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REPORT ON THE ARTICULATORY AND INTELLIGIBILITY STATUS OF SOCIALLY DISADVANTAGED PRE-SCHOOL CHILDREN.

BY- FRIEDLANDER, GEORGE H.
INSTITUTE FOR RETARDED CHILD. OF SHIELD OF DAVID

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THIS STUDY OF THE ARTICULATORY AND INTELLIGIBILITY LEVEL OF A SOCIALLY DISADVANTAGED GROUP OF CHILDREN IN THE HEAD START PROGRAM INVOLVED 150 CHILDREN, 4 1/2 - 6 YEARS OF AGE, WITH EQUAL NUMBERS OF BOYS AND GIRLS. THIS GROUP WAS COMPOSED OF CHILDREN OF FAMILIES WITH SPANISH LANGUAGE BACKGROUND, OF CHILDREN OF NATIVE NEGRO FAMILIES, AND OF CHILDREN OF NATIVE WHITE FAMILIES. ALL CHILDREN WERE TESTED WITH THE TEMPLIN-DARLEY DIAGNOSTIC TEST OF ARTICULATION. A TAPED CONVERSATION WITH EACH CHILD WAS USED FOR EVALUATION BY AN INDEPENDENT GROUP OF EXAMINERS IN THE AREAS OF INTELLIGIBILITY, VERBAL PROFICIENCY, FOREIGN ACCENT, REGIONAL ACCENT, AND ARTICULATORY DEFECTS. FAMILY DATA ON OCCUPATION, INCOME, FAMILY SIZE, AND LANGUAGES SPOKEN AND A SAMPLING OF PARENT ARTICULATORY LEVEL WAS OBTAINED. THIS DATA WAS CORRELATED AS VARIABLES WITH THE ARTICULATORY AND INTELLIGIBILITY LEVEL OF THE CHILDREN TESTED. DATA INDICATED THAT ALL GROUPS WERE MINIMALLY PROFICIENT IN INTELLIGIBILITY AND VERBAL PERFORMANCE. WHITE CHILDREN SHOWED GREATER ARTICULATORY MATURITY THAN THE NEGRO AND SPANISH-LANGUAGE CHILDREN. FACTORS SHOWN TO BE OF NO INFLUENCE WERE SEX OF CHILD, OCCUPATION AND INCOME OF FATHER, AND FOREIGN LANGUAGE BACKGROUND. POOR ARTICULATORY PERFORMANCE, THEREFORE, REFLECTS A DEVELOPMENTAL LAG IN ARTICULATORY GROWTH. NEW TESTING INSTRUMENTS WHICH ALLOW FOR ETHNIC DIFFERENCES IN ARTICULATION SHOULD BE DEVELOPED FOR FUTURE STUDY. (LG)

PROJECT HEAD START
OFFICE OF ECONOMIC OPPORTUNITY
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REPORT ON THE ARTICULATORY AND INTELLIGIBILITY STATUS OF SOCIALLY DISADVANTAGED PRE-SCHOOL CHILDREN

Principal Investigator
and
Project Director:

George H. Friedlander, Ph.D.

Assisted by:

Virginia DiBonaventura
Jill Giattino
Arthur Roza

Sponsored by:

Institute for Retarded Children
of The Shield of David
1800 Andrews Avenue
Bronx, New York 10453

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- - the children of Head Start who participated in this study

- - the parents of the children

ABSTRACT

This study of the articulatory and intelligibility status of a socially disadvantaged group of children in the Head Start Program involved 150 children, 4 1/2 - 6 years of age, with equal numbers of boys and girls. This group was composed of children of families with Spanish language background, of children of native Negro families and children of native White families.

All children were tested with the Templin-Darley Diagnostic Test of Articulation. A taped conversation of each child was used for evaluation by an independent group of examiners in the areas of intelligibility, verbal proficiency, foreign accent, regional accent and articulatory defects.

Family data on occupation, income, family size, languages spoken and a smapling of parent articulatory status was obtained. This data was correlated as variables with the articulatory and intelligibility status of the children tested.

The study found inconsistency in the articulatory scores of the population of all ages and groups, and severe developmental articulatory immaturity. The group attained levels of intelligibility and verbal proficiency consistent with minimal needs for school readiness. The study found that few variables in the family data correlated significantly and meaningfully with the child's performance in articulation and intelligibility.

TABLE OF CONTENTS

APPENDIX

INTRODUCTION

The inauguration of the Head Start program in the summer of 1965 as part of the overall plan of the Office of Economic Opportunity mobilized large numbers of specialists in both general and particular areas of child development. One group of specialists represented the field of evaluation. It appeared to this group, as it did to this investigator, that to develop meaningful and sequential programs demanded a broad spectrum of specialized information about the group for whom the programs were intended. Some studies of culturally disadvantaged children were available to serve as a basis for planning. These studies, however, were usually small testing procedures on urban "ghetto" populations. Usually there was no control over the educational curriculum, the procedures for testing learning ability, discovering disabilities, and reevaluating or revising the curriculum. In addition, semantic confusion served to support ethnic and racial bias, and the culturally disadvantaged child was equated with the non-educable child with the corollary of impoverished curriculum and unstimulating teaching. The current mythology about the culturally disadvantaged child will be replaced by credible information and facts, only when careful analyses of the parameters of function of this population are studied. This group is no more homogeneous in its many aspects than the middle class group against whom it is constantly being measured. Groups within the group will have to be studied. We will have to discover whether there are areas of deficiency or dysfunction, and areas of proficiency and performance which distinguish this group generally or sections of this

group particularly. We will then be able to plan appropriate curriculum and method. We must determine whether the results of our investigations show that culturally disadvantaged pre-school children are generally or specifically different from their peers physically, intellectually, emotionally and socially. If they are, we must determine whether these differences are related to or are a consequence of poverty and disadvantage. We must then determine what we are going to try to do and how we are going to try to do it. To assume that what has been believed is true because so many have believed it so long, is to destroy truth and the search for truth. It was in this spirit that this study was conceived.

The purpose of this study was to explore some aspects of the communication abilities of children in the Head Start program. There is general agreement that communication, both verbal and non-verbal, is an area with which educators of pre-school children must be concerned. It has been accepted that, generally, culturally disadvantaged children, both pre-school and school children, show deficiencies in the quantity, quality and complexity of their oral communication. This study was designed to investigate one aspect of this problem and report its findings. This study will basically attempt to present a picture and profile of the articulatory status of three groups of culturally disadvantaged pre-school children:

(a) a group of children of Spanish-speaking family background

(b) a group of children of native Negro background

(c) a group of children of native White background

This study will analyze possible influences on their articulatory status and to compare this status in detail with existing articulatory norms. In addition, this study will try to correlate data on the families of these children, such as, language background, occupation, income, size, etc., with the data on articulatory proficiency and deficiency.

Intelligibility will be studied as an aspect of the communication status of the population and will be correlated with the variables of articulation and family data. Although verbal proficiency will not be studied intensively, it will be examined as it relates to the aspects of articulation and intelligibility. Finally, the study will make observations and recommendations about articulation and intelligibility testing, further verbal communication studies, and curriculum and procedure for verbal communication programs for future Head Start programs.

POPULATION

The population for this study consisted of one hundred fifty (150) children in three (3) centers of the Head Start program in New York City. They were selected with the assistance of the Director and Assistant Director of the program for several reasons. An attempt was made to obtain a representative sample of children and families in the New York population of Head Start. Center #1 was located in a new housing project to which the occupants had moved within the past year from the slum areas of the lower Bronx and upper east side of Manhattan. This population was predominantly of Spanish-speaking background, with

some Negro and native White population in the project and the environs. The classes were somewhat integrated. Center #1 was conducted under the auspices of the Community Center of the housing project.

Center #2 was located in an integrated housing project in Queens which had been in existence for more than ten years. The majority of the families were long time residents of a community in which extensive child and parent integrated activity had been centered around both the schools and the housing project. This center was conducted under the auspices of the New York City Board of Education.

