PSYCHOGENIC ARTICULATION DISORDERS RELATED TO VERBAL SKILLS AND INTELLIGENCE AS MEASURED BY THE WECHSLER INTELLIGENCE SCALE FOR CHILDREN

Thesis for the Degree of Ph.D.

MICHIGAN STATE UNIVERSITY

Katharine Gorrell Butler

1967

THESIS

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has been accepted towards fulfillment
of the requirements for

Ph.D. degree in Audiology
and Speech Sciences

Herbert J. Oyer
Major professor

Date June 8, 1967

O-169

ABSTRACT

PSYCHOGENIC ARTICULATION DISORDERS
RELATED TO VERBAL SKILLS AND INTELLIGENCE
AS MEASURED BY THE
WECHSLER INTELLIGENCE SCALE FOR CHILDREN

by Katharine G. Butler

While there has been a considerable amount of research in the area of speech and language in the technical aspects of identifying and remediating speech and language disorders, comparatively little research has been conducted regarding the relationship of functional articulatory disorders and verbal skills. Furthermore, even less research has drawn upon a standardized measurement which yields both quantitative and qualitative data on verbal and performance levels of functioning.

The purpose of this study is to evaluate the functioning of children exhibiting severe articulatory defects in terms of their verbal skills based upon their performance on the 11 subtests of the Wechsler Intelligence Scale for Children. The normative group of the standardization sample serves as controls. The experimental group is rigidly controlled for sex, age, degree of speech defect, I.Q. range, peripheral auditory competency, visual-motor skills, monolingualism, and socio-economic status. Children exhibiting brain injury and known central nervous system dysfunction were excluded from the experimental sample, as were gifted and mentally retarded children. The functional articulatory defect was characterized by a

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a minimum of 5 or more misarticulated phonemes, consistently occurring in at least 2 of the 3 consonant positions in single word utterances.

Each of the 50 subjects, ranging in age from 6-0 to 12-0, with a mean age of 8-0, were administered the Wechsler Intelligence Scale for Children under standardized testing conditions. The examiner recorded all verbal and motor responses on the protocol forms. Subjects' responses were tabulated and the raw data for analyses consisted of 542 subtest scaled scores and 150 I.Q. scaled scores.

These 692 scores were subjected to a series of tests of significance for the difference between the means of the groups. It was found that there were significant differences between the two populations in regard to both Verbal I.Q. and several of the subtests.

On the basis of the results, the following conclusions seem warranted:

1. Children with psychogenic speech defects and those with normal speech reveal no differences in performance in "general intelligence" on the Full Scale I.Q. as determined by the Wechsler Intelligence Scale for Children.

2. Children with psychogenic speech defects reveal I.Q. scores that are significantly lower in the area of verbal skills than do children with normal speech.

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3. Verbal subtests of the WISC, as achieved by children with psychogenic speech defects, namely, Information, Vocabulary, Arithmetic and Digit Span, are significantly lower than those achieved by children with normal speech. However, children with psychogenic speech problems reveal significantly better performance on Picture Completion, a subtest of the Performance Scale, than do children with normal speech who are of average intelligence.

4. There are no significant differences between children with psychogenic speech defects and children with normal speech for the subtests which measure Picture Arrangement, Block Design, Object Assembly, and Coding on the Performance Scale of the Wechsler Intelligence Scale for Children.

Recommendations for further research were made on the basis of these findings.

PSYCHOGENIC ARTICULATION DISORDERS RELATED TO VERBAL SKILLS AND INTELLIGENCE AS MEASURED BY THE WECHSLER INTELLIGENCE SCALE FOR CHILDREN

by

Katharine G. Correll Butler

A THESIS

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

DOCTOR OF PHILOSOPHY

Department of Speech

1967

G-16551
12-8-67

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1968

ACKNOWLEDGMENTS

My debt to many is very great:

To Dr. Charles Van Riper, who
placed my feet upon the path,

To Dr. Herbert Oyer, who
lengthened the path into infinity,

To Dr. Marion McPherson, who,
on one occasion, branched the path,

And to my husband, who
has let me share yet another path,
and surely . . . the most important.

K. G. B.

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CHAPTER I

INTRODUCTION

Speech and language are learned processes, but the manner and degree to which they are learned is of primary importance to those interested in verbal communication. Difficulty in verbal communication based upon faulty learning of articulatory skills has long been considered an area of concern in the field of speech pathology and audiology.

Speech disorders may be classified in gross fashion as either functional or organic, with the presumably functional, or psychogenic, disorders far outweighing those of organic origin in frequency of occurrence. However, comparatively little is known regarding psychogenic factors in functional articulatory defects, although the study of the acoustical manifestations of articulation deviancy has been underway for three decades. In addition, little research has been attempted in the specific realm of articulatory deficiencies and verbal skills as measured by a standardized instrument which assesses several aspects of verbal performance.

