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ABSTRACT

A study was conducted to investigate methods of grouping children in grades 1 and 2 in a speech and hearing therapy program, and to determine the prevalence of certain auditory skills and deviant swallowing behavior associated with articulation problems. A screening test of articulation identified 255 control and 255 experimental subjects. A test battery was administered, on the basis of which six therapy groups were formed. Statistical analysis of data collected from a later administration of tests showed the grouping of children with articulation problems, and the use of pre-professionals (graduate students in speech and hearing pathology) to be effective procedures. Five of the groups achieved mean gain of articulation scores greater than that of the control groups. Of the 12 variables studied, nine achieved significant gain by the experimental samples in any group. Association of auditory deviations with articulation problems was confirmed, but deviant swallowing behavior was not a factor. (KW)

FINAL REPORT
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May 8, 1970

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Much credit is due the principals of the five experimental and five control schools whose cooperation made this study possible:

EXPERIMENTAL	CONTROL
Noble Norman (W. J. Turner)	R. E. Jones (Circle Park)
Otho Morgan (Mary L. Phillips)	Carl Evans (Westcliff)
J. E. Jones (South Hills)	J. D. Parnell (Bruce Shulkey)
Ruth Workman (Carter Park)	Charles Harter (Greenbriar)
Marshall Bonner (R. Vickery)	Reginald Thompson (Kirkpatrick)

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SUMMARY

Background

To care for children with speech defects in a public school system speech clinicians are assuming a heavy burden. It has been estimated that the average clinician in a public school system carries a case load of 130 children and that they are normally seen in groups of four or five twice each week (31, p.20). It has also been predicted that of that number approximately 81% will have problems of articulation of a functional nature (31, p.20). It is apparent that little time can be available for individual needs of the child who is severely handicapped in communication skills and that this situation precludes the establishment of a clinical setup in a public school system.

In relation to the management of problems of articulation in the early grades, many factors must be carefully evaluated. Articulation is related to the total complexity of language and the learning of language and, therefore, to the total system of communication. To isolate articulation as a single factor of development may be an over-simplification. It is the opinion of some workers in the field that problems of language underly problems of articulation (8, p.1; 6, p.339; 39, p.179). Also to be considered in the management of articulation problems is the relationship that articulation bears to the acquisition of academic skills. One authority (13) reported that some children, who he predicted would outgrow their problems of articulation, later came back presenting formidable deficits in other language skills. And speech clinicians must also consider the relation of articulatory efficiency and the emotional adjustment of the child. Interpersonal relationships are basic and fundamental to adjustment in our society. To be able to pronounce one's own name correctly is a necessary skill.

It seems imperative to revise the present program of speech therapy in public schools in order that all children who need assistance with development of communication skills will receive it and that those who need specific and individualized help will likewise receive this kind of attention.

Objectives

It was the broad purpose of this study to investigate a method of grouping children in the first and second grades in a public school speech and hearing therapy program in such a way that each child would receive maximal attention for his particular problem of functional articulation. It was also the purpose of the study to determine the prevalence of factors associated with articulatory ability in such children. These factors were certain auditory skills and deviant swallowing behavior.

Procedures

Ten schools in the Fort Worth Independent School District were selected on the basis of population, availability of therapists, and socio-economic level. Five schools constituted the control group and five schools the experimental group.

All children in the first and second grades in the selected schools were administered a screening test of articulation in September, 1968. Those children who had one or more errors of articulation and who evidenced no abnormality of a neurological or organic basis constituted the subjects of the study. At the termination of the study the total number of subjects in the experimental group was 255, and the total number of subjects in the control group was 255.

Diagnostic testing for the subjects of the study was begun October 15, 1968. All children were given the following battery of tests:

Templin-Darley Screening Test of Articulation
Peabody Picture Vocabulary Test
Predictive Screening Test of Articulation
Auditory Subtests of the Revised Illinois Test of Psycholinguistic Abilities
Test of deviant swallowing behavior

On the basis of the above tests six groups were formed. Therapy for Groups I and II was conducted by graduate students in speech and hearing pathology, Texas Christian University. Some subjects within Groups I or II also demonstrated deviant swallowing behavior, and these were given muscular retraining by public school therapists in addition to therapy received in Group I or Group II. Groups III, IV, V, and VI were the responsibility of speech clinicians certified by the Texas Education Agency and employed by the Fort Worth Independent School District. Therapy in each of the six groups was geared toward information obtained from diagnostic testing.

In May, 1969, the battery of diagnostic tests was readministered to the subjects of the study. Data thus collected were subjected to statistical analyses.

Conclusions and Recommendations

The investigators of this study believe that the limited time for therapy precludes definite conclusions or predictions. However, the data strongly suggest that the manner of grouping children with functional articulation problems and the use of pre-professionals may be effective procedures in a public school speech therapy program.

Since the improvement of functional articulation problems was the primary goal of the study, articulation scores as shown by the Templin-Darley Screening Test of Articulation were of special interest. Of

the six groups of subjects, the experimental sample of five of the groups achieved mean gain of articulation scores which was greater than that of the control groups. The experimental sample of Group IV showed statistically significant gain at the .05 level of confidence.

Twelve variables were scrutinized in the study. Of the twelve, only three failed to achieve statistically significant gain by the experimental samples in any group. They were the Peabody Picture Vocabulary Test, sound blending, and the Predictive Screening Test of Articulation. On no measure did the control sample attain statistically significant gain. The experimental sample of each one of the six groups achieved statistically significant mean gain in one or more of the variables studied.

The suspected association of auditory deviations and articulation problems was validated in this study. In the composite Group I and II, 82% of the total sample of 135 subjects had auditory inefficiencies. In the composite Group III, IV, V, and VI, 78% of the sample of 120 exhibited auditory deviations as defined by the criteria of this study. Nineteen of the 24 subjects in the experimental sample who attained a score of 50 on the Templin-Darley Screening Test of Articulation during the course of the study retained auditory inefficiencies.

Results of the study do not support the assumption that deviant swallowing behavior is a factor affecting articulation scores to a marked degree and more specifically affecting the production of adequate /r/ sounds. In none of the six groups was there a statistically significant association between swallowing behavior and scores on the Templin-Darley Screening Test of Articulation. In the composite Group IV and VI, in which all subjects were judged to have deviant swallowing behavior, there was a significant but weak association between percentage of correct swallowing behavior and number of defective /r/ sounds; however, this intercorrelation was in a direction which was in contradiction to what is empirically known by the investigators about swallowing behavior and production of /r/ sounds. This cannot be adequately explained except on the basis of varying criteria for evaluation of swallowing behavior by the therapists of the study.

Pre-professionals handled approximately one-half of the experimental sample of subjects. The composite sum of Groups I and II showed statistically significant gain in 5 of the 12 measures studied. In this study it was evident that pre-professionals were effective in improving scores of auditory measures as well as in improving functional articulation errors.

Three composite groups were studied in order to study relationships between articulation, auditory abilities, and swallowing behavior. In each of the three groups studied, the majority of the auditory tests formed a positive cluster which was highly related to the Peabody Picture Vocabulary Test. In each of the groups the variable with the highest intercorrelation was grammatic closure, followed by auditory

association and the Peabody Picture Vocabulary Test. The auditory variable with the lowest intercorrelation in two groups was auditory sequencing. In a third group it was next to the lowest. Examination of results showed that there was a significant but weak relationship between auditory tests and the scores of Templin-Darley Screening Test of Articulation. There was a strong intercorrelation between the Templin-Darley Screening Test of Articulation and the Predictive Screening Test of Articulation. Number of defective /r/ sounds was highly associated with scores on the Templin-Darley Screening Test of Articulation.

The strongest evidence in support of the hypotheses would have been if all of the mean differences for the experimental group were significantly higher than the corresponding differences for the controls. However, in all variables the mean gain by the experimental sample over the control sample, whether statistically significant or not, was not a random one. The consistent uniformity of this superiority must be regarded at this intermediate stage of training as strongly suggestive of the possibility of even greater differences if training were continued.

Results of this study indicate a practical need to continue the project in its present theoretical structures and to expand its findings in a number of specific ways.

Questions to be studied are optimal group size for effective therapy, auditory deviations and their effect on articulation, validation of the criteria utilized for auditory deviations in this study, necessary length of time for therapy in order to achieve maximal results during an academic year, proper utilization of pre-professionals in a program of speech and hearing therapy, identification of needs of non-Anglo-Americans which could be ameliorated by speech therapists, standardization or effective means of evaluating swallowing behavior, expansion of present cutoff scores for first grade children in the Predictive Screening Test of Articulation to include children in the second grade of this community.

Finally, and most importantly, a thorough investigation of the relationship of auditory inefficiencies as defined in this study and classroom achievement should be undertaken. Verification of this suspected relationship would modify the role and responsibilities of the speech clinician in a public school system and provide much needed assistance to children who have difficulty in the classroom as a result of auditory difficulties.

INTRODUCTION

Background of the Problem

The prevalence of speech defects has been difficult to determine with accuracy. Many surveys have been conducted with varying results. In a recent publication (16, p.6) the rate of speech defects per 1,000 persons under 25 was given as 9.7. Among school children four percent have been reputed to be in need of speech correction (21, p.1). Although statistics differ, it is recognized that speech handicaps of all types are widespread (16, p.4) and that the problem of articulation is by far the most prevalent among them. In the monograph, "Public School Speech and Hearing Services" (31, p.20), eighty-one percent of the entire case load of the average public school therapist is said to be composed of problems of functional articulation.

To care for children with speech defects in a public school system, speech clinicians are assuming a heavy burden. It has been estimated that the average clinician in a public school system carries a case load of 130 children and that these children are normally seen in groups of four or five, twice each week (31, p.20). Seventy-five percent of the children enrolled in these classes are in the kindergarten or first or second grades (31, p.35). It is apparent that little time can be available for individual needs of the child who is severely handicapped in communication skills and that this condition precludes the establishment of a clinical setup in the public school system.

For many years the problem of supplying a sufficient number of speech clinicians to care for the speech handicapped has been a critical one (21, p.3). A further concern of many persons who work with speech handicapped school children in the public school setting is that the revised and upgraded standards of American Speech and Hearing Association may further curtail the number of available speech pathologists at least temporarily. The master's degree or its equivalent, one year's sponsored professional experience, and a written examination are considered to be minimum qualifications by the national professional association of speech and hearing pathologists (2).

In view of the prevalence of communication problems in the schools and the belief of some authorities that they are increasing in terms of numbers of children requiring remedial and corrective attention, a serious staffing problem exists. The number of qualified personnel is not adequate to meet the present needs and certainly not increased needs. How they can take care of those who are speech handicapped presents a major pressing problem.

In the past few years, several solutions have been offered, no one of which has been investigated thoroughly to determine its value. The newly stated role of the qualified speech pathologist stresses

an advisory capacity, which implies the use of ancillary supportive personnel (17, 18, 34, 45). The most appropriate type of person to perform the supporting functions has not been determined. In addition, despite a number of investigations, the selection of case loads for speech clinicians in public schools (1, 30, 35) is also unresolved. An obvious solution to overloading is reduction of the case load (30). However, this would require the availability of powerful instruments of evaluation. It is well established that approximately 50 percent of children in the first grade will outgrow their functional articulatory problems (42). If this percent could be identified with accuracy for all populations of children, then case load distributions could be more effectively planned. Several studies have been concerned with this problem (7, 10, 22, 38). Implicit in this kind of solution of proper identification and distribution of case load is the assumption that many of the problems of articulation dealt with by the speech clinicians are not in reality problems of articulation but more likely are evidences of late maturation (30, 39, 42).

Related Literature

In relation to the management of problems of articulation in the early grades, many factors must be evaluated. Articulation is related to the total system of communication. To isolate articulation as a single factor of development may be an over-simplification. Tikofsky (41, p.202), for example, has suggested that phonology, semantics, and syntactics should be studied as an integrated whole. Carroll (6, p.339) also believes that most aspects of language are highly related. Concerning some aspects of an ongoing study, Templin (39, p.179) has stated, "The suggestion of the relation of adequacy of articulation of phonemes to morphomological change raised the question of whether children exhibit a sensitivity to their language environment that is reflected in more adequate performance in a number of dimensions of language." The relationship of the auditory systems to the development of language is well documented (4, 14, 23, 24, 28, 33). There is also some evidence of a relationship between some subtests of the Illinois Test of Psycholinguistic Abilities and the problem of articulation (8, 11, 32). Dickson (8, p.1) is of the opinion that many speech clinicians suspect problems of language underlying problems of articulation; when this suspicion is present, he suggests that some kind of evaluation of language should be done. In his study which investigated these hypotheses, he showed that there was, in fact, often a deficit of language in children with articulation problems measured by the Illinois Test of Psycholinguistic Abilities. The implications of these studies are plain: where there are factors of misarticulation, there may well be deficits in other aspects of language as well.

Objectives

It was the broad purpose of this study to investigate a method of grouping children in the first and second grades in a public school

speech and hearing therapy program in such a way that each child would receive maximal attention for his particular problem. It was also the purpose of this study to determine the prevalence of some factors associated with articulatory ability in such children. These factors were certain auditory skills and deviant swallowing behavior. It was hypothesized that such groupings would enable the speech clinician to:

1. Give more time and attention to severe problems of articulation.
2. Provide therapy, with assistance of pre-professionals, to all children with functional articulation problems at a time when the children are learning to read and to form important interpersonal relationships.
3. Handle more effectively the large case load demanded of public school therapists.

PROCEDURES

This project was undertaken as a joint study by the Division of Communication Pathology, Texas Christian University, Fort Worth, Texas, and the Speech Therapy Program of the Special Education Department, Fort Worth Independent School District.

Speech Clinicians

The five speech clinicians who participated in therapy in this study held a certificate as a speech and hearing therapist from the Texas Education Agency. Two held the Certificate of Clinical Competence in Speech Pathology from American Speech and Hearing Association, and the certification of another was pending. One of the five had four years of experience; two had five years; one had six years; and one had seven years of experience as a speech and hearing clinician.

All therapy in this study was supervised by Edwina Sanders, who held the Certificate of Clinical Competence in Speech Pathology, American Speech and Hearing Association. During the course of this study, Edwina Sanders met weekly with the five therapists to evaluate methods and responses of the subjects of the study.

In anticipation of the study all speech clinicians to be involved began a training program conducted by Edwina Sanders in September, 1968. This consisted of study of the auditory subtests of the Revised Illinois Test of Psycholinguistic Abilities and methods of therapy geared to remediation of deficits. Attention was given to methods of detection and therapy for deviant swallowing behavior.

Pre-Professionals

Three graduate students in the Division of Communication Pathology, Texas Christian University, were selected to conduct therapy for Groups I and II of the study. None of these students was qualified for certification by Texas Education Agency. Each was without experience in this type of therapy.

The project directors met with these graduate students once each week during the course of the study and devised lesson plans which were then expedited by the students. Training was thus a continuing process with constant evaluation of subjects' reactions.

Selection of Schools

Ten schools were selected on the basis of population, availability of therapists, and socio-economic level. They were representative of the school population of the Fort Worth Independent School District. The schools were as follows:

Control Schools	Population	Experimental Schools	Population
Circle Park	561	W. J. Turner	484
Westcliff	507	Mary Louise Phillips	607
Bruce Shulkey	778	South Hills	781
Greenbriar	841	Carter Park	831
Kirkpatrick	559	Vickery	518

Selection of Subjects

In September, 1969, all children in the first and second grades of the ten sample schools were given a screening test of articulation. Those who had one or more errors of articulation and who evidenced no abnormality of a neurological or organic basis constituted the subjects of the study. At the termination of the study 255 children composed the experimental group and 255 children the control group.