Center #3 was located in the fringe area of a segregated Negro community in Brooklyn. Its population was drawn from families in predominantly substandard housing. It was conducted by the Education Department of the Catholic Archdiocese embracing the Borough of Brooklyn.

For the purpose of obtaining a representative sampling of the population, samplings of the population were obtained from each center to make up a total of 150 subjects. This population will be studied as representative of (1) their age levels, (2) their sex, (3) their ethnic backgrounds. The sampling obtained is presented as Table 1 below:

POPULATION

Age	Negro (Native)		Spanish (Ethnic)		White (Native)		Total
	Sex		Sex		Sex		
	M	F	M	F	M	F	
4.6 - 4.11	6	10	5	10	7	6	44
5.0 - 5.5	9	8	9	7	7	8	48
5.6 - 6.0	9	9	12	6	11	11	58
Totals	24	27	26	23	25	25	
Totals	51		49		50		150

Hereafter for purposes of convenience, the group of children of Spanish-speaking families will be called the Spanish children or Spanish group and will be tabled as S. The native Negro group will be called Negro or N. The native White group will be called White or W. In doing this, we are fully aware of the fact that this convention is established for convenience of reporting.

TEST PROCEDURES

The Templin-Darley Test of Articulation was selected to be administered to each of the subjects. This test was selected for several reasons. It is a comprehensive test containing 176 items. The sound elements tested include 25 different consonant sounds, 12 vowels and 6 diphthongs. These sounds are presented as singles, blends and in initial, medial and final positions. The test words were selected, in so far as possible, so that they would be familiar to young children and picturable without ambiguity. One hundred fifty of the 176 test words appear both in the International Kindergaretn Union list, which contains the vocabulary used by normal children before they enter the first grade, and the Gates list of words which are considered suitable for inclusion in reading materials in grades 1, 2, and 3. Twelve words appear in one but not both lists. Fourteen words appear on neither list. A validity study of the test by Jordan demonstrated the validity of the Diagnostic Test on 150 children ranging in age from five to ten years of age. In addition, norms have been established for ages ranging from three to eight on 60 subjects for each age level. In each age level, two-thirds of the subjects were selected from families

in the low socio-economic groups V, VI, and VII of the Minnesota Scale of Parental Occupations. All of the subjects were white and monolingual.

The test was administered by testers who have had professional experience as speech therapists and who have ASHA certification or the requirements for certification. Ten subjects were tested by all testers to establish inter-tester reliability.

The test was administered in strict accordance with the instructions on page 6 of the manual for the test. The picture stimulus was presented first. If no response was elicited, the cue sentence was supplied. If no response was elicited, an imitative response was called for. A tabulation of the mode of response was made to determine the ability of the subject to respond to the spontaneous material of each item. The mode response for each sound for each subject was marked and tabulated. The test of each subject was taped on an unobtrusive portable Panasonic tape recorder for later reevaluation.

The results of the test were analyzed according to the test form and each child was given a second testing of sounds misarticulated. At this time each sound misarticulated was presented for imitation with intense auditory stimulation as an isolated sound, a syllable, a word and a blend, if appropriate. At this time, a conversational sequence of at least two minutes was taped. Questions were presented by the examiner related to trips, classroom activities, or play activities. This sample served later as the listening sample for the independent experts who used scales of intelligibility, verbal proficiency and articulatory error.

INDEPENDENT EXPERTS

Five independent experts were selected to make judgments of intelligibility, verbal proficiency and articulatory error. Each expert was selected on the following criteria:

(1) At least five years experience as speech therapist with populations representative of the subjects tested.

(2) A Masters degree in speech correction.

(3) Certification in Speech by the American Speech and Hearing Association.

All the experts were present at the playback sessions and marked each subject based upon the following scale:

Intelligibility:

1. Not intelligible
2. Occasional word or phrase understood
3. Intelligible because subject is known (minimum intelligibility for conveying basic ideas)
4. Generally intelligible - regardless of presence of error
5. Easily and readily intelligible

Verbal Performance:

1. Does not respond verbally to verbal question stimuli
2. Responds in single words to occasional, minimal number of questions
3. Responds in single words and occasional phrases to most questions
4. Responds with words and phrases and elaborates on some questions
5. Responds easily with variety to verbal stimuli

Foreign Accent:

1. Severe
2. Moderate
3. Slight
4. None

Regional Speech:

1. Severe
2. Moderate
3. Slight
4. None

Articulatory Disorders:

1. Severe
2. Moderate
3. Slight
4. None

The subject were identified only by subject number. Inter-tester reliability was established on each aspect of the examination on the basis of the first ten subjects.

PARENT TESTING

The screening test section of the Templin-Darley Articulation Test was administered to thirty parents of the subjects tested. These tests were taped. An analysis of the test items was made to serve as a basis for judgment and discussion of the immediate adult influence on the articulatory patterns of the subjects tested. The parents were tested on the basis of availability. Some parents were tested when they

came to escort their children to or from school sessions or when they came for medical or educational conferences.

FAMILY DATA

The following family data was sought for each subject tested:

(1) Date of birth of subject

(2) Place of birth of subject

(3) Age of father

(4) Age of mother

(5) Number and ages of siblings

(6) Languages spoken and understood by parents

(7) Languages spoken and understood by siblings

(8) Father's occupation

(9) Aggregate family income

This data was secured from Head Start data sheets, from parent interviews and from family data sheets prepared for this study and distributed by school personnel. Absence of family data occurred in the areas of father's occupation and family income. The latter item presented real anxiety for many families who regarded such data as a possible threat to their continued residence in a housing project where there is a maximum family income for residence eligibility.

EXPERIMENTAL TEST

As this study neared its close, preliminary efforts were made to devise a test which was easier to administer, consumed less time and contained vocabulary more consistent with the vocabulary

used every day by the subjects tested. The test procedure was imitative and non-pictorial. This enabled use of words which cannot be presented pictorially.

The test was administered to twenty subjects. The results will be correlated with the Templin-Darley results.

TEMPLIN-DARLEY TEST OF ARTICULATION

Tester Reliability

In order to establish tester reliability, ten subjects were examined by each of the testers involved in the study. Scores were obtained on the

(1) Templin-Darley Screening Test

(2) Intelligibility Test

(3) Verbal Proficiency Test

There were four testers involved in the Templin-Darley Screening Test and five testers in the Intelligibility and Verbal Proficiency Tests. The criterion measure for the articulation test was the number of correctly articulated items on the 50 item Templin-Darley Screening Test. The criterion measures on the Intelligibility Test and Verbal Proficiency Test were the scores obtained on the 5 point scale prepared for these areas by the principal investigator.

The correlations among the scores of the examiners on these tests were very high. Correlation on the Templin-Darley Screening Test was .97. Correlation on the Intelligibility Test was .96 and on the Verbal Proficiency Test .94.

The Templin-Darley Test of Articulation

One of the purposes of this study was to determine the effectiveness of the T-D test as an instrument for use with the population of the Head Start program. One of the elements already discussed and presented in TableI is the mode of response of the population. From this table it is evident that the total population and

the sub groups both in age and ethnic/or racial composition responded to the test in such a fashion as to make it essentially an imitative test. The responses by mode of the total group resulted in the following means and sigmas:

	M.	S.D.
Mode #1 (picture)	37.9	18.4
Mode #2 (sentence)	21.48	18.2
Mode #3 (imitative)	120.33	33.3

These results lead this investigator to the conclusion that an imitative test most satisfactorily meets the level of the population tested. This is true of all groups tested but not to the same degree. Since the W group and the N group were all native born, it cannot be attributed to foreign language or foreign birth influences.

Since the vocabulary of the Templin-Darley test is scaled to a kindergarten level, it does not seem possible that a pictorial vocabulary level can be reasonably lower and fulfill the function of the test. An imitative test consisting of words in use in the daily speech of the population we are concerned with seems to offer good possibilities. Templin has reported no significant differences in spontaneous versus imitative articulation testing. There are, however, contrary opinions which in the opinion of this investigator show statistically significant but not meaningful differences. It is this investigator's opinion that the language disabilities in vocabulary, intelligibility, verbal proficiency and articulation of the Head Start group as reported by this investigator and others at

a conference on assessment and evaluation indicate the need for revision of existing tests and test procedures in these areas in order to test the Head Start population efficiently and effectively. Most tests and test procedures have been devised for and validated on middle class white populations. Revision or adaptation of old tests, or creation of new ones would seem to be required.