Developmentally, the importance of articulatory adeptness is reflected in the other speech and language

measures. As Schreiber points out throughout her text, successful skills in one area increase the probability of success in other areas.[1] The magnitude of failure of many children to achieve success is indicated by Hall's comprehensive review of functional disorders of articulation. She indicates that

> articulation problems have long been recognized as the most prevalent of all the disorders of speech. Because this is true and since only a small fraction of articulation cases are organically based, functional articulation problems constitute a highly significant group of disorders in the total field of speech pathology. They merit serious study and much greater scientific investigation than they have yet received, not only because they are so common but also because they are by no means so simply explained and treated as many people have assumed.[2]

In addition, she indicates that "probably more than any other type of speech disorder, . . . functional articulation cases are intimately associated with all dimensions of . . . the individual's growth."[3] These dimensions include physical, intellectual, emotional and social growth patterns and their intra-relationships as well as the modification of these patterns as a function of the environment. Thus, it can be seen that functional articulatory defects

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[1]Flora R. Schrieber, Your Child's Speech (New York: G. P. Putnam's Sons, 1956), pp. ii-391.

[2]Margaret Hall Powers, "Functional Disorders of Articulation—Symptomatology and Etiology," Handbook of Speech Pathology, ed. Lee Edward Travis (New York: Appleton-Century-Crofts, Inc., 1957), p. 707.

[3]Ibid., p. 709.

represent only the diagnostic label for a comprehensive disorder.

The American Speech and Hearing Association has indicated its concern regarding the etiological significance of articulatory disorders by appointing a committee to study the research needs specifically related to this problem. The committee concluded that

> research in the area of articulatory problems not only must be related to other dimensions of language which may be affected, but also must building upon normative data involving the development of articulation from birth through adulthood. These data and the conditions from which they arise must provide the starting point for investigation of deviant behavior. Unfortunately, information on this subject is not highly reliable. The conventional phonemic concept used by most research workers and clinicians in defining the articulatory disorder were questioned by the committee. Creation of a more satisfactory concept is dependent in part upon the availability of more information about the development of articulation.[4]

The committee also indicated that there was a need for research in relation to linguistic factors such as vocabulary, sentence structure, sentence length, and articulation development in relation to social, psychological, physical and intellectual factors, among many others.[5]

The interweaving of articulatory ability in the

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[4]Jesse Villarreal et al., "I. Report of Sub-Committee on Articulation Problems," Journal of Speech and Hearing Disorders Monograph: Research Needs in Speech Pathology and Audiology, Supplement V (September, 1959), p. 14.

[5]Ibid., p. 15.

fabric of speech, language and personality is not a recent concept. For example, Terman and Merrill pointed out in 1937 that

> language, essentially, is the shorthand of the higher thought processes, and the level at which this shorthand functions is one of the most important determinants of the level of the processes themselves.[6]

Therefore, it can be seen that the cognitive aspects of language have long been evaluated as essentially determining the extent of the growth of the cognitive processes. Language and cognition appear to develop together.

While Terman and Merrill attempted to measure this growth through a considerable number of verbally-oriented sub-tests on the Stanford-Binet, David Wechsler later moved to a more global concept of verbal performance and its intellectual connotations. He reported that

> clinical experience and research in the past two decades have shown that it is not possible to identify or equate general intelligence with intellectual ability, however defined. Actually any and every test of intelligence measures something more, often a good deal more, than sheer intellectual ability—or any aspect of it, verbal, abstract, numerical or even 'g'.[7]

Thus, in designing a test of intelligence, Wechsler concluded

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[6]Lewis M. Terman and Maud A. Merrill, Measuring Intelligence (New York: Houghton Mifflin Company, 1937), p. 5.

[7]David Wechsler, WISC Manual: Wechsler Intelligence Scale for Children (New York: The Psychological Corporation, 1949), pp. 4-5.

that

> while intellectual capacity (or any facet of it) may be a unitary trait or ability, general intelligence is not. In brief, intelligence is a part of a larger whole, namely personality itself.[8]

Wechsler noted that the 12 tests which comprise the Wechsler Intelligence Scale for Children are divided into two subgroups identified as Verbal and Performance, and indicated that most of the verbal tests correlate better with each other than with tests of the performance group. Concomitantly, the performance tests correlate more adequately with each other than with the verbal subtests. However, he takes care to emphasize that both subgroups of tests tap other factors,

> among them non-intellective ones, which cut across the groups to produce other classifications or catagories that are equally important to consider in evaluating the individual's performance.[9]

It may be concluded, therefore, that language, cognition, intellectual capacity, general intelligence, and personality cannot be truly dichotomized along any series of continuums, but rather, reflect a reciprocal interweaving of processes and developmental patterns. In addition, recent research in oral language performance indicates a close relationship between psycholinguistic

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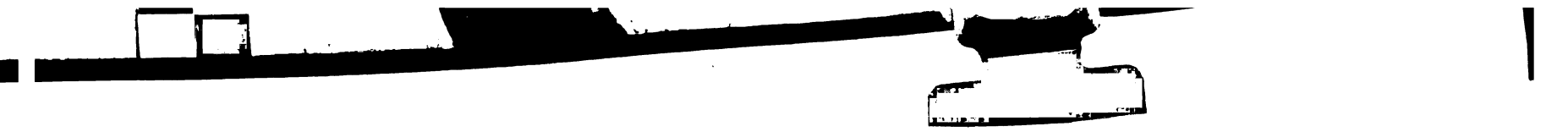
[8]Ibid., p. 5.