Administration of Tests

Initial diagnostic testing was begun October 15, 1968, in the experimental group and completed October 28, 1968. Final testing was begun May 5, 1969, and completed May 23, 1969.

Eight professional clinicians were involved in the testing of the subjects. Those therapists did not conduct therapy for the subjects they tested. All verbal responses of all subjects were tape recorded.

The following diagnostic tests were administered:

1. Templin-Darley Screening Test of Articulation (40)

   This set of picture cards is designed to be used as both a screening and diagnostic test of articulation. Since the official beginning of the study was delayed and in the interest of time, the screening test was used. The scores served to indicate changes in articulatory behavior. The test was taped.

2. Peabody Picture Vocabulary Test (9)

   This is a test of receptive vocabulary, yielding a mental age. Scores served as one of the criteria for matching children in the experimental and control group.

3. Predictive Screening Test of Articulation (42)

   The purpose of this test is to identify those children in the first grade who will spontaneously overcome articulation problems by the time they reach third grade. In this study the test was used for grouping of subjects. The same cutoff score was used for all subjects whether in the first or second grade. Reference is made to Appendix A for a copy of this test.

4. Auditory Subtests of the Revised Illinois Test of Psycholinguistic Abilities (26)

a. Auditory Reception

This is a test to assess the ability of a child to derive meaning from verbally presented material.

b. Auditory Association

This test taps the child's ability to relate concepts presented orally. It is on the cognitive or representational level of the Revised Illinois Test of Psycholinguistic Abilities.

c. Auditory Sequential Memory

This test assesses the child's ability to reproduce from memory sequences of digits increasing in length from two to eight digits. It is at the automatic level of the Revised Illinois Test of Psycholinguistic Abilities.

d. Verbal Expression

The purpose of this test is to assess the ability of the child to express his ideas spontaneously. It is on the representational level of the Revised Illinois Test of Psycholinguistic Abilities.

e. Grammatic Closure

This test assesses the child's ability to make use of the redundancies of language in acquiring automatic habits for handling syntax and grammatic inflections. The conceptual difficulty is low; it is placed in the automatic level of the Revised Illinois Test of Psycholinguistic Abilities.

f. Auditory Closure

This test assesses the child's ability to reproduce a total word when some of the sounds are deleted. It is placed at the automatic level of functioning.

g. Sound Blending

This test provides a way of assessing the organizing process at the automatic level in the auditory-vocal channel. The sounds of a word are spoken singly, and the child must synthesize the separate parts of the word and produce an integrated whole.

5. Test of Deviant Swallowing Behavior

There is no standardized test to assess the adequacy of swallowing behavior. In this study the subject was asked to drink a sip of water. As he prepared to swallow the clinician quickly parted his lips to observe action of the tongue. The muscles of the cheeks were noted as was the pursing and tensing of the lips. Behavior was labeled as "pass" or "fail."

In February, 1969, an informal screening test of articulation was readministered to subjects of the experimental group. When no errors of articulation were made the subject was dismissed from the study. All so dismissed were given the entire diagnostic battery as were the matched controls. In June, 1969, data collected from the diagnostic battery were subjected to statistical analyses.

Grouping Procedure

The following criteria formed the bases for grouping subjects:

1. Predictive Test of Articulation

Pass: Score of 34 or more; Fail: Score of 33 or less.

2. Auditory Subtests of Revised Illinois Test of Psycholinguistic Abilities

Fail: Scores of two or more auditory tests which are two years below either chronological or mental age; or difference of two years or greater between high scores of two or more subtests and low scores of two or more subtests.

3. Swallowing Behavior

Pass or Fail.

The groups formed as a result of above criteria were as follows:

Group I-A*	Pass Predictive Test Pass Auditory Criteria Pass Swallowing Behavior
Group I-B*	Pass Predictive Test Pass Auditory Criteria Fail Swallowing Behavior
Group II-A*	Pass Predictive Test Fail Auditory Criteria Pass Swallowing Behavior
Group II-B*	Pass Predictive Test Fail Auditory Criteria Fail Swallowing Behavior

	Fail	Predictive Test
Group III	Pass	Auditory Criteria
	Pass	Swallowing Behavior
	Fail	Predictive Test
Group IV	Pass	Auditory Criteria
	Fail	Swallowing Behavior
	Fail	Predictive Test
Group V	Fail	Auditory Criteria
	Pass	Swallowing Behavior
	Fail	Predictive Test
Group VI	Fail	Auditory Criteria
	Fail	Swallowing Behavior

*Groups I and II were subdivided in this manner to indicate more precisely the types of therapy involved. Both Groups I and II were administered speech improvement lessons by pre-professionals. However, Group I-B and Group II-B received additional support from professional personnel for specific instruction in swallowing behavior.

Subjects

Subjects within groups were matched according to mental age as shown by Peabody Picture Vocabulary Test and articulation score as shown by Templin-Darley Screening Test of Articulation.

The six groups of the study were initially composed of the following numbers of subjects in the designated schools:

EXPERIMENTAL			CONTROL		
School	Group	Subjects	School	Group	Subjects
Turner	I-A	6	Circle Park	I-A	6
	I-B	3		I-B	3
	II-A	2		II-A	2
	II-B	9		II-B	9
	III	9		III	9
	IV	12		IV	12
	V	9		V	9
	VI	9		VI	9
Mary Louise Phillips	I-A	6	Westcliff	I-A	6
	I-B	3		I-B	3
	II-A	14		II-A	14
	II-B	3		II-B	3
	III	8		III	8
	IV	4		IV	4
	V	5		V	5
	VI	4		VI	4

EXPERIMENTAL			CONTROL		
School	Group	Subjects	School	Group	Subjects
South Hills	I-A	11	Bruce	I-A	11
	I-B	4	Shulkey	I-B	4
	II-A	14		II-A	14
	II-B	3		II-B	3
	III	7		III	7
	IV	13		IV	13
	V	8		V	8
	VI	7		VI	7
Carter Park	I-A	13	Greenbriar	I-A	13
	I-B	5		I-B	5
	II-A	16		II-A	16
	II-B	7		II-B	7
	III	3		III	3
	IV	6		IV	6
	V	12		V	12
	VI	12		VI	12
Vickery	I-A	10	Kirkpatrick	I-A	10
	I-B	2		I-B	2
	II-A	29		II-A	29
	II-B	6		II-B	6
	III	1		III	1
	IV	0		IV	0
	V	21		V	21
	VI	12		VI	12

TOTAL NUMBER OF SUBJECTS		TOTAL NUMBER OF SUBJECTS	
Experimental Groups		Control Groups	
Group I-A	46	Group I-A	46
Group I-B	17	Group I-B	17
Group II-A	75	Group II-A	75
Group II-B	28	Group II-B	28
Group III	28	Group III	28
Group IV	35	Group IV	35
Group V	55	Group V	55
Group VI	44	Group VI	44
	328		328

Total Number of Subjects in Groups I-A, I-B, II-A, and II-B:

Experimental: 166 Control: 166

Total Number of Subjects in Groups III, IV, V, and VI:

Experimental: 162 Control: 162

In February, 1969, the following subjects in the experimental groups I-A, I-B, II-A, and II-B were dismissed from therapy because they demonstrated adequacy in articulation:

W. J. Turner	Group II-A	1
	Group II-B	2
Mary Louise Phillips	Group I-A	1
	Group II-A	3
Carter Park	Group I-A	1
	Group II-A	1
	Group II-B	2
South Hills	Group I-A	2
	Group II-A	1
	Group II-B	3
TOTAL.		17

No subject was dismissed in Groups III, IV, V, or VI.

During the course of the study seventy-three subjects dropped from the study. Their matched controls were then dropped.

In June, 1969, the six groups which composed the subjects of the study were as follows:

EXPERIMENTAL SUBJECTS			CONTROL SUBJECTS		
Turner	Group I-A	3	Circle Park	Group I-A	3
	Group I-B	0		Group I-B	0
	Group II-A	5		Group II-A	5
	Group II-B	11		Group II-B	11
	Group III	5		Group III	5
	Group IV	4		Group IV	4
	Group V	8		Group V	8
	Group VI	8		Group VI	8
Mary Louise Phillips	Group I-A	3	Westcliff	Group I-A	3
	Group I-B	0		Group I-B	0
	Group II-A	18		Group II-A	18
	Group II-B	1		Group II-B	1
	Group III	0		Group III	0
	Group IV	2		Group IV	2
	Group V	1		Group V	1
	Group VI	3		Group VI	3

EXPERIMENTAL SUBJECTS			CONTROL SUBJECTS		
South Hills	Group I-A	6	Bruce Shulkey	Group I-A	6
	Group I-B	1		Group I-B	1
	Group II-A	8		Group II-A	8
	Group II-B	13		Group II-B	13
	Group III	6		Group III	6
	Group IV	2		Group IV	2
	Group V	11		Group V	11
	Group VI	12		Group VI	12
Carter Park	Group I-A	3	Greenbriar	Group I-A	3
	Group I-B	0		Group I-B	0
	Group II-A	17		Group II-A	17
	Group II-B	10		Group II-B	10
	Group III	2		Group III	2
	Group IV	3		Group IV	3
	Group V	14		Group V	14
	Group VI	9		Group VI	9
Vickery	Group I-A	4	Kirkpatrick	Group I-A	4
	Group I-B	4		Group I-B	4
	Group II-A	23		Group II-A	23
	Group II-B	5		Group II-B	5
	Group III	1		Group III	1
	Group IV	2		Group IV	2
	Group V	13		Group V	13
	Group VI	14		Group VI	14

TOTAL NUMBERS IN SPECIFIC GROUPS

Experimental Subjects		Control Subjects	
Group I-A	19	Group I-A	19
Group I-B	5	Group I-B	5
Group II-A	71	Group II-A	71
Group II-B	40	Group II-B	40
Group III	14	Group III	14
Group IV	13	Group IV	13
Group V	47	Group V	47
Group VI	46	Group VI	46
TOTAL	255	TOTAL	255

The discrepancy in figures in Group II-B and Group VI is the result of the regrouping of some few subjects at the initiation of therapy, when some errors in original tabulations were noted.

It should be reported that although a rather large number of children, seventy-three, were dropped from the study, more than half, forty, of the seventy-three remained in the therapy program. Either no match in the control group was found for these children, or their matches moved out of the school district.

The number of subjects in the experimental group who received assistance with problems of communication is delineated above. The following subjects in the control group received therapy:

Kirkpatrick

Group I-A	0
Group I-B	0
Group II-A	3
Group II-B	1
Group III	0
Group IV	0
Group V	6
Group VI	9

Circle Park

Group I-A	0
Group I-B	0
Group II-A	0
Group II-B	1
Group III	3
Group IV	2
Group V	5
Group VI	3

Greenbriar

Group I-A	0
Group I-B	0
Group II-A	0
Group II-B	1
Group III	0
Group IV	0
Group V	3
Group VI	1

Bruce Shulkey

Group I-A	2
Group I-B	0
Group II-A	1
Group II-B	2
Group III	1
Group IV	0
Group V	3
Group VI	2

Westcliff

Group I-A	0
Group I-B	0
Group II-A	2
Group II-B	1
Group III	1
Group IV	0
Group V	1
Group VI	2

TOTAL RECEIVING THERAPY: 56

NUMBER NOT RECEIVING THERAPY: 199

Therapy

Group I-A

Pre-professionals were utilized. Language stimulation was stressed. Sounds of the language were given primary attention in these activities. Reference is made to Appendix B.

Group I-B

Pre-professionals were utilized. The same plan of procedure was followed as that in Group I-A with the exception that those children who demonstrated deviant swallowing behavior were given, in addition, muscular retraining activities by speech clinicians. Reference is made to Appendix B.

Group II-A

Pre-professionals were utilized. The same plans of procedure were utilized as for Group I with the exception that the auditory skills were stressed to a marked extent. Reference is made to Appendix B.

Group II-B

Pre-professionals were utilized. The same plans of procedure were utilized as for Group I-B with the exception that the auditory skills were stressed markedly in addition to muscular retraining by professional clinicians. Reference is made to Appendix B.

Group III

Speech clinicians were in charge of Group III. Conventional speech therapy procedures were followed. Five clinicians worked with this group. Reference is made to Appendix C.

Group IV

Speech clinicians were in charge of this group. Conventional speech therapy was utilized with the exception of additional specific neuromuscular drills for correction of deviant swallowing behavior. Five clinicians worked with this group. Reference is made to Appendix C.

Group V

Speech clinicians were in charge of this group. Conventional speech therapy was utilized with the exception of very specific and marked activities designed to improve auditory skills. Five clinicians worked with this group. Reference is made to Appendix C.

Group VI

Speech clinicians were in charge of this group. Conventional speech therapy was utilized with the exception of very specific and marked activities designed to improve auditory skills and the addition of specific neuromuscular activities to ameliorate deviant swallowing behavior. Five clinicians worked with this group. Reference is made to Appendix C.

RESULTS AND DISCUSSION

This study was initiated October 15, 1968, the date of its official authorization by the Office of Education, Department of Health, Education, and Welfare. Testing was completed November 1, 1968, and therapy started on that date. Therapy was terminated May 1, 1969, and all retesting accomplished before the end of the school year. Total number of subjects at the completion of the study was 510, with 255 in the experimental sample and a like number in the control sample. Of this number, experimental groups I and II, under the direction of pre-professionals, consisted of 135 subjects; and experimental groups III, IV, V, and VI, under the direction of professional speech clinicians, consisted of 120 subjects.

Variables subjected to statistical analyses were scores of Peabody Picture Vocabulary Test; auditory reception; auditory association; auditory sequencing; verbal expression; grammatic closure; auditory closure; sound blending; the Predictive Screening Test of Articulation; the Templin-Darley Screening Test of Articulation; swallowing behavior; and the number of /r/ sounds misarticulated on the Templin-Darley Screening Test of Articulation.

Length of Time for Therapy

Time of actual therapy for the subjects in the study was approximately 5½ months. The investigators feel strongly that this compressed span of time has modified the results of the study. It is usual for therapy to continue in the public schools for approximately 7½ months of a 9-month school year. To modify an established pattern of neuromuscular behavior in 5½ months is difficult and especially so when new patterns of speaking must become automatic.

Case Load of Professional Clinicians

The total number of subjects in therapy was not decreased. In the experimental group the number of clients usually enrolled in a speech therapy program was significantly increased. This was because all children with functional articulation problems were included in the study. The distribution of subjects in diagnostic groups appears in Table I. Therapy groups, likewise, were not diminished in size, and the highly individualized attention planned for Groups III, IV, V, and VI was not realized. Table II shows the distribution of subjects in therapy groups. Because of the numbers in each therapy unit it seems likely that any significant change occurring was because of therapy geared to specific diagnostic data and not to increased individual attention.

