research, 7(June, 1964), p. 122.

Vandemark investigated the oral language achievement of children having defects in articulation.

> It appears that children with defective articulation are not inhibited in terms of the amount of verbal output, but they do perform less well in areas of grammatical completeness and complexity of responses.[15]

These studies show evidence that children with articulation errors are probably deficient in the use of verbal language.

Other studies have shown children with defective speech to be less efficient than normally speaking children in the areas of oral and silent reading and vocabulary development. Yedinack conducted a study to investigate differences in development and patterning of intelligence, articulation, oral and silent reading, vocabulary, and oral language development of second grade children. One of the groups investigated consisted of children seriously defective in articulation. Children with articulation defects were found to be significantly inferior to children with normal speech on objective measures of oral and silent reading ability and in the area of vocabulary development.[16]

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[15] Ann Vandemark and Mary B. Mann, "Oral Language Skills of Children with Defective Articulation," Journal of Speech and Hearing Research, 8(December, 1965), p. 412.

[16] Jeanette Yedinack, "A Study of the Linguistic Functioning of Children with Articulation and Reading Disabilities," Journal of Genetic Psychology, 74(March, 1949), pp. 23 ff.

Artley reviewed studies of the relationship between the inability to produce the proper speech sound and reading ability. He concluded that there appears to be a relationship between speech difficulties and deficiences in reading ability and that there are some indications that this relationship exists even in silent reading.[17]

According to Everhart, "Speech and reading are inextricably associated in the process known as communication or language."[18] He states that any limitation in one of these two processes is "...directly reflected to some degree in the other."[19]

Hildreth states that speech and reading are intimately related since both are forms of language expression. It is her opinion that "...even in silent reading the persistence of inner speech suggests the close connection between reading and oral language."[20] According to Hildreth, a

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[17] Sterl Artley, "A Study of Certain Factors Presumed to be Associated with Reading and Speech Difficulties," Journal of Speech and Hearing Disorders, 13(December, 1948), p. 359.

[18] Rodney W. Everhart, "Literature Survey of Growth and Developmental Factors in Articulatory Maturation," Journal of Speech and Hearing Disorders, 25(February, 1960), p. 59.

[19] Ibid.

[20] Gertrude Hildreth, "Speech Defects and Reading Disability," Elementary School Journal, 46(February, 1946), p. 326.

child's initial success and ultimate development in reading depends on his command of speech.[21]

Jackson found speech defects to be more frequent among retarded readers than among advanced readers. The tests administered in this study measured the rate and comprehension of silent reading and not oral ability.[22]

The reported research reveals that children who are defective in articulation perform inferiorly to normally speaking children in the areas of language ability, oral and silent reading, vocabulary, and grammatical complexity.

Therefore, it is hypothesized that children with functional articulation disorders will attain scores on verbal intelligence tests which are significantly lower than verbal scores attained by normally speaking children. In order to test this hypothesis, scores obtained from verbal intelligence tests administered to a group of children with functional articulation disorders were compared with verbal scores obtained from a group of children with normal speech. Variables which might affect performance on verbal tests were controlled by matching the two groups on sex, chronological age, and nonverbal intelligence scores.

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[21] Ibid.

[22] Joseph Jackson, "A Survey of Psychological, Social, and Environmental Differences Between Advanced and Retarded Readers," Journal of Genetic Psychology, 65(March, 1944), p. 127.

CHAPTER II

PROCEDURE

I. SUBJECTS

Children with functional articulation disorders were chosen as subjects in this study because this speech defect is the one most frequently encountered in the public schools.

Subjects were forty fourth grade children, thirty boys and ten girls, ranging in chronological age from nine years-nine months to eleven years-nine months. All children attended one of four elementary schools located in rural North Carolina communities. Twenty of these children were judged as having functional articulation disorders and formed the experimental group. The remaining twenty demonstrated normal speech and were the control group.

Fourth grade children were chosen as subjects in order to reduce the possibility of developmental articulation errors. According to Templin and Poole, the normal child can be expected to reach maturity of articulation by eight years of age.[1]

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[1] Mildred C. Templin, "Speech Development in the

Fifteen boys and five girls constituted the experimental group. Criteria for inclusion in this group were: (1) that they be presently enrolled or awaiting re-enrollment (after transfer from another school) in public school speech therapy; (2) that they exhibit no evidence of neuromuscular impairment or severe deviation of oral structures; (3) that they show no overt signs of emotional disturbance, as judged by their classroom teachers; (4) that they pass a pure-tone screening test administered at twenty decibels for four frequencies (500 cps, 1000 cps, 2000 cps, 4000 cps) in both ears; (5) that they score 44 or less on the Templin-Darley Screening Test of Articulation. This is the cut-off score given for eight year olds.

