

A COMPARISON OF THE PERFORMANCE OF CHILDREN
WITH FUNCTIONAL ARTICULATION DEFECTS TO
CHILDREN WITH NORMAL SPEECH ON THE ILLINOIS
TEST OF PSYCHOLINGUISTIC ABILITIES

Thesis for the Degree of M. A.
MICHIGAN STATE UNIVERSITY

Janet S. Kinstle
1964





ABSTRACT

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by Janet Stash Kinstle

The purpose of this study was to determine whether any difference exists between the psycholinguistic abilities of children who have functional articulation defects and children who have normal speech as measured by the Illinois Test of Psycholinguistic Abilities (ITPA).

Psycholinguistic abilities which were studied and compared were those defined by the authors of the test, Samuel Kirk and James McCarthy. There were nine such abilities assessed by the ITPA from the nine individual subtests which comprise the ITPA battery. A comparison was made between the nine subtests for both groups of children, as well as between the total ITPA performance.

The subjects used in this study were twenty children with functional articulation defects and twenty children with normal speech in grades one, two, and three at Holy Cross School, Lansing, Michigan. The two groups were matched by sex, age, and intelligence.

The experimental edition of the ITPA, developed in 1961 at the Institute for Research of Exceptional Children, University of Illinois, was used in this study. Comparisons were made between the nine subtests and the total test performance for these two groups from the raw scores obtained by each subject.

The results of this study indicated that there are only slight differences in the performances of the children with functional articulation defects when compared to the subtest performance of children with normal speech. The children with functional articulation defects did slightly better on the total ITPA battery than did the children with normal speech. Both of these differences, on the nine subtests, and on total test performance, were found to be non-significant. This indicated that there is no significant difference between the psycholinguistic abilities of children who have functional articulation defects and children who have normal speech, as measured by the ITPA. It was suggested that the reason for the slight variation found in the ITPA performance for these two groups was due to possible errors in this edition of the test or to uncontrolled individual differences in the subjects.

It was concluded that the ITPA can be used as a diagnostic tool for planning remedial therapy for children who have functional articulation defects, if the remediation is in the area of psycholinguistics. This remediation

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can most effectively be accomplished when working with each child separately and when the results of the ITPA for that child are supplemented with other relevant data.

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A THESIS

Submitted to
Michigan State University
in partial fulfillment of the requirements
for the degree of

MASTER OF ARTS

Department of Speech

1964

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CHAPTER I

STATEMENT OF THE PROBLEM

Introduction

Speech is many things to many people; it can be a way of communicating with and controlling one's environment. Man learned to speak because he realized the need for speech, because the environment in which he found himself necessitated the use of speech.¹ There can be natural limitations, however, to the use one makes of his speech. Speech is a kind of behavior and like all behavior, is limited by nature to bodily machinery that must do the work. This machinery is employed by man who produces linguistic forms for speech through his oral (articulatory), vocal and pantomimic mechanism.³ If these mechanisms cannot be accurately used by the possessor, particularly his articulatory mechanism, then he is handicapped indeed, because "oral words have obvious

¹Jon Eiseuson, The Psychology of Speech (New York: F. S. Crofts, and Co., 1938), p. 26.

²George A. Miller, Language and Communication (New York: McGraw-Hill Book Co., Inc., 1951) p. 10.

³Jon Eisonson, The Psychology of Communication (New York: Appleton-Century-Crofts, 1963) p. 6.

advantages over either gesture or voice alone for communication purposes."¹

Statement of Problem and
Purpose of Study

Language ability involves more than the production of speech. It includes the psychological foundations for this behavior, the structures of the language, and the relationship of the two (psycholinguistics).² The person who cannot manipulate this behavior is seriously handicapped; this is especially true of those persons who have defective articulation. To many persons, articulation defects seem relatively unimportant. But severe articulatory cases find the demands of modern life very difficult. "In several cases, communication is almost impossible."³ Of all the speech disorders teachers encounter, articulation defects are the most frequent. "Three percent of the youth between five and twenty-one have articulation defect."⁴ We also know that functional articulation problems constitute a

¹Ibid., p. 14.

²Dorothy Sievers et al. Selected Studies on the Illinois Test of Psycholinguistic Abilities (Urbana, Illinois: University of Illinois Press, 1963) p. 27.

³Charles VanRiper, Speech Correction (Englewood Cliffs, New Jersey: Prentice-Hall, Inc., 1963) p. 21.

⁴Jon Eisenson and Mardel Ogilvie, Speech Correction in the School (New York: The Macmillan Co., 1963) p. 171.

highly significant group of disorders in the total field of speech pathology.¹ From this information, it seems that articulation problems are important to people studying speech correction. If we can learn more about them, perhaps we can do more to plan adequate therapy for the correction of articulation defects. The purpose of this study is to see how children with functional articulation defects compare with children who have normal speech in the area of psycholinguistics as measured by the Illinois Test of Psycholinguistic Abilities (ITPA). It is hoped that more will be learned about this test, which is still in the experimental edition. It is also thought that answers to the following questions can, in part, be obtained: (1) Do children with functional articulation defects perform differently in the areas of psycholinguistics which are measured in the ITPA? (2) If so, in what areas (subtests) is there a significant difference? (3) With knowledge about the ITPA, can it be used as a diagnostic tool, with children having articulation defects, to determine a therapeutic program for them?

¹Margaret H. Powers, "Functional Disorders of Articulation Symptomatology and Etiology," in Lee Edward Travid (ed.) Handbook of Speech Pathology (New York: Appleton-Century-Crofts, 1957) p. 707.

Hypotheses

The first two questions above can be used for the following null hypotheses:

1. There is no significant difference between the mean scores obtained by the children with functional articulation defects and children with normal speech on any of the nine subtests of the ITPA.
2. There is no significant difference between the ITPA total scores obtained by the children with functional articulation defects and children with normal speech.

Importance of Study

"Other difficulties are closely related to articulatory difficulties."¹ Thus, "defective articulation may be a single problem to a child or it may be a symptom of a more complex syndrome."² There has been much research done relating defective articulation to such areas as parental maladjustment,³ intelligence and social class,⁴

¹Eisenson and Ogilvie, op. cit., p. 176.

²Ibid., p. 177.

³Kenneth Scott Wood, "Parental Maladjustment and Functional Articulation Defects in Children," Journal of Speech Disorder, XI (December, 1946) p. 255-275.

⁴Mildren Templin, "Relationship of Speech and Language Development to Intelligence and Socio-Economic Status," Volta Review, LX (September, 1958), p. 331-334.

maturation,¹ discrimination ability,² auditory ability,³ and emotional stability.⁴ However, little research, in comparison to all the other areas studied, has been done in relating defective articulation to other areas of language, particularly the area of psycholinguistics. Research in the area of articulation problems not only must be related to other dimensions of language, but also must build upon normative data involving development of articulation.⁵ In a paper presented at the American Speech and Hearing Association Convention in 1963, it was urged that research be concerned with relating articulation errors to other aspects of language. Articulation disorders are a language system that a child has learned; it is his own

¹V. Row and R. Milisen, "The Effect of Maluration Upon Defective Articulation in the Elementary Grades," Journal of Speech Disorders, VII (March, 1942), p. 37-50.

²J. M. Bruns, "Experimental Study of Auditory Discrimination Abilities of Children With Articulation Disorders," Exceptional Children, XXIII (March, 1957) p. 88-91.

³M. Hall, "Auditory Factors in Functional Articulatory Speech Defectives," Journal of Experimental Education, VII (December, 1938), p. 110-13.

⁴M. G. McAllister, "A Study of the Relationship Between Defects of Articulation in Speech and Emotional Instability in Elementary School Children." (unpublished Master's dissertation, University of Washington, 1948).

⁵R. Milisen, "Research Needs in Speech Pathology and Audiology," Journal of Speech and Hearing Disorders, Monograph Supplement V, (September, 1959), p. 14.

dialect. Errors may be related to linguistic tasks so that it is a language error and not an articulation error.¹

The few studies which have been done in the past, relating defective articulation to language, have been chiefly concerned with sentence length, spelling, spoken vocabulary, and the ability to express oneself verbally.²

Since the development of the ITPA in 1961, there have been two studies reported which have used this test with children who have articulatory defects and children with normal speech. Using this test as a screening tool for all children entering the University of Houston Speech Clinic for a speech evaluation, Dr. Arnold has found that children with articulation defects do seem to have some defects in psycholinguistics. She reports that these children are lower than children with normal speech in the areas of automatic-sequential subtests.³ Ferrier, in a Ph.D. dissertation, studied children with articulation defects and children with normal speech, using tests in addition to the ITPA, and found results similar to those

¹H. Winitz, "Linguistic Approach to Articulation Disorders," report presented at ASHA Convention, Chicago, Illinois (November, 1963).