TABLE I

Distribution of Subjects in Diagnostic Groups

Group	Experimental	Control
I	24	24
II	111	111
III	14	14
IV	13	13
V	47	47
VI	46	46
TOTAL:	255	255

TABLE II

Distribution of Subjects in Therapy Groups

Group	Experimental		Control	
	Maximum Number	Minimum Number	Maximum Number	Minimum Number
I	6	3	6	3
II	25	14	6	3
III	6	3	6	3
IV	6	3	6	3
V	6	3	6	3
VI	6	3	6	3

Subjects Receiving Therapy

All children in the experimental group were given therapy. In the control groups a number of subjects did not receive therapy. This is shown in Table III. The practice of withholding therapy from children in the first and second grades has been due to information that mild disorders of articulation may be outgrown; to pressing needs of other children; and to the large case load of clients. Since many children in the control group did not receive therapy as opposed to the total number in the experimental group receiving therapy, any change achieved by the experimental group over the control group must be attributed to therapy, since factors such as maturation applied equally to both groups.

Subjects Attaining 50 on Templin-Darley Screening Test of Articulation

The attainment of the score of 50 on the Templin-Darley Screening Test of Articulation indicated that a subject had no articulation error on the test. Although the number of subjects who attained such a score was the same for the experimental group and the control group, an examination of the articulation scores in the groups showed a positive increment in scores by the experimental groups over the control groups in all except Group III. These trends are discussed later when each group is analyzed separately with reference to increments or changes in mean gains. Table IV shows the number of subjects who received the score of 50 on the Templin-Darley Screening Test of Articulation during the course of the study.

Of the 24 achieving 50 on the Templin-Darley Screening Test of Articulation in the experimental sample, nineteen retained some auditory deviations. Eighteen of the control group attaining such a score of 50 still had auditory deviations. Such subjects should be observed in their classroom activities to determine if auditory inefficiencies, in fact, are associated with articulation problems, language, and academic success in the classroom.

TABLE III

Distribution of Subjects Receiving Therapy or Receiving No Therapy

Group	Subjects - Therapy		Subjects - No Therapy	
	Experimental	Control	Experimental	Control
I	24	2	0	22
II	111	12	0	99
III	14	5	0	9
IV	13	2	0	11
V	47	18	0	29
VI	46	17	0	29
TOTAL:	255	56	0	199

TABLE IV

Number of Subjects Achieving the Maximum Score of 50 On the Templin-Darley Screening Test of Articulation

Group	Experimental Sample		Control Sample	
	February, 1969	May, 1969	February, 1969	May, 1969
I	4	0	0	0
II	13	4	0	21
III	0	1	0	3
IV	0	1	0	0
V	0	0	0	0
VI	0	1	0	0
TOTAL:	17	7	0	24

Population of Anglo-Americans

The writers conjectured that the inclusion of non-Anglo-Americans might modify results of the study. No comparison based on exact statistical analyses was made between control and experimental samples of the Anglo-Americans and the non-Anglo-Americans, since subjects were not matched according to race. However, because of the composition of two schools, Kirkpatrick (a control) and Vickery (an experimental school), it was felt that matching of race probably occurred incidentally. Both schools have an almost exclusive population of non-Anglo-Americans and were the only ones in the study with such an incidence of non-Anglo-Americans. The mean scores of the Anglo-Americans can be compared with the mean scores of the full group which contained both Anglo-Americans and non-Anglo-Americans. Reference is made to Tables V and VI. On the mean of the pre-tests of the sum of Groups I and II and of Groups III, IV, V, and VI in both experimental and control samples, Anglo-Americans achieved superiority of scores with few exceptions. Comparing the differences of mean gain between pre- and post-tests of the full group and of the Anglo-Americans in Groups I and II, the full group of the experimental sample achieved negligible superiority of scores over the Anglo-Americans in seven of the twelve variables. In Groups III, IV, V, and VI, the full group of the experimental sample showed negligible mean gains over the Anglo-Americans in five of twelve variables. This would seem to indicate that the non-Anglo-Americans were not significantly depressing scores of the groups and further that they were profiting by their experience. However, in this connection the problem of assessing articulatory problems of non-Anglo-Americans, and particularly Negroes, arises. Individual judgment of the tester undoubtedly played a significant role. In addition, the nature of the articulation test may offer an explanation. In the Templin-Darley Screening Test of Articulation only one response contains the [3] and none the [ɔ]. It is possible that the word arrow might have given some difficulty in the Negro population because of the medial glide. At any rate, scores were not significantly depressed by very prevalent substitutions for [3] and [ɔ] among Negroes of this area. This can be seen when one checks the mean number of defective /r/ sounds in both composite Group I and II and in III, IV, V, and VI. The full group had a smaller mean number of defective /r/ sounds than did the Anglo-Americans in both control and experimental samples. Vowels, frequently distorted by Negroes, were not assessed. The total effect of the inclusion of non-Anglo-Americans in the study cannot be precisely determined. It seems clear that clinicians who check articulation of non-Anglo-Americans should be given special training in determining what aspects of articulation are defective so that maximum consistency could be expected in results obtained.

TABLE V

Tabulation of Mean Scores of Experimental and Control Groups of Full Groups I and II and Anglo-Americans of Groups I and II on Pre- and Post-Measures of Performances

Experimental Groups

	Full Group			Anglo-American Group		
Test	Pre	Post	Difference	Pre	Post	Difference
PPVT	80.43	86.31	5.88	85.99	91.54	5.55
Aud.Rec.	75.01	86.75	11.74	82.60	91.94	9.34
Aud.Ass'n.	75.30	82.74	7.44	79.38	85.99	6.61
Aud.Seq.	80.67	89.57	8.90	82.32	91.29	8.97
Verb.Exp.	69.67	77.33	7.66	73.55	80.45	6.90
Gram.Clo.	72.07	80.74	8.67	76.38	87.86	11.48
Aud.Clo.	76.03	94.59	18.56	82.56	102.83	20.27
Sound Bl.	79.19	85.09	5.90	83.58	92.74	9.16
PSTA	40.20	41.67	1.47	40.49	41.85	1.36
T-D	42.85	44.69	1.84	42.96	45.13	2.17
Swallow (% Correct)	0.67	0.87	0.20	0.63	0.82	0.19
# Def. /r/	2.02	1.66	-0.36	2.69	2.30	-0.39

Control Groups

	Full Group			Anglo-American Group		
Test	Pre	Post	Difference	Pre	Post	Difference
PPVT	83.10	88.41	5.31	89.83	95.50	5.67
Aud.Rec.	80.26	82.93	2.67	86.24	91.50	5.26
Aud.Ass'n.	79.75	84.19	4.44	84.93	89.31	4.38
Aud.Seq.	84.96	93.51	8.55	85.40	93.73	8.33
Verb.Exp.	73.89	76.65	2.76	76.73	80.82	4.09
Gram.Clo.	78.66	86.56	7.90	84.26	93.65	9.39
Aud.Clo.	83.67	97.34	13.67	94.43	108.53	14.10
Sound Bl.	76.46	87.47	11.01	82.44	95.08	12.64
PSTA	41.70	42.97	1.27	41.97	43.01	1.04
T-D	44.48	45.53	1.05	45.06	45.42	0.36
Swallow (% correct)	0.67	0.73	0.06	0.66	0.70	0.04
# Def. /r/	1.86	1.42	-0.44	2.12	1.74	-0.38

TABLE VI

Tabulation of Mean Scores of Experimental and Control Groups of Full Groups III, IV, V, and VI and Anglo-Americans of Groups III, IV, V, and VI on Pre- and Post-Measures of Performances

Experimental Groups

	Full Group			Anglo-American Group		
Test	Pre	Post	Difference	Pre	Post	Difference
PPVT	78.33	86.42	8.09	85.50	91.19	5.69
Aud.Rec.	73.30	85.13	11.83	79.67	90.54	10.87
Aud.Ass'n.	73.02	83.03	10.01	79.38	86.50	7.12
Aud.Seq.	77.32	89.75	12.43	85.62	94.38	8.76
Verb.Exp.	68.30	78.16	9.86	73.26	81.32	8.06
Gram.Clo.	67.48	79.54	12.06	76.22	83.10	6.88
Aud.Clo.	71.73	93.20	21.47	82.46	100.50	18.04
Sound Bl.	69.04	82.37	13.33	74.44	86.71	12.27
PSTA	25.38	32.08	6.70	25.31	33.24	7.93
T-D	27.85	34.36	6.51	28.46	35.44	6.98
Swallow (% correct)	0.51	0.73	0.22	0.47	0.74	0.27
# Def. /r/	6.04	4.43	-1.61	7.61	5.54	-2.07

Control Groups

	Full Group			Anglo-American Group		
Test	Pre	Post	Difference	Pre	Post	Difference
PPVT	77.39	83.13	5.74	83.25	87.99	4.74
Aud.Rec.	74.03	79.83	5.80	79.64	84.73	5.09
Aud.Ass'n.	72.72	79.80	7.08	75.68	83.93	8.25
Aud.Seq.	79.35	88.72	9.37	78.38	87.05	8.67
Verb.Exp.	67.82	72.35	4.53	71.09	75.83	4.74
Gram.Clo.	70.98	76.78	5.80	74.43	81.84	7.41
Aud.Clo.	73.33	87.77	14.44	82.14	95.43	13.29
Sound Bl.	69.23	79.99	10.76	73.58	84.33	10.75
PSTA	26.43	32.19	5.76	26.75	31.48	4.73
T-D	29.65	34.59	4.94	30.34	34.03	3.69
Swallow (% correct)	0.53	0.66	0.13	0.54	0.65	0.11
# Def. /r/	5.77	5.04	-0.73	7.08	6.39	-0.69

Pre-Professionals and Mean Scores of Composite Group I and II

In the planning of this study the investigators hypothesized that persons with no professional experience but with a bachelor's degree in speech therapy could handle effectively certain children with mild problems of articulation. The criterion for such mild problems was the achievement of a score of 34 or greater on the Predictive Screening Test of Articulation. It was recognized that the test was standardized only for children in the first grade and that the inclusion of second grade children would constitute some errors in grouping. Originally it was planned to have pre-professionals work only with children who achieved a score of 34 or greater and who had no other problems which the directors of the study felt would complicate progress. However, of the children who passed the Predictive Screening Test of Articulation, one hundred eleven or 82% had auditory deviations according to the criteria of this study. Forty-five or 33% had swallowing inefficiency. Because of the large numbers of children with auditory and swallowing differences, it was decided to allow pre-professionals to include specific auditory training in their program. It was also decided that professionals would work once a week briefly with those children who demonstrated deviant swallowing behavior, which therapy would be in addition to that conducted by pre-professionals.

For the purposes of statistical analyses, Group I-A and Group I-B were treated as a unit. Group II-A and Group II-B were handled in the same manner. The difference in both B groups was that of deviant swallowing behavior. The combination is justified, since in this study it is the plan of grouping and the handling of therapy that is under scrutiny.

Pre-professionals, with supervision and guidance, worked with both Groups I and II. Therapy differed between the groups in the kind and amount of auditory stimulation provided for the clients. On the whole, the programs were characterized by stress on listening skills and group responses, with a reduction in individual participation. There was limited direct articulation therapy in the larger therapy groups.

Reference is made to Table VII for comparison of mean scores of experimental and control samples on pre- and post-measures of performance in the composite Group I and II. Statistically significant gains were achieved by the experimental sample in auditory reception, auditory association, verbal expression, auditory closure, and swallowing behavior. On all other measures of performance, with the exception of sound blending and change in number of defective /r/ sounds, the experimental group achieved greater gains than did the control sample. In considering the significance of scores for the number of defective /r/ sounds it should be noted that a drop in numbers of defective /r/ sounds is an improvement even though it is indicated by a negative number. Likewise, a positive number indicates an increase and therefore is not an improvement.

TABLE VII

Comparison of Mean Scores of Experimental and Control Samples on Pre- and Post-Measures of Performance, Sum of Groups I and II

N = 135 in each sample

Test	Experimental			Control			Comparison Differences	
	Pre	Post	Diff.	Pre	Post	Diff.	D_E-D_C	t
PPVT	80.43	86.31	5.88	83.10	88.41	5.31	0.57	0.40
Aud.Rec.	75.01	86.75	11.74	80.26	82.93	2.67	9.07	3.44**
Aud.Ass'n.	75.30	82.74	7.44	79.75	84.19	4.44	3.00	2.15*
Aud.Seq.	80.67	89.57	8.90	84.96	93.51	8.55	0.35	0.17
Verb.Exp.	69.67	77.33	7.66	73.89	76.65	2.76	4.90	2.69**
Gram.Clo.	72.07	80.74	8.67	78.66	86.56	7.90	0.77	0.45
Aud.Clo.	76.03	94.59	18.56	83.67	97.34	13.67	4.89	2.03*
Sound Bl.	79.19	85.09	5.90	76.46	87.47	11.01	-5.11	0.77
PSTA	40.20	41.67	1.47	41.70	42.97	1.27	0.20	0.43
T-D	42.85	44.69	1.84	44.48	45.53	1.05	0.79	1.71
Swallow (% correct)	0.67	0.87	0.20	0.67	0.73	0.06	0.14	4.15**
# Def./r/	2.02	1.66	-0.36	1.86	1.42	-0.44	0.08	0.30

* Significant at the 0.05 level of confidence, df 134

** Significant at the 0.01 level of confidence, df 134

Professional Speech Clinicians and Mean Scores of the Sum of Groups III, IV, V, and VI

Groups III, IV, V, and VI were composed of subjects who made a score of 33 or less on the Predictive Screening Test of Articulation (refer to Table VIII). It was assumed that articulatory problems in these groups were more severe and more persistent than those problems in Groups I and II. Of the total number of subjects in the composite sum of Groups III, IV, V, and VI, 93 or 78% had auditory deviations according to the criteria of this study, and 59 or 49% had swallowing deviations.

Professional clinicians were responsible for Groups III, IV, V, and VI. Therapy was directed specifically to diagnostic data. However, the choice of sounds of the language to work with and the order of working with such sounds were the prerogative of the individual speech clinician.

Table VIII shows that statistically significant gain in the mean scores of the experimental sample over the mean gain of the control sample occurred in auditory reception, verbal expression, grammatic closure, auditory closure, and swallowing behavior. On all other scores positive superiority was achieved by the experimental over the control group. Speech clinicians involved with these groups indicated that additional time was needed for therapy to be as efective as they desired it to be. The negative difference for defective /r/ sounds indicates a decrease in number and therefore an improvement.

TABLE VIII

Comparison of Mean Scores of Experimental and Control Samples on Pre- and Post-Measures of Performance, Sum of Groups III, IV, V, VI

N = 120 in each sample

	Experimental			Control			Comparison Differences	
Test	Pre	Post	Diff.	Pre	Post	Diff.	D_E-D_C	t
PPVT	78.33	86.42	8.09	77.39	83.13	5.74	2.35	1.59
Aud.Red.	73.30	85.13	11.83	74.03	79.83	5.80	6.03	1.99*
Aud.Ass'n.	73.02	83.03	10.01	72.72	79.80	7.08	2.93	1.78
Aud.Seq.	77.32	89.75	12.43	79.35	88.72	9.37	3.06	1.20
Verb.Exp.	68.30	78.16	9.86	67.82	72.35	4.53	5.33	2.59*
Gram.Clo.	67.48	79.54	12.06	70.98	76.78	5.80	6.26	3.89**
Aud.Clo.	71.73	93.20	21.47	73.33	87.77	14.44	7.03	2.49*
Sound Bl.	69.04	82.37	13.33	69.23	79.99	10.76	2.57	1.14
PSTA	25.38	32.08	6.70	26.43	32.19	5.76	.94	1.06
T-D	27.85	34.36	6.51	29.65	34.59	4.94	1.57	1.72
Swallow (% correct)	0.51	0.73	0.22	0.53	0.66	0.13	.09	2.00*
# Def./r/	6.11	4.63	-1.48	5.78	4.85	-0.93	-0.55	1.20

* Significant at the 0.05 level of confidence, df 119

** Significant at the 0.01 level of confidence, df 119

Individual Groups

Group I

Group I was composed of 24 subjects in the experimental sample and a like number in the control sample, all of whom earned a score of 34 or greater on the Predictive Screening Test of Articulation. No subject in either sample had auditory deviations according to the criteria of this study. Twenty-one per cent of the experimental group had deviant swallowing behavior, and 24% in the control group had deviant swallowing behavior. Therapy units were small. Refer to Table IX.