The Templin-Darley diagnostic test which was administered to each subject proved to be a test requiring a long period of time to complete. Each test was administered at one session. In reporting on testing conditions of the first ten subjects tested by each examiner, it was unanimously agreed that "restlessness," "wandering attention," and "verbal expressions of fatigue" were indicated by almost all subjects. Many factors in the administration of each school's program made it advisable to retain the procedure of administering the test in one session. However, it was decided to conduct the diagnostic test with break or rest periods. Since rest periods could not be held constant in time or number, it was not possible to secure reliable data on the time involved in administering the diagnostic test. A sampling of subjects selected haphazardly were timed in a range of 36 - 48 minutes. It was possible to test only three subjects in a school session of about 2 1/2 hours. It was reported by all examiners that tester fatigue was an operating factor and would have precluded further testing beyond that period of time.

There are three measures of articulation which correlate moderately high with each other and can be used as bases for correlations with other variables. These measures were found to correlate

with each other in the population tested by Templin. These measures are:

(1) Number correct on screening test

(2) Number correct on diagnostic test

(3) Number singles defective

Correlation of 3 measures r =

	(1)	(2)	(3)
(1)	-	.89	.68 -
(2)	.89	-	.75 -
(3)	.68 -	.75 -	-

All of these correlations are significant at .01 level.

Omissions, Substitutions and Distortions

In projecting the level of articulation demonstrated on the screening and diagnostic tests and with the number of singles defective, the possibilities of large numbers of omissions would have been reasonable. Since substitutions and distortions increase in that order as omissions decrease, the ratio of these errors to each other was expected to follow this trend. The results obtained are appended as Tables II, III, and IV for the total population, by subgroups and by age within groups.

Here we find no patterns for groups or ages which are consistant with articulation studies on other populations.

(1) Although the differences are not meaningful the age levels within each group do not show the expected decrease in

omissions with increased age in a regular progression.

(2) There is some slight but not meaningful increase in substitutions and distortions with a decrease in omissions but this is inconsistent.

(3) The mean level of total errors of omission, substitution and distortion places the groups in the following order:

N group = 19.44

S group = 18.68

W group = 16.13

This is inconsistent with other articulatory findings of the study and with the hypothesized expectancy of poorer function in the bilingual group which is also most deprived. Recognizing the limited number of the population and its geographical confinement, this investigator is not ready to state that the relationships formerly accepted in articulatory development do not hold for this large section of our population. But serious questions are raised which must be answered by more extensive studies.

In seeking correlation with severity of error or intelligibility as judged by independent samples and testers, we find the following data:

Correlation of Intelligibility with Articulatory Errors

Omissions	.27 - *
Substitutions	.45 - *
Distortions	.33 - *

* Significant .01 level

Here also we find that the high correlation of omissions with severity of error or intelligibility judged by the listener is not sustained in this population. The data indicates that in terms of judged severity or intelligibility, it is better to know about the area of substitution in this population.

ARTICULATORY ANALYSIS

This section will deal with a description of the performance of each of the groups on each of the sounds of the test. A full summary of the number of omissions, distortions and substitutions for each group, and a listing of total errors for each group for each sound is reproduced as Table I.

For purposes of discussion and comparison, a sound was considered severely defective when more than 50% of the group made errors of omission, distortion or substitution in producing the sound. The following table indicates the performance of each group in these terms.

Group	No. of sounds 50% defective
S group	56
N group	52
W group	29

It is interesting to note in this tabulation that

(1) all the sounds missed by W group was missed by N group and S group

(2) all the sounds missed by W group and N group were missed by S group

(3) except medial t (eating).

In this single instance, there were 27 errors by N group, 28 errors by W group and 16 by S group. The only explanation this examiner can offer is that the inclusion of t may have represented the greater dependence of S group on imitation and the additional auditory stimulus. This seems likely since the errors of the W group and N group errors were errors of omission.

An analysis of the remainder of the sounds would also help to give a better picture of full group performance. In the sounds not produced defectively by 50 percent of the group,

(1) 71 sounds were produced with approximately the same number of errors by all groups

(2) 12 were produced with equal variation among the groups with the greatest number by S group, then N group, then W group

(3) 26 sounds were produced with S and N group errors equal and high, W group low

(4) 8 sounds were produced by S group with error, and low error by N and W groups

(5) 3 sounds were presented in error of moderate number by one group and not the others with no reason to account for it. The following table will attempt to present this data graphically.

No. of sounds incorrect by less than 50% of group	
Grouping	No.
All groups equal	71
S - N - W	12
S N - W	26
S - N W	8
N - S W	2 (duck, television)
W - S N	1 (glass)

It is possible to obtain from Table I a complete picture of the performance of each group on each sound of the diagnostic test, and such analysis may be very useful for specialists in articulation. This study will present a discussion of the table for those who would find some generalizations and observations useful.

One would expect the influence of bilingualism to show itself in the speech analysis of a group of 49 young children of families with Spanish language backgrounds. These errors should be found primarily in the area of sounds in English which do not occur in Spanish or which occur in somewhat altered form. These sounds may be summarized as follows:

(1) The vowel sounds of English not present in Spanish:

p<u>i</u>n	<u>u</u>p
p<u>a</u>n	th<u>e</u>
b<u>oo</u>k	y<u>ou</u>

(2) The vowel sounds which are different or altered:

c<u>ow</u>	s<u>ee</u>
d<u>ay</u>	

(3) The consonant sounds of English not present in Spanish:

si<u>ng</u>	<u>h</u>e
<u>sh</u>e	<u>w</u>e
<u>th</u>is	<u>wh</u>ip
mea<u>s</u>ure	

(4) The consonant sounds of English different or altered:

<u>r</u>ead	<u>l</u>ook
poo<u>r</u>	pi<u>ll</u>ow
tige<u>r</u>	<u>v</u>ery

It must be borne in mind that the Spanish language influences are modified as the characteristics of the Spanish which is spoken by the group is modified. It is recognized by experts in

this area that the Spanish spoken by Puerto Ricans and Latin Americans is not only different from Castillian Spanish but is itself further altered by different regional dialects.

Examination of the table's vowel and diphthong areas indicates that performance of the S group was good with relatively little error in these areas. The greatest numbers of errors occurred on music, bird and pin but approximately the same number of errors was made by the N group and the W group on these sounds. In the area of the other vowels and diphthongs there were relatively few errors by any group.

In the area of consonant sounds, we must recognize the existence of three factors which may be operative:

(1) the foreign language, the regional and the community language influences

(2) the appropriate age for development of consonant sounds

(3) the stimulation or feedback factors in both family and community.

It will not be possible to ascribe error clearly to any one factor to the exclusion of the others. However, comparisons of group performances may give more weight to one factor than another as we create a sound error profile.

The consonant errors which constituted the largest group missed by 50 percent of the W group were errors in sounds beyond the age ability of the population. For the purposes of comparison of age level speech development, the charts used were based upon studies by Poole and Templin. The population studied ranged from

4.5 years to 6 years of age. The mean age of the total group was 5.28 years. The sound "l" is generally regarded as a 6.5 year sound. That would be the age at which 90 percent of the group produced the sound correctly. Blends of "l" would represent a further advance, placing the age level at 7.5 years. These errors constituted the largest group of errors for the W group. Other sound errors which were beyond the age group and missed by more than 50 percent of the W group were:

mask	feather
wheel	fourth
twelfth	caged
smooth	month

The errors in omission of final consonants in elephant, hand, locked and the medial in eating are common errors in children. These are "careless" errors. They are not confined to socially deprived populations. The sounds listed above would seem to indicate no unusual sound error pattern in the W group.