²Norma Schnneidermann, "A Study of the Relationship Between Articulation Ability and Language Ability," Journal of Speech and Hearing Disorders, XX (December, 1955), 359-364.

³Genevieve Arnold, "The Illinois Test of Psycholinguistic Abilities and Severe Articulation Problems," abstracted in Journal of ASHA, V (October, 1963), p. 789.

reported above by Arnold, i.e., children with articulation defects had psycholinguistic defects in the automatic-sequential subtests.¹

It is hoped that additional information about the psycholinguistic abilities of children with defective articulation will be gained by the statistical treatment of the questions asked at the beginning of this study. The results of this study may reinforce the information presented by Arnold and Ferrier's reports, or they may offer some contradictory conclusions regarding the psycholinguistic abilities of children with defective articulation. In either case, it is hoped that more knowledge about the use and application of the ITPA as a diagnostic tool with children having articulation defects, will be gained.

Definition of Terms

For the purpose of this study, the terms used are defined in the following manner:

Language--Any system of recognized symbols to produce or prevent specific responses of thoughts, or feelings or actions.²

¹E. E. Ferrier, "An Investigation of Psycholinguistic Factors Associated With Functional Defects of Articulation." (Unpublished Ph.D. dissertation, University of Illinois, 1963).

²Eisenson, Psychology of Speech, p. 3.

Speech--That form of language which man produces without resorting to agencies outside his own organism.¹

Defective Articulation--Articulation defects fall in four categories: (1) The substitution of one sound for another ("Trum" for "drum"); (2) The omission of sounds ("dess" for "dress"); (3) The distortion of sounds ("The listner recognizes the sound for what it is, but is distracted by it"), and (4) Addition of sounds ("sthme" for "some").²

Functional Articulation Disorders--

a functional disorder can be defined as an inability to produce correctly all of the standard speech sounds of the language an inability for which there is no appreciable structural, physiological, or neurological basis in the speech mechanism or its supporting structures, but which can be accounted for normal variations in the organism or by environmental or psychological factors.³

Normal Speaking Children--Those children not possessing any obvious speech defect and having never received speech therapy for any speech problems.

Illinois Test of Psycholinguistic Abilities--A

standardized test, developed by Samuel A. Kirk and James J. McCarthy for the purpose of identifying psycholinguistic

¹Ibid.

²Eisenson and Ogilvic, op. cit., p. 173.

³Powers, in Travis, op. cit., p. 1708.

abilities and disabilities in children between the ages of two and one half and nine. This study will use the experimental edition of this test, which uses nine individual modalities in the form of nine separate subtests (See Appendix B).

Organization of the Thesis

Chapter I contains the statement of the problem which led to this study. It includes an introduction to this topic, as well as an outline of the purpose of the study. It sets forth the hypotheses to be considered, presents the importance of the study, and contains a definition of terms which will be used throughout the study.

Chapter II contains a review of the literature which is available concerning this topic.

Chapter III contains the discussion of the subjects, equipment, and methods utilized in collection and analyzing the data for this study.

Chapter IV contains a discussion of the results of the study.

Chapter V contains a summary and conclusions of the study, including implications for future research.

CHAPTER II

REVIEW OF THE LITERATURE

Introduction

One of the most thoroughly investigated areas of articulation is etiology. From much of this research has come the notion that articulation is usually related to some other problem.¹ What this other problem, or problems, may be, however, is uncertain and very contradictory. The investigation of articulation problems and their association with psycholinguistics has been investigated relatively little. This is an area of language and psychology which seems very much related to articulation problems; "the area of psycholinguistics may be closely related to the problems of functional defective articulation."² It is certainly worthy of more research, as a review of literature indicates.

Relationship Between Articulation and Other Areas of Language

Edith A. Davis was one of the first persons to investigate the language ability of a child with defective

¹Charles VanRiper, op. cit., p. 198.

²Joseph Jaffe, "Formal Language Patterns As Defensive Operations," in Dominick Barbara (ed.) Psychological and Psychiatric Aspects of Speech and Hearing (Springfield, Illinois: Charles C. Thomas, 1960) p. 150.

articulation to determine whether any relationship exists between general language ability and articulation disorders. She explains that

. . . although not all the differences in language ability between 5 1/2 year old children with perfect articulation and those with defective articulation are not all statistically reliable, the evidence is so consistent as to make it extremely probable that faulty articulation tends to retard general language development through the kindergarten year."¹

Williams, McFarland, and Little, investigating pre-school children, found a moderate relationship among length of sentences, grammatical completeness and complexity, correctness of word usage, articulation ability, chronological and mental age. In this study, spoken and understood vocabulary did not correlate highly with the other variables they studied.²

In another 1937 study, Johnson and House found 12% of the children they studied, who had functional defective articulation, were delayed in speech development.³

However, in 1949, Yedinach found that articulation errors and measures of language ability were not

¹Edith A. Davis, The Development of Linguistic Skill in Twins, Singletons, With Siblings and Only Children, From Age 5 to 10 Years (Minnesota: University of Minneapolis Press, 1937) p. 40.

²H. M. Williams, M. L. McFarland and M. J. Little, Development of Language and Voice in Young Children (University of Iowa, Student Child Welfare, 1937), XIII (2).

³Wendell Johnson and E. House, "Certain Laterality Characteristics of Children With Articulation and Reading Disabilities," Elementary School Journal, XXXVIII (September, 1937) p. 52-58.

significantly correlated. in a study of 7 1/2 year old children who were tested for articulation ability, intelligence, length of response, and grammatical complexity and completeness.¹

The study done by Schnneidermann, in 1955, used a measure of spoken vocabulary, sentence length, and a rating by the classroom teachers to test for a relationship between general language ability and articulation errors. Her findings showed that children with the lowest score of language also had the most articulation errors, whereas the children who had the highest score of language ability had the lowest number of defective speech sounds.²

In 1958 Ham tested forty children with functional defective articulation for spelling and articulation errors, and concluded

the presence of articulation problems in early grades may tend to be accompanied by problems in other areas of language skills. One can only speculate whether the original articulation problems contribute to spelling or reading problems or whether all facets of general language skills.³

¹J. G. Yerdinack, "A Study of the Linguistic Functioning of Children With Articulation and Reading Disabilities," Journal of Genetic Psychology, LXXIV (1959) 23-59.

²Schnniederman, op. cit.

³R. E. Ham, "Relationship Between Misspelling and Misarticulation," Journal of Speech and Hearing Disorders, XXIII (March, 1958) 294-297.

Relationship Between Psycholinguistics
and Speech Disorders

The new discipline of psycholinguistics attempts to relate structure of a language to the psychological states of people who use it. "Thus, language, thought and experience are intimately related."¹ An imbalance in one may produce an upset in the others. John Irwin is one of the many writers who illustrated this in their writings. As he says:

Voice and articulation are phases of the bio-social act of speaking and development of each requires a common series of learning experiences, entered into with common degrees of social and emotional adjustment, and a variation in any of these dimensions may affect voice or articulation.²

He further points out that articulation defects can be psycholinguistically orientated if they grow out of a need a child has to talk in a misarticulated manner.³

In this same source, Holtzman related that any functional speech disorder is caused by the speaker's personality overtly affecting his speech.⁴

¹Jaffe, op. cit., p. 149.

²John V. Irwin, "Psychological Implications of Voice and Articulation Disturbances," in Barbara, ibid., p. 299.

³Ibid., p. 317.

⁴Paul D. Holtzman, "Communication Versus Expression in Speaking and Listening," ibid., p. 5.

Schreiber, in the same book, also explained this idea by saying

As a child develops speech, his personality develops (the psyche), and it is impossible to separate the two. Speech environment is most important to the development of functional defective articulation, i.e., in the home, many defective articulation errors are developed by imitation or the need for attention.¹

One other writer in this source, Robert Oliver, explained that with functional articulation defects there may be a change in the personality directly responsible.²

Spiestersbach illustrated the close association between psycholinguistics and speech problems by saying,

A speech disorder which does not have a psychological impact on the speaker is not a disorder of any consequence since communication is apparently proceeding without difficulty.³

In a recent text of readings in the area of psycholinguistics, the importance of psycholinguistics in understanding speech disorders is emphasized by several writers. In B. F. Skinner's paper, this source, the relationship of psycholinguistics to articulation is shown by an explanation of

¹Forors R. Schreiber, "The Psychological Factors Affecting the Development of Speech in the Early Years," ibid., p. 66.