The control group consisted of fifteen boys and five girls who demonstrated normal speech. These subjects were chosen from a group of 120 fourth grade children according to the following criteria: (1) that they pass a pure-tone screening test administered at twenty decibels for four frequencies (500 cps, 1000 cps, 2000 cps, 4000 cps) in both ears; (2) that they show no overt signs of emotional disturbance, as judged by their classroom teachers; (3) that they

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Young Child: 3. The Development of Certain Language Skills in Children," Journal of Speech and Hearing Disorders, 17 (September, 1952), p. 284; and Irene Poole, "Genetic Development of Consonant Sounds in Speech," Elementary English Review, 11(June, 1934), p. 161.

score 48 or more on the Templin-Darley Screening Test of Articulation; (4) that they match individually the members of the experimental group on chronological age (within six months), nonverbal intelligence scores (within ten points), and sex.

II. TEST MATERIALS

Each member of the experimental and control groups was administered several tests--a pure-tone screening test, an articulation test, and verbal and nonverbal intelligence tests.

Audiometric testing. Pure-tone screening tests were administered in a routine manner using Maico Model MA-11 Audiometer. Any child who failed to respond to any frequency tested at twenty decibels, in either ear, was eliminated from the experiment.

Articulation testing. According to Templin, "Whenever the chief purpose of testing is to screen acceptable from unacceptable articulation only a non-diagnostic test of general articulation is necessary."[2]

In this study adequacy of articulation was determined by means of scores obtained on the Templin-Darley Screening

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[2]Mildred C. Templin, "A Non-Diagnostic Articulation Test," Journal of Speech Disorders, 12(December, 1947), p. 392.

Test of Articulation. This test consists of fifty items which were found best to discriminate between good and poor articulation of preschool and kindergarten children. These items may be elicited by the first fifty pictures of the Templin-Darley Diagnostic Test of Articulation. In this study the Screening Test was administered by obtaining spontaneous responses from the subjects through the use of these pictures.

A list of words and the sound tested in each may be found in Appendix A. Appendix B contains the Articulation Test Form used in scoring results.

Intelligence testing. Lorge-Thorndike Intelligence Tests were chosen for use in this study since they are quickly and easily administered, allow for testing of groups, and have both verbal and nonverbal batteries.

> The Lorge-Thorndike Intelligence Tests are a series of tests of abstract intelligence covering the range from kindergarten to college freshmen. Abstract intelligence is defined as the ability to work with ideas and the relationships among ideas. The tests are based on the premise that most abstract ideas with which the school child or the working adult deals are expressed in verbal symbols, so much that verbal symbols are the appropriate medium for the testing of abstract intelligence. Nevertheless, they take account of the fact that for some--the young, the poorly educated, or the poor reader--the printed words may constitute an inadequate basis for appraising an individual's abilities. Consequently, a parallel set of

nonverbal tests is provided to accompany the basic verbal series.[3]

Lorge-Thorndike Intelligence Tests are available in five levels, two equivalent forms, Verbal and Nonverbal Batteries, and Consumable or Re-Usable Editions. For use in this research, Level 3 for grades four through six, Form A, and the Re-Usable Edition for both Verbal and Nonverbal Batteries were chosen.

The Verbal Battery is composed of the following subtests: Word Knowledge, Sentence Completion, Verbal Classification, Verbal Analogies, and Arithmetic Reasoning.

The Nonverbal Battery is completely pictorial, diagrammatic, or numerical. Subtests are Figure Analogies, Figure Classification, and Number Series. According to the authors, these subtests "...permit an appraisal of abstract intelligence which is not influenced by specific disability in reading."[4]

Of primary concern to this study is the degree to which the Verbal and Nonverbal Batteries of the Lorge-Thorndike measure the same ability. For separate age groups, the correlation between the batteries "...tends to be about .65."[5] Lorge and Thorndike state, "Clearly there is much

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[3]Irving Lorge and Robert L. Thorndike, The Lorge-Thorndike Intelligence Tests--Technical Manual (Boston: Houghton Mifflin Company, 1962), p.2.