[9]Ibid., p. 6.



functions, as detailed above, and articulatory competence. While defective articulation and disturbance of psycholinguistic function may be differentiated, DeHirsch, Jansky and Langford report that

> the two are closely related. Difficulties with formulation of conceptual material belonging to the psycholinguistic aspect of language often leads directly to a breakdown in articulation because the organizational load becomes too heavy.[10]

They report that articulatory competence depends upon the accurate perception and recall of "auditory-verbal gestalten; on adequate central integration of fine movement patterning of the peripheral speech mechanism; and according to Hardy, . . . on feedback."[11] The complexity of functional, or psychogenic, articulatory disorders is thus confirmed.

Purpose of the Study

The present study deals with the performance of speech defective children who exhibit a functional articulation disorder as measured by a standardized intelligence test. While there are literally hundreds of published intelligence tests, of the standardized tests available, the Wechsler Intelligence Scale for Children constitutes the most reliable and valid instrument which provides for

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[10]Katrina DeHirsch, Jeannette Jefferson Jansky and William S. Langford, "The Oral Language Performance of Premature Children and Controls," Journal of Speech and Hearing Disorders, XXIX, No. 1 (February, 1964), p. 64.

[11]Ibid., p. 63.

both verbal and non-verbal measurement, as well as permitting analysis of several verbal scales related to speech and language functions.

The purpose of the study is to evaluate the functioning of children exhibiting severe articulatory defects and the "normal child" as portrayed by the mean performance of the standardization groups utilized in the Wechsler Intelligence Scale for Children sample.

The following null hypotheses were formulated for this study:

1. There are no significant differences in functioning between speech defective children, as defined in this study, and normal children on the Full Scale Intelligence Quotients of the Wechsler Intelligence Scale for Children.

2. There are no significant differences in functioning between speech defective children and normal children on the Verbal Scale of the Wechsler Intelligence Scale for Children.

3. There are no significant differences between speech defective children and normal children on the Performance Scale of the Wechsler Intelligence Scale for Children.

4. There are no significant differences between speech defective children and normal children on the sub-test

scaled scores, and, in particular, the Vocabulary subtest of the Verbal Scale.

Importance of the Study

As was recently indicated by the U. S. Department of Health, Education and Welfare, impairments of articulation are among the treatment problems of over 15% of the entire population of the United States, ages birth to 21.[12] In addition, surveys over the past thirty years have indicated that children and adults suffering from some type of speech disorder outnumber all other handicapped groups.[13, 14]

Evidence of the current interest in the speech handicapped is reflected by the level of current federal support in this area. Research support for the year 1965 was supplied by a number of agencies, including the Vocational Rehabilitation Administration, Division of Handicapped Children and Youth, and the Division of Educational Research of the U. S. Office of Education, Children's Bureau of the

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[12]U. S. Department of Health, Education, and Welfare, Public Health Service, Research Profile, Summary of Program in Hearing, Language, and Speech Disorders, Profile 4, PHS Pub. No. 1156, Rev., 1965, p. 2.

[13]A. W. Mills and H. Streit, "Report of a Speech Survey, Holyoke, Mass.", Journal of Speech Disorders, VII, No. 2 (June, 1942), pp. 161-67.

[14]Charles Van Riper, Speech Correction: Principles and Methods (New York: Prentice-Hall, Inc., 1954), pp. 33-36.

Welfare Administration, Division of Chronic Diseases of the Public Health Service, National Institute of Neurological Diseases and Blindness, and the National Institute of Child Health and Human Development. These agencies contributed a grand total of approximately $18,575,639.00 for speech and hearing in the year 1965, $8,798,743.00 of it for research. One agency, the Office of Education, reports that among the objectives of its Children's Bureau are two of importance to this study: (1) To assist in the early detection of children with conditions resulting in communicative handicaps and (2) the provision of multi-disciplinary and comprehensive diagnostic evaluations of speech, hearing and language disorders.[15]

So important is the need for specific identification of children suffering from a variety of speech disorders (the most common of which are articulatory defects) that the U. S. Office of Education, Division of Handicapped Children and Youth, is funding a multi-million dollar project which is to be designed as a prevalence study of speech and hearing disorders among school children in the United States. The primary objective is to obtain a reliable estimate of the prevalence of speech and hearing disorders in school children

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[15]American Speech and Hearing Association, "Federal Support of the Profession of Speech and Hearing," ASHA, VIII, No. 5 (May, 1966), p. 197-99.

by means of a sampling technique and screening procedures. Data will be gathered from approximately 200,000 children from the 48 continental states.[16] The current focus via funding on speech and hearing problems and thus upon articulatory disorders which make up the numerical majority of these problems reinforces the need for knowledge regarding the child who possesses this most common syndrome, the functional articulatory defect.

As the American Speech and Hearing Association Committee on Articulation Disorders indicated in 1965, there is a need to develop a more satisfactory definition of "articulation disorder" as well as a need to define both the factors which promote and the factors which impede the normal development of speech sound articulation.[17] In addition, while research devoted to the etiology of functional articulation problems has been fairly extensive, this research has failed to indicate specific factors as having causal significance. Winitz and Lawrence, in a review of the major studies in this area, report that present research knowledge of functional articulation cases has failed to demonstrate systematic deficiencies for any of the factors

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[16]American Speech and Hearing Association, "Institutional News and Announcements," ASHA, VII, No. 11 (November, 1965), p. 480.