²Robert T. Oliver, "Speech as Influence," ibid., p. 36.

³Duane C. Spiestersbach, "Research in Articulation Disorders and Personality," Journal of Speech and Hearing Disorders, XXI (September, 1956) 329-335.

how our psychological make-up (behavior) influences our language and speech (articulation). Words uttered without some behavior on the speaker's part have little meaning.¹

Ruth White suggests that psycholinguistics is related to articulation since the etiology of functional articulation defects can stem from physiological or psychological, origin. The adherents of the psychological school say defective articulation is caused by emotional blocking, lack of necessary home stimulation to speak, etc.²

Eisenson and Ogilvie discuss one specific case suffering from functional defective articulation and requiring the aid of a psychologist to help correct his speech. Concluding their review of this case, the writers say that certainly not all articulation defects require psychological care, but when it is needed, psychological help is important and uniquely effective in aiding speech therapy of functional articulation cases.³

Some of the previously cited sources in Barbara's book also relate the importance of the speech therapist knowing

¹B. F. Skinner, "A Functional Analysis of Verbal Behavior," in Sol Saporta (ed.) Psycholinguistics, (New York: Holt, Rinehard, and Winston, 1961), p. 69.

²Ruth M. White "Maturation and Speech Development," in Barbara, op. cit., p. 233.

³Eisenson and Ogilvie, op. cit., p. 212.

of this close relationship between psycholinguistics and speech disorders in order to plan adequate and the most beneficial therapy.

Studies Using Tests Similar to ITPA Subtests
With Children Having Defective Articulation

The abilities of children who have functional defective articulation disorders have been studied for many years by using various tests, depending on the ability being studied. From these studies have come many uncertain results, due either to lack of refinement of the test instrument or the use of many different samples with the same tests. For this study, a review of the literature which deals with studies that have used other tests to study those abilities similarly assessed by the ITPA will be given.

Auditory Memory Span.--This is one of the most frequently studied abilities in relation to defective articulation. It is said to be related particularly to the etiology of articulation disorders. However, looking at individual studies specifically, a very contradictory and confusing picture is found.

Hall, 1938, found no difference in auditory memory for speech sounds between groups of functional defective

articulatory cases at a University and at an elementary school level with carefully matched groups with good speech.¹

Metraux, 1942, studied various speech defectives, not just those defective in articulation, and normal speaking children, using the tests Anderson (1939) developed for testing auditory memory span for speech. The conclusion was that the speech defectives were inferior on consonant tests. In 1944, Metraux found an increase in the ability of memory span for consonant and vowels with age.²

Mase, 1946, found no difference in auditory memory span between normal speaking boys and boys with functional articulatory defects in fifth and sixth grade.³

Reid, in 1947, also found no correlation between auditory memory span and functional articulation defects.⁴

Prins, in 1962, using the forward digits test from the Wechsler Intelligence Scale for Children and a two-digit series from a table of random number, found a depressed performance in the digit span for those children

¹Hall, op. cit., p. 110-132.

²R. W. Metraux, "Auditory Memory Span for Speech Sounds for Speech Defective Children Compared With Normal Children," Journal of Speech Disorders, VII (March, 1942), 33-36.

³D. Mase, Etiology of Speech Defects (New York: Teachers College, College, Columbia University, 1946).

⁴Gladys Reid, "The Etiology and Nature of Functional Articulation Defects in Elementary School Children," Journal of Speech Disorders, XII (June, 1947) 143-150.

with defective articulation who commit omission type of errors.¹

Auditory Memory Span is assessed in the ITPA under "Auditory-Vocal Sequencing" (See Appendix B).

The possibility that the articulatory defect may be an expression of the basic maladjustment of the speaker must be recognized.² In reviewing the literature dealing with the psychological aspects of persons with defective articulation, the article by Spriestersbach reviews many studies done previously in which tests were used to determine any relationship between psychological make-up and speech. Since the psychological aspect of the speaker may be affected by his speech disorder, particularly an articulation disorder, and since the ITPA assesses psycholinguistic ability, several studies using psychological tests with children having defective articulation are reviewed here. The following studies are from Spriestersbach's review of research in this area.

Psychological Aspects.--One of the most frequently employed tests for studying psychological aspects of children with defective articulation is the California Test of Personality.

¹T. David Prins, "Motor and Auditory Abilities in Different Groups of Children With Articulation Deviations," Journal of Speech and Hearing Research, V (June, 1962), 161-168.

²Spriestersbach, op. cit., p. 330.

Wood, 1946, gave articulatory defectives the California Test of Personality and the Pintner Aspects of Personality Test. Fifty children tested did not differ from the test norms significantly. But on the Thematic Apperception Test, given to one half of them, only three exhibited no preponderance of unfavorable dynamisms.¹

Deming, 1952, gave 20 elementary school children with functional articulation defects, and a matched control group, the Bender Visual-Motor Gestalt Test. He found that the speech defectives were more withdrawn and constricted in their social and outer world relations than were the children with normal speech.²

Greenberg, 1952, tested 36 children with functional articulation defects in grades four, five, and six, and a matched control group. He felt that there was a relationship between personality and articulation errors, but he was not certain exactly what it was. He did note that the children with defective articulation tended to be more dependent on others, more defensive and less well-adjusted than normals.³

¹Wood, op. cit., p. 270.

²B. A. Deming, "A Study of Emotional Adjustment of Functional Articulation Cases as Indicated by the Bender-Gestalt Test (Unpublished Master's dissertation, University of Oklahoma, 1952).

³Kenneth R. Greenberg, "A Study of the Relationship Between Articulation Disorders and Personality in Intermediate Grades." (Unpublished Master's dissertation, Ohio State University, 1952).

The studies just cited have shown some relationship between the psychological aspects of a person and his speech. Several studies, however, have been reported which show no relationship between these two factors.

Anders, 1945, gave the California Test of Personality to 53 children age range of 6 to 12 years, who had functional articulation defects. In comparison to the norms for this test, these subjects were above average on adjustment.¹

Reid, 1947, gave the California Test of Personality to 38 children having functional articulation disorders, from grades one through seven; she concluded that improvement in articulation ability is not related to and cannot be predicted from personal and social adjustment.²

McAllister, 1943, gave 100 children with articulation defects in the first 8 grades, and a matched control group, The California Test of Personality and found no significant difference.³

Nelsen, 1953, studied 35 children with functional articulation disorders from grades three, five and seven, and matched controls; using the California Test of

¹O. M. Anders, "A Study of the Personal and Social Adjustment of Children With Functional Articulation Defects." (unpublished Ph.D. dissertation, University of Wisconsin, 1945).

²Reid, op. cit., p. 149.

³McAllister, op. cit.

Personality. too, he found no significant support that children with functional disorders of articulation are more poorly adjusted than are children with normal speech of comparable age.¹

Spriestersbach concluded his review of this area of language and personality by saying that the choice of the testing instrument is of great importance in each study, and may account for some of the inconsistency found in the studies just cited.²

There have been several other studies done, using tests with children having defective articulation, to compare them to children with normal speech, in one other area very similar to abilities tested in the ITPA. This is the area of Verbal and Non-Verbal (Performance) Tasks.

Verbal and Non-Verbal Task studies have used various tests to determine whether or not persons with defective articulation perform differently from children with normal speech. These studies include the following:

Sperling, 1948, gave 36 children with an age range of 6 to 12, who were diagnosed as articulatory defectives,

¹O. W. Nelson, "An Investigation of Certain Factors Relating To Nature of Children With Functional Defects of Articulation," Journal of Education Research XLVII (1953) p. 215.