The errors of the S group and the N group follow identical patterns although not to the same degree. There are no vowel errors in the group of errors missed by 50 percent. Vowel errors were noted in greater quantity during the conversation portion prior to testing. The ability of the children to produce correct sounds in the controlled conditions of one word utterances was remarked upon by all the testers. The initial "h" which should have caused difficulty with the S group was no problem on the test. The initial and final "y" caused difficulty over 50 percent for both the S and the N groups but for apparently different reasons. The S group has a language

background factor to contend with as well as the fact that the sound is considered to be in the 6.5 year range. The N group did as poorly with it. Other above age sounds missed by both groups were:

windows	fourth	sprinkle
bell	wasp	triangle
garage	nest	left
bridge	mask	there
wheel	first	month
mother	month	feather
large	twelfth	zipper
porch		

Many "s" blends were missed, sprinkling, string and scratch. All "l" blends from #81 - #94 were missed.

Although most of the sounds missed were above age of population sounds, there can be no question that the number of subjects missing these sounds and others in the not over 50 percent group represents immaturity in sound development in the population as a whole. This raises important questions which this study can answer only in part. The statistical pattern which will be discussed in another section in more detail indicates that the total population scored a mean of 122.89 correct on the diagnostic test. This is lower than the 4 year norm for the test. The mean age of the population was 5.3 years. The intelligibility mean and the verbal proficiency mean were both below the age level of the population. In addition the inability of the group to respond to the stimulation

modes of the test and their use of the imitative mode accentuates their inability to respond to pictures representing essentially a kindergarten vocabulary list. The means of each mode of the test are

Mode #1	(picture stimulation)	37.89
Mode #2	(sentence stimulation)	21.48
Mode #3	(imitative)	120.33

Here we see that only 1/3 of the test was handled by stimulation methods and 2/3 of the test was based upon imitation. There is conflicting evidence in past studies of the influence of the imitative method. Templin has stated that there is no significant difference when imitation is used in testing articulation. However, the inability of a group to respond to the test items by the stimulation method warrants the conclusion that

(1) the test items were not within the vocabulary levels of the group or

(2) the pictorial and sentence cue stimulation was not geared to the population tested or

(3) this kind of test requiring verbal response to visual and auditory cues is not within the activity level of the population.

These possibilities are reinforced when the mode responses are examined by groups.

Mode Response by Groups

	Mode #1		Mode #2		Mode #3	
	Mean	S. D	Mean	S.D	Mean	S.D
S group	28.07	15.48	13.56	12.4	139.24	28.9
N group	37.6	17.61	21.09	21.56	120.62	29.78
W group	46.84	17.00	27.77	16.07	101.50	29.86

INTELLIGIBILITY AND VERBAL PROFICIENCY

Intelligibility

It is generally recognized that defective articulation creates problems both for the speaker and the listener. It is generally recognized that the adverse reaction of the listener to the communication difficulties of the speaker may create serious emotional and social problems for the speaker. For these reasons, testing the articulation of pre-school or school children should be followed by therapy designed to reduce in quantity and quality those deviations which create adverse reactions in the listener. Studies of the variables in articulation testing have concluded that the reactions of the listener are dependent upon the frequency of articulatory errors and the degree of severity of the error. The frequency of error measurements most closely related to independent listener reactions to independent connected speech samples are (a) number of defective single sounds, (b) number of defective single items (6). The severity of error measurements indicate that omissions of sounds are more distracting to the listener than substitutions and that substitutions are more distracting than distortions. Some investigators have developed degree of severity scales by weighting sounds by frequency of occurrence of the sound in the language (21), by degree of distortion, by weighting of substituted and omitted sounds and by weighting phonetic consistency of errors (10). Some studies have studied listener reactions to defective articulation directly rather than from articulation test data (1, 2, 9, 8, 12).

This investigation has presented the data for items correct on screening and diagnostic testing and for defective singles. Data

for listener reactions to independent speech samples will now be presented. Correlations of this intelligibility sample with the above mentioned variables and with additional variables will be presented in Appendix Table V.

Intelligibility Scores by Groups

	M	S.D.
Total Groups	3.64	.63
S	3.43	.71
N	3.68	.49
W	3.80	.63

Since a score of 3 was considered the minimum standard for intelligibility, the results obtained would indicate that each group was above this level, with the N and W groups approaching the level of 4 in intelligibility. The results of t tests on the above data show

(1) Difference between S and N groups significant at .05 level

(2) Difference between S and W groups significant at .01 level

(3) Difference between N and W groups not significant.

Although some of these differences are statistically significant, they are not very meaningful. For the purposes of evaluating the status of these children for school admission into kindergarten and first grade, we can conclude that most of them will be understood at least on a minimal level by their teachers. The S group will present slightly greater difficulties in intelligibility for the teacher. The N and W groups will be more readily understood and will not differ materially in the listening judgment of their teachers.

Correlation of intelligibility with other variables (Appendix Table VI) produce the following conclusions.

(1) The score on diagnostic test and the number of single sounds defective give us articulatory test data which is consistent with the judgments of the independent experts of the conversation sample.

(2) The kind of error score which is of most significance in determining the intelligibility of the subject is different with each group. In the S group the most significant factor is omissions, in the N group distortions and in the W group substitutions.

(3) The subjects who did not respond with picture or sentence stimulation and who required an imitative response tended to score lower in intelligibility.

(4) The judgment of the independent experts in scoring intelligibility correlates highly with their judgment of articulatory deficiency demonstrating a high reliability factor in these independent judgments.

(5) The degree of intelligibility in the S group correlates significantly at the .01 level with both the language spoken by parents and the language spoken by siblings. However, it cannot be considered meaningful at this level.

(6) There is no significant correlation between the level of income of the family and intelligibility, except in the N group. In this group, the range of income is wide. With the

correlation at a minimal .05 level, we can only say that the children of the lowest income families in this group tend to be less intelligible.

Verbal Proficiency

This study was not primarily concerned with verbal language performance. Studies primarily designed for that purpose would use the standard verbal performance tests used by Winitz (19, 20), Templin (16), and others. For the purposes of this study, the verbal proficiency level of each child was rated by independent, experienced examiners from tapes which were used to test both intelligibility and verbal proficiency. The 5 point scale used was intended to assess whether this population was responsive to verbal stimuli in terms of both frequency of response and the general quantity of the response. The purpose of this procedure was to evaluate the response of the child to the questions of an adult in a simulated school or pupil-teacher situation.

The achieved by the total group and the sub groups are listed below:

Means and S. D. of Verbal Proficiency Scores

	Mean	S.D
Total Group	3.23	.72
S Group	3.025	.79
N Group	3.39	.66
W Group	3.29	.66

The results of t tests of significance among the groups indicate

(1) Difference between S and N groups significant at .05 level

(2) Difference between S and W groups significant at .10 level

(3) Difference between N and W groups not significant.

The scores indicate that minimal standards of quantity and frequency of response were met by the total population and by each group. A score of 3 was considered the cut-off between satisfactory and unsatisfactory performance. Here again, as in the area of intelligibility the significance of the differences is not really meaningful in terms of actual performance by the individuals in terms of functioning in a kindergarten or first grade classroom.

Correlations between intelligibility scores and verbal proficiency scores for the total group and for the sub groups indicate a high correlation at the .01 level.

Total Group	.67	$r_{.01} = .21$
S group	.73	$r_{.01} = .36$
N group	.48	
W group	.72	

Correlations of verbal proficiency with other variables produce the following conclusions.

(1) The number of single sounds defective gives us the measure of articulation with the highest correlation with verbal proficiency scores.

(2) The articulatory error score which tells us most about the verbal proficiency ability of the group varies. There is no significant error factor of the S group related to scores of verbal proficiency. In the N group, it is better to know about distortions, in the W group about substitutions in making judgments as to the possible verbal proficiency levels of the subjects.

(3) The subjects who were able to respond to the picture stimulus tended to be more verbally proficient.

(4) The correlation between independent judgments of verbal proficiency and articulatory status, although significant were not as high or as consistent as the judgments involving intelligibility.

(5) The correlation between language spoken by the parent and languages spoken by siblings, although higher than the correlation of intelligibility and languages spoken, is significant at the .01 level but cannot be considered meaningful.