[17]Villarreal, op. cit., pp. 14-17.

studied. They state that since organic factors have never been clearly shown to operate in the "usual" functional articulation case, it may be assumed that certain unidentifiable learning factors have operated in the past to account for the differences in articulatory functioning of young children.[18] Their study led them to conclude that there was no difference between children with good and poor articulation in rate or level of learning.

> In summary, it would seem that differences in articulation ability may be due to some rather complex reinforcement contingencies that have operated in the past or still operate, for when learning conditions are made similar, as in this study, differences between children with good and poor articulation are not apparent in rate or level of learning. Since little is known about the factors that account for language learning although much information is available on the stages of language growth, it is not as yet clear what the reinforcement contingencies might be.[19]

The "yet-unindentifiable learning factors" influencing articulatory skills, to which Winitz and Lawrence allude, may be among those which Andreas has referred as "language habits." He indicates that language represents learning of long standing in the temporal sense, and he reports that divergence

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[18]Harris Winitz and Martha Lawrence, "Children's Articulation and Sound Learning Ability," Journal of Speech and Hearing Research, IV, No. 3 (September, 1961), pp. 259-68.

[19]Ibid., p. 266.

of past language experience will be reflected in verbal responses.[20]

In past attempts to understand articulatory problems, little emphasis has been placed upon the psychological factors as well as the learning factors. For example, in her well-known discussion of functional disorders of articulation, Margaret Hall Powers is able to provide reference information on only 4 studies related either directly or indirectly to the functional aspect of such defects, although 148 references are included in the chapter regarding the symptomatology and etiology of articulatory disorders.[21] In another review of research on articulatory disorders and personality, Spriestersbach indicates that studies geared to assess the impact of functional articulation disorders have been largely ignored and points out that lack of interest cannot be due to lack of material since articulatory disorders constitute the bulk of the speech pathologist's clinical load.[22] He stresses the psychogenic nature of a non-organic articulatory disorder by stating that there is a "personal backwash" in speech or communication.

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[20]Burton G. Andreas, Experimental Psychology, (New York: John Wiley and Sons, Inc., 1960), p. 5.

[21]Powers, op. cit., pp. 707-68.

[22]Duane C. Spriestersbach, "Research in Articulation Disorders and Personality," Journal of Speech and Hearing Disorders, XXI, No. 3 (September, 1956), pp. 329-35.

He adds that

> this logic, pursued to its ultimate conclusions, would appear to say that 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. . . . An articulation disorder may cause such psychological repercussions within the speaker that maladjustments will be the probable conclusion.[23]

Spriestersbach's review included every appropriate study that had been abstracted or published in Speech Monographs, the Journal of Speech and Hearing Disorders and Psychological Abstracts during the period 1950 to 1956. He found 9 studies in all and, after evaluating each in terms of research design and statistical analysis, reported that

> with a five to four count in favor of maladjustment it would appear that no conclusive data exist on which to base any kind of a generalization, one way or the other. However, one is struck by the wide range of severity of the articulatory defects frequently found in the groups studied. It is to be questioned whether many of the mild articulatory defects that are worked with clinically really represent serious barriers to communication.[24]

The writer's review of research in this area would indicate that the above criticism of past research design has not as yet been remedied. There is little or no similarity between the various samples of "mild", "moderate" or "severe" articulatory defects as described in current research, even on

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[23] Ibid., p. 330.

[24] Ibid., p. 333-34.

such a gross measure as the number of misarticulated phonemes. As Spriestersbach pointed out in his summary

> . . . it would be surprising to find that measurable maladjustments are related to this rather vaguely defined group of problems. The study is yet to be done which attempts to measure the adjustment problems of a group of speakers with severe articulatory problems. The multiplicity of causes is so great, the effects of the disorder are so varied, and the inherent error within the testing instruments used is so great that it would be surprising, indeed, to find conclusive data on this question from the study of the usual 'representative' sample of individuals with articulatory problems.[25]

He further feels that test measures of personality are, at best amorphous. Such measures are likely to be invalid. He states

> one is forced to conclude that the contribution of research to an understanding of the relationship between articulatory defects and personality is largely negative. The data do not justify a statement about the relationships.[26]

Spriestersbach concludes that "utilization of appropriate instruments and the construction of relevant hypotheses are long overdue."[27]

A possible method of approach to this problem of the effect of functional, or psychogenic, speech problems upon the verbal communicative behavior of children may be through the use of the more adequately standardized and validated diagnostic instrument, the Wechsler Intelligence Scale for

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[25] Ibid.

[26] Ibid.

[27] Ibid.

Children. The speech defective child's performance on the Verbal Scale is of particular interest since it is a matter of clinical observation that school adjustment is related to verbal skills. The Vocabulary subtest holds special interest as well since performance in Vocabulary appears to be sensitive to early parent-child relationships. Finally, achievement, as reflected by both oral and visual skills, is measured throughout both the Verbal and Performance Scales of the Wechsler. Everhart states still more explicitly that speech and reading are inextricably associated in the process of language and adds that "any limitation or facility in one is directly reflected to some degree in the other. Articulatory defects are considered to affect reading skills."[28]

For at least the past two decades, those interested in written language disorders and in reading difficulties have been utilizing the Wechsler Intelligence Scale for Children in an attempt to establish a "poor reader profile." Sampling difficulties have also been encountered in this area, and most of the data reported have been collected on a small number of subjects. Just as there tends to be little or no differentiation made between milld, moderate or severe articulation disorders, there also tends to be little