Predictions were that this group would make a greater gain in articulation skills than any other group. No great differences in scores should be achieved in auditory skills, since no problems originally existed in these areas.

At the termination of the study, the mean gain of the experimental group over the mean gain of the control group on the Templin-Darley Screening Test of Articulation came close to the .05 level of confidence. Statistically significant gain was made in auditory closure. On all other measures except auditory sequencing and reduction of defective /r/ sounds, positive increment was in favor of the experimental group. It seems safe to assume that with additional time this improvement in scores would have increased. In this study, pre-professionals achieved positive increments of scores with a group of children who had, according to this study, mild disorders of articulation. Further study should be made of similar situations to determine if pre-professionals can consistently contribute to the correction of certain kinds of articulation disorders.

TABLE IX

Comparison of Mean Scores of Experimental and Control Samples on Pre- and Post-Measures of Performance, Group I

N = 24 in each sample

Test	Experimental			Control			Comparison Differences	
	Pre	Post	Diff.	Pre	Post	Diff.	D_E-D_C	t
PPVT	75.29	83.96	8.67	77.04	82.63	5.59	3.08	1.32
Aud.Rec.	75.92	85.58	9.66	77.21	81.17	3.96	5.70	0.89
Aud.Ass'n.	73.50	79.67	6.17	77.75	83.17	5.42	0.75	0.22
Aud.Seq.	91.67	98.04	6.37	81.38	92.88	11.50	-5.13	0.95
Verb.Exp.	73.71	80.00	6.29	75.00	73.58	-1.42	7.71	1.59
Gram.Clo.	71.50	79.33	7.83	75.13	82.54	7.41	0.42	0.13
Aud.Clo.	75.38	101.17	25.79	81.25	96.50	15.25	10.54	2.16*
Sound Bl.	76.54	86.46	9.92	78.08	85.13	7.05	2.87	0.53
PSTA	40.38	42.00	1.62	41.50	42.71	1.21	0.41	0.40
T-D	42.92	45.42	2.50	43.83	44.83	1.00	1.50	1.40
Swallow (% correct)	0.79	0.96	0.17	0.79	0.83	0.04	0.13	1.81
# Def./r/	1.79	1.63	-0.16	2.25	1.75	-0.50	0.34	0.58

* Significant at the 0.05 level of confidence, df 23

Group II

This group was composed of 111 subjects in the experimental sample and a like number in the control sample. Expectations were that this group would achieve less success than Group I in improvement of articulation and that some modification of auditory and swallowing behavior would occur. Although auditory deviations might not be etiological factors in articulation problems, it was assumed by the investigators that the presence of such auditory deviations would hinder to some degree improvement in skills of articulation. Reference is made to Table X.

Results were consistent with expectations. No significant gain was made on the Templin-Darley Screening Test of Articulation by the experimental group. However, there was a positive superiority of mean gains of the experimental over the control sample in all measures except sound blending and reduction of defective /r/ sounds. Statistically significant gains occurred in auditory reception, auditory association, verbal expression, and swallowing behavior. Both Group I and Group II were handled by pre-professionals. Whether the smaller gain in articulation in Group II as compared with Group I was because of large therapy groups or the presence of auditory deviations in Group II cannot be determined at this time. However, it is evident that pre-professionals can work with large groups of children who have auditory differences and achieve significant improvement in such auditory skills. If auditory skills, in fact, accompany articulation disorders and affect academic achievement, then pre-professionals may play a significant role in the profession of speech pathology.

TABLE X

Comparison of Mean Scores of Experimental and Control Samples on Pre- and Post-Measures of Performance, Group II

N = 111 in each sample

Test	Experimental			Control			Comparison Differences D_E-D_C	t
	Pre	Post	Diff.	Pre	Post	Diff.		
PPVT	81.54	86.82	5.28	84.41	89.66	5.25	0.03	0.01
Aud.Rec.	74.82	87.00	12.18	80.92	83.32	2.40	9.78	3.38**
Aud.Ass'n.	75.68	83.41	7.73	80.18	84.41	4.23	3.50	2.27*
Aud.Seq.	78.29	87.74	9.45	85.73	93.65	7.92	1.53	0.70
Verb.Exp.	68.80	76.75	7.95	73.64	77.32	3.68	4.27	2.19*
Gram.Clo.	72.19	81.05	8.86	79.42	87.42	8.00	0.86	0.43
Aud.Clo.	76.17	93.17	17.00	84.20	97.52	13.32	3.68	1.35
Sound Bl.	79.77	84.79	5.02	76.11	87.97	11.86	-6.84	0.86
PSTA	40.16	41.60	1.44	41.75	43.03	1.28	0.16	1.45
T-D	42.84	44.53	1.69	44.62	45.68	1.06	0.63	0.61
Swallow (% correct)	0.64	0.85	0.21	0.65	0.70	0.05	0.16	4.17**
# Def./r/	2.07	1.66	-0.41	1.77	1.34	-0.43	0.02	0.07

* Significant at the 0.05 level of confidence, df 110

** Significant at the 0.01 level of confidence, df 110

Group III

Fourteen subjects in the experimental group and 14 in the control group comprised this sample, which was handled by professional clinicians. Scores on the Predictive Screening Test of Articulation were 33 or less. Therapy units ranged from 3 to 6 in number. There were no auditory problems and no swallowing problems according to the criteria of this study. Reference is made to Table XI for results.

Initially, it was expected that some superiority of mean scores in articulation would be achieved by the experimental group. However, results were not compatible with such expectations. Superiority was not achieved by the experimental sample on either the Predictive Screening Test of Articulation or the Templin-Darley Screening Test of Articulation. In fact, the control made insignificantly larger mean gain on both of these tests. Statistically significant gain was achieved by the experimental group in auditory sequencing and was the only group of the six to accomplish this. Table XI indicates that slight superiority was achieved by the control group in certain other measures. These results were not anticipated and can only be explained in terms of the nature of the therapy. Since no problem other than articulation existed according to the criteria of this study, since therapy groups were not reduced in size for the experimental group, since conventional therapy would be appropriate for this group, and since time of therapy was too short for significant gains in articulation, it is reasonable to think that both experimental and control groups would obtain relatively the same changes in articulatory ability.

TABLE XI

Comparison of Mean Scores of Experimental and Control Samples on Pre- and Post-Measures of Performance, Group III

N = 14 in each sample

Test	Experimental			Control			Comparison Differences $D_E - D_C$	t
	Pre	Post	Diff.	Pre	Post	Diff.		
PPVT	76.43	81.57	5.14	74.21	80.36	6.15	-1.01	0.25
Aud.Rec.	73.86	89.21	15.35	73.21	80.43	7.22	8.13	1.27
Aud.Ass'n.	73.21	81.57	8.36	74.07	83.64	9.57	-1.21	0.28
Aud.Seq.	74.93	94.57	19.64	75.29	81.57	6.28	13.36	2.39*
Verb. Exp.	72.57	82.21	9.64	66.29	71.07	4.78	4.86	1.51
Gram.Clo.	73.50	87.71	14.21	69.14	75.00	5.86	8.35	1.70
Aud.Clo.	76.07	98.36	22.29	75.14	94.64	19.50	2.79	0.43
Sound Bl.	70.79	83.64	12.85	71.07	77.29	6.22	6.63	1.16
PSTA	28.93	34.36	5.43	29.50	35.14	5.64	-0.21	0.17
T-D	32.86	36.07	3.21	32.86	38.93	6.07	-2.86	0.30
Swallow (% correct)	1.00	1.00	0.00	1.00	1.00	0.00	0.00	0.00
# Def./r/	6.00	3.92	-2.08	6.92	5.78	-1.14	-0.94	0.43

* Significant at the 0.05 level of confidence, df 13

Group IV

Group IV was composed of 13 subjects, all of whom failed tests of swallowing behavior, failed the Predictive Screening Test of Articulation, but passed all auditory tests. Although the total number in the group was small, therapy units were of a conventional size, as shown by Table II. Results are shown in Table XII and have interesting implications when results are compared with results obtained from other groups of the study. Group IV was the only one to achieve statistically significant mean gain of experimental sample over the control sample on the Templin-Darley Screening Test of Articulation. It was also the only group to achieve statistically significant superiority in correction of defective /r/ sounds. The experimental sample received therapy for deviant swallowing behavior in conjunction with therapy for defective articulation. It is not known in how many instances the /r/ was directly attacked in therapy, but one might surmise that methodology for deviant swallowing was especially effective for correction of misarticulations. Further investigation of these results seem indicated.

Group V

Group V was composed of 47 subjects in the experimental group and a like number in the control group, all of whom failed auditory tests and all of whom passed swallowing tests. Refer to Table XIII. It was anticipated that this group would show slight improvement in articulation and that auditory skills would show positive change.

At the termination of the study, negligible changes in mean gain in articulation scores occurred in both the experimental and the control group. Statistically significant gain occurred in the experimental group in auditory association, auditory closure, and sound blending. Results were consistent with logical expectations within the time limit of the study, and the number of positive gains of the experimental group suggests that continued progress would have been made by such experimental group had more time been available.

TABLE XII

Comparison of Mean Scores of Experimental and Control Samples on Pre- and Post-Measures of Performance, Group IV

N = 13 in each sample

Test	Experimental			Control			Comparison Differences D_E-D_C	t
	Pre	Post	Diff.	Pre	Post	Diff.		
PPVT	72.31	80.38	8.07	76.38	83.92	7.54	0.53	0.14
Aud.Rec.	70.54	83.08	12.54	67.31	81.00	13.69	-1.15	0.19
Aud.Ass'n.	74.00	81.08	7.08	72.31	78.38	6.07	1.01	0.23
Aud.Seq.	79.92	96.38	16.46	77.92	89.46	11.54	4.92	0.66
Verb.Exp.	70.92	79.92	9.00	73.54	72.54	-1.00	10.00	2.55*
Gram.Clo.	68.54	75.08	6.54	72.62	77.85	5.23	1.31	0.37
Aud.Clo.	68.54	97.46	28.92	78.69	95.54	16.85	12.07	1.76
Sound Bl.	68.62	85.92	17.30	75.92	87.38	11.46	5.84	1.17
PSTA	25.85	32.31	6.46	27.15	32.69	5.54	0.92	1.35
T-D	27.77	36.00	8.23	32.31	35.92	3.61	4.62	2.36*
Swallow (% correct)	0.00	0.38	0.38	0.00	0.15	0.15	0.23	1.38
# Def./r/	6.54	3.69	-2.85	3.38	3.92	0.54	-3.39	2.68*

* Significant at the 0.05 level of confidence, df 12

TABLE XIII

Comparison of Mean Scores of Experimental and Control Samples on Pre- and Post-Measures of Performance, Group V

N = 47 in each sample

Test	Experimental			Control			Comparison Differences D_E-D_C	t
	Pre	Post	Diff.	Pre	Post	Diff.		
PPVT	80.87	89.60	8.73	76.77	82.98	6.21	2.52	0.98
Aud.Rec.	70.51	84.85	14.34	77.32	80.28	2.96	11.38	2.08*
Aud.Ass'n.	73.34	83.94	10.60	73.28	79.47	6.19	4.41	1.79
Aud.Seq.	74.49	84.68	10.19	77.74	88.55	10.81	-0.62	0.13
Verb.Exp.	68.66	75.02	6.36	67.57	74.30	6.73	-0.37	0.10
Gram.Clo.	65.13	78.02	12.89	74.34	79.98	5.64	7.25	2.93**
Aud.Clo.	72.17	91.49	19.32	75.77	87.49	11.72	7.60	1.84
Sound Bl.	66.06	81.57	15.51	73.91	83.56	9.65	5.86	1.55
PSTA	25.51	31.87	6.36	27.30	33.72	6.42	-0.06	1.37
T-D	26.87	33.47	6.60	29.49	35.79	6.30	0.30	0.61
Swallow (% correct)	1.00	0.98	-0.02	1.00	1.00	0.00	-0.02	1.00
# Def./r/	6.68	5.26	-1.42	6.38	5.62	-0.76	-0.66	0.97

* Significant at the 0.05 level of confidence, df 46

** Significant at the 0.01 level of confidence, df 46

Group VI

Group VI was composed of 46 subjects in the experimental sample and a like number in the control sample, all of whom had auditory inefficiencies and all of whom failed swallowing tests. Reference is made to Table XIV.

It was initially predicted that this group would make less progress in all areas than the other groups of the study because of the presence of both auditory deviations and swallowing problems. Results in some instances surpassed such expectations. Positive superiority of gains of the experimental over the control group occurred in all measures except sound blending. Statistically significant gains were achieved in verbal expression and in grammatic closure. The question arises at this point, "When there are a number of problems to be corrected, what is an adequate length of time for therapy sessions?" If a short period of time is to be divided and attention given to a number of problems other than articulation, is 30 minutes twice a week sufficient? Should length of time of each session be extended, or should meetings be more frequent? Speech clinicians received diagnostic information which indicated need for attention in three areas: articulation, swallowing, and auditory inefficiencies. The fact that positive achievement occurred in all areas except one indicates a realistic direction of therapy. With sufficient time it is plausible to assume that more significant results could have been achieved.

TABLE XIV

Comparison of Mean Scores of Experimental and Control Samples on Pre- and Post-Measures of Performance, Group VI

N = 46 in each sample

Test	Experimental			Control			Comparison Differences D_E-D_C	t
	Pre	Post	Diff.	Pre	Post	Diff.		
PPVT	78.00	86.35	8.35	79.28	83.89	4.61	3.74	1.57
Aud.Rec.	76.76	84.74	7.98	72.80	78.87	6.07	1.91	0.41
Aud.Ass'n.	72.35	83.11	10.76	71.85	79.37	7.52	3.24	1.07
Aud.Seq.	80.20	91.59	11.39	82.63	90.85	8.22	3.17	0.80
Verb.Exp.	65.89	79.63	13.74	66.91	70.70	3.79	9.95	2.76**
Gram.Clo.	67.74	79.87	12.13	67.65	73.76	6.11	6.02	2.09*
Aud.Clo.	70.85	92.17	21.32	68.78	83.76	14.98	6.34	0.18
Sound Bl.	71.67	81.78	10.11	62.00	75.09	13.09	-2.98	0.79
PSTA	24.02	31.52	7.50	24.39	29.59	5.20	2.30	0.63
T-D	27.35	34.28	6.93	28.09	31.67	3.58	3.35	0.50
Swallow (% correct)	0.00	0.50	0.50	0.04	0.35	0.31	0.19	1.41
# Def./r/	5.43	3.92	-1.51	5.48	4.61	-0.87	-0.64	0.83

* Significant at the 0.05 level of confidence, df 45

** Significant at the 0.01 level of confidence, df 45

Measures of Performance

The Peabody Picture Vocabulary Test was one of the criteria for matching subjects in this study. In no group was vocabulary directly taught. It may be assumed that any increment in scores came indirectly as a result of auditory stimulation. This test was one of three measures of the study which showed no statistically significant gain by any experimental group. However, in all groups except Group III, changes were positively in favor of the experimental sample. Reference is made to Table XV.