[4]Ibid., pp. 2-3.

[5]Ibid., p. 12.

in common between what is being measured in the two series."[6]

Information pertaining to reliability of the Lorge-Thorndike Intelligence Tests is found in Appendix C. Validity information is found in Appendix D.

III. TESTING PROCEDURE

Names of potential subjects to be included in the experimental group were obtained from the public school speech therapists. These children were tested at their respective schools. The pure-tone screening test and the Templin-Darley Screening Test were individually administered to each child. Those children who satisfied established criteria were included in the experimental group and were administered Nonverbal and Verbal Batteries of the Lorge-Thorndike Intelligence Test.

Testing was divided into three areas and administered as follows: first day--pure-tone screening test and Templin-Darley Screening Test; second day--Nonverbal Battery of the Lorge-Thorndike; third day--Verbal Battery of the Lorge-Thorndike. The three days of testing were not necessarily consecutive, and when the group being tested consisted of no more than four subjects, the first two areas of testing were administered on the same day.

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[6] Ibid.

One hundred and twenty fourth graders at one of the schools involved in the research were administered the Nonverbal Battery of the Lorge-Thorndike Intelligence Test. Testing was done in groups of approximately forty subjects. From these 120 subjects, twenty children who satisfied the established criteria were chosen to form the control group.

One of the children chosen for the control group displayed signs of brain damage. Due to this possibility, he and his experimental partner were eliminated from the study. Thus the final number of experimental-control pairs was reduced to nineteen.

The nineteen subjects comprising the control group were administered the Verbal Battery of the Lorge-Thorndike.

All testing for this study was carried out by the researcher during the period from April 25, 1967 through June 1, 1967.

CHAPTER III

RESULTS AND CONCLUSIONS

I. TEST RESULTS

Raw data were analyzed using the *t* test to determine the significance of the difference in verbal intelligence scores between the experimental and control groups.

Results of the matching of experimental and control groups and statistical analysis of nonverbal scores are found in Table I. The mean nonverbal intelligence score for the experimental group was 93.9 (s=12.28), and for the control group, the mean was 95.6 (s=11.93).

Administration of the Verbal Battery to these matched groups resulted in a mean score of 96.3 (s=11.16) for the experimental group and a mean of 102.2 (s=12.45) for the control group. A comparison was made between verbal scores for the two groups. Results are presented in Table II.

Application of the *t* test to the differences in verbal intelligence scores between the paired groups resulted in a *t* value of -11.78 which is significant at the .05 level of confidence.

TABLE I

MATCHING OF EXPERIMENTAL AND CONTROL GROUPS

Pairs	Sex	Experimental		Control	
		CA	Nonverbal IQ	CA	Nonverbal IQ
1	m	10-6	81	10-4	83
2	m	9-11	95	9-10	94
3	m	10-9	78	10-8	83
4	m	10-0	92	10-2	93
5	m	10-6	109	10-5	109
6	m	10-1	101	10-5	102
7	m	10-3	87	10-6	91
8	m	9-10	114	9-11	115
9	m	10-1	105	10-3	109
10	m	11-9	81	11-4	73
11	m	10-0	107	9-11	110
12	m	10-5	83	10-9	88
13	m	9-10	99	9-9	97
14	m	10-5	75	10-4	82
15	f	9-10	98	9-9	98
16	f	10-4	77	10-0	83
17	f	10-4	110	10-3	111
18	f	9-11	100	9-11	104
19	f	10-3	93	10-1	92
Mean Scores			$\bar{x}$=93.9		$\bar{x}$=95.6
Standard Deviations			s=12.28		s=11.93

TABLE II

COMPARISON OF VERBAL INTELLIGENCE SCORES FOR EXPERIMENTAL AND CONTROL GROUPS

	Verbal IQ		
Pairs	Experimental	Control	Difference
1	92	99	- 7
2	103	107	- 4
3	91	100	- 9
4	90	81	9
5	104	113	- 9
6	112	115	- 3
7	85	88	- 3
8	123	121	2
9	98	111	-13
10	73	78	- 5
11	91	114	-23
12	96	81	15
13	105	102	3
14	86	106	-20
15	106	104	2
16	87	95	- 8
17	97	110	-13
18	99	111	-12
19	91	105	-14
Mean Scores	$\bar{x}$=96.26	$\bar{x}$=102.15	- 5.89 t=-11.78*
Standard Deviations	s=11.16	s= 12.45	

*significant at .05 level of confidence

II. CONCLUSIONS

The results of this study provide evidence that children with functional articulation disorders obtain scores on verbal intelligence tests which are statistically significantly lower than scores obtained by a matched group of children with normal speech. These findings support those of Sperling who found that articulatory defective children attain lower verbal scores than performance scores.