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[28]Rodney W. Everhart, "Literature Survey of Growth and Development Factors in Articulatory Maturation," Journal of Speech and Hearing Disorders, XXV, No. 1 (February, 1960), p. 62.

differentiation made between a mild, moderate or severe reading disorder. Thus, it is not surprising to find that Everhart reports that

> an investigation of research reports indicates an absence of complete agreement as to the relationship of reading defects to articulation aberrations. . . . Any limitation in real or vicarious experiences, with their concomitant limitations in word meaning and articulatory fluency could peradventure have a bearing upon reading ability.[29]

Whatever the sampling difficulties encountered, it has been reported by psychologists involved in clinical work that research on 14 well-known and standardized tests, including the Binet and the Wechsler Intelligence Scale for Children "supported" at least one hypothesis which is pertinent to the present study, and that is that "each subtest item of standardized intelligence tests can tap wide personality dimensions."[30]

Since the Wechsler Intelligence Scale for Children subtests scaled scores may reveal typical performance on the part of articulatory defective children, it is of importance to note that while

> the numerical measures of scatter in themselves are not regarded as very helpful in clinical

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[29] Ibid., p. 60.

[30] Erika Fromm, Lenore Hartmann and Marian Marschak, "Children's Intelligence Tests as a Measure of Dynamic Personality Functioning," American Journal of Orthopsychiatry, XXVII, No. 1 (January, 1957), pp. 134-44.

> diagnosis, the extent and scatter and the qualitative analysis of the test performance are extremely valuable in determining the extent of maladjustment. Scatter is thought of dynamically as the interrelationship of functions underlying the individual's achievement on the various subtests and represents the intra-individual configuration or pattern."[31]

It is hoped that this study may make a contribution in the specific area of analysis of the relationships between functional articulation disorders in children and the subtest scatter on the Wechsler Intelligence Scale for Children.

Definitions

Several terms appear in the literature dealing with the various aspects of this study. These terms and their definitions follow.

Articulation. As defined by Powers, it is the production of speech sounds by the stopping or constricting of the vocalized or non-vocalized breath stream by movement of the lips, tongue, velum or pharynx.[32]

Disorders of Articulation. These refer to the faulty placement, timing, direction, pressure, speed, or integration of these movements, resulting in absent or incorrect speech sounds, as defined by Powers.[33]

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[31]Erika Fromm and Lenore Hartmann, Intelligence, a Dynamic Approach, (Garden City, New York: Doubleday and Company, Inc., 1955), pp. 45-46.

[32]Powers, Op. cit., p. 707

[33]Ibid.

Functional Disorders of Articulation. Powers states

> . . . A functional articulation 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 by normal variations in the organism or by environmental or psychological factors.[34]

For the purposes of this study, a functional or psychogenic articulation disorder is operationally defined as misarticulations or omissions of standard English phonemes by an individual who reveals no structural, physiological or known neurological basis for these deviations.

Classification of Functional Articulation Defects. Considerable confusion exists in the literature regarding classification of articulatory defects. With children under eight, maturational effects of phonemic growth must be taken into account.[35] Children below this age may misarticulate some phonemes and still possess "normal speech." Templin and Darley state that accurate articulation is "assumed completed for most children by the age of eight."[36]

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[34] Ibid., p. 708.

[35] Mildred Templin, "Norms on a Screening Test of Articulation for Ages Three through Eight," Journal of Speech and Hearing Disorders, XVIII, No. 4 (December, 1953), pp. 323-31.

[36] Mildred Templin, The Templin-Darley Tests of Articulation, (Iowa City, Iowa: Bureau of Educational Research and Service Extension Division, State University of Iowa, 1960), p. 8.

Templin's research untilized as a criterion of phonemic age the passage of test items by 90% or more of her sample. Age scaling procedures are common, as exemplified by the Laradon Scale[37] but do not measure levels of severity. In addition, recent research indicates that the age scales themselves may be inaccurate. A recent study of 15,255 children revealed that by the end of the first grade, no phoneme was misarticulated by 10% of the children. The authors concluded that all phonemes are fully developed by at least the age of seven.[38]

Severity judgments are difficult for yet another reason. As Morrison points out, "Indices based solely on the frequency of error may be inadequate for some clinical and experimental purposes.[39] Misarticulations must be evaluated in terms of the degree of misarticulation, the consistency of misarticulation, and the intelligibility level of communicative speech as well as the "raw" number of errors.

There appears to be no satisfactory classification system. Even crude counting becomes complex since each

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[37]William Edmonston, Laradon Articulation Scale Manual, (Beverly Hills, California: Western Psychological Services, 1963), p. 2.

[38]Kathleen Pendergast, et. al., "An Articulation Study of 15,255 Seattle First Grade Children with and without Kindergarten," Exceptional Children, XXXII, No. 8 (April, 1966), pp. 541-50.