FAMILY DATA

Occupation Status of Father

No.	S.	N.	W.
1.	-	2	3
2.	6	3	6
3.	9	21	11
4.	4	3	5
5.	-	-	1
6.	13	14	8
7.	-	-	-
Blank	17	8	16

Code for Occupation of Father

OEO Project Head Start

1. Professional, Technical, Managerial
2. Clerical, Sales
3. Craftsman, Foreman, Operative
4. Service or Private Household Worker
5. Farmer
6. Laborer
7. Student

Blank No response

Aggregate Family Income

No.	S.	N.	W.
1.	-	1	-
2.	1	-	-
3.	2	1	4
4.	8	10	6
5.	8	15	7
6.	8	8	15
7.	-	3	2
8.	-	2	-
9.	-	-	-
0.	-	-	-
Blank	22	11	16

Means and S. D. of Income by Groups

	Total Pop.	S.	N.	W.
M.	5.02	4.74	5.1	5.15
S.D.	1.20	1.07	1.3	1.14

Code for Aggregate Family Income

OEO Project Head Start

1.	Less than $1,000	7.	$6,000 - $7,999
2.	$1,000 - $1,999	8.	$8,000 - $9,999
3.	$2,000 - $2,999	9.	$10,000 plus
4.	$3,000 - $3,999	0.	Don't know
5.	$4,000 - $4,999	Blank	No response
6.	$5,000 - $5,999		

FOREIGN LANGUAGE INFLUENCES

Family Lanugage Status for S Group

	Parents	Subject and Siblings
Speak English only	2	5
Speak English - some Spanish	17	26
Speak Spanish - some English	24	16
Speak Spanish only	6	1
	49	49

The above table presents the following picture of the language status of the subjects and their siblings:

55% speak English as their major language with some Spanish

33% speak some English with Spanish as their major language

2% speak Spanish only (1 child)

10% speak English only

98% speak some English

The language status of the parents of the subjects of this study present the following language status:

35% speak English as their major language with some Spanish

49% speak some English with Spanish as their major language

4% speak English only

12% speak Spanish only

88% speak some English

There were 11 families, 9 in the W group and 2 in the N group, in which the parents spoke a foreign language to each other infrequently. In the N group the languages were French and an African dialect. In the W group, the languages were French, Italian and German. The children of these families showed little or no effect of these minimal language background influences.

PARENT TESTING ON SCREENING TEST

As part of an effort to evaluate family and community language background influences, thirty parents were tested with the Templin-Darley Screening Test. The parents tested were those who came to the Head Start centers to bring their children to school and those who were available after a conference with the nurse or teacher. Parents representative of the composition of the child population were tested. The total group contained only six fathers.

Group	N	Mean	S.D.
S	10	42.9	4.8
N	10	48.1	.84
W	10	46.1	2.7

The mean places the S parent group at the 7 year level, the W group at the 7 year 8 month level and the N group on the 8 year level. All of these levels are sufficiently high in the scale of articulatory correctness to constitute no serious negative influence on the child population. The standard deviations would seem to indicate that more negative influences exist in the S group than in the others. There is great homogeneity in the N group influences. Each of the groups tested achieved intelligibility scores clustering around the 4 score which reflects their ability to be generally intelligible even with the presence of occasional error.

The language spoken by the S parents correlates with the screening test score of their children at -.39 with the diagnostic test score at -.43, with their intelligibility score at .42 and with verbal proficiency at -.22. All are significant at the .01 level. From this and related data above, we must conclude that the language spoken by the parents is a moderate but not determining factor in the articulatory, intelligibility and verbal proficiency performances of their children.

THE EXPERIMENTAL TEST

In the closing weeks of the study, a simple test was developed to test some working hypotheses which had developed during the testing program. There was a distinct impression gained by the testers that the use of a pictorial test which permitted pictorial stimulation, sentence clue stimulation and, if no response was stimulated, imitative stimulation, created a mounting failure factor which interfered with and conditioned both the motivation for future efforts at pictorial identification and the spontaneity and vigor which clarity of articulation requires. Some comments on testing indicated reduction of vocal intensity, solemn mien, slumping, loss of eye contact and requests for diversionary activity, i.e. need for a drink, use of bathroom, etc., in those children who were finding difficulty in answering the test in Mode #1 or Mode #2.

The second point of concern involved the area of phonetic consistency. Since almost all articulation tests involve testing one sound in each test word, the testers became aware of and reported many instances of articulatory error in sounds other than the one being tested. These errors were noted because they occurred on sounds which had already been correctly produced when they had been tested. For example, the w in wading was incorrectly produced in a word in which we were testing the vowel a, but correctly produced in water in which we were testing for w. When we found many such instances, we questioned marking a test item as correct which in other instances was produced incorrectly. In other words we were looking for a way to score phonetic inconsistency.

The experimental test was made non-pictorial. This permitted the use of words from the daily use vocabulary of our population which had no feasible or reasonable pictorial representation. In this way we felt we could achieve more appropriate test items. In addition, the test for all subjects and all items would be imitative. We hoped to test boredom and lack of rapport which are the most frequent reasons advanced by pictorial test advocates in analysis of an imitative approach. The scoring of the 164 test sounds involved testing of each sound in each word and recording the result. Since there were sounds tested more than once, the procedure required each sound to be considered separately in adding the number correct and that a sound produced incorrectly at any time be considered as incorrectly produced in listing incorrect sounds. There were 164 sounds in the test.

The test was given to 20 subjects. Both sexes and all groups were included. The subjects were selected because they were available at the time the testing was done. The test was administered in mean time of 7.6 with a range of 6 1/2 minutes to 9 minutes. Children who made more errors required more recording time from the tester. There was no overt evidence of boredom. The testers found the analysis of results easy because of the simplicity of the test.

The results of the test will be presented with the results of the Templin-Darley diagnostic test for the same subject.

Test	N	Mean	S. D.
Experimental Test	20	142.95	23.34
Templin-Darley Diagnostic	20	132.65	51.6

t test significant at .05 level

We can conclude from this data that the Experimental Test tends to have less variance and may therefore be more reliable; that the variance between the scores is statistically significant but further study will be required to find the specific factors of this variance. It is, however, a promising start in exploring new testing for the study of populations which do not readily lend themselves to tests presently available.

SUMMARY

This study investigated the articulatory status of 150 Head Start children of different ethnic backgrounds and the relationship of this status to intelligibility. Many other variables were studied in terms of the testing instrument, the Templin-Darley Test of Articulation, the judments of independent experts on intelligibility, verbal proficiency, foreign accent, regional accent and articulation. Family background information relating to occupations, income and languages spoken and understood was obtained and correlated with the experimental data.

This investigation disclosed:

(1) the test instrument presented difficulties in terms of the level of words used for test items. Although based upon kindergarten levels, many of the test items were beyond the language level of the group both for pictorial recognition and imitation.

(2) the length of the diagnostic test presented difficulties in maintaining attention and alert performance.

The data obtained from the test indicate that

(1) the native White children performed best on the articulation test and showed the highest level of articulatory maturity.

(2) the sounds missed most frequently by native Negro children and children of parents of Spanish language background were not based upon regional or foreign speech but were articulatory errors based upon immaturity in articulatory development. This was confirmed by the judgment of independent experts who analyzed taped samples of each child.

(3) the age level norms for all groups on articulatory test measures at all ages were from 18 months to 6 months below chronological age levels. The order of profieiency placed the groups in the following ascending order of ability (a) S group (b) N group (c) W group.

(4) the performance of males and females showed little significant variation except in the oldest level of the W group where the differences were significant.

(5) the intelligibility status and the verbal proficiency status of all groups were above the minimal levels for school readiness communication.

(6) the intelligibility and verbal proficiency scores correlated significantly with measures of articulation. The best measure was number of singles defective, followed by number correct on the diagnostic test.

(7) the occupation of the father and aggregate family income were not significant in the articulatory, intelligibility or verbal proficiency status of the children.

(8) the foreign language background of the parents of the S group was not reflected as an important factor in the performance level of the group.

(9) the parents tested showed good articulatory ability and good intelligibility levels.