The fact that children with articulation defects score higher on intelligence tests in which the language factor is minimal also lends support to those studies dealing with the language ability of articulatory defective children. Since other variables were held constant in this investigation, it would appear that the linguistic factor is responsible for the lower scores attained on verbal intelligence tests by children with speech defects. This seems to indicate that, in conducting speech therapy with the child who has defective articulation, the therapist should emphasize improvement in language ability as well as correction of defective sounds.

Although differences in verbal intelligence scores between experimental and control groups were statistically significant at the .05 level of confidence, several factors should be considered in determining the practical significance of these results:

(1) This study was limited to fourth grade children attending elementary schools in rural North Carolina.

(2) The matching of experimental and control members on nonverbal intelligence scores varied from within zero points to within eight points. This range might be expected to create some variability in verbal scores between groups.

(3) The standard deviation of the Lorge-Thorndike Intelligence Tests is 16. This would result in considerable overlap between the distributions of verbal intelligence scores for experimental and control groups.

(4) The correlation between Verbal and Nonverbal Batteries of the Lorge-Thorndike is about .65, indicating that there may be some difference in the abilities measured by these batteries.

(5) Of particular importance in interpreting the significance of these results is the fact that only six of the nineteen experimental members were judged as having severe articulatory defects, that is having three or more defective sounds. It is felt that the differences in verbal scores between groups would have shown greater significance had the experimental group included more subjects with severe functional articulation problems.

This study points to the need for further research comparing verbal and nonverbal intelligence scores of children with articulatory defects. Before final conclusions concerning intelligence testing of speech defective children

can be made, research utilizing other test batteries, larger samples, and more subjects with severe problems should be conducted.

Although this study is limited, it is recommended, on the basis of these findings, that both verbal and nonverbal measures be used in evaluating the intelligence of articulatory defective children. Final judgment concerning intellectual function of children with functional articulation disorders should not be made on the basis of verbal testing alone.

CHAPTER IV

SUMMARY

A review of studies dealing with the general intelligence level of children with speech defects and the comparison of their verbal and nonverbal intelligence scores has been presented. Evidence that articulatory defective children perform inferiorly to normally speaking children in the areas of language ability, grammatical complexity, vocabulary development and oral and silent reading has also been cited.

The purpose of this study was to compare the verbal intelligence scores of children with functional articulation disorders with verbal intelligence scores of a matched group of children with normal speech. It was hypothesized that, when matched with normally speaking children on sex, chronological age, and nonverbal intelligence scores, children with functional articulation disorders would achieve significantly lower scores on verbal intelligence tests.

Forty subjects, thirty boys and ten girls, were selected from the fourth grades in four elementary schools in rural North Carolina. Twenty of these were judged, according to scores on the Templin-Darley Screening Test of Articulation, as having functional articulation defects and formed

the experimental group. The remaining twenty demonstrated normal speech and were the control group. The matched groups were administered the Verbal Battery of the Lorge-Thorndike Intelligence Test, and the resulting verbal scores were compared and analyzed.

Application of the *t* test to differences in verbal scores between groups resulted in a *t* value of -11.78, significant at the .05 level of confidence. Thus it was demonstrated that children with functional articulation defects did score significantly lower on verbal intelligence tests than a matched group of children with normal speech.

It was recommended, on the basis of these findings, that both verbal and nonverbal measures be utilized in evaluating the intellectual function of articulatory defective children.