Auditory Reception scores are shown in Table XVI. Positive superiority of the experimental group over the control group in mean gains were achieved by all groups except Group IV. In Groups II; composite Group I and II; Group V; and composite Group III, IV, V, and VI, statistically significant gains occurred. This test concerns an ability important for interpersonal behavior and classroom achievement, the ability to discriminate and integrate what is heard. The positive superiority of the experimental sample over the control sample indicates achievement over and above the gains accruing as a result of the classroom, since both groups were exposed in like fashion to an academic program.

Auditory Association mean scores for experimental and control samples are shown in Table XVII. In all groups except Group III, positive increment of the experimental group exceeded that of the control group. In Group II and in the composite sum of Groups I and II, statistically significant scores were achieved by the experimental group. This test is on the representational level of the Illinois Test of Psycholinguistic Abilities. Improvement would be expected to accrue as a result of specific training in auditory abilities in classes of speech therapy.

Auditory Sequencing showed statistically significant gain by the experimental sample only in Group III. Some superiority of score of the experimental sample was achieved in all other groups except I and V. Refer to Table XVIII. Performance on this test showed less overall improvement than any other auditory performance and in the experience of the writers is a skill demanding a longer length of time for improvement than that of the present study.

Verbal Expression showed statistically significant superiority of the experimental sample in Group I; the composite sum of Groups I and II; Group IV, Group VI; and the composite sum of Groups III, IV, V, and VI. This skill is essential to proficiency in language, and any improvement may be considered a positive prognosis for language development and academic achievement. Results are shown in Table XIX.

TABLE XV

Comparison of Mean Scores of Experimental and Control Samples on Pre- and Post-Measures of Performance on Peabody Picture Vocabulary Test

Group	Experimental			Control			Comparison Difference	
	Pre	Post	Diff.	Pre	Post	Diff.	D_E-D_C	t
I	75.29	83.96	8.67	77.04	82.63	5.59	3.08	1.32
II	81.54	86.82	5.28	84.41	89.66	5.25	0.03	0.01
I-II	80.43	86.31	5.88	83.10	88.41	5.31	0.57	0.40
III	76.43	81.57	5.14	74.21	80.36	6.15	-1.01	0.25
IV	72.31	80.38	8.07	76.38	83.92	7.54	0.53	0.14
V	80.87	89.60	8.73	76.77	82.98	6.21	2.52	0.98
VI	78.00	86.35	8.35	79.28	83.89	4.61	3.74	1.57
III-VI	78.33	86.42	8.09	77.39	83.13	5.74	2.35	1.59

TABLE XVI

Comparison of Mean Scores of Experimental and Control Samples on Pre- and Post-Measures of Performance on Auditory Reception Scores

Group	Experimental			Control			Comparison Difference	
	Pre	Post	Diff.	Pre	Post	Diff.	D_E-D_C	t
I	75.92	85.58	9.66	77.21	81.17	3.96	5.70	0.89
II	74.82	87.00	12.18	80.92	83.32	2.40	9.78	3.38**
I-II	75.01	86.75	11.74	80.26	82.93	2.67	9.07	3.44**
III	73.86	89.21	15.35	73.21	80.43	7.22	8.13	1.27
IV	70.54	83.08	12.54	67.31	81.00	13.69	-1.15	0.19
V	70.51	84.85	14.34	77.32	80.28	2.96	11.38	2.08*
VI	76.76	84.74	7.98	72.80	78.87	6.07	1.91	0.41
III-VI	73.30	85.13	11.83	74.03	79.83	5.80	6.03	1.99*

* Significant at the 0.05 level of confidence

** Significant at the 0.01 level of confidence

TABLE XVII

Comparison of Mean Scores of Experimental and Control Samples on Pre- and Post-Measures of Performance on Auditory Association Scores

Group	Experimental			Control			Comparison Difference	
	Pre	Post	Diff.	Pre	Post	Diff.	D_E-D_C	t
I	73.50	79.67	6.17	77.75	83.17	5.42	0.75	0.22
II	75.68	83.41	7.73	80.18	84.41	4.23	3.50	2.27*
I-II	75.30	82.74	7.44	79.75	84.19	4.44	3.00	2.15*
III	73.21	81.57	8.36	74.07	83.64	9.57	-1.21	0.28
IV	74.00	81.08	7.08	72.31	78.38	6.07	1.01	0.23
V	73.34	83.94	10.60	73.28	79.47	6.19	4.41	1.79
VI	72.35	83.11	10.76	71.85	79.37	7.52	3.24	1.07
III-VI	73.02	83.03	10.01	72.72	79.80	7.08	2.93	1.78

TABLE XVIII

Comparison of Mean Scores of Experimental and Control Samples on Pre- and Post-Measures of Performance on Auditory Sequencing Scores

Group	Experimental			Control			Comparison Difference	
	Pre	Post	Diff.	Pre	Post	Diff.	D_E-D_C	t
I	91.67	98.04	6.37	81.38	92.88	11.50	-5.13	0.95
II	78.29	87.74	9.45	85.73	93.65	7.92	1.53	0.70
I-II	80.67	89.57	8.90	84.96	93.51	8.55	0.35	0.17
III	74.93	94.57	19.64	75.29	81.57	6.28	13.36	2.39*
IV	79.92	96.38	16.46	77.92	89.46	11.54	4.92	0.66
V	74.49	84.68	10.19	77.74	88.55	10.81	-0.62	0.13
VI	80.20	91.59	11.39	82.63	90.85	8.22	3.17	0.80
III-VI	77.32	89.75	12.43	79.35	88.72	9.37	3.06	1.20

* Significant at the 0.05 level of confidence

TABLE XIX

Comparison of Mean Scores of Experimental and Control Samples on Pre- and Post-Measures of Performance on Verbal Expression Scores

Group	Experimental			Control			Comparison Difference	
	Pre	Post	Diff.	Pre	Post	Diff.	D_E-D_C	t
I	73.71	80.00	6.29	75.00	73.58	-1.42	7.71	1.59
II	68.80	76.75	7.95	73.64	77.32	3.68	4.27	2.19*
I-II	69.67	77.33	7.66	73.89	76.65	2.76	4.90	2.69**
III	72.57	82.21	9.64	66.29	71.07	4.78	4.86	1.51
IV	70.92	79.92	9.00	73.54	72.54	-1.00	10.00	2.55*
V	68.66	75.02	6.36	67.57	74.30	6.73	-0.37	0.10
VI	65.89	79.63	13.74	66.91	70.70	3.79	9.95	2.76**
III-VI	68.30	78.16	9.86	67.82	72.35	4.53	5.33	2.59*

* Significant at the 0.05 level of confidence

** Significant at the 0.01 level of confidence

Grammatic Closure showed statistically significant gain in the experimental sample in Group V; Group VI; and the composite Group III, IV, V, and VI. In all other groups improvement for the experimental group was greater than for the control sample. Refer to Table XX. Grammatic closure represents usage of morphology and is basic to development of language. Morphology as such was not directly taught in any group but probably occurred as a result of improvement in listening skills. It was anticipated that inclusion of non-Anglo-Americans would depress the scores of this test. Tables V and VI show that in the composite Group I and II and composite Group III, IV, V, and VI, both the experimental and control samples of Anglo-Americans had a higher mean score on the pre-test than did the full group which contained Negroes. Gain was uniformly shown by both experimental and control samples on post-tests. With the exception of the experimental sample of composite Group III, IV, V, and VI, the greater gain was made by the Anglo-American sample. This could be interpreted to mean that, in fact, the inclusion of non-Anglo-Americans did depress scores on this test. Further study is indicated to determine specific needs of Negroes in public school speech therapy programs.

Auditory Closure tests the ability to derive meaning from a distorted whole. On the Illinois Test of Psycholinguistic Abilities it is listed as a "supplementary test." Presumably, its full implication for language development is not fully established. In this study statistically significant differences were achieved by the experimental sample in Group I; sum of Groups I and II; and sum of Groups III, IV, V, and VI. Reference is made to Table XXI.

Sound Blending was one of three measures in which no statistically significant gain was made. However, positive increments in favor of the experimental group were made by Groups I, II, IV, and V. In the Illinois Test of Psycholinguistic Abilities this test is also listed as a supplementary test. Refer to Table XXII.

TABLE XX

Comparison of Mean Scores of Experimental and Control Samples on Pre- and Post-Measures of Performance on Grammatic Closure Scores

Group	Experimental			Control			Comparison Difference	
	Pre	Post	Diff.	Pre	Post	Diff.	D_E-D_C	t
I	71.50	79.33	7.83	75.13	82.54	7.41	0.42	0.13
II	72.19	81.05	8.86	79.42	87.42	8.00	0.86	0.43
I-II	72.07	80.74	8.67	78.66	86.56	7.90	0.77	0.45
III	73.50	87.71	14.21	69.14	75.00	5.86	8.35	1.70
IV	68.54	75.08	6.54	72.62	77.85	5.23	1.31	0.37
V	65.13	78.02	12.89	74.34	79.98	5.64	7.25	2.93**
VI	67.74	79.87	12.13	67.65	73.76	6.11	6.02	2.09*
III-VI	67.48	79.54	12.06	70.98	76.78	5.80	6.26	3.89**

TABLE XXI

Comparison of Mean Scores of Experimental and Control Samples on Pre- and Post-Measures of Performance on Auditory Closure Scores

Group	Experimental			Control			Comparison Difference	
	Pre	Post	Diff.	Pre	Post	Diff.	D_E-D_C	t
I	75.38	101.17	25.79	81.25	96.50	15.25	10.54	2.16*
II	76.17	93.17	17.00	84.20	97.52	13.32	3.68	1.35
I-II	76.03	94.59	18.56	83.67	97.34	13.67	4.89	2.03*
III	76.07	98.36	22.29	75.14	94.64	19.50	2.79	0.43
IV	68.54	97.46	28.92	78.69	95.54	16.85	12.07	1.76
V	72.17	91.49	19.32	75.77	87.49	11.72	7.60	1.84
VI	70.85	92.17	21.32	68.78	83.76	14.98	6.34	0.18
III-VI	71.73	93.20	21.47	73.33	87.77	14.44	7.03	2.49*

* Significant at the 0.05 level of confidence

** Significant at the 0.01 level of confidence

TABLE XXII

Comparison of Mean Scores of Experimental and Control Samples on Pre- and Post-Measures of Performance on Sound Blending Scores

Group	Experimental			Control			Comparison Difference	
	Pre	Post	Diff.	Pre	Post	Diff.	D_E-D_C	t
I	76.54	86.46	9.92	78,08	85.13	7.05	2.87	0.53
II	79,77	84.79	5.02	76.11	87.97	11.86	-6.84	0.86
I-II	79.19	85.09	5.90	76.46	87.47	11.01	-5.11	0,77
III	70.79	83.64	12,85	71.07	77.29	6.22	6.63	1.16
IV	68.62	85.92	17.30	75.92	87.38	11.46	5.84	1.17
V	66.06	81,57	15,51	73.91	83.56	9,65	5.86	1.55
VI	71.67	81,78	10.11	62.00	75,09	13,09	-2,98	0.79
III-VI	69.04	82.37	13.33	69.23	79,99	10.76	2.57	1.14

The Predictive Screening Test of Articulation was arbitrarily utilized as one criterion for grouping of subjects. The directors of the study were aware that the cutoff score of 34 was inappropriate for children in the second grade and that the use of that score would include in Groups I and II some children who would predictably not outgrow their difficulties. However, in this initial investigation its use was necessary in view of the lack of other appropriate predictive measures. Further study should be made in order to determine the cutoff score for children in the second grade in this community.

No group showed statistically significant change on this test. Refer to Table XXIII. At first thought, this result seems to contradict initial projections for therapy. Upon consideration of certain factors, however, such a result seems plausible and should have been anticipated. The Predictive Screening Test of Articulation is heavily weighted with /r/. Of a possible score of 47 on the test, thirteen responses relate to the /r/ sound. This means that a defective /r/ will carry great weight in the total scoring. Literature has shown that the /r/ is one of the most frequently defective sounds (43), and practicing clinicians seem to agree that it is one of the most difficult to modify. Therefore, results at the termination of the study undoubtedly reflect the heavy weighting of the /r/ on this test and the short time for the correction of a difficult sound. It should be mentioned that the supportive personnel assisting in this project notified the writers that they could not achieve change in the /r/ unless they could have time for more individualized attention.

The Templin-Darley Screening Test of Articulation, like the Predictive Screening Test of Articulation, is heavily weighted with /r/ sounds. Of a possible score of 50, fifteen responses contain the /r/ sound. Changes in the scores of this test were used as indications of progress and as the criterion for dismissal from therapy. For results, refer to Table XXIV. Group IV was the only one of the six groups which made statistically significant gain in mean scores on this test. It is of interest to note that this group was also the only group of the six which made statistically significant gain in correction of defective /r/ sounds. In all groups except Group III, greater increments accrued for the experimental sample than for the control sample. In other words, therapy was progressing in favor of the experimental group, and with more time for therapy it might be anticipated that greater positive gains would occur for the experimental sample.

TABLE XXIII

Comparison of Mean Scores of Experimental and Control Samples on Pre- and Post-Measures of Performance on Predictive Screening Test of Articulation

Group	Experimental			Control			Comparison Difference	
	Pre	Post	Diff.	Pre	Post	Diff.	D_E-D_C	t
I	40.38	42.00	1.62	41.50	42.71	1.21	0.41	0.40
II	40.16	41.60	1.44	41.75	43.03	1.28	0.16	1.45
I-II	40.20	41.67	1.47	41.70	42.97	1.27	0.20	0.43
III	28.93	34.36	5.43	29.50	35.14	5.64	-0.21	0.17
IV	25.85	32.31	6.46	27.15	32.69	5.54	0.92	1.35
V	25.51	31.87	6.36	27.30	33.72	6.42	-0.06	1.37
VI	24.02	31.52	7.50	24.39	29.59	5.20	2.30	0.63
III-VI	25.38	32.08	6.70	26.43	32.19	5.76	0.94	1.06

TABLE XXIV

Comparison of Mean Scores of Experimental and Control Samples on Pre- and Post-Measures of Performance on Templin-Darley Screening Test of Articulation

Group	Experimental			Control			Comparison Difference	
	Pre	Post	Diff.	Pre	Post	Diff.	D_E-D_C	t
I	42.92	45.42	2.50	43.83	44.83	1.00	1.50	1.40*
II	42.84	44.53	1.69	44.62	45.68	1.06	0.63	0.61
I-II	42.85	44.69	1.84	44.48	45.53	1.05	0.79	1.71
III	32.86	36.07	3.21	32.86	38.93	6.07	-2.86	0.30
IV	27.77	36.00	8.23	32.31	35.92	3.61	4.62	2.36*
V	26.87	33.47	6.60	29.49	35.79	6.30	0.30	0.61
VI	27.35	34.28	6.93	28.09	31.67	3.58	3.35	0.50
III-VI	27.85	34.36	6.51	29.65	34.59	4.94	1.57	1.72

* Significant at the 0.05 level of confidence

Swallowing Behavior - The writers hypothesized that deviant swallowing behavior would interfere with the production of certain sounds. This would include the /r/ family of sounds. The /s/ was omitted from final analysis because if connected with deviant swallowing it could be more easily corrected than the defective /r/ in the opinion of the investigators.