It is the conclusion of this investigator that the group studied is minimally proficient in intelligibility and verbal

proficiency. The articulatory performance of the population reflects developmental lag in articulatory growth rather than foreign or regional speech. There is no evidence to indicate that the variables in this study account for the immaturity of the articulatory status, or the minimal level of intelligibility or verbal proficiency.

RECOMMENDATIONS FOR RELATED STUDIES AND REMEDIATION PROGRAMS

The experiences gained in this study and the results obtained raise many questions which strongly suggest the need for further studies. Some of these are directly concerned with the specific areas explored by this study. Others are in areas related to this study.

In this study, the Templin-Darley test of articulation was used because of its completeness and its standardization. The norms for the screening and full diagnostic test had been established on a sufficiently large population from ages 3 - 8 years of age with a section of the population from low income families. In use the test revealed that with the population of this study the test became essentially an imitative test. It is this investigator's opinion that an imitative test can assess articulatory patterns effectively. However, many of the words in the test were unfamiliar to the children. What effect the attempt to pronounce these unfamiliar words may have upon error is conjectural. There can be no questioning the fact that confidence in the recognition of familiar words may

produce the best efforts in articulation of which the subject is capable. This would seem to indicate the need for a test whose test words are taken from the use vocabulary of the population. The Kindergarten Scale seems too high for this population.

Recent studies have indicated that articulatory error involved in the determination of intelligibility is closely related to the frequency of occurrence in the language of the sounds which are in error. This would seem to indicate the need for a weighting of sounds based upon frequency.

Another element which should be considered in new test construction is the factor of phonetic consistency. In tests which examine the performance of only a single sound from among many it is not possible to check more than one performance of a sound in a position. Even this requires an extensive test for a full complement of individual sounds and sound combinations. A test whose construction and test procedure consisted of more than one performance judgment for a sound in a position would enable the tester to check the phonetic consistency of the sound.

The test should permit of a method of scoring which will produce an easily computed score which will permit of standardization on a population of varied economic, ethnic and racial backgrounds. This population must be selected from rural and urban groups. The attempt to create such a test primarily for pre-school children should be a function of research and study under Project Head Start.

This study of an urban population of varied backgrounds should be only the beginning of a series of studies on the articulatory status and intelligibility of a wide variety of population groups of varied economic, geographic, ethnic and racial groups. Such studies would enable us to re-evaluate the studies which produce norm age development scales in articulation. A careful assessment of all studies purporting to set age level norms must allow for careful appraisal of economic, social, intellectual, ethnic, racial, and geographic variables.

Longitudinal studies should be conducted to determine the rate at which articulatory maturity occurs in different segments of our deprived populations and the age norms for different stages of this development. This study which encompassed some of the groups in the Head Start program in New York is itself only a partial study of these groups and could not include children of many ethnic groups in the city nor children of all social and economic levels of a deprived population. The fact that these children are all part of one program called Head Start should not lead anyone to question the extreme heterogeneity that exists within the group.

Further studies should be initiated seeking those factors which contribute to slow development of speech and language. These factors must be sought not only in the areas of deprivation and poverty in the family, but also in the areas of emotional and social relationships in the family.

This investigator has worked for many years with children whose deficiencies in speech and language have been organically predicated. Studies to determine the incidence of mild or "soft-signs" of organic impairment in children in Head Start programs would help to clarify the status of another segment of this population whose neurological dysfunction must not be masked by attributing their status solely to deprivation and poverty.

Programs for achieving more mature status in articulation, intelligibility and verbal proficiency must be instituted as part of the readiness-for-school aspect of Head Start, controlled studies of the effect of

(1) individual remediation by speech and language therapists.

(2) psychomotor and stimulation experiences by trained personnel.

(3) planned units of vocabulary and conversation based upon daily living experiences carried out by teachers under specialized supervision.

(4) planned speech improvement lessons based upon songs, stories and communication units.

All of these areas of remediation must be planned, instituted and evaluated in an effort to shorten the period of growth to improved status and speech and language maturity.

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TABLE I

ANALYSIS OF SOUND ERRORS ON TEMPLIN-DARLEY DIAGNOSTIC TEST BY GROUPS

		S.			N.			W.			Total Error		
		O	D	S	O	D	S	O	D	S	S.	N.	W.
1	feet	0	0	0	0	0	0	0	0	0	1	0	0
2	pin	0	0	8	0	0	6	0	0	7	8	6	7
3	bed	1	3	3	0	2	4	0	0	2	7	6	2
4	cat	0	0	4	0	0	3	0	0	2	4	3	2
5	gun	0	1	2	0	0	1	1	0	0	3	1	1
6	balloon	1	1	2	0	0	2	0	0	0	4	2	0
8	car	0	0	2	0	0	1	0	0	3	2	1	3
9	clock	0	2	2	0	0	1	0	0	3	4	1	3
10	ball	0	0	0	0	0	0	0	0	0	0	0	0
11	book	0	0	0	0	1	0	0	0	3	0	1	3
12	shoe	0	1	1	0	1	1	0	1	0	2	2	1
14	cone	0	0	1	0	0	1	0	0	0	1	1	0
15	house	0	0	1	0	0	4	0	0	2	1	4	2
16	cake	0	0	0	0	1	0	0	0	0	0	1	0
17	pie	0	1	0	0	0	1	0	1	4	1	1	5
18	boy	0	0	0	0	0	0	0	1	3	0	0	4
19	mittens	0	0	0	0	0	0	0	0	0	0	0	0
19	lemon	0	0	3	0	0	2	0	0	3	3	2	3
19	drum	2	3	2	1	0	0	1	0	0	7	1	1
20	nose	0	0	0	0	0	0	0	0	0	0	0	0
20	banana	0	0	0	0	1	4	0	0	3	0	5	3
20	spoon	5	2	9	7	1	6	2	0	5	16	14	7
21	swinging	0	11	7	0	2	16	0	1	8	18	18	9
21	ring	0	5	4	0	3	6	1	0	7	9	9	8

		S.			N.			W.			Total Error		
		O	D	S	O	D	S	O	D	S	S.	N.	W.
22	pencil	0	0	0	0	0	1	0	0	0	0	1	0
22	sleeping	0	0	0	1	0	0	0	0	2	0	1	2
22	cup	1	0	3	0	1	1	1	0	0	4	2	2
23	bear	0	0	2	0	0	0	0	0	0	2	0	0
23	baby	0	0	0	0	0	0	0	0	0	0	0	0
23	tub	0	2	9	6	0	10	1	0	12	11	16	13
24	tongue	0	2	0	0	0	2	1	0	3	2	2	4
24	eating	4	1	11	16	3	8	16	0	12	16	27	28
24	boat	16	0	4	19	0	2	18	0	2	20	21	20
25	doll	6	2	4	2	0	2	2	1	2	12	4	5
25	wading	3	6	0	7	1	2	3	0	1	9	10	4
25	slide	26	2	2	24	0	2	11	0	4	30	26	15
26	kiss	0	0	1	0	1	1	0	0	0	1	2	0
26	pocket	1	1	0	1	1	0	1	0	0	2	2	1
26	duck	4	0	0	11	1	0	1	0	0	4	12	1
27	girl	1	0	3	0	0	2	0	0	3	4	2	3
27	wagon	0	0	2	0	0	3	0	0	3	2	3	3
27	dog	7	0	13	12	1	6	0	0	4	20	19	4
29	umbrella	0	12	3	0	7	10	0	0	15	15	17	15
29	bell	2	12	24	1	0	25	2	0	10	38	26	12
30	fence	1	1	2	0	0	1	0	0	3	4	1	3
30	telephone	0	0	1	0	0	1	0	0	3	1	1	3
30	knife	1	0	5	2	1	1	1	0	3	6	4	4
31	clover	1	7	18	0	0	12	0	0	6	26	12	6