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APPENDIX

APPENDIX A

The following is a list of words used in the Templin-Darley Screening Test of Articulation along with the sound tested in each word as indicated by its phonetic symbol.

bird	/ɝ/	frog	/fr-/
music	/ju/	three	/θr-/
rabbit, arrow	/r/	shredded wheat	/ʃr-/
leaf	/l/	planting	/pl-/
valentine	/v/	clown	/kl-/
thumb, bathtub, teeth	/θ/	glass	/gl-/
there, feather, smooth	/ð/	flower	/fl-/
zipper	/z/	smoke	/sm-/
sheep, dishes, fish	/ʃ/	snake	/sn-/
television	/ʒ/	spider	/sp-/
yellow, onion	/j/	stairs	/st-/
chair, matches, watch	/tʃ/	sky	/sk-/
jar, engine	/dʒ/	sled	/sl-/
presents	/pr-/	sweeping	/sw-/
bread	/br-/	twins	/tw-/
tree	/tr-/	queen	/kw-/
dress	/dr-/	splash	/spl-/
crayons	/kr-/	sprinkling can	/spr-/
grass	/gr-/	string	/str-/
		scratch	/skr-/

APPENDIX B

TEMPLIN-DARLEY SCREENING AND DIAGNOSTIC TESTS

OF ARTICULATION

Description of testing situation:

TEMPLIN-DARLEY SCREENING AND DIAGNOSTIC TESTS

OF ARTICULATION

APPENDIX B

ARTICULATION TEST FORM

Name _____

Date _____ Age _____ Sex _____

Examiner _____

Bureau of Educational Research and Service
Extension Division
State University of Iowa
Iowa City, Iowa

RECORD SHEET

Key: Mark correct sound (√); substitutions with sound substituted; omitted sounds (-); distorted sounds (x); no response (nr).

		I	M	F					
1. i___	19.m___	___	___	___	r-blends	Syllabic	Non-Syllabic ɚ		Other 2-element Blends
2. ɪ___	20.n___	___	___	___	44.pr-___	53.-mɚ___	64.-ɚm___		109.tw-___
3. ɛ___	21.ŋ	___	___		45.br-___	54.-nɚ___	65.-ɚn___		110.kw-___
4. æ___	22.p___	___	___	___	46.tr-___	55.-pɚ___	66.-ɚp___		111.-zm___
5. ʌ___	23.b___	___	___	___	47.dr-___	56.-bɚ___	67.-ɚb___		112.-ŋk___
6. ə___	24.t___	___	___	___	48.kr-___	57.-tɚ___	68.-ɚt___		113.-dʒd___
7. ɝ___	25.d___	___	___	___	49.gr-___	58.-dɚ___	69.-ɚd___		114.-mp___
8. ɚ___	26.k___	___	___	___	50.fr-___	59.-kɚ___	70.-ɚk___		115.-nt___
9. ɑ___	27.g___	___	___	___	51.θr-___	60.-gɚ___	71.-ɚg___		116.-nd___
10. ɔ___	28.r___	___	___		52.ʃr-___	61.-fɚ___	72.-ɚf___		117.-kt___
11. ʊ___	29.l___	___	___			62.-ðɚ___	73.-ɚθ___		118.-pt___
12. u___	30.f___	___	___	___		63.-ʃɚ___	74.-ɚtʃ___		119.-ft___
13. ju___	31.v___	___	___	___			75.-ɚdʒ___		3-element blends
14. oʊ___	32.θ___	___	___	___	1-blends	Vowel 1 81.-pl___	88.-lp___		120.spl-___
15. aʊ___	33.ð___	___	___	___	76.pl-___	82.-bl___	89.-lb___		121.spr-___
16. eɪ___	34.s___	___	___	___	77.bl-___	83.-tl___	90.-lt___		122.str-___
17. aɪ___	35.z___	___	___	___	78.kl-___	84.-kl___	91.-lk___		123.skr-___
18. ɔɪ___	36.ʃ___	___	___	___	79.gl-___	85.-gl___	92.-lf___		124.skw-___
	37.ʒ		___	___	80.fl-___	86.-fl___	93.-lθ___		125.-kst___
	38.h___	___				87.-sl___	94.-lz___		126.-mpt___
	39.ṁ___	___			s-blends 95.sm-___	-sm___			127.-mps___
	40.w___	___			96.sn-___		ɚ, ɝ, and vowel 1 with blends		128.-ntθ___
	41.j___	___			97.sp-___	-sp___			
	42.tʃ___	___	___		98.st-___	-st___	102.-stɚ___		
	43.dʒ___	___	___		99.sk-___	-sk___ -ks___	103.-skɚ___		106.-ŋkl___
					100.sl-___		104.-mbɚ___		107.-ŋgl___
					101.sw-___		105.-ɝst___		108.-lfθ___

Note: The items followed by double lines constitute the 50-item Screening Test.