²Spriestersbach, op. cit.

a verbal and a non-verbal test. She concluded that there is a statistically significant difference between verbal and non-verbal test results in this group, and the difference was in favor of the non-verbal test.¹

Maxwell, 1954, used articulatory defective and normal speaking boys, ages seven, eight, and nine years old. To measure oral-motor diadochokinesis, he used repetitions of (pa), (ta), (ka), and (la), and (pa-ta-ka). To test eye-hand coordination, MacQuarrie's Tapping, Dotting and Tracing Test, Bilton's Ball Bouncing Test, Gesell's Fillet and Bottle Test, the Seguin form Board and the author's cube stacking tests were used. Stature was measured by Oscretzky scales; gait, by four walking tests. From these tests, Maxwell concluded that there are statistically significant differences between the motor performances of groups of children with normal speech and motor performances of groups of children with only two or three defective consonant sounds.²

Trapp and Evans, 1960, reported a test with children having mild articulation defects, and a control group of normal speakers, as well as a group with severe functional articulation defects, and a similar control group. The

¹Shirley L. Sperling, "A Comparison Between Verbal and Non-Verbal Test Results of Children With Articulatory Speech Defects." (Unpublished Master's dissertation, University of Michigan, 1948)

²Keith L. Maxwell, "A Comparison of Certain Motor Performances of Children With Normal Speech and Children With Defective Consonant Articulation." (unpublished Ph.D. dissertation, University of Michigan, 1953).

non-verbal task used was Wechsler's digit symbol subtest from the Wechsler Intelligence Scale for Children. Articulation defects were determined by the Templin Articulation Screening Test. These authors found that a group with mild defective articulation did significantly higher than the severe defectives on the first and combined trials.¹

Prins, 1962, investigated motor and auditory ability in 92 children, ages 3 to 6; he used control and experimental groups similar in age, sex distribution, intelligence and socio-economic status. Tests of motor skills were used based on DeJohn categorization of equilibratory and non-equilibratory coordination. The Pellet and Bottle Test, oral diadochckinesia tests, and tandem walking tests were used to further test non-verbal performance. The results of this study showed a significant difference among the subgroups of children with different articulation deviations and also between certain subgroups and normal speaking children in selected motor and auditory skills.²

Dickson, 1962, reported a study of children with defective articulation who spontaneously outgrew their errors as compared to children who didn't, concluding that

¹E. Phillip Trapp and Janet Evans, "Functional Articulation Defect and Performance on a Non-Verbal Task," Journal of Speech and Hearing Disorders, XXV (1960), p. 179.

²Prin, op. cit., p. 164.

children who retain speech errors are inferior in gross motor tasks to those who outgrow them.²

Therefore, from these studies just cited, it seems possible that the ITPA, which assesses verbal and non-verbal tasks, may reinforce the above conclusions or other contradictory information about the verbal and motor ability of children with defective articulation.

Previous Studies Done Using the ITPA

Since the development of the experimental edition of the ITPA in 1961, a number of investigations have been done using it with different kinds of children to determine its ability to differentiate and diagnose many disorders. Unfortunately, many of these studies are unpublished and therefore, unavailable for review. Those which have been published, or reviewed elsewhere, are reviewed here to give the reader some more information about the ITPA as a diagnostic tool, an instrument for planning therapy, as well as a research instrument to learn more about the disorder being studied.

Olson reports a study using the ITPA with receptive and expressive aphasic children and a group of deaf children to determine whether this test would differentiate between

¹Stanley Dickson, "Differences Between Children Who Spontaneously Outgrow and Children Who Retain Functional Articulation Errors," Journal of Speech and Hearing Research, V (September, 1952), 269-271.

these groups' responses. He felt that deaf children are often misdiagnosed as aphasic. His results showed that the clinically diagnosed receptive asphasic children achieved profiles of scores on the ITPA similar to the clinical diagnosis. Thus, the ITPA did differentiate between these three groups.¹

Bateman reported a study using the ITPA with partially seeing children to determine if there is any relationship between the kind of visual handicap and the reading ability, and to determine if any relationship exists between the psycholinguistic ability and the reading function of the visually defective. The Monroe Diagnostic Reading Examination was also used. She found that the ITPA appears as an excellent diagnostic aid for determining the level and mode of the visual functioning in partial-seeing children.² This was one of several studies Bateman has done with the ITPA. She gives another report on the use of this test with visually-handicapped children in which she explains a specific case who had learning problems due to visual problems, along with certain psycholinguistic handicaps. From ITPA performance, reading grade level and assessment of visual handicap,

¹James L. Olson, "A Comparison of Receptive Aphasic, Expressive Aphasic, and Deaf Children on the ITPA," in James J. McCarthy, et al. (ed.) Selected Studies on the ITPA (Urbana, Illinois: University of Illinois Press, 1963) p. 4-69.

²Barbara D. Bateman, "Reading and Psycholinguistic Processes of Partially Seeing Children," James McCarthy et al. (ed.), ibid., p. 70-84.

a plan for a remedial program was planned.¹ Bateman strongly suggests that the ITPA, along with other information, can be very valuable for planning appropriate remedial programs for children having psycholinguistic, as well as other, deficiencies.

Kass, using the ITPA with children retarded in reading, added five subtests to the automatic-sequential (See Appendix B) level, and gave the ITPA to 7 9-11 year olds. See found that these children had more deficiencies at the integration level than at the representational level. (See Appendix B) Her conclusion was that the integration level of communication is more closely related to the acquisition of reading skill than is the representational level.²

James Otto Smith studied the effects of a group language development program upon psycholinguistic abilities of educable mentally retarded children to determine whether or not language age (LA) of these children could be significantly increased as a result of approximately three months of experimental treatment. This study did demonstrate that

¹Barbara D. Bateman, "Mile Visual Defect and Learning Problems in Partially Seeing Children," The Sight Saving Review, XXXIII (Spring, 1963) 30-33.

²Corrine E. Kass, "Some Psychological Correlation of Severe Reading Disability," in James McCarthy, et al. (ed.) op. cit., 87-95.

IA could be significantly increased as obtained by the ITPA, using sixteen matched pairs of children, aged 7 to 10 years.¹

Another study has been reported using the ITPA to plan a remedial program for one specific disorder in children. Karnes and Wollersheim report an investigation of strengths and weaknesses of partially seeing children through intensive differential diagnosis. They wanted to demonstrate the usefulness of the ITPA for planning an appropriate educational program for these children. Finding that the psycholinguistic processes involving visual and motor abilities of partially seeing children are significantly inferior to their auditory and vocal abilities as indicated by ITPA performance, they recommended that teachers utilize what abilities the child does have and work to improve his weak areas.²

In a report by Kirk and Bateman, it was also observed that progress could be made by helping a child in his weaker areas, as determined by the ITPA. Using a case study of one child, along with the ITPA profile of this child, they determined what specific disabilities he had. In this case,

¹James Otto Smith, "Group Language Development for Educable Mental Retardates," Exceptional Children, XXIX, (October, 1962) 95-101.

²Merle Karnes and Janet Wollersheim, "An Intensive Differentially Diagnosis of Partially Seeing Children to Determine Implications for Education," Exceptional Children, XXXVIII (September, 1963), 17-25.

it was in the area of learning. An organized tutorial remedial program was devised to ameliorate his specific deficits and then the child was reexamined with the ITPA and other psychometric tests. The authors concluded that a thorough diagnosis, and properly planned remedial programs, such as special education for mental retardates, can help children improve their weaker and less developed abilities.¹

From these studies it seems as though the ITPA can be a useful tool for planning remediation programs with certain handicapped groups of children. It is hoped that this study will indicate its similar usefulness in planning remedial speech therapy for children having defective articulation.

The use of the ITPA for diagnostic purposes is explained by the authors of the test in a recent publication, in which they explain the development of the test, its purpose, what it can and cannot be used for, and what kind of problems in children it best differentiates. In concluding their article they stress the need for further research with the ITPA to determine more of its practical application.²

¹Samuel Kirk and Barbara Bateman, "Diagnosis and Remediation of Learning Disabilities," Exceptional Children XXIX (September, 1962) 73-78.

²Samuel Kirk and James McCarthy, "The Illinois Test of Psycholinguistic Abilities--An Approach to Differential Diagnosis," American Journal of Mental Deficiency, LXVI, (1961) 399-412.

CHAPTER III

SUBJECTS, EQUIPMENT, AND PROCEDURE

Subjects

The subjects for this study were twenty children with functional articulation defects and twenty children with normal speech, making the experimental and control groups, respectively, for a total sample of forty. These children were all taken from grades one, two, and three at Holy Cross School in Lansing, Michigan. The subjects' ages ranged from 6-5 to 8-11. The two groups were matched according to sex, age, and intelligence. Only two children who were matched differed in age by more than four months. The IQ's did not vary in any case by more than 10 points. From the school records it was ascertained that nearly all of the children used were from middle class homes. IQ's of all children used in this study were determined by either the California Test of Mental Maturity¹

¹E. T. Sullivan, W. W. Clark, and E. W. Tiegs, California Test of Mental Maturity (Los Angeles, California: California Test Bureau, 1957).

or the SRA Achievement Test¹ which had been administered to them at the beginning of the school year by the school.

All the children at Holy Cross School had been screened for speech defects by student clinicians from Michigan State University at the beginning of the school year. Those children who were referred for speech correction because of their faulty articulation were used in the experimental group, but only if their speech disorder was a "functional articulatory defect" as defined in Chapter I. For this study the children with defective articulation had moderate unintelligible speech, i.e., there were no severe or very slight misarticulation errors in the speech of the experimental group.