		S.			N.			W.			Total Error		
		O	D	S	O	D	S	O	D	S	S.	N.	W.
31	stove	4	2	22	13	1	12	4	0	8	28	26	12
34	soap	1	0	11	0	0	8	0	0	7	12	8	7
34	bicycle	0	0	11	1	2	10	3	1	7	11	13	11
34	mouse	0	1	11	2	5	10	1	2	8	12	17	11
35	scissors	2	1	16	1	5	15	1	1	10	19	21	12
35	windows	9	1	16	8	2	24	1	3	17	26	34	21
37	garage	5	8	18	5	7	16	3	2	25	31	28	30
38	horse	6	2	3	2	2	0	1	0	3	11	4	4
39	grasshopper	2	1	1	0	0	1	1	0	0	4	1	1
43	bridge	0	6	19	2	2	22	2	0	10	25	26	12
39	wheel	0	17	20	0	18	8	0	7	18	37	26	25
39	white	0	16	11	1	19	7	0	8	18	27	26	26
40	water	0	0	0	0	2	0	0	0	2	0	2	2
40	sandwich	1	2	4	1	2	5	2	0	7	7	8	9
53	hammer	0	3	2	1	0	2	1	0	5	5	3	1
54	dinner	0	3	1	0	0	2	0	0	4	4	2	4
55	paper	0	3	0	0	0	4	0	0	6	3	4	6
56	rubber	0	3	0	0	0	3	0	0	5	3	3	5
57	doctor	0	5	0	0	2	4	0	1	6	5	6	7
58	ladder	1	4	7	0	1	12	0	0	6	12	13	6
59	cracker	0	5	5	0	6	7	1	0	7	10	13	8
60	tiger	0	4	4	1	2	2	0	0	6	8	5	6
61	gopher	0	5	2	1	0	4	0	1	8	7	5	9
62	mother	0	6	28	0	5	21	0	0	20	34	26	20

		S.			N.			W.			Total Error		
		O	D	S	O	D	S	O	D	S	S.	N.	W.
63	washer	0	8	10	1	3	11	0	2	7	18	15	9
64	arm	1	3	2	1	0	4	0	0	2	6	5	2
65	horn	0	6	5	0	0	1	0	0	1	11	1	1
66	sharp	2	6	5	5	4	4	2	0	3	13	13	5
67	curb	7	11	4	9	1	10	0	1	8	22	20	9
68	heart	6	3	8	8	1	4	5	1	2	17	13	8
69	card	8	5	3	12	4	4	2	2	2	16	20	6
70	fork	5	6	2	5	2	4	0	0	0	13	11	0
71	iceberg	7	13	5	8	10	10	0	1	10	25	28	11
72	scarf	3	2	9	0	1	8	0	0	4	14	9	4
73	fourth	6	2	27	4	2	22	2	2	21	35	28	25
74	porch	2	1	17	2	1	8	0	0	16	20	11	16
75	large	4	3	21	2	0	24	0	2	12	28	26	14
77	blocks	2	2	4	1	1	5	0	1	9	8	7	10
81	apple	0	3	26	0	1	26	0	4	22	29	27	26
82	table	2	6	24	1	1	30	0	1	25	32	32	26
83	bottle	0	10	23	0	3	29	0	4	22	33	32	26
84	buckle	1	4	22	0	1	26	0	6	19	27	27	27
85	eagle	0	5	23	0	1	25	0	6	19	28	26	25
86	ruffle	0	2	25	0	2	30	0	1	25	27	32	26
87	whistle	0	3	27	0	1	29	0	4	22	30	30	26
88	help	1	3	21	3	5	35	1	2	20	25	43	23
89	bulb	3	5	23	5	4	30	3	0	30	33	39	33
90	belt	3	4	22	5	1	25	1	0	24	29	31	25

		S.			N.			W.			Total Error		
		O	D	S	O	D	S	O	D	S	S.	N.	W.
91	milk	3	4	23	3	3	25	0	0	22	30	33	22
92	wolf	4	8	28	1	4	34	3	5	26	40	39	34
93	health	0	3	40	1	2	34	0	2	35	43	37	37
94	nails	3	5	28	2	8	23	1	4	22	36	33	27
95	possum	1	4	11	0	7	9	0	1	10	16	16	11
97	wasp	13	1	21	10	3	20	4	1	16	35	33	21
98	nest	9	0	20	10	5	19	3	3	13	29	34	19
99	mask	8	4	22	8	2	20	3	2	20	34	30	25
99	books	8	1	9	2	2	9	1	0	8	18	13	9
102	sister	7	6	6	0	3	14	0	3	9	19	17	12
103	whisker	4	7	11	2	4	12	2	0	11	22	18	12
104	December	1	5	6	1	2	8	1	3	8	12	11	12
105	first	11	3	13	7	3	17	1	1	14	27	27	16
106	sprinkle	2	8	16	0	6	27	0	1	16	36	33	17
107	triangle	4	4	18	2	5	21	0	1	15	28	28	16
108	twelfth	3	4	39	7	6	31	1	1	41	46	44	43
111	chasm	3	9	14	2	7	14	0	1	7	26	23	8
112	trunk	0	4	7	7	0	3	0	2	2	11	10	4
113	caged	22	4	13	21	4	6	26	1	2	41	31	29
114	lamp	7	4	5	13	0	5	5	0	0	16	18	5
115	elephant	25	4	1	21	2	7	20	1	2	30	30	24
116	hand	25	1	4	21	0	5	23	0	0	30	26	23
117	locked	17	5	7	18	2	6	13	1	11	29	26	25
118	stopped	25	1	5	21	2	5	14	0	2	31	28	16

		S.			N.			W.			Total Error		
		O	D	S	O	D	S	O	D	S	S.	N.	W.
119	left	19	2	7	16	1	8	3	0	15	28	25	18
124	squirrel	3	5	15	0	7	16	0	4	13	23	23	17
125	fixed	9	4	21	6	5	9	5	2	3	34	20	10
126	jumped	14	3	3	13	1	3	7	1	0	20	17	8
127	stamps	11	4	8	7	1	12	1	2	7	23	20	10
128	month	0	4	27	3	1	23	1	2	23	31	27	26

TEMPLIN-DARLEY SCREENING TEST

		S.			N.			W.			Total Error		
		O	D	S	O	D	S	O	D	S	S.	N.	W.
7.	bird	0	6	4	0	7	5	0	5	8	10	12	12
13.	music	0	8	7	0	5	9	0	2	12	15	14	14
28.	rabbit	0	3	11	0	0	8	0	0	6	14	8	6
28.	arrow	0	2	11	1	5	9	0	1	7	13	15	8
29.	leaf	0	0	4	0	0	2	0	0	7	4	2	7
31.	valentine	0	1	33	0	0	31	0	0	21	34	31	21
32.	thumb	0	2	32	0	2	32	3	2	28	34	34	33
32.	bathtub	6	1	28	6	2	26	15	1	18	35	34	34
32.	teeth	3	2	35	3	1	30	3	3	26	40	34	32
33.	there	0	2	36	0	3	33	1	1	24	38	36	26
33.	feather	0	4	31	7	1	23	0	0	26	35	31	26
33.	smooth	15	5	28	14	1	23	6	0	22	48	38	28
35.	zipper	0	2	28	0	5	21	0	0	12	30	26	12
36.	sheep	0	1	13	0	1	12	0	1	7	14	13	8
36.	dishes	0	4	8	1	5	8	0	0	5	12	14	5
36.	fish	0	3	9	0	2	10	0	2	6	12	12	8
37.	television	1	4	10	7	2	13	5	7	2	15	22	14
41.	yellow	0	3	11	0	1	6	1	1	2	14	7	4
41.	onion (s)	0	4	6	0	4	4	0	2	5	10	8	7
42.	chair	0	2	19	0	0	11	0	0	6	21	11	6
42.	matches	0	1	17	1	3	9	0	2	2	18	13	4
42.	watch	1	0	19	2	1	11	0	4	3	20	14	7
43.	jar	3	2	7	0	1	4	0	1	4	12	5	5
43.	engine	0	14	4	0	2	14	0	12	2	18	16	14