During the course of this study it became apparent that the concept of "deviant" and "correct" swallowing was not completely amenable to delineation and agreement. What constituted "normal" for some testers was not uniformly considered "normal" by others, and this occurred in spite of a short preliminary period of training for the testers. Since the study was delayed in its inception, all periods of training for the clinicians were reduced. In future studies, either more rigorous training should be done, or all judgments relative to swallowing behavior should be done by one tester. Because of the foregoing, figures on swallowing behavior should be interpreted with caution.

As can be seen by Table XXV, Group II; the composite Group I and II; and the composite Group II, IV, V, and VI achieved statistically significant changes in the experimental group in swallowing behavior. Only in Group V was there a very negligible difference in favor of the control sample. Groups I-B and II-B had 45 subjects with deviant swallowing behavior. This was 33% of the total number of 135 subjects in Groups I and II. In Groups III, IV, V, and VI, a total of 59 had deviant swallowing behavior. This figure represented 49% of the total number of 120 subjects in the groups. In other words, those groups which were predicted to have more severe problems of articulation likewise had an increase in deviant swallowing behavior. As stated previously, future studies should attempt to standardize evaluation and progress of swallowing behavior in order to assess correctly its effect on articulation.

Table XXVI shows the number of defective /r/ sounds in the groups of the study. Because drop in defective /r/ is an improvement, the signs used in this table indicate the direction of improvement and so mean improvement from pre- to post-test. Examination of the table shows that in Group I, Group II, and composite Group I and II improvement was negligibly in favor of the control sample. These groups were handled by pre-professionals, whose primary emphasis in therapy was auditory training, or learning to listen critically. For the correction of a defective /r/ this ability may be insufficient for its correction. Groups III, IV, V, and VI and composite Group III, IV, V, and VI all made positive change in favor of the experimental group. The experimental group of Group IV achieved a statistically significant gain as compared with the gain of the control group. It seems evident that for experienced speech clinicians as well as for pre-professionals, the modification of the /r/ sound demands a period of time longer than the time span of the study.

Prevalence of Auditory Inefficiencies

The total number of subjects in Groups I and II was 135. Of that number, 82% were judged to have auditory deviations. Groups III, IV, V, and VI consisted of 120 subjects, of whom 78% were judged to have auditory deviations. Of the total number of subjects of the study, 204 or 80% had such problems. The writers wish to stress that the study was not conducted for the purpose of identifying children with language or learning disabilities. In the opinion of the investigators, the criteria utilized were adequate to identify a child whose progress might be impeded in mastering skills of articulation or in academic achievement because of immaturity of auditory skills. The writers feel that a large number of such children are today a part of every classroom; that their problems, though minimal, may interfere with their adequate adjustments; and that speech clinicians can and should assist such children in overcoming some of their obstacles to learning.

Had more stringent criteria been employed, fewer children would have been identified as having auditory deviations. Further studies should relate severity of articulation, auditory deviations, and academic achievement.

Reaction of Classroom Teachers

Teacher reaction to the subjects in the experimental samples was studied in terms of a questionnaire presented to each teacher involved in the study. In every instance, the classroom teachers were enthusiastic about the program. They were pleased that all children who had problems of articulation could receive immediate special service, rather than waiting for maturation to modify their speech. A copy of the questionnaire and a summary of responses may be found in Appendix D.

Intercorrelation of Variables

This study was undertaken in order to investigate answers to some basic questions about articulation, auditory abilities, and swallowing behavior. One question was whether articulation problems of school aged children frequently masked auditory disabilities and to what degree this association occurred. The second question focused on swallowing behavior as a possible significant factor in articulation difficulties. The third explored relationships between various patterns of variables as a basis for planning therapy.

Answers to these questions were sought by examination of correlations among the tests in the battery administered to all children in this study. In relation to the first question, the correlation between scores on the Templin-Darley Screening Test of Articulation and the auditory tests provided quantitative data concerning the relationship between these variables for each of the samples tested. The correlations between scores on articulation and swallowing tests

provided similar data with the second question. In relation to the third question, the data of interest involved the clustering of variables as indicated by the patterns of correlations obtained.

In order to facilitate correlational analyses, three groupings of subjects were used. First, Groups I and II were combined to provide a sample of 270 subjects, all of whom passed the Predictive Screening Test of Articulation. The second grouping combined Groups III, IV, V, and VI, providing 240 subjects, all of whom failed the Predictive Screening Test of Articulation. The third grouping treated Groups IV and VI. This last composite of 118 subjects was of special interest because all subjects failed both the Predictive Screening Test of Articulation and swallowing test and were considered appropriate for the evaluation of relationship of swallowing behavior and articulatory ability.

Groups I and II

This composite group consisted of 270 subjects, all of whom passed the Predictive Screening Test of Articulation. In a group of this size, a correlation of .12 or higher is required for significance at the .05 level of confidence and .16 or higher at the .01 level.

Relationship between articulation disorders and prevalence of auditory inefficiencies - Table XXVII shows the correlation coefficients relative to articulation disorders and auditory inefficiencies of subjects of the study. The auditory tests are numbered 2 through 8. It can be seen that the Templin-Darley Screening Test of Articulation is significantly related to all auditory variables except sound blending at the .01 level of confidence. Even though the correlations for the six variables are significant, the highest coefficient, .32 for grammatic closure, is actually marginal and insubstantial, accounting for less than 10% of the common variance between articulation and grammatic closure. These results are interpreted to indicate that there is a significant but weak relationship between articulation skills and the auditory skills evaluated in this study. The relationships are not considered high enough to be useful as a diagnostic indicator for subjects of this sample. Judgment should be delayed until further study of similar groups yields additional information.

Relationship between articulation skills and swallowing behavior - The coefficient between variable 10, Templin-Darley Screening Test of Articulation, and variable 11, swallowing behavior, is non-significant. As far as Groups I and II are concerned, these results must be interpreted as inconclusive, since a limited number of subjects in Group I and II were evaluated as having deviant swallowing behavior.

TABLE XXVII

Intercorrelations Among 12 Diagnostic Tests*
Pretreatment Administration:
Total Sample (Sum of Composite Groups I and II); N = 270

	12	1	2	3	4	5	6	7	8	9	10	11	12
PPVT	1		65	67	26	45	63	49	18	19	24	-02	-02
Aud.Rec.	2			62	20	44	56	42	08	20	23	-06	00
Aud.Ass'n.	3				31	43	63	55	10	19	20	00	03
Aud.Seq.	4					23	27	20	20	09	16	-11	-01
Verb.Exp.	5						39	33	10	13	18	-01	00
Gram.Clo.	6							56	18	31	32	-04	-07
Aud.Clo.	7								24	21	18	-11	07
Sound Bl.	8									01	00	04	00
PSTA	9										75	-03	-49
T-D	10											03	-62
% Cor.Sw.	11												-01
# Def./r/	12												

* Decimal points omitted

Clusters of Variables

In relation to the question of clusters, Table XXVIII was prepared to show the average intercorrelation for each of the twelve variables in rank order from highest to lowest. Examination of this table shows that the highest commonality is found for variable 6, grammatic closure; variable 1, Peabody Picture Vocabulary Test; and variable 3, auditory association. These are closely associated with all other variables except auditory sequencing, sound blending, number of defective /r/ sounds, and scores on swallowing behavior. The eight highest ranks include Templin-Darley Screening Test of Articulation and the Predictive Screening Test of Articulation. These intercorrelations indicate that among these subjects five of the seven auditory tests form a positively associated cluster, which is highly related to the Peabody Picture Vocabulary Test and to a less degree to Templin-Darley Screening Test of Articulation.

An association of particular interest, as shown by Table XXVII, is that between variables 9 and 10. The high correlation of .75 between Predictive Screening Test of Articulation and the Templin-Darley Screening Test of Articulation suggests that these two tests are measuring essentially the same functions. Lastly, the high correlation between Templin-Darley Screening Test of Articulation and number of defective /r/ sounds points up the fact that in this group of subjects, failure to master a defective /r/ would seriously depress scores of the Templin-Darley Screening Test of Articulation. The negative scores obtained for number of defective /r/ sounds, in relation to the articulation tests, were counted as positive signs in computing average intercorrelations since the number of defective /r/ sounds is negatively related to positive scores on the Templin-Darley Screening Test of Articulation and on the Predictive Screening Test of Articulation.

TABLE XXVIII

Rank Order of Average Intercorrelations of 12 Diagnostic Tests in Battery for Total Sample (Sum of Composite Groups I and II) N = 270

Test No.	Test Title	Average Intercorrelations	Rank Order
6	Gram.Clo,	.31	1
1	PPVT	.31	2
3	Aud,Ass'n.	.31	3
2	Aud,Rec.	.28	4
7	Aud.Clo,	.26	5
10	T-D	.24	6
5	Verb.Exp.	.22	7
9	PSTA	.21	8
4	Aud,Seq.	.15	9
8	Sound Bl.	.09	10
12	# Def. /r/	.09	11
11	% Cor. Swal.	.03	12

Groups III, IV, V, and VI

This sample consisted of 240 subjects, all of whom failed the Predictive Screening Test of Articulation. In a group of this size, a correlation of .12 or above is required for significance at the .05 level of confidence and .16 or higher at the .01 level.

Relationship between articulation disorders and prevalence of auditory inefficiencies - The correlation coefficients relevant to the relationship between articulation and auditory abilities are shown in Table XXIX. In this table, the Templin-Darley Screening Test of Articulation is number 10, and auditory variables are numbered 2 through 8. The results show that the Templin-Darley Screening Test of Articulation is significantly associated with auditory association at the .05 level and with auditory sequencing, grammatic closure, auditory closure, and sound blending at the .01 level of confidence. Correlations are positive but non-significant for auditory reception and verbal expression. Even though the correlations for the five auditory variables are significant, the highest coefficient, .24 for auditory closure, is actually marginal and insubstantial, accounting for less than 10% of the common variance between articulation and auditory closure. These results are interpreted to indicate that there is a significant but weak relationship between articulation skills and auditory skills investigated in this study. The relationships are not considered high enough to be useful as diagnostic indicators for subjects of this group.

Relationship between articulation skills and swallowing behavior - In respect to the relationship between swallowing behavior and scores on the Templin-Darley Screening Test of Articulation, the coefficient between variables 10 and 11 is not significantly greater than zero. The present sample consists of a limited proportion of subjects who demonstrated deviant swallowing behavior. For this group, results do not support a relationship between swallowing behavior and articulatory ability.

TABLE XXIX

Intercorrelations Among 12 Diagnostic Tests*
Pretreatment Administration:
Total Sample (Sum of Composite Groups III, IV, V, and VI)
N = 240

	12	1	2	3	4	5	6	7	8	9	10	11	12
PPVT	1		57	58	29	43	60	48	45	07	10	03	22
Aud.Rec.	2			51	27	34	53	39	41	05	05	02	24
Aud.Ass'n.	3				33	46	64	50	44	06	13	05	15
Aud.Seq.	4					21	40	20	34	14	17	-08	07
Verb.Exp.	5						48	41	34	01	06	02	15
Gram.Clo.	6							53	51	16	23	07	16
Aud.Clo.	7								54	17	24	08	12
Sound Bl.	8									16	21	05	05
PSTA	9										82	19	-18
T-D	10											07	-34
% Cor.Sw.	11												15
# Def./r.	12												

* Decimal points omitted

Clusters of Variables

Table XXX shows the average intercorrelation for each of the twelve variables in rank order from highest to lowest. Examination of the table shows that the highest commonality is found for variable 6, grammatic closure. This variable is highly associated with auditory association, Peabody Picture Vocabulary Test, auditory closure, sound blending, auditory reception, and to a less degree to other variables scrutinized. With the possible exception of auditory sequencing and verbal expression, auditory variables form a positive cluster closely related to Peabody Picture Vocabulary Test and to a less degree to the Templin-Darley Screening Test of Articulation and to the Predictive Screening Test of Articulation.

An association of particular interest in this group is that between variables 9 and 10 as shown by Table XXIX. The correlation of .82 between the Predictive Screening Test of Articulation and the Templin-Darley Screening Test of Articulation suggests that for this group these tests were measuring essentially the same functions. Lastly, the high correlation between Templin-Darley Screening Test of Articulation and the number of defective /r/ sounds points up the weight of /r/ sounds on total score of articulation. The negative scores obtained for number of defective /r/ sounds in relation to the articulation tests were counted as positive signs in computing average intercorrelations since the number of defective /r/ sounds is negatively related to positive scores on the Templin-Darley Screening Test of Articulation and on the Predictive Screening Test of Articulation.

TABLE XXX

Rank Order of Average Intercorrelations of 12 Diagnostic Tests in Battery for Total Sample (Sum of Composite Groups III, IV, V, and VI) N = 240

Test No.	Test Title	Average Intercorrelations	Rank Order
6	Gram.Clo.	.36	1
3	Aud.Ass'n.	.32	2
1	PPVT	.32	3
7	Aud.Clo.	.31	4
8	Sound Bl.	.29	5
2	Aud.Rec.	.28	6
5	Verb.Exp.	.2[illegible]	7
10	T-D	.20	8
4	Aud.Seq.	.20	9
9	PSTA	.17	10
12	# Def./l/	.15	11
11	% Cor. Swal.	.05	12

Groups IV and VI

This sample consisted of 118 subjects, all of whom failed Predictive Screening Test of Articulation and all of whom failed tests of swallowing behavior. This group was considered particularly appropriate for the study of the relationship of swallowing behavior and articulation since all subjects failed swallowing behavior. Auditory disabilities were not scrutinized since Group IV, a part of the composite Group IV and VI, did not contain any subjects with auditory deviations. For this total sample, a correlation of .20 or higher is required for significance at the .05 level of confidence and .24 or higher at the .01 level.

Reference to Table XXXI indicates that the coefficient between variables 10 and 11, Templin-Darley Screening Test of Articulation and percentage of correct swallowing behavior, is not significantly greater than zero. Of special interest is the relationship between the number of defective /r/ sounds and the percentage of correct swallowing behavior. It was the opinion of the investigators that in many instances the presence of defective /r/ sounds would be associated with deviant swallowing behavior. Table XXXI shows that the coefficient between percentage of correct swallowing behavior and the number of defective /r/ sounds is .23. This is significant at the .01 level of confidence. However, the correlation is not in the expected direction and must be interpreted to mean that correct swallowing is related to defective /r/ sounds. Since the investigators do not have independent data on the reliability of measures of swallowing behavior, the positive relationship cannot be explained. This relationship is contrary to what is empirically known by the investigators and may be the result of inadequate measures of swallowing behavior.