Equipment

The Illinois Test of Psycholinguistic Abilities, developed by Samuel A. Kirk and James J. McCarthy at the Institute for Research on Exceptional Children, University of Illinois, Urbana, Illinois, was used in this study. Forty record forms were used to record each subject's responses individually.

Since there was a large clock, with a sweep second hand, in the testing room, visible to the examiner, but

¹L. P. Thorpa, D. W. LeFefer, and R. A. Naslund, Science Research Associates Achievement Series (Chicago, Illinois: Science Research Association, Inc., 1958)

not to the subjects, it was used for timing the parts of the test which require a clock or stop watch to be timed accurately.

Testing was done in the teachers' meeting room which is adjacent to the principal's office and very accessible to all children. It was a relatively quiet room since there were no classrooms nearby. Only the subject and the examiner were present while each test was administered.

Procedure

The functional articulation problem of each subject in the experimental group was further determined by the examiner who talked with each subject for a few minutes before administering the ITPA. This was done not to determine what the specific articulatory problem was, but to be certain that it was a functional articulatory disorder.

The ITPA was administered to all subjects according to the standardized procedure outlined in the test manual. All of the subjects in the experimental group were given the test; then the subjects in the control group were tested. The subjects in the control group were called at random, as were the subjects in the experimental group. The inter-communication microphone system in the principal's office was used to call each subject individually to the testing room.

Each subject knew that he (she) was being given an individual test, but because of the age of most of the children, the purpose of the testing was not explained in detail. All subjects were encouraged to do as well as they could. Rapport was easily established, as all of the subjects seemed interested in the test and seemed to enjoy this experience.

Test results were recorded with a minimal of writing by the examiner (to maintain rapport). The tests were all recorded according to instructions in the test manual, with Total ITPA Scores, Language Age Scores, and Standard Scores assigned to each subject accordingly. (See Appendix C.)

CHAPTER IV

RESULTS AND DISCUSSION

The test results of twenty children with defective articulation and twenty children with normal speech on the Illinois Test of Psycholinguistic Abilities (ITPA) were analyzed to determine how these two groups performed on this test. These results will indicate whether the defective articulation of some children may be related to other psycholinguistic problems, or if there is no relationship whatsoever, as determined by the ITPA.

Methodology

The test scores for each group were tabulated and from these results the following scores were obtained: (1) raw scores of each subtest; (2) total ITPA score for each subject; and (3) language age and standard scores for each subtest and each total test (See Appendix for raw data).

The mean was determined from the raw scores and from the ITPA totals for each subject in both groups to determine if any differences existed in the mean scores from this test performance. The formula used

was from Blalock's Social Statistics.¹ The means of the ITPA subtests by groups appear in Table 1. The means of the ITPA total scores appear in Table 2.

Analysis of variance, two-way analysis, treatment by levels, as employed by Lindquist,² was done to determine if there is any variation in these two groups' performance on the ITPA. The analysis was done with the nine subtests (rows) and the two groups (columns) to determine variation between the groups and between the nine subtests. Although analysis of variance does not tell where variation may be, it does indicate if there is any significant variance to warrant further investigation and statistical treatment. The results of this analysis are in Table 3. The formula used for this statistical treatment is given in Lindquist.³

Results

The analysis of variance in Table 3 indicates from the .027 F that any variations found between the control group and the experimental group (represented by columns) is non-significant at the five percent level of confidence. The 1.15 F indicates that any variation within the test,

¹Hubert M. Blalock, Social Statistics (New York: McGraw-Hill Book Co., 1960) p. 46.

²E. F. Lindquist, Design and Analysis of Experiments in Psychology and Education (Boston: Houghton-Mifflin Co., 1953) p. 118.

³Ibid.

TABLE 1.--Mean Scores on Subtests of the Illinois Test of Psycholinguistic Abilities For the Control and Experimental Groups.

Subtests	Control Group	Experimental Group
Auditory Decoding	16.50	16.25
Visual Decoding	13.70	15.20
Auditory-Vocal Association	14.00	15.45
Visual-Motor Association	21.20	20.00
Vocal Encoding	14.30	13.40
Motor Encoding	16.45	16.20
Auditory-Vocal Automatic	25.10	27.75
Auditory-Vocal Sequencing	20.60	20.05
Visual-Motor Sequencing	26.50	28.60

TABLE 2.--Mean Score on Total Illinois Test of Psycholinguistic Abilities for the Control and Experimental Groups

Total ITPA Score	Control Group	Experimental Group
Total ITPA Score	172.05	173.50

TABLE 3.--Analysis of Variance for Significant of Difference Between Children With Defective Articulation and Children With Normal Speech Relative to Performance on the ITPA

Components	Freedom	Sum of Squares	Variance	F
Columns	1	.40	.40	.027
Rows	8	9810.65	1226.33	84.51
Rows x Columns	8	133.75	16.71	1.15
Within-Cells	342	4965.10	15.41	
Total	359	14909.90		

among any of the nine subtests (represented by rows x columns) for the control and experimental groups is also non-significant. The 84.51 F merely indicates that there is significant variation among the nine subtests of the ITPA, which has already been indicated, i.e, each subtest tests a separate ability. The concern here is with the first two F's mentioned, both hope to be non-significant

According to Fisher and Yates' table of Percent Points in the Distribution of F, and F score of .027 with 1 and 8 Degrees of Freedom, and an F score of 1.15, with 8 and 342 Degrees of Freedom respectively, do not show significant variation at the five percent level of confidence.¹

¹Ibid.

The null hypothesis number one, stating that there are no significant differences between these two groups on any of the nine subtests of the ITPA cannot, therefore, be rejected. The null hypothesis number two, stating that there is no significant difference between the total test performance of the control group and the total test performance of the experimental group cannot be rejected either.

Discussion

The limitations of this study must be kept in mind in discussing the data results. Since socio-economic status of the children being studied was not a controlled variable, and since studies have shown this to be a relative factor in the language development and ability of children,^{1,2} the findings of this study may be affected by this. This could account in part, for the results of this study being contrary to previous studies which examined psycholinguistic abilities of children with defective articulation and found them to be somewhat inferior to normal speaking children in respect to psycholinguistic abilities (Chapter I, Arnold and Ferrier).

¹Templin, op cit.

²Davis, op. cit.

Table 1 illustrates some slight differences between the control group and the experimental group on subtest performance by comparing the mean scores of the subtests for the two groups. It can be observed that the control group did slightly better on seven of the subtests, while the experimental group did slightly better on just two subtests. This slight difference was undoubtedly due to individual differences in the children, such as difference in interest, motivation, or some other unmeasurable variable. Also, as the authors of this test have observed, any individual test performance may differ slightly from the norms due to test unreliability from basic errors in this experimental edition of the ITPA.¹ It is suggested that the psycholinguistic abilities, or disabilities, as measured by the ITPA, of any child with defective articulation, would be examined individually to determine the usefulness of this test as a diagnostic tool for planning remedial therapy. As a group, children with defective articulation did not differ significantly from children with normal speech in the area of psycholinguistic abilities. Individually, any differences are due to either differences in the child as compared to others, or in test unreliability.

Table 2, which shows that the mean ITPA total score of children with defective articulation was 173.50 and the mean ITPA total for children with normal speech was 172.05,

illustrates only non-significant variation between the control and the experimental group on total test performance.

These findings indicate that the psycholinguistic abilities of children with defective articulation, when compared to children with normal speech by the ITPA, do not differ significantly. The third question which was raised in Chapter I, asks if the ITPA could be used as a diagnostic with children who have defective articulation. This writer feels that this question can be answered in the affirmative, when ITPA results are used individually and with other information to plan a remedial program. As one writer, whose work with the ITPA was mentioned in Chapter I, suggests, the ITPA is a valuable tool, diagnostically, when used with other information. As she says, "With the results of the ITPA at hand, the clinician can now group the children for therapy according to their specific linguistic strengths and weaknesses."¹

This study has shown just one of the many possible uses for the Illinois Test of Psycholinguistic Abilities--to plan a therapeutic program for children having defective articulation, when used with information in addition to the ITPA results. Continued research with this test, as

¹Arnold, op. cit., p. 789.

well as continued use of the test, will perhaps give more information as to the use and significance of the results presented here.

CHAPTER V

SUMMARY, CONCLUSION, AND IMPLICATIONS FOR FUTURE RESEARCH

Summary

Children with defective articulation have been compared to children with normal speech in relation to their language development, including grammar, vocabulary size, and sentence length. They have also been compared to each other in relation to certain psychological factors--maturation, emotional stability, and environmental influence.