[39]Sheila Morrison, "Measuring the Severity of Articulation Defectiveness," Journal of Speech and Hearing Disorders, XX, No. 4 (December, 1955), p. 348.

position in which it may occur in a word, making a total maximum count of 96, as in one study,[40] or by defining misarticulated phonemes as ones which are deviant in one or more positions, as in another study.[41] A severe articulatory disorder has been variously portrayed as a numerical entity of 3,[42] or has been noted as 3 to 4,[43] as a minimum of 4,[44] a maximum of 5,[45] or even as 6 errors.[46] A few studies

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[40]Carl H. Weaver, Catherine Furbee, and Rodney W. Everhart, "Paternal Occupational Class and Articulation Defects in Children," Journal of Speech and Hearing Disorders, XXV, No. 2 (May, 1960), pp. 171-75.

[41]Rodney Everhart, "The Relationship between Articulation and Other Developmental Factors in Children," Journal of Speech and Hearing Disorders, XVIII, No. 4 (December, 1953), pp. 332-38.

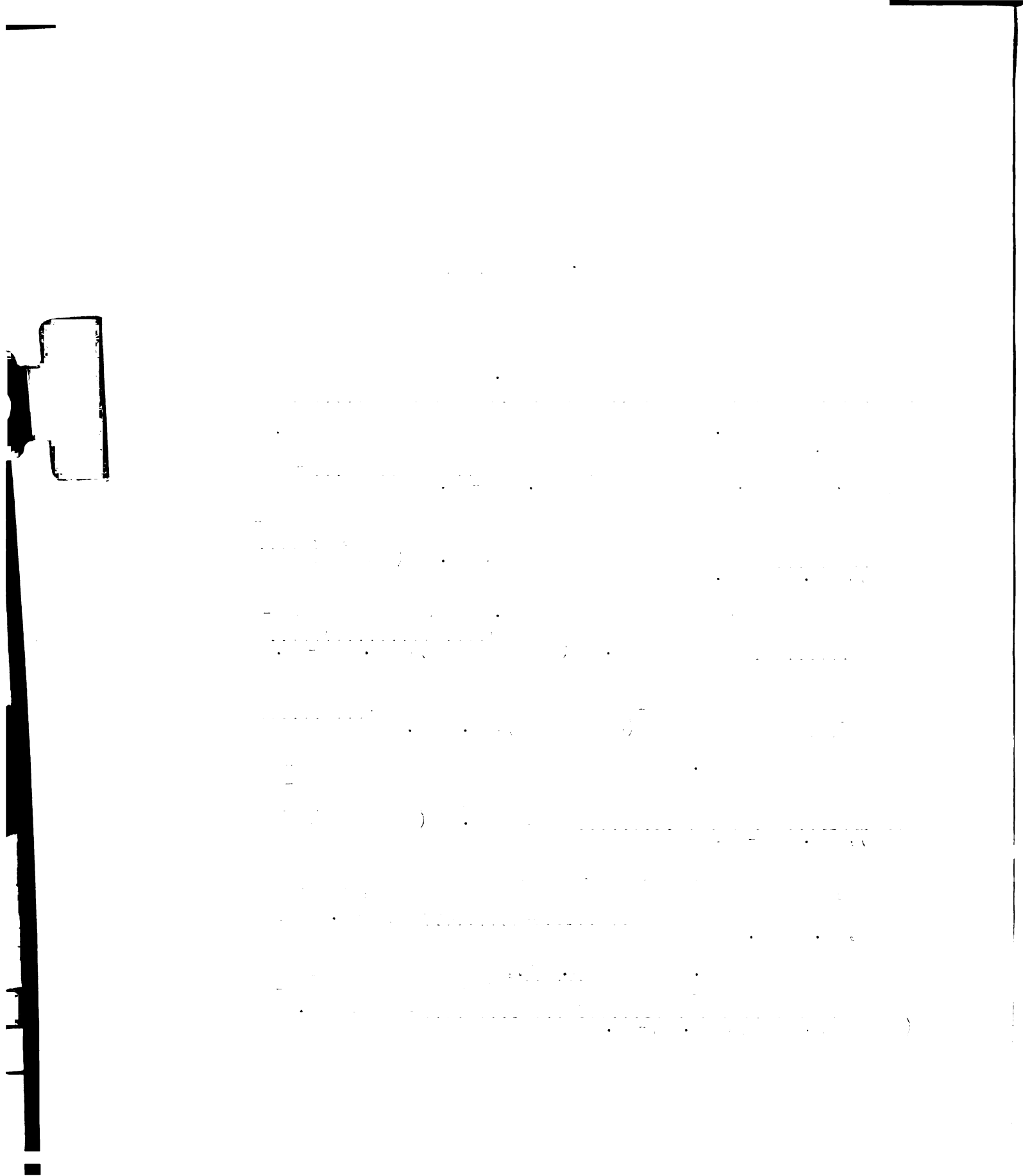
[42]Edna Jenkins and Frances E. Lohr, "Severe Articulation Disorders and Motor Ability," Journal of Speech and Hearing Disorders, XXIX, No. 3 (August, 1964), pp. 286-92.

[43]Louis Lerea and Bruce Ward, "Speech Avoidance Among Children with Oral-Communication Defects," Journal of Psychology, LX, 2nd half (July, 1965), p. 266.

[44]Ernest L. Kronvall and Charles Diehl, "The Relationship of Auditory Discrimination to Articulation Defects of Children with No Known Organic Impairment," Journal of Speech and Hearing Disorders, XIX, No. 3 (September, 1954), pp. 335-38.

[45]Ernest L. Kronvall, "An Investigation of Some of the Factors Frequently Suggested as Causes of Functional Articulation Disorders," Dissertation Abstracts, Vol. XXVI, No. 8, p. 4810.