TABLE XXXI

Intercorrelations Among 12 Diagnostic Tests•
Pretreatment Administration:
Total Sample (Sum of Composite Group IV and VI)
N = 118

	12	1	2	3	4	5	6	7	8	9	10	11	12
PPVT	1		57	63	29	38	62	45	42	19	12	13	12
Aud.Rec.	2			53	29	36	50	38	33	05	-05	11	26
Aud.Ass'n.	3				34	47	63	47	46	14	16	15	05
Aud.Seq.	4					28	38	19	35	22	20	06	-03
Verb.Exp.	5						49	40	31	11	10	-02	13
Gram.Clo.	6							55	49	33	32	15	06
Aud.Clo.	7								53	30	31	05	03
Sound Bl.	8									25	24	00	-04
PSTA	9										83	13	-23
T-D	10											08	-40
% Cor.Sw.	11												23
# Def./r/	12												

• Decimal points omitted

Clusters of Variables

Table XXXII shows average intercorrelations of the twelve variables in rank order from highest to lowest. The highest commonality is seen for variable 6, grammatic closure, which is highly associated with auditory association and the Peabody Picture Vocabulary Test. With the exception of auditory sequencing, auditory variables form a positive cluster highly related to Peabody Picture Vocabulary Test and to a less degree to Templin-Darley Screening Test of Articulation and the Predictive Screening Test of Articulation. Another association of interest shown in both groups previously discussed is the high relationship between Predictive Screening Test of Articulation and the Templin-Darley Screening Test of Articulation. Also, the intercorrelation of scores of Templin-Darley Screening Test of Articulation and the number of defective /r/ sounds points up the fact that in this group of subjects, failure to master defective /r/ sounds would seriously depress scores of the articulation test. The treatment of the negative scores on the defective /r/ sounds as they relate to the tests of articulation has been previously explained.

TABLE XXXII

Rank Order of Average Intercorrelations of 12 Diagnostic Tests in Battery for Total Sample (Sum of Composite Groups IV and VI)
N = 118

Test No.	Test Name	Average Intercorrelation
6	Gram. Clo.	.38
3	Aud. Ass'n.	.34
1	PPVT	.33
7	Aud. Clo.	.31
8	Sound Bl.	.28
2	Aud. Rec.	.34
5	Verb. Exp.	.25
9	PSTA	.23
10	T-D	.23
4	Aud. Seq.	.21
12	# Def. /r/	.12
11	% Cor. Swallow	.10

CONCLUSIONS AND RECOMMENDATIONS

The investigators believe that the limited time for therapy in this study precludes definite conclusions relative to the questions investigated. However, the data strongly suggest that the manner of grouping children with functional articulation problems and the use of pre-professionals may be effective procedures in a public school speech correction program.

The primary goal of the study was to achieve effective improvement in articulation skills and to include in therapy any child in the experimental group who had any functional misarticulation. At the termination of the project the experimental sample in five of the six groups had achieved greater positive mean gain on articulation scores than did the control sample. The experimental sample of Group IV showed gain significant at the .05 level of confidence on the Templin-Darley Screening Test of Articulation. The greater gain of the control sample on articulation score in Group III was negligible.

Twelve variables were studied. Of these, only three failed to achieve statistically significant mean gain by the experimental sample in any of the six groups. The three were Peabody Picture Vocabulary Test, sound blending, and the Predictive Screening Test of Articulation. In no instance was statistically significant gain for any variable made by any group of the control sample. With few exceptions, positive increments in favor of the experimental group occurred in all groups for all measures. Each of the six groupings of subjects comprising the experimental sample achieved statistically significant mean gain in one or more variables studied. A logical assumption would be that the experimental samples would continue positive gain with additional time for therapy.

One of the assumptions of this study was that auditory inefficiencies frequently were associated with articulation disorders. Results tend to substantiate this assumption. In the composite sum of Groups I and II, 82% of the total number of 135 subjects had auditory inefficiencies as defined by this study. In the composite sum of Groups III, IV, V, and VI, 78% of the total number of 120 subjects demonstrated such auditory deviations. It was also believed that a child might overcome his problem of articulation and retain his auditory inefficiencies. Nineteen of the 24 subjects in the experimental sample who attained a score of 50 on the Templin-Darley Screening Test of Articulation and were dismissed from therapy retained some auditory differences as defined by this study.

The investigators of the study assumed that inadequate patterns of swallowing would be reflected in articulation scores and more specifically in the number of defective /r/ sounds in the sample. Results were contrary to expectations. No significant relationships were found. The explanation for this may lie in the lack of adequate objective measures of deviant swallowing behavior.

Approximately one-half of the population of subjects in this project were handled by pre-professionals under supervision. These pre-professionals were without experience and did not hold any type of certification. Each had a bachelor's degree and was working to earn a master's degree at Texas Christian University. The experimental samples of Groups I and II showed statistically significant gain in five of the twelve measures studied. At a time when the role of the supportive personnel or pre-professional is being studied and when American Speech and Hearing Association is seeking to clarify roles of certified clinicians, this study may indicate ways in which the pre-professional can be of service to the speech pathologist.

Three composite groups were studied in an attempt to answer questions about articulation, auditory abilities, and swallowing behavior. In each of the composite groups the majority of the auditory tests formed a positive cluster and were highly related to the Peabody Picture Vocabulary Test. The variable with the highest intercorrelation in each of the three groups was grammatic closure. The three highest intercorrelations accrued for grammatic closure, auditory association, and Peabody Picture Vocabulary Test. In two groups, auditory sequencing was the lowest of the auditory variables, and in one group it was next to the lowest. In all three groups, there was a significant but weak relationship between auditory tests evaluated and the Templin-Darley Screening Test of Articulation. In all the groups there was a high correlation between the Templin-Darley Screening Test of Articulation and the Predictive Screening Test of Articulation. In all groups the number of defective /r/ sounds was highly related to scores on the Templin-Darley Screening Test of Articulation. No significant relationship was found between swallowing and articulation scores.

The strongest evidence in support of the hypotheses of this study would have been if all of the mean differences for the experimental group were significantly higher than the corresponding differences for the controls. Actually, nine of the twelve variables considered in this study achieved this statistically significant gain in one or more groups. Moreover, in all variables the gain by the experimental sample over the control sample, whether statistically significant or not, was not a random one; the consistent uniformity of this superiority must be regarded at this intermediate stage of training as strongly suggestive of the possibility of even greater differences if training were continued.

Results of the study indicate a practical need to continue the project in its present structure and to expand its findings in a number of specific ways.

Group size may be an important variable in therapy. In Group II therapy units included as many as 24 subjects; Groups III, IV, V, and VI never included less than 3. If size of groups were adjusted, would therapy be positively affected?

Auditory deviations and their effect on speech therapy should be investigated. There is a question of whether groups which consist of subjects with auditory deviations as well as articulation problems do less well than those subjects with articulation problems but no auditory deviations.

Therapy should be extended to include a minimum of eight months. Positive gains for the experimental group should then be checked to determine whether the present trend is projected significantly when longer periods for therapy are allowed.

The status and progress of non-Anglo-Americans should be studied. The problem of dialect communities is a pressing one in elementary schools today; the manner of handling them is of paramount importance. What kinds of speech therapy would be most beneficial to these minority groups? Furthermore, criteria for evaluating the articulation of such non-Anglo-Americans needs to be systematized.

The use of pre-professionals should be substantiated in a continuing study. The profession of speech pathology needs to know the kinds of problems with which these pre-professionals can be effective and whether they can or should be utilized in handling the large number of children in the first and second grades with functional articulation problems. The present study suggests that they are effective in modifying auditory inefficiencies as well as effecting some changes in articulatory behavior.

The method of evaluating swallowing behavior should be studied and attempts made to arrive at uniform criteria for judgment of "adequate" or "inadequate." Methods of attacking the problem in a public school situation should be scrutinized. While the present study showed a significant number of children evaluated as having deviant swallowing behavior, such behavior was not significantly related to articulation scores.

Diagnostic information relative to spontaneous remission of articulation errors should be obtained for second grade children of this area. This could be accomplished by retesting at the second and third grade level those children who were tested in this study and who have received in the intervening time no kind of speech therapy. The Predictive Screening Test of Articulation should be utilized for this purpose.

Finally, a thorough investigation of the relationship of auditory inefficiencies, as defined in this study, and classroom behavior should be undertaken. Verification of this suspected relationship would greatly modify the role and responsibilities of the speech clinician in the public school system and provide much needed assistance to children who have difficulty in the classroom as a result of auditory inefficiencies.

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APPENDIX A

PREDICTIVE SCREENING TEST OF ARTICULATION

PREDICTIVE SCREENING TEST OF ARTICULATION (PSTA), U. S. OFFICE OF EDUCATION GRANT 3-7-068717-0198, PROJECT NO. 3-8717, C. VAN RIPER, WESTERN MICHIGAN UNIVERSITY, 1968

RESPONSE SHEET

CHILD'S NAME _____ BIRTHDATE _____ CHILD'S TOTAL SCORE _____

GRADE _____ SCHOOL _____ EXAMINER _____

CITY _____ STATE _____ DATE _____

RECORD THE CHILD'S RESPONSE TO EACH ITEM OF THE PSTA BY CIRCLING THE 1 IF HIS RESPONSE IS CORRECT OR BY CIRCLING THE 0 IF HIS RESPONSE IS INCORRECT (OR IF NO RESPONSE IS MADE). COMPUTE THE CHILD'S "TOTAL SCORE" BY COUNTING THE NUMBER OF ITEMS WHERE 1 HAS BEEN CIRCLED. ENTER THIS SCORE IN THE APPROPRIATE SPACE AT THE TOP OF THE RESPONSE SHEET.

ITEM	RESPONSE		ITEM	RESPONSE		ITEM	RESPONSE	
PART I			PART III					
1. RABBIT	1	0	18. PRESENTS	1	0	37. SPLASH	1	0
2. SOAP	1	0	19. BREAD	1	0	38. STRING	1	0
3. LEAF	1	0	20. CRAYONS	1	0	PART IV		
4. ZIPPER	1	0	21. GRASS	1	0	39. SENTENCE	1	0
PART II			22. FROG	1	0	PART V		
5. MUSIC	1	0	23. THREE	1	0	40. (s)	1	0
6. VALENTINE	1	0	24. CLOWN	1	0	41. (0)	1	0
7. TEETH	1	0	25. FLOWER	1	0	PART VI		
8. SMOOTH	1	0	26. SMOKE	1	0	42. SEESEESEE	1	0
9. ARROW	1	0	27. SNAKE	1	0	43. ZOOZOOZOO	1	0
10. BATHTUB	1	0	28. SPIDER	1	0	44. PUHTUHKUH	1	0
11. SHEEP	1	0	29. STAIRS	1	0	PART VII		
12. DISHES	1	0	30. SKY	1	0	45. LA-LA-LA	1	0
13. CHAIR	1	0	31. SWEEPING	1	0	PART VIII		
14. MATCHES	1	0	32. PLANT	1	0	46. (ear) RECOGNITION	1	0
15. WATCH			33. SHREDDED WHEAT	1	0	PART IX		
16. JAR			34. TREE	1	0	47. CLAPPING RHYTHM	1	0
17. ENGINE			35. DRESS	1	0			
			36. SLED	1	0			

APPENDIX B

ILLUSTRATIVE LESSON PLANS FOR GROUPS I AND II

GROUP I

I. General Goals of Therapy

A. To learn to listen discriminately to sounds of the language which have been properly identified by student clinician.

B. To learn to produce the sounds of the language in isolation.

C. To put the sounds correctly into nonsense syllables, words, and phrases.

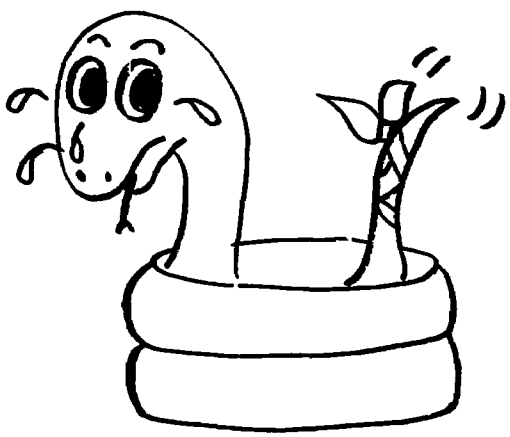
D. To be aware of importance of posture in voice production.

E. To be aware of and have opportunities to produce adequate voice.

II. Example of Therapy

A. Identification of /s/ sound.

1. Story



Once there was a little boy named Sam and his sister named Sue who lived in the country with their mother and father. There were many trees around their house, and not far away there was a beautiful stream of water.

Sam and Sue wanted so much to wade in the water. But every time they came close, they heard something that frightened them. It sounded like this: s-s-s-s-s-s. They tried to wade early in the morning, but they heard s-s-s-s-s-s. They tried right after lunch. But there it was again! S-s-s-s-s-s. They thought that something was saying to them: Don't you come near this place! One day their father went to the edge of the water to look. He heard s-s-s-s-s-s, too, and he told Sam and Sue that they shouldn't wade until they had discovered what it was.

One day Sam and Sue were so hot. They decided to try to go near the water once again. They came closer and closer and did not hear anything at all. Then they had their toe in the water, and suddenly right beside them they heard a very loud S-S-S-S-S-S! This time they saw what it was. It was a snake. They looked, and they saw that the snake had hurt his tail. That was probably why he was saying s-s-s-s-s-s. It was probably his way of saying OUCH! They ran home and got a bandage and tied up

the snake's tail. And after that they were never afraid to wade again, even though they heard s-s-s-s-s. They knew that the snake was their friend.

2. Differentiation of /s/ from other sounds of the language.

When student clinician produces /s/ sound, children raise hands; stand up; sit down; place mark on board, etc.
Use of programmed instruction for discrimination of /s/ sound.

B. Production of /s/ sound.

Use of mirror.
Description of production of sound.
Practice in production of /s/ sound in isolation, through games, and activities.

C. Incorporation of /s/ sound in nonsense syllables, words, and phrases. Examples:

Nonsense syllables:
Each child has a nonsense name with the /s/ sound in it, and children greet each other, using their /s/ name.

Phrases:
I'm sorry.
I see it.
It's time to go.

Poems:
Skamp the skunk was really silly;
He had a friend named Silly Willy.
They saw a squirrel when the acorns were ripe,
And thought he was a skunk without a stripe.

Sucho Snail was some slowpoke;
His sad story is no joke;
He was going to take his teacher some clover,
But when he got to school, it was already over!

Games:
Simon Says

D. Importance of posture in voice production.

Use of pictures.
Student clinician demonstrates different postures, calling attention to the desirable and undesirable.
Practice good posture using the "Good Posture Basket" (a straw basket which each child holds on head and walks without dislodging the basket).

E. Adequate voice production.

Demonstration of pleasant and unpleasant voices (too loud, too soft, too nasal, etc.) by student clinician. Each child has opportunity to imitate.
"Act out" being happy with a happy voice, sad with a sad voice.