The combination of these two general areas of growth--language and psychological (psycholinguistics), has not been studied as much with children who have defective articulation. With the development of the Illinois Test of Psycholinguistic Abilities, it is possible now to compare children having defective articulation with children having normal speech, in this area of psycholinguistics, to determine what difference may exist.

The purpose of this study has been to discover if any difference exists in the area of psycholinguistics ability of twenty children with moderately defective articulation and twenty children with normal speech, as

determined by their performance on the ITPA. Comparisons were made between the total mean scores on each subtest and between the ITPA total scores for each group. Both groups of children, the experimental and the control, were children in the first three grades at Holy Cross School in Lansing, Michigan. The groups were matched by sex, age, and intelligence.

Conclusions

The findings of this study indicate that the experimental group had a slightly higher ITPA total score than the control group had. There was some variation in the nine subtests of the ITPA for these two groups, too, as shown by the means of these nine tests for each group. However, statistical treatment indicated that there is no significant variance between the subtest performance or between the total test performance for the children with articulation defects and the children with normal speech, used in this study, on the ITPA

It is this writer's conclusion that the slight individual differences observed between the experimental and the control groups' performances on the ITBA are attributed either to individual differences within the subjects themselves, or to possible test unreliability. As a group, children with defective articulation do not differ significantly from children with normal speech in psycholinguistic abilities, as measured by the ITPA.

Conclusions of this study are:

1. The ITPA, when used with children having defective articulation to compare their psycholinguistic abilities with normal speaking children, indicates no significant difference between these two groups.

2. There may be slight individual differences in the psycholinguistic ability of some children with defective articulation when compared to children who have normal speech. These differences are not significant, and are probably due to differences in the children or test unreliability.

3. When used individually, with specific children having defective articulation, the ITPA may serve as a useful diagnostic tool for specific psycholinguistic diagnosis and for planning individualized remedial therapy.

Implications for Future Research

This study has been limited to the analysis of the performance of children with functional articulation disorders as compared to the performance of children with normal speech on the Illinois Test of Psycholinguistic Abilities. Using this test, this study has tapped only one relationship--test performance--which might exist between these two groups of children. Whether or not psycholinguistic ability and articulation ability are related in areas than single test performance, remains to be investigated.

Several questions were raised during this study which are presented as possible implications for future research-- in the area of psycholinguistics and speech disorders, as well as in the use and implications of the ITPA.

1. Does the ITPA correlate highly with any other test of language, indicating that it may assess abilities other than just psycholinguistic abilities?
2. Is there any significant difference between specific articulation errors and success or failure on any of the nine subtests of the ITPA.
3. How do children with functional articulation errors compare to children with normal speech on the ITPA when socio-economic status is a controlled variable?
4. Do children with severe articulation disorders differ from children with mild or slight articulation disorders on the ITPA?
5. How do other specific speech defective groups, such as stutterers, compare with normal speaking persons, on the ITPA? Does it differentiate significantly between these two groups?
6. Do any of the nine subtests of the ITPA correlate significantly with subtests from other standardized tests, language or intelligence tests?

Specifically, does the Auditory-vocal sequencing (repetition of digits) correlate with the Digit Span test of the Stanford-Binet or Wechsler Intelligence Tests; Does the Auditory Decoding (controlled vocabulary test) correlate with the Vocabulary tests from any other battery of tests?

Answers to the above questions may offer more insight into the differential diagnosis of speech disorders, as well as present more useful information about the use and application of the Illinois Test of Psycholinguistic Abilities.

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APPENDICES

APPENDIX A

APPENDIX A

THE ILLINOIS TEST OF PSYCHOLINGUISTIC ABILITIES

Development

The following information about the Illinois Test of Psycholinguistic Abilities has been taken, for the most part, from the test manual and from a supplementary booklet by the authors of the test, Samuel Kirk and James McCarthy. The booklet is entitled, The Construction, Standardization, and Statistical Characteristics of the Illinois Test of Psycholinguistic Abilities (Urbana, Illinois: University of Illinois Press, 1963). Information from other sources is so indicated by footnote reference.

This test is the result of work begun almost a decade ago. It was designed to meet the need of a comprehensive instrument for the assessment of language development in exceptional children, particularly of pre-school age. The development of a comprehensive test had to wait upon the development of a comprehensive psychological theory of language acquisition and use. In 1952, Professor C. E. Osgood, of the University of Illinois, produced such a theory (See Appendix B). From this theory a list and

definition of all essential psycholinguistic abilities was made and tests were constructed to assess them.

The first such test appeared in 1955, under the title, Differential Language Facilities Test. It was constructed and standardized by Dorothy J. Sievers as a doctoral dissertation.

A major technical problem in constructing this test was in developing tests which could be administered to young children, would measure one ability at a time, would have statistical reliability and adequate construct validity, and would be short enough to administer in one examination period.

Three major test revisions were required to produce the final test battery. The final battery was standardized on 700 children from Decatur, Illinois, between the ages of two and a half and nine years old.

Statistical Data

Norms

Language Age Norms have been provided in order that the results of the ITPA may be compared with many other measures of children that are expressed in terms of age scores.

Standard Score Norms provide a means of comparing a subject with his own standardization group. Use of standard

scores allows the results of any test of the battery to be compared directly with the results of any other test in the battery.

Raw Score Norms are provided for comparing test and retest results for the same subject. They allow a comparison between each subject and the standardization group in terms of raw data.

A difference of less than 1.00 between standard scores should not be considered reliable; similarly, a difference of less than two years between language age scores should not be considered reliable.

Validity.--The validity of the ITPA is mostly face validity. More empirical checks are needed and recommended by the authors of the test to further study and check the validity of the test. The following validity measures have been reported:

Construct Validity.--The authors have stressed that since the development of the test was revised until they felt it measured what they intended to measure, they feel it contains construct validity. They do suggest, however, that the ITPA battery and the individual tests need to be correlated with other similar tests to determine how accurately the ITPA does test what it is supposed to test.

Diagnostic Validity.--Some work has been done with differential diagnosis (see studies reviewed in Chapter II), in which the ITPA has proved useful for diagnostic purposes,

and seems to contain diagnostic validity. Again, more time is needed in studying this factor.

Concurrent Validity.--Six individual cases are discussed in the test manual which show that the ITPA very closely approaches concurrent validity, but as the test is used over a longer period of time, this factor can be further studied.

Predictive Validity.--Studies have shown that two variables, mental age and socio-economic status, are correlated with the ITPA. The latter variable is not as closely correlated below the age of six years.

Reliability.--Two forms of reliability studies have been reported.

Internal Consistency.--This is shown to be reliable at .89 (Motor Encoding) to .95 (Auditory Vocal Association and Auditory Decoding)

Stability.--Full range estimates show .80 (Visual Decoding) to .97 (Auditory Vocal Association). Split-half reliability indicates .90 (Motor Encoding) to .96 (Auditory Vocal Association and Auditory Decoding). This indicates that the test has known reliability, but not as much as continued research and use of the test may indicate. The reliability is more certain than the validity so far.

Factor Analysis.--The ITPA was subjected to a Principle Axis Factor Analysis which extracted all the variance. This was done with the over-all test battery and with the individual age groups on which the test was standardized. From this, the following factors were extracted:

General Linguistic factor appears to be accounted for in about 80% of the common variance.

General expressive ability, a group factor, accounts for about 4% of the common variance.

General expressive ability, a group factor, accounts for about 4% of the common variance.

Specific factors.--Studies by Center, and Semmel and Meuller have shown that specific factors include immediate recall of auditory symbols (Auditory-Vocal Sequencing), expression of ideas by gesture (Motor Encoding), immediate recall of visual symbols (Visual Motor Sequencing), and the ability to relate meaningful visual stimuli (Visual-Motor Association). These each accounted for 3% of the variance.

Total test analysis indicated that these six factors accounted for about 95% of variance. However, the authors still feel that each of the nine subtests assesses an individual ability. "All nine abilities for which the test were designed appear as factors throughout the analysis,

but with varying frequency and weight," as Kirk and McCarthy explain in this booklet.

Sex Differences.--Using t-tests between male and female means for testing age level with each being preceded by an F test the authors determined any differences by sex on test performance. Although some tests favored boys (Visual Decoding and Vocal Encoding) and others favored girls (Visual-Motor Sequencing, Visual-Motor Association, and Auditory Decoding), the battery as a whole did not markedly favor either sex, or at best favors girls slightly.

Age Difference.--With rare exception, raw score means increase regularly with age. Standard deviations, slightly constricted in the lowest and highest age groups, tend to remain relatively constant, within tests, over the age range of the tests.