ANALYSIS SHEET

1. Comparison with norms:
   a. Of the 50 Screening Test items, how many did subject produce correctly? _____
   b. According to the table of norms for the Screening Test, what is the mean number of items correctly produced by children of this age and sex? _____
   c. According to Screening Test norms, what cut-off score separates adequate from inadequate performance at the age of this subject? _____
   d. Of the 176 Diagnostic Test items, how many did subject produce correctly? _____
   e. According to the table of norms for the Diagnostic Test, what is the mean number of items correctly produced by children of this age and sex? _____
   f. How many singles (numbers 1-43) were defective in any position? _____

2. Analysis of misarticulations: analyze the subject's production of the phonemes listed as singles (numbers 1-43).
   a. List all error sounds, indicating position of error (I, M, F).

Omissions	Substitutions	Distortions

   b. Which of these phonemes (1-43), incorrectly articulated as singles in the positions indicated above, were correctly articulated as singles in at least one position?

   _____

   c. Which of these phonemes (1-43), incorrectly articulated as singles in any position, were correctly produced in any of the blends in which they were further tested?

   _____

   d. Which phonemes (1-43), not correctly produced as singles in any position or subsequently in blends, were correctly produced following stimulation as described below?

As a Single			In a blend
In isolation	In a syllable	In a word	in a word

   e. **The following phonemes were never articulated correctly anywhere in the test or following any type of stimulation:**

   _____

3. **Factors possibly related to patterns of misarticulation:** _____

   _____

   _____

APPENDIX B

Description of distortion errors noted on record sheet:

_____

_____

_____

_____

Rating of intelligibility of connected speech:

_____ Readily intelligible

_____ Intelligible if listener knows topic

_____ Words intelligible now and then

_____ Completely unintelligible

Errors noted in connected speech not noted on articulation test:

_____

_____

_____

_____

_____

Description of testing situation:

_____

_____

_____

_____

APPENDIX C

Reliability of the Lorge-Thorndike Intelligence Tests

Alternate Forms Reliability of Lorge-Thorndike Intelligence Tests

Battery and Level	*Grade Level*	*No. of Cases*	*Raw Score Mean**		*Raw Score Standard Deviation**		*Correlation*
			Form A	*Form B*	*Form A*	*Form B*	
PRIMARY							
Level 1	1	1053	39.69	38.77	10.35	9.37	.810
Level 2	2	760	41.62	40.59	7.45	8.21	.761
NONVERBAL							
Level 3	5	724	48.64	45.89	11.86	12.71	.814
Level 4	8	596	41.37	40.66	12.87	13.97	.776
Level 5	11	574	38.13	37.02	12.03	11.95	.846
VERBAL							
Level 3	5	724	51.35	51.78	15.08	14.69	.896
Level 4	8	596	43.56	45.84	13.88	13.83	.865
Level 5	11	574	40.61	41.41	11.44	11.01	.858

*Weighted average of A-B and B-A orders.

Test-Retest Reliability Over a Period of Time

		Original Test		*Retest*		*Correlation*
		Mean	*S.D.*	*Mean*	*S.D.*	
Grade 4	Verbal	104.8	14.4	102.3	13.8	.75
Grade 4	Nonverbal	95.1	13.6	100.0	14.9	.58
Grade 5	Verbal	101.0	14.5	102.6	13.8	.79
Grade 5	Nonverbal	90.5	17.4	99.1	15.2	.60

APPENDIX D

Validity of the Lorge-Thorndike Intelligence Tests

Evidence of the validity of the Lorge-Thorndike Intelligence Tests centers around (1) the choice of test content designed to measure the ability to handle abstract concepts, symbols, and relations and (2) correlations of the Lorge-Thorndike with other measures of intelligence and with tests of educational achievement. Correlations of the Lorge-Thorndike Intelligence Tests with three other group intelligence tests are reported. Correlations for Nonverbal and Verbal Batteries respectively are (1) .74 and .79 with the California Mental Maturity Scale, (2) .65 and .77 with Kuhlmann-Anderson Intelligence Tests, and (3) .71 and .84 with Otis Quick-Scoring Mental Ability Tests. Correlations of Level 3 of the Lorge-Thorndike Tests with Stanford-Binet IQ's are .80 for the Verbal Battery and .69 for the Nonverbal Battery.

Correlations of the Lorge-Thorndike Intelligence Tests with educational achievement measures are substantial, with correlations for the Nonverbal Battery being around .60 with subtests and .70 with total achievement, while corresponding figures for the Verbal Battery are around .75 and .85.