GROUP II

I. General Goals of Therapy

A. To learn to listen discriminately to sounds of the language which have been properly identified by student clinician.

B. To learn to produce the sounds of the language.

C. To put the sounds correctly into nonsense syllables, words, and phrases.

D. To be aware of importance of posture in voice production.

E. To be aware of and have opportunities to produce adequate voice.

F. To improve additional auditory skills.

1. Auditory memory
2. Auditory association
3. Verbal expression
4. Auditory sequencing
5. Grammatic closure
6. Auditory closure
7. Sound blending

II. Examples of Therapy

A. Identification of /k/ sound.

1. Story

Once upon a time there was a beautiful little Princess. She lived with her father, who was King, and her mother, who was Queen. Her parents loved her very much, but they were troubled. All day long she sang. She never stopped to talk. And the King couldn't make her stop singing.

One day he called in his Court Magician. "Make the Princess stop singing all the time, and I'll give you a big reward!" So the Court Magician went to his magic room, and he stirred and poured things into his black magic pot, and he mumbled,

"Abra cadabra, fishes and fleas,
Chickens and whalebones, mosquitoes and peas,
When I make magic, they do as I please,
Little pink feathers as light as a sneeze!"

Then out of the black magic pot he took a handful of beautiful pink feathers, and he went into the courtyard to wait for the Princess to appear.

It wasn't very long until the Princess and all her little friends came out singing, singing, singing. And as she came close the Court Magician turned loose the pink feathers in the breeze. One landed on the back of the Princess' tongue; one landed on the back of the dog's tongue; one landed on the back of the cat's tongue; and one landed on the back of the bird's tongue. The Princess didn't sing; she said /k/, /k/, /k/, /k/ and put the back of her tongue against the roof of her mouth to unglue the pink feather. Nothing happened. She coughed /k/, /k/, /k/, /k/! The little dog coughed /k/, /k/, /k/, /k/! The little cat coughed /k/, /k/, /k/, /k/! The little bird didn't sing; it coughed /k/, /k/, /k/, /k/ because they <u>all</u> had little pink feathers on their tongue, and they were <u>stuck</u>!

When the King heard all this noise, /k/, /k/, /k/, /k/, he was very angry. "Numbskull!" he shouted. "I wanted the Princess to stop singing and <u>talk</u>. I didn't want to hear /k/, /k/, /k/, /k/ all day!"

So the Court Magician had to go back to his magic pot and brew more magic. He mixed turnips and squash and dandelions. And then he told the Princess to take a drink and the little dog and the little cat and the little canary. And just guess! All the little pink feathers floated away in the breeze, and the Princess laughed and said, "Oh, I'm so happy about the pink feather! I'm glad I <u>can</u> say /k/, /k/, /k/, /k/ because I need it when I talk!"

And the bird started singing; and the dog started barking; and the cat started meowing. And the King was very happy.

2. Differentiation of /k/ from other sounds of the language.

When student clinician produces /k/ sound, children raise hands; stand up; sit down; place mark on board, etc. Class divided into teams and number of correct responses counted for each team.

B. Production of /k/ sound.

Use of mirror.
Description of production of sound by referral to story.
Back of tongue against roof of mouth as if to dislodge pink feather.
Practice /k/ sound in isolation through games and activities.

C. Incorporation of /k/ sound in nonsense syllables, words, and phrases.

Examples:

<u>Nonsense syllables</u>:
Counting game - Ka-ka-kee, out goes he! Who is last to be in the circle?

Phrases
Come on.
Look at me.
Okay.

Poems:
The poem of the story. This contains several /k/ sounds.

Games and activities:
Card games based on "Give me this one..."
Activities based on phrase, "I guess..."
Activities based on use of functional phrases.

D. Importance of posture in voice production.

Same general plan as Group I.

E. Adequate voice production.

Same general plan as Group I.

F. Improvement of auditory skills.

1. Auditory memory
Repeat story. Act out story. Fill in missing words of story.

2. Auditory association
Group divided into two teams; student clinician asks one team a question, which one of the members answers if he can. Correct answers are scored. Examples of questions:
You drink from a _____.
In winter you wear a _____.

3. Verbal expression
Group tells a story. Student clinician starts with several sentences which contain key words with /k/ sound in them. Each child continues to tell the story, adding a sentence at a time. The story is repeated in toto.

4. Auditory sequencing
Student clinician calls on children, beginning with two; she gives each a name which is not their own. Members of the class attempt to remember names in sequence. The number is gradually increased to the limit of memory span of group. Names include sound the group is working on.

5. Grammatic closure
Grammatic closure is an integral part of all verbal expression and verbal activities. It was not taught directly as testing items appear in the Illinois Test of Psycholinguistic Abilities.

6. Auditory closure
The student clinician provides examples from which the children have to provide the correct word. This is done in the form of games, teamwork as well as individual responses.

7. Sound blending
Initially, the student clinician presents the stimuli. Soon, however, the children are able to present the sounds of a word singly and at the proper intervals and seem to enjoy doing it. All activities are in the form of games and competitive activities.

APPENDIX C

ILLUSTRATIVE LESSON PLANS FOR GROUPS III, IV, V, AND VI

GROUP III

I. General Goals of Therapy

A. To develop proper use of the speech mechanism.

B. To develop correct articulation of sounds.

C. To develop proficiency in the oral communication of ideas.

II. Example of Therapy Lesson Plan

A. Specific Goals

1. To improve flexibility and control of tongue movements.
2. To develop correct articulation of defective sounds.
3. To use correct articulation of defective sounds in a speaking situation.
4. To evaluate the articulation of sounds.

B. Materials

1. Tape recorder
2. Frisky Pony stick puppet
3. Play money
4. Question cards
5. Money box with the amount each question is worth written on back of small card.

C. Procedure

1. Each child answers roll with his sound.
2. The therapist tells the story of Frisky Pony, using the Frisky Pony stick puppet. The children join the therapist in the tongue activities.
3. Each child is given an opportunity to give the name of a television program that has his sound in it. The child who is first to name a program with his sound may be the first contestant, and the others will follow in the order in which they can name a different program with their sound in its name.
4. Good Speech Pays Off - This activity is good for verbal expression and auditory reception. It requires a tape recorder. It is a "radio program." The therapist is the emcee and makes a big production of the "show." The therapist might say something like this:

   "Good morning. This is station S-P-E-E-C-H broadcasting to you from _____ Elementary School. Welcome to that ever popular quiz show, Good Speech Pays Off. We

have selected (number) students to be our contestants, each hoping to win our grand prize.

"I see our first contestant coming forward now. Would you please give your name, age, and teacher's name. Thank you, Miss _____. Now would you please draw a card to determine how much your first question is worth? (Put cards in a box labeled "Good Speech Pays Off," and on each card write an amount of money.) I see your question is worth _____ dollars, and here is your _____ dollar question. By all means, remember that 'Good Speech Pays Off.' (Read the question.)

"That is correct. Here are your _____ dollars. And now, here comes our second contestant." (Repeat above.)

After each child has had three turns, say, "In just a moment we will return to you with the name of today's grand winner." Turn off recorder to see who has the most money. "Today's grand winner is _____ _____. Thank you for tuning in to Good Speech Pays Off. Remember to tune in again tomorrow."

Play back the program, and let children critique their speech. This activity is good for stabilizing children's sounds in the articulation classes.

D. Evaluation

These activities provide an excellent opportunity to assess a child's progress in habituating correct articulation of his sound. Interest is high and sustained. Feedback provided by the tape recorder is valuable to both children and therapist.

GROUP IV

I. General Goals of Therapy

A. To develop proper use of the speech mechanism.

B. To develop correct articulation of sounds.

C. To develop proficiency in the oral communication of ideas.

D. To develop correct swallowing habits.

II. Example of Therapy Lesson Plan

A. Specific Goals

1. To habituate proper tongue placement and manner of swallowing.

2. To improve correct articulation of sounds.

B. Materials

1. Paper sacks with "kite-eating trees" pasted on front. (A slit is made for the mouth so that kites can be fed to the tree.)

2. Multicolor construction paper kites with various activities printed on them.

a. Sentences utilizing production of tongue tip sounds to facilitate habituation of correct tongue placement.

b. Tongue twisters and Limericks.

c. Activities for habituation of correct swallowing, i.e., "Do two CHA swallows."

C. Procedure

1. Give each child a kite-eating tree.

2. Place kites in center of table with printed side down.

3. Children take turns choosing a kite and performing the activity printed on back.

4. Upon performance of activity (correct articulation of sounds in sentences, tongue twisters, etc., or of activity to correct deviant swallowing behavior) the child may feed his kite to the tree.

5. The child who has the greatest number of kites may be line leader at the close of the therapy session.

D. Evaluation

The children are highly motivated to improve articulation and perform the activities for habituating correct swallowing behavior. Improvement in both areas was noted.

GROUP V

I. General Goals of Therapy

A. To develop discrepant auditory abilities.

1. To correctly interpret what is heard.

2. To relate what is heard to that which has been heard previously.

3. To express ideas orally.

4. To use habitually the common forms of language.

5. To remember in the proper order that which has been heard previously.

6. To predict from its discrete parts the whole of aurally presented stimuli.

7. To synthesize into a whole the parts of aurally presented stimuli.

B. To develop proper use of the speech mechanism.

C. To develop correct articulation of sounds.

D. To develop proficiency in the oral communication of ideas.

II. Example of Therapy Lesson Plan

A. Specific Goals

1. To correctly interpret what is heard.

2. To remember what is heard in the proper order.

3. To express ideas orally.

4. To articulate sounds correctly.

B. Materials

1. Small squares of colored tagboard with absurd sentences printed on them.

2. Game board.

3. Markers.

4. Spinner.

C. Procedure

1. Give examples of the kinds of sentences which are to be used. Be sure that the children understand that they are to explain why a sentence does not make good sense.

2. Show the game board, and give verbal directions on how it is to be played. Have children repeat in their own words what they are to do. Simplify the game if necessary.

3. Let children find pictures on the game board which have their individual sounds; name them; tell the position of the sound; practice saying the word the wrong way, then practice saying it the right way.

4. Spin to see who plays first, then proceed clockwise.

5. Sentence cards are stacked according to individual sounds to be practiced. Spin, choose a marker, and listen while the teacher or another child reads the card. Player is to respond using his best speech. He must explain why the sentence is absurd. If his response is accepted, he may move marker according to number he spins.

6. As markers are moved along the train track the children name the various places (pictures) that they pass. If a child lands on a red tie he must go back one space. If he lands on a green tie he gets a free turn. The winner is the one who reaches destination first.

D. Evaluation

Activity is fun, and as the game progresses the children learn to formulate and explain their answers with greater skill. Correct articulation is promoted. Improvement may also be noted in the ability to remember and follow verbal directions and in sequential counting.

GROUP VI

I. General Goals of Therapy

A. To develop discrepant auditory abilities.

1. To correctly interpret what is heard.

2. To relate what is heard to that which has been heard previously.

3. To express ideas orally.

4. To use habitually the common forms of language.

5. To remember in the proper order that which has been heard previously.

6. To predict from its discrete parts the whole of aurally presented stimuli.

7. To synthesize into a whole the parts of aurally presented stimuli.

B. To develop proper use of the speech mechanism.

C. To develop correct articulation of sounds.

D. To develop proficiency in the oral communication of ideas.

E. To develop correct swallowing habits.

II. Example of Therapy Lesson Plan

A. Specific Goals

1. To teach tongue/lip flexibility and control for establishing correct swallowing behavior.

2. To give the child practice in following oral directions.

3. To increase the child's ability to remember in order that which is heard.

4. To improve the child's ability to fill in missing parts and produce a complete word.

5. To improve the child's ability to produce his sound in the initial position of words.

B. Materials

1. Clown face.

2. Picture of barn on side of box.

3. Small plastic farm animals.

4. Dot-to-dot exercise.

C. Procedure

1. Children follow oral and visual directions of the therapist, who will use a clown face to demonstrate tongue and lip exercises.

2. The children are shown a picture of a barn pasted to the side of a box. Small plastic animals are shown to the children, who name them, identify and produce the initial sound of each name. If the children have been given a particular sound on which to work, they may have the privilege of putting that animal whose name has their sound in the barn.

3. When all animals are in the barn, the therapist says, "Here is a barn, and in this barn are some animals. If you listen, you will know which animals are in the barn because I'm going to make some animal sounds. I will make two or three sounds, so don't say anything until I finish. Then I will ask someone to tell me in order the names of the animals whose sounds I make. If you are correct, the animals will come out of the barn. Are you ready?" If a child names the animals in the correct sequence, they are removed from the barn. Another child may put them back into the barn when he names them in the order in which they were removed.

4. Upon completion of the above activity the therapist will sound blend each farm animal's name. Children recognizing the animal's name will say it aloud.

5. A dot-to-dot picture of a horse will be used for oral practice of individual speech sounds. Each correctly pronounced speech word earns each child a line from one dot to the next.

D. Evaluation

The children are motivated to produce adequate tongue and lip movements by the clown face. Control of movements is improved. The clown encourages the children to listen attentively and to follow the directions given. Drill in correct articulation of sounds is facilitated by the dot-to-dot picture as well as the use of the names of the animals. The sound blending activity is particularly successful, probably because of the activities which precede.

APPENDIX D

QUESTIONNAIRE FOR CLASSROOM TEACHERS

May 26, 1969

TO: Experimental Schools of the Speech Therapy Research Project

FROM: Edwina Sanders, Teacher/Coordinator

RE: Evaluation of Special Speech Therapy Program

We are truly grateful for your cooperation and help in our search for better ways to help children with communication problems. As soon as results of the study are completed we will share them with you. We would appreciate your taking just a few minutes to answer the following questions:

1. Do you think the children who were in the speech therapy program from your room can communicate better? Yes_____ No_____

2. Do you feel they have made more progress in the special grouping this year than in the conventional grouping of past years? Yes_____ No_____

3. How many children are in your room? _____

4. How many children from your room were in the speech therapy program? _____

5. Have you any comments on the special project?

6. Have you any suggestions that would make the speech therapy program more advantageous to the children and/or you?

Please return this questionnaire to your principal at your earliest convenience.

Composite of Answers to Questionnaire Given to Classroom Teachers

I. Do you think the children who were in the speech therapy program from your room can communicate better? Do you feel they have made more progress in the special grouping this year than in the conventional grouping of past years?

Yes (31); Don't honestly know (3); No answer (1)

II. Number from each room included in the special speech therapy research project:

1	room	had	1	pupil	6	rooms had	7 pupils
3	"	"	2	"	4	" "	8 "
2	"	"	3	"	2	" "	9 "
4	"	"	4	"	2	" "	10 "
1	"	"	5	"	1	" "	12 "
8	"	"	6	"	1	" "	16 "

III. Have you any comments on the special project? (Following is a cross-section of the answers received)

A. The children enjoyed this program very much. I feel that each of the children grew from this experience.

B. The specialized help seemed more beneficial.

C. I hope the project can continue.

D. I could wish that we had a better understanding of the speech problems of our children.

IV. Have you any suggestions that would make the speech therapy program more advantageous to the children and/or you? (Following is a cross-section of the answers received)

A. I have been so happy over the results of the program this year that I can't be constructive in my critique - just hope and pray we have same program again.

B. None - except time of day for group to leave - not during first of day planning time.

C. Having so many in this program and having them scheduled at varying times worked a hardship on the class schedule. It would have been better if more could have gone at one time.

D. I wish they could all go at one time, but if it is better for the child I don't mind as much.

E. Longer periods or more classes per week.

F. I wish the teacher had some way of reinforcing what the speech teacher helps them with.

G. Smaller groupings, more individual attention.