APPENDIX B

APPENDIX B

A MODEL OF PSYCHOLINGUISTIC ABILITIES

An Outline of Osgood's Theory

There are three major dimensions of psycholinguistic abilities represented in the model of linguistic and communication theory presented by C. E. Osgood. The following outline has been taken from the ITPA test manual and is presented as an introduction to the psycholinguistic model of the ITPA which follows this outline. The three major dimensions in Osgood's theory are (1) levels of organization, (2) psychological processes, and (3) channels of communication. Each major dimension is subdivided as follows:

I. Levels of Organization

- A. The Representational Level to mediate activities requiring meaning or significance of linguistic symbols.
- B. The Integration Level to mediate habitual activities requiring retention of linguistic symbol/sequences and execution of automatic habit chains.

- C. Projection Level deals with innate psychological processes and since it cannot be altered through learning, it is dropped from further consideration.

II. Psycholinguistic Processes

- A. Decoding is the sum total of habits required to obtain meaning from either visual or auditory linguistic stimuli.
- B. Encoding is the total of those habits required to express oneself in words or gestures.
- C. Association involves those habits required to manipulate linguistic symbols internally

III. Channels of Communication

This dimension describes the sensory-motor path over which linguistic symbols are received and responded to. They are divided into mode of reception and mode of response.

An Outline of Psycholinguistic Abilities in the ITPA

The nine psycholinguistic abilities assessed in the ITPA are defined below and each definition is followed by a brief explanation of how each ability is tested. (Numbers, 1, 2, 3, etc. correspond to Figure 1).

I. Tests at the Representational Level

A. Decoding Tests.

Test 1, Auditory Decoding.--This ability, to comprehend the spoken word, is assessed by

questions of object junction, such as, "Do cars fly?"

Test 2, Visual Decoding.--This test assesses the ability to comprehend pictures and written words. After exposure to a stimulus, the subject identifies one from four other which is semantically, not physically, identical.

B. Association Tests

Test 3, Auditory-Vocal Association.--The ability to relate spoken word in a meaningful way is tested by using familiar analogies which the subject must complete such as, "Ice cream is cold, soup is _____"

Test 4, Visual-Motor Association tests the ability to relate meaningful visual symbols by having the subject select from among a set of pictures one which most meaningfully relates to a given stimulus picture

C. Encoding Tests

Test 5, Vocal Encoding is the ability to express one's ideas verbally, and is assessed by asking the subject to "tell me all about" on object such as a ball, block, etc.

Test 6, Motor Encoding. the ability to express one's ideas by gestures, is tested by asking the subject to supply the appropriate motion for an object shown to him.

II. Tests at the Automatic-Sequential Level

A. The Automatic Tests

Test 7, Auditory Vocal Automatic ability permits one to predict future linguistic events from past experience. It is assessed by asking the subject to supply the last word to a test statement and is basically a test of grammar.

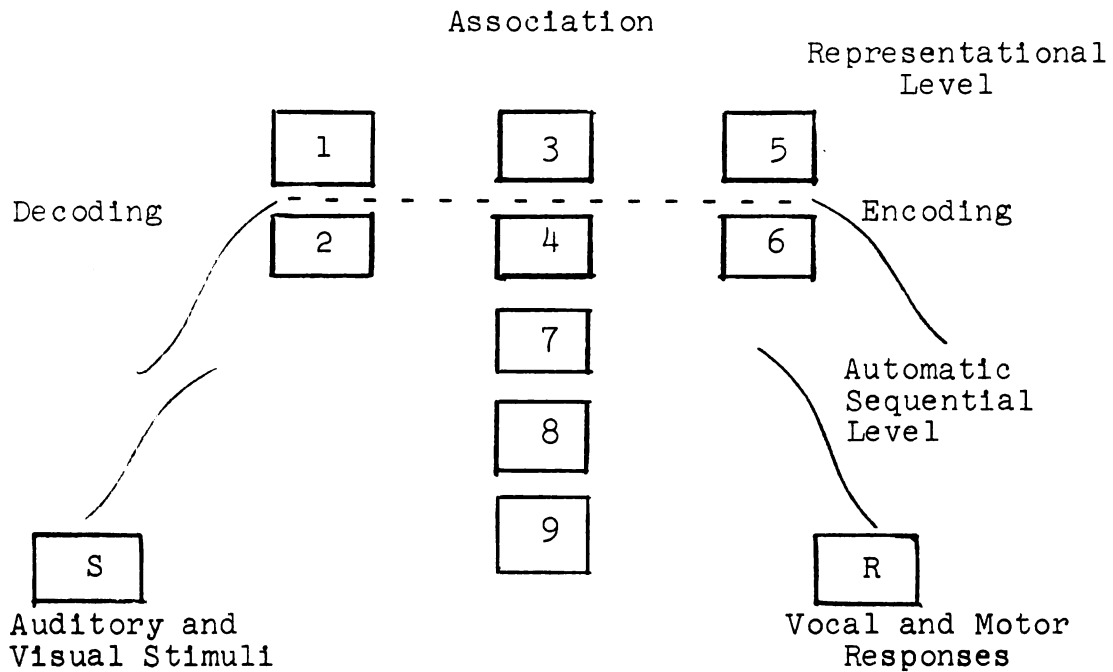
B. The Sequencing Tests

Test 8, Auditory-Vocal Sequencing, ability to correctly repeat a sequence of symbols previously heard is tested by a modified digit repetition test.

Test 9, Visual-motor sequencing is the ability to correctly reproduce a sequence of symbols previously seen. It is tested by requiring the subject to duplicate the order of a sequence of pictures or designs from memory.

FIGURE 1

The Clinical Model for the Illinois Test
of Psycholinguistic Abilities



Representational Level

1. Auditory Decoding
2. Visual Decoding
3. Auditory-Vocal Assoc.
4. Visual-Motor Assoc.
5. Vocal Encoding
6. Motor Encoding

Automatic-Sequential Level

7. Auditory-Vocal Automatic
8. Auditory-Vocal Sequential
9. Visual-Motor Sequential

APPENDIX C

APPENDIX C

RAW DATA

Test Scores for Children With Articulation Defects

Subtest	AD	VD	AVAs	VMAs	VE	ME	AVA	AVS	VMS	TOT.
<u>Subject</u>										
1	21	15	13	17	7	14	7	27	14	135
2	28	16	21	17	18	19	30	8	8	175
3	26	12	20	19	13	13	17	28	7	155
4	29	14	19	17	8	13	13	20	11	145
5	33	15	11	20	16	19	14	17	10	159
6	27	13	20	22	17	16	17	33	17	182
7	28	16	19	23	17	14	15	31	12	175
8	30	14	20	20	18	12	19	34	11	178
9	28	15	17	9	14	11	13	20	10	137
10	24	18	21	23	19	16	15	21	16	173
11	26	13	15	26	16	9	13	26	14	158
12	28	18	20	20	13	18	17	32	13	180
13	32	20	22	20	19	17	19	36	17	202
14	26	13	24	22	19	16	19	30	16	185
15	30	13	21	22	17	16	17	30	12	178
16	28	19	23	19	14	19	14	33	15	184
17	32	17	23	22	19	21	19	27	13	193
18	33	19	25	21	22	19	22	32	22	215
19	34	11	20	26	14	15	19	28	16	183
20	29	14	22	16	24	13	16	20	14	168

Test Scores for Children With Normal Speech

Subtest	AD	VD	AVAS	VMAS	VE	ME	AVA	AVS	VMS	TOT.
<u>Subject</u>										
1	12	13	17	18	19	8	18	27	12	144
2	32	15	19	22	13	16	14	33	13	178
3	32	9	20	22	19	14	15	30	14	175
4	30	11	19	18	8	12	14	12	14	138
5	25	11	18	21	19	10	15	36	14	170
6	24	10	20	21	13	12	13	20	11	134
7	16	14	22	18	19	17	14	21	15	156
8	32	15	17	14	11	11	10	22	15	147
9	26	14	20	17	15	15	15	37	11	170
10	29	14	20	20	14	16	14	33	15	176
11	23	14	25	24	17	13	18	36	14	184
12	31	13	21	21	17	12	21	28	14	178
13	32	17	25	22	27	14	21	31	15	204
14	27	12	21	21	10	15	16	26	15	163
15	32	17	24	24	18	16	18	32	15	197
16	27	17	24	24	21	16	22	36	17	204
17	25	12	21	20	14	14	18	36	16	176
18	29	17	24	20	12	18	16	24	15	175
19	20	14	23	20	16	14	18	36	18	179
20	26	15	24	25	27	17	20	26	12	192