		S.			N.			W.			Total Error		
		O	D	S	O	D	S	O	D	S	S.	N.	W.
44.	presents	0	5	8	0	1	6	1	2	4	13	7	7
45.	bread	0	4	8	0	0	9	1	0	3	12	9	4
46.	tree	1	1	11	0	1	10	1	1	10	13	11	12
47.	dress	2	3	12	0	2	8	1	0	8	17	10	9
48.	crayons	1	4	9	0	3	4	1	1	6	14	7	8
49.	grass	1	1	10	1	0	5	1	0	4	12	6	5
50.	frog	0	3	13	0	2	16	0	2	13	16	18	15
51.	three	0	2	25	0	1	25	0	3	24	27	26	27
52.	shredded	3	13	22	0	4	30	0	5	26	28	34	31
76.	planting	3	1	11	0	2	9	0	0	12	15	11	12
78.	clown	1	1	7	0	0	8	1	0	9	9	8	10
79.	glass	2	0	6	1	0	5	1	1	12	8	6	14
80.	flower	4	1	7	1	3	6	1	1	3	12	10	5
95.	smoke	5	1	16	2	2	12	1	1	11	22	16	13
96.	snake	3	2	16	1	5	12	0	1	9	21	18	10
97.	spider	7	2	10	1	0	16	1	0	9	19	17	10
98.	stairs	7	1	9	2	4	9	1	0	9	17	15	10
99.	sky	6	1	12	3	3	12	1	1	9	19	18	11
100.	sled	4	2	16	0	7	12	1	4	9	22	19	14
101.	sweeping	3	2	12	1	5	10	1	1	11	17	16	13
109.	twins	2	5	6	0	2	11	1	2	10	13	13	13
110.	queen	1	3	9	0	1	7	0	0	6	13	8	6
120.	splash	6	4	17	5	3	15	2	0	14	27	23	16
121.	sprinkling	2	8	22	3	8	15	0	1	12	32	26	13
122.	string	5	5	16	3	3	20	0	0	20	26	26	20
123.	scratch	5	2	22	1	2	19	1	0	12	29	22	13

TABLE II

MEANS AND SIGMAS FOR TOTAL GROUP

	Omissions	Substitutions	Distortions
Mean	3.49	11.01	3.6
S. D.	3.05	6.80	2.64

TABLE III

MEANS AND SIGMAS FOR ETHNIC GROUPS

		Omissions	Substitutions	Distortions
S	M	3.02	12.06	3.56
	S. D.	1.71	5.9	2.37
N	M	4.18	11.02	4.24
	S. D.	4.21	6.72	3.08
W	M	3.23	9.93	2.97
	S. D.	2.49	7.54	2.24

TABLE IV

MEANS AND SIGMAS FOR ETHNIC GROUPS BY AGE

			Omissions	Substitutions	Distortions
S	4.6 - 4.11	M	2.92	11.00	3.46
		S. D.	1.44	6.29	3.05
	5 - 5.5	M	2.76	12.93	4.31
		S. D.	1.58	7.10	2.39
	5.6 - 6	M	3.33	12.16	3.00
		S. D.	2.13	4.66	1.65
N	4.6 - 4.11	M	6.15	12.33	5.69
		S. D.	6.67	7.20	3.86
	5 - 5.5	M	3.19	9.41	3.31
		S. D.	2.34	5.85	2.39
	5.6 - 6.0	M	3.50	11.44	3.67
		S. D.	2.35	7.33	2.54
W	4.6 - 4.11	M	3.33	10.00	3.09
		S. D.	2.50	8.16	2.74
	5 - 5.5	M	3.00	11.53	2.70
		S. D.	3.58	8.67	2.21
	5.6 - 6	M	3.29	8.76	3.07
		S. D.	1.76	6.63	2.09

TABLE V

MEANS AND STANDARD DEVIATIONS ON DIAGNOSTIC AND SCREENING TESTS BY AGE IN ETHNIC GROUP.

Age and Ethnic group	N	Screening Test Mean	Screening Test S. D.	Diagnostic Test Mean	Diagnostic Test S. D.
4.6 - 4.11					
S	15	29.27	10.69	121.40	30.72
N	16	28.53	13.27	105.80	30.75
W	13	34.71	15.09	139.50	31.04
5.0 - 5.5					
S	16	28.63	10.66	110.38	30.20
N	17	35.29	9.61	125.29	29.27
W	15	34.00	11.74	126.13	29.59
5.6 - 6.0					
S	18	29.22	8.80	114.28	19.84
N	18	31.67	12.25	125.33	28.38
W	22	35.86	10.99	135.62	28.67

TABLE VI

CORRELATIONS OF INTELLIGIBILITY AND VERBAL PROFICIENCY WITH 15 VARIABLES.

	Intelligibility				Verbal Proficiency			
	Total	S	N	W	Total	S	N	W
Correct on screening test	.47	.43	.40	.53	.37	.42	.32	.34
Correct on diagnostic test	.52	.49	.41	.59	.42	.42	.39	.45
# siggles defective	-.52	-.50	-.45	-.59	-.46	-.45	-.50	.45
# omissions	-.27	-.42	-.25	-.43	-.23	-.24	-.34	-.28
# substitutions	-.45	-.34	-.42	-.57	-.36	-.26	-.38	-.42
# distortions	-.33	-.23	-.51	-.37	-.29	-.22	-.45	-.28
Mode of response 1	.40	.33	.23	.50	.40	.47	.32	.44
Mode of response 2	.29	.40	.19	.28	.08	.28	-.13	.20
Mode of response 3	-.44	-.45	-.26	-.41	-.31	-.44	-.10	-.29
Foreign accent	.39	.56	-.09	.00	.36	.57	-.22	.00
Regional accent	.12	-.19	.32	.64	.07	-.17	.36	.42
Articulatory defect	.70	.75	.67	.74	.48	.64	.35	.43
Language spoken by parents	-	-.22	.00	-	-	-.33	.00	.00
Language spoken by siblings	-	-.25	.00	-	-	-.31	.00	.00
Income	.11	.00	.28	-.04	.12	.09	-.28	.01

Throughout table for total group $r_{.05} = .16$, $r_{.01} = .21$ (df = 150)

Throughout table for S, N, W $r_{.05} = .27$, $r_{.01} = .35$ (nearest df = 50)

EXPERIMENTAL ARTICULATION TEST

ring --

finger ---

nothing ----

very ----

sugar ----

washing ----

dish ---

teacher ----

ouch --

cheek ---

juice ---

orange -----

zoo --

lazy ----

pocket -----

paper ----

lip ---

bathtub ------

candy -----

hide ---

girl ---

off --

near ---

stove ----

thumb ---

month ---

this ---

this ---

mother ----

smooth ----

balloon -----

pencil ------

size ---

rug ---

brown ----

prize ----

cry ---

drop ---

fresh ---

trick ----

blue ---

play ---

clap ----

fly ---

slow ---

snow ---

stop ---

spill ----

skip ----

Omissions

Substitutions

Distortions

No. Correct

NAME _____

Apreciado Padre;

Esperamos que usted nos pueda ayudar dandonos cierta informacion. Por favor conteste usted la lista de preguntas que estan debajo de las rayao y devuelva a la escuela con su nino. Muchas gracias por su cooperacion.

Sinceramente,

- -

1. Adonde nacio el padre del nino? _____
2. Adonde nacio la madre del nino? _____
3. Que idiome habla el padre la mayor parte del tiempo? _____
4. Otro idioma que el padre entiende. _____
5. Que idioma habla la madre la mayor parte del tiempo? _____
6. Otro idioma quo la madre entiende. _____
7. Que idioma habian sus ninos la mayor parte del tiempo? _____
8. Otro idioma que sus ninos entienden. _____

Hermanos y Hermanas

Nombre	Edad	Nacio En
_____	_____	_____

- -

Translation of Spanish Questionnaire

Dear Parent:

We hope you can help us by giving us some information. Please answer the list of questions below the lines, and return the form to school with your child. Thank you for your cooperation.

1. Where was the child's father born? _____
2. Where was the child's mother born? _____
3. What language does the father speak most of the time? _____
4. Other language the father understands. _____
5. What language does the mother speak most of the time? _____
6. Other language the mother understands. _____
7. What language do the children speak most of the time? _____
8. Other language the children understand. _____

Brothers and Sisters

Name	Age	Born in
_____	_____	_____