[46]Ronald K. Sommers et. al., "Effects of Speech Therapy and Speech Improvement upon Articulation and Reading," Journal of Speech and Hearing Disorders, XXVI, No. 1 (February, 1961), pp. 27-38.



provide no phonemic criteria.[47, 48] While the above-cited studies vary considerably in the age range of subjects, most utilize six-year-olds whose "normal" speech may well incorporate 2, 3 or more errors.

For the purpose of this study, subjects have been chosen who exhibit a minimum of 5 misarticulated phonemes, which occur consistently in at least two of the 3 positions (initial, medial, and final) in single word utterances, and whose intelligibility is reduced in running speech. Since the mean age of the children in this study is 8-0, this would indicate on an a priori basis, that a severe articulatory defect exists. This is a more stringent application of defectiveness than has been heretofore applied.

Application of the term functional or psychogenic for this study incorporates the Power's definition quoted early in this section. Each subject was evaluated for structural, physiological, or neurological disorders based upon case history, school records, medical reports, and an oral peripheral examination, as well as gross and fine motor evaluation. Children with known organic, neurological or brain-injured syndromes were rejected from the sample.

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[47]Dorothy K. Marge, "The Social Status of Speech-Handicapped Children," Journal of Speech and Hearing Disorders, IX, No. 2 (June, 1966), pp. 165-78.

[48]Genivieve Arnold, "The Illinois Test of Psycho-Linguistic Ability and Severe Articulatory Problems," ASHA Convention Abstracts, V, No. 10 (October, 1966), p. 789.

Dyslalia. This term refers to defective articulation due to faulty learning or to abnormality of the external speech organs and is not due to lesions of the central nervous system.[49] In this study, dyslalia is referred to solely as defective articulation resulting from faulty learning.

Dyslexia. This term has been variously defined as partial inability to read characterized by associative learning difficulty and as a form of dysphasia by Wood,[50] or as a symptom of congenital language disability by Arnold,[51] or as a specific reading disability known as specific dyslexia, implying an idiopathic condition, by Kessler.[52] For the purpose of this study, dyslexia is defined as a partial inability to read, a disorder of unknown etiology, and specific dyslexia is a symptom of general language disability.

Test Variability. According to Wechsler, test variability defines two types of erraticism in performance, i.e.

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[49]Kenneth S. Wood, "Terminology and Nomenclature," Handbook of Speech Pathology, ed. Lee Edward Travis (New York: Appleton-Century-Crofts, Inc., 1957), p. 54.

[50]Ibid.

[51]Godfrey E. Arnold, "I. Present Concepts of Etiologic Factors," Studies in Tachyphemia (New York: Speech Rehabilitation Institute), p. 11.

[52]Jane W. Kessler, Psychopathology of Childhood (Englewood Cliffs, New Jersey: Prentice-Hall, Inc.), p. 147.

inter-test and intra-test variability.[53] Inter-test variability is often referred to as "scatter" or the unevenness in "the level of achievement on different subtest groups or tests. One can observe scatter in the distribution of passed and failed tests."[54] Scatter is also defined as the intra-individual configuration or pattern, or the "interrelationship of functions underlying the individual's achievements on various subtests."[55]

For the purpose of this study, inter-test variability, scatter, and patterning will all refer to the variation in performance by the subject on the sub-tests of the Wechsler Intelligence Scale for Children.

Anxiety. Among selected definitions of anxiety appear the following: (1) it is a feeling, or affect, of a particularly unpleasant nature which may limit the individual's freedom of action;[56] (2) it is a disruptive state which reflects itself in fluctuations in attention and inability to concentrate.[57] Wechsler states that some of the WISC sub-

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[53]David Wechsler, The Measurement and Appraisal of Adult Intelligence (Baltimore, Maryland: The Williams and Wilkins Co., 1958), p. 162.

[54]Erica Fromm and Lenore Hartmann, Intelligence, A Dynamic Approach (Garden City, New York: Doubleday and Co., Inc., 1955), p. 45.

[55]Ibid.

[56]Kessler, op. cit., p. 44.

[57]Wechsler, op. cit., pp. 175-75.

tests are more sensitive to anxiety, such as Arithmetic, Digit Span, Digit Symbol, and Coding.[58]

For the purpose of this study, anxiety is defined as a disruptive state which may be reflected by the depression of certain sub-test scores.

Intellectual Dysfunction. Intellectual dysfunction may be of two types. General intellectual dysfunction is referred to as intellectual inhibition effecting observable behavior, while learning disabilities are simply intellectual dysfunctioning limited to scholastic endeavors.[59] The latter definition is reflected in Wechsler's statement that intellectual functioning may be thought of as the "ability to learn."[60] Thus, intellectual dysfunction is the inability to learn.

For the purpose of this study, intellectual dysfunction is defined in a very restrictive fashion, i. e., the depression of the sub-test scores indicating disability in learning.

Organization of the Report

Chapter I has introduced the concept of functional disorders of articulation and its importance to general speech and language function, as well as its relationship to verbal

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[58]Wechsler, op. cit.

[59]Fromm and Hartmann, op. cit., p. 25.