Standard Scores for Children With Normal Speech

Subtest	AD	VD	AVAS	VMAS	VE	ME	AVA	AVS	VMS	TOT.
Subject										
1	+N	-.86	-1.76	-.47	-.18	-2.26	.64	.20	-1.32	-1.99
2	1.93	.14	.09	1.23	-.69	.09	.14	1.81	-.69	1.39
3	1.93	-1.23	.69	1.23	.48	-.34	.44	1.21	-.39	1.20
4	1.47	-.63	.27	.30	-1.66	-.76	.14	-2.40	-.37	-1.10
5	.28	-1.03	-.09	.65	.05	-2.06	.35	2.04	-.62	.20
6	.05	-1.37	.50	.65	-.89	-1.52	-.11	-.61	-1.39	-1.42
7	-1.81	.02	1.09	-.07	.05	-1.18	.12	-.45	-.37	-.43
8	1.91	.37	-.39	-1.04	-1.20	-1.79	.81	.28	-.37	-.83
9	.51	.02	.50	-.31	-.58	-.72	.35	2.20	-1.39	.20
10	.80	-.50	-.43	.05	-1.02	-.21	.35	-.28	-.64	-.27
11	-.75	-.50	1.80	1.10	-.52	-.98	.64	1.80	-.87	.16
12	.32	-.86	.02	.31	-.52	-1.24	1.39	.38	.87	-.16
13	1.91	1.06	1.98	.39	1.30	-.99	1.73	1.21	-.37	1.73
14	.28	-1.22	.02	.31	-1.68	.46	.15	.02	-.64	-.97
15	1.58	1.58	1.36	1.10	-.35	-.21	.64	1.58	-.64	.86
16	.28	1.64	1.36	1.10	.15	-.21	1.64	1.80	-.18	1.24
17	-.46	-1.90	-.43	-.44	-1.33	-1.27	.00	1.66	.82	-1.05
18	.42	-.04	.79	-.44	-1.69	-.16	.83	-.74	-1.06	-1.11
19	-1.55	-1.16	.39	-.44	-.96	-1.27	.00	1.66	-.34	-.87
20	1.24	-.70	.79	1.21	1.02	-.44	.83	-.34	-1.77	-.08

Standard Scores for Children With Articulation Defects

Subtest	AD	VD	AVAS	VMA _s	VE	ME	AVA	AVS	VMS	TOT.
<u>Subject</u>										
1	.58	.59	-2.23	.07	-1.86	-.34	-1.92	.61	-.37	-1.29
2	1.02	.89	1.11	.07	.25	.52	1.62	1.21	-1.84	1.20
3	-.04	.32	.69	.54	-.69	-.55	1.03	.81	-2.09	-.04
4	1.25	.44	.27	.07	-1.66	-1.55	1.14	-.80	-1.11	-.67
5	2.14	.37	-.98	.41	-.42	.36	.12	-1.11	-1.65	-.29
6	.75	.33	.50	.89	-.26	-.45	.81	1.54	.15	.74
7	.98	.72	.20	.98	-1.26	-.99	.35	1.21	-1.14	.43
8	1.44	.02	.50	.41	-.11	-1.52	1.27	1.71	-1.39	.56
9	.98	.37	-.39	-2.24	-.73	-1.79	-.11	-.61	-1.65	-1.28
10	-.50	.10	.02	.84	-.18	-.21	-.10	-.87	-.41	-.43
11	.02	.86	-2.65	1.63	-.68	-2.01	-.60	.02	-.87	-1.24
12	.54	.93	-.43	.05	-1.18	.31	.41	1.09	-1.32	-.05
13	1.58	1.65	.47	.05	-.18	.05	.89	1.80	-.18	1.13
14	.02	-.86	1.36	.58	-.18	-.21	.89	.73	-.41	.22
15	1.06	-.86	.02	.58	-.52	-.21	.40	.73	-1.32	-.16
16	.20	.71	.39	-.77	-1.33	.12	-1.65	1.06	-1.06	-.57
17	1.08	.04	.39	.22	-.42	.67	.41	-.14	-1.53	-.02
18	1.30	.71	1.20	-.11	.12	.12	1.65	.86	.61	1.30
19	1.52	-2.28	-.84	1.54	-1.33	-.99	.41	.08	-.82	-.63
20	.42	-1.16	-.02	-1.76	.48	-1.54	-.83	-1.54	-1.29	-1.53

Language Age Scores for Children With Articulation Defects

Subtest	AD	VD	AVAS	VMA _s	VE	ME	AVA	AVS	VMS	TOT.
Subject										
1	5-9	6-8	4-11	6-10	3-6	5-10	4-3	8-6	6-0	5-9
2	8-10	7-10	7-8	6-10	6-11	7-11	8-9	+N	4-4	7-5
3	6-6	5-10	7-3	7-6	5-4	5-5	8-0	+N	4-2	6-6
4	+N	6-8	6-10	6-10	3-10	5-5	6-10	5-7	5-1	6-1
5	+N	7-3	5-6	7-10	6-4	8-8	6-10	4-10	4-10	6-8
6	7-11	6-3	7-3	6-3	7-4	6-10	8-10	+N	6-1	7-9
7	8-10	7-10	6-10	8-11	6-7	5-10	7-3	+N	5-4	7-5
8	+N	6-8	7-3	7-10	6-11	5-0	8-0	+N	5-1	7-7
9	8-10	7-3	6-1	4-0	5-8	4-7	6-6	5-7	4-10	5-9
10	6-9	7-3	7-8	8-11	7-4	6-10	7-3	5-11	6-9	7-4
11	7-6	+N	5-6	+N	6-4	3-10	6-6	7-10	6-0	6-7
12	8-10	6-3	7-3	7-10	5-4	7-11	8-0	+N	5-8	7-8
13	+N	+N	8-3	7-10	7-4	7-4	8-9	+N	7-4	+N(9-4)
14	7-6	6-3	+N	8-7	7-4	6-10	8-9	+N	6-9	8-0
15	+N	6-3	7-8	8-7	6-7	6-10	8-0	+N	5-4	7-7
16	8-10	+N	9-0	7-6	5-8	8-8	6-10	+N	6-4	7-11
17	+N	8-9	9-0	8-9	7-4	+N	8-9	8-6	5-8	8-9
18	+N	+N	+N	8-3	+N	8-8	+N	+N	+N	+N(9-4)
19	+N	5-6	7-3	+N	5-8	6-4	8-9	+N	6-9	7-10
20	+N	6-8	8-3	6-6	+N	5-5	7-7	5-7	6-0	7-1

Language Age Scores for Children With Normal Speech

Subtest	AD	VD	AVAS	VMAS	VE	ME	AVA	AVS	VMS	TOT.
1	4-1	6-3	6-1	7-2	7-4	3-6	8-4	8-6	5-4	6-0
2	+N	7-3	6-10	8-7	5-4	6-10	6-10	+N	5-4	7-7
3	+N	4-9	7-3	8-7	7-4	5-10	+N	6-0	7-5	7-5
4	+N	5-6	6-10	7-2	3-10	5-0	6-10	3-9	6-0	5-10
5	7-1	5-6	6-6	8-3	7-4	4-2	7-3	+N	6-0	7-2
6	6-9	5-2	7-3	8-3	5-4	5-0	6-6	5-7	5-1	5-8
7	4-9	6-8	8-3	7-2	7-4	7-4	6-10	5-11	6-4	6-6
8	+N	7-3	6-1	5-0	4-9	4-7	5-4	6-3	6-4	6-2
9	7-6	6-8	7-3	6-10	7-0	6-4	7-3	+N	5-1	7-2
10	+N	6-8	7-3	7-10	5-8	6-10	6-10	+N	6-4	7-6
11	6-5	6-8	+N	9-3	6-7	5-5	8-4	+N	6-0	7-11
12	+N	6-3	7-9	9-3	6-7	5-0	9-6	+N	6-0	7-7
13	+N	8-9	+N	8-7	+N	5-10	9-6	+N	6-4	+N(9-4)
14	7-11	5-10	7-8	8-3	4-5	6-4	7-7	7-10	5-6	6-10
15	+N	8-9	+N	9-3	6-11	6-10	8-4	+N	6-4	8-11
16	7-11	8-9	+N	9-3	8-11	6-10	+N	+N	7-4	+N(9-4)
17	7-1	5-10	7-8	7-10	5-8	5-10	8-4	+N	6-9	7-6
18	+N	8-9	+N	7-10	5-1	7-11	7-7	7-0	6-4	7-5
19	5-8	6-8	9-0	7-10	6-4	5-10	8-4	+N	7-10	7-7
20	7-6	7-3	+N	+N	+N	7-4	9-1	7-10	5-4	8-6

+N = Above norms

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