[60]Wechsler, op. cit., pp. 4-5.

performance as measured by standardized tests of intelligence. The problem of this paper was presented, viz., the evaluation of the verbal and non-verbal functioning level of children exhibiting severe articulatory defects as compared with normal children on the Wechsler Intelligence Scale for Children. Several terms encountered in the current study were defined and discussed.

Chapter II presents a comprehensive overview of the literature related to past research in the areas of articulation, psychogenic disorders, intelligence testing, linguistic functioning, intellectual patterning, and parent-child relationships. These areas will be considered in the following order: (1) development of articulatory skills, (2) Psychogenic aspects of articulatory skills, (3) intelligence testing variability as related to articulation and language skills, (4) dyslalia and dyslexia as related linguistic functions, and (5) the influence of parent-child interaction upon functional articulatory disorders.

Chapter III presents the procedures related to this study, including selection of subjects and test administration.

Chapter IV details the results of the statistical analyses. The results of this study are discussed with regard to the hypotheses set forth in Chapter I. The findings of this study are related to previous research.

Chapter V presents a summary of the present study. Conclusions are drawn on the basis of the analysis, and recommendations for further research are made.

CHAPTER II

REVIEW OF THE BACKGROUND LITERATURE

There has been considerable research over the past years which indicates that the development of articulatory skills is dependent upon much more than a normal physiological substructure. Everhart reviewed the growth and developmental factors in articulatory maturation as identified in the literature during the past 15 years reported that

> whether or not the child develops acceptable patterns of articulation depends upon numerous complex and multi-dimensional elements. In the final analysis, it is not practicable to relegate articulatory maturation to any one single variable of growth and development. Actually, competency in articulation seems to focus upon the extent to which all developmental propensities contribute to the eventuation of speech out of the psycho-physical systems inherent in the human organism. The maturation of articulation in many children does not proceed in an orderly cycle, but is subjected to various disturbances imposed by individual deviations in sequence, rate and pattern of growth and development.[61]

In a somewhat more simplified statement, Myklebust indicated that three "integrities" are necessary for the acquisition of language: (1) the integrity of the peripheral nervous system, (2) the integrity of the central nervous

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[61]Everhart, "Literature Survey of Growht and Development Factors in Articulation Maturation," op. cit., p. 59.

system, and (3) the integrity of the emotions.[62] Milisen further defines such a triumvirate in his statement that

> conditions which precipitate and maintain articulation defects after the child has begun to speak are only an extension of the conditions which limited the production and differentiation of sounds and which interferred with the development of a communication attitude before he began to speak. . . . This concept that misarticulation is a substitute response precipitated by a breakdown in the normal learning process should simplify articulation therapy because one does not need to create distinct types of therapy for all of the 'organic' and 'non-organic' groups. He will instead deal with each case on its own merits which will be determined primarily by behavior and speech performance, not by appearance and inheritance.[63]

While others might not agree with the therapeutic approach suggested above, there would be considerable agreement among research workers in the area of articulatory disorders that articulation defects are related to environmental conditions and communication attitudes.[64, 65, 66]

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[62]Helmer Myklebust, "Language Disorders in Children," Exceptional Children, XXII, No. 4 (January, 1956), pp. 163-64.

[63]Robert Milisen, et. al., "The Disorder of Articulation: A Systematic Clinical and Experimental Approach," Journal of Speech and Hearing Disorders, Monograph Supplement No. 4 (December, 1954), p. 8.

[64]Ernest Henrickson, "Psychological Aspects of the Development of Speech and Language, "Archives of Physical Medicine Rehabilitation, XXXXI, No. 3 (March, 1960), pp. 95-102.

[65]Everhart, "The Relationship between Articulation and Other Developmental Factors in Children," op.cit., p. 332.

[66]Powers, op. cit., p. 711.

Many speech pathologists feel that it is the communication attitude of the speech defective himself which contributes heavily to the etiology of articulatory defects.[67, 68, 69] Others have found little or no correlation between disturbed communication attitudes and articulatory skills.[70, 71] Some point an accusing finger at the mother-child relationships as the crux of both the articulatory disorder and the child's personality difficulties. McCarthy summarizes much of this research by saying

> When the child whose speech is not developing normally is examined, it is usually found that there have been anomalies of language development present in one form or another throughout

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[67]Lerea and Ward, op. cit., pp. 265-70.

[68]Arthur L. Solomon, "Emotional and Behavior Problems of First Grade School Children with Functional Defects of Articulation," ASHA, II, No. 10 (October, 1960), p. 378.

[69]Arthur L. Solomon, "Personality and Behavior Patterns of Children with Functional Defects of Articulation," Child Development, XXXII, No. 4 (December, 1961), pp. 731-37.

[70]O. W. Nelson, "An Investigation of Certain Factors Relating to the Nature of Children with Functional Defects of Articulation," Journal of Educational Research, XXXXVII, No. 3 (November, 1953), pp. 211-16.

[71]Leonard Goodstein, "Functional Speech Disorders and Personality: A Survey of the Research," Journal of Speech and Hearing Disorders, XXIII, No. 4 (December, 1958), pp. 359-75.

> his life. These language disorders tend to appear in children who manifest certain types of personalities.[72]

There have been a number of conflicting studies in this general area. For example, Andersland reports that a relationship exists between children's articulation skills and maternal scores on certain personality tests which purport to measure hostility and rejection.[73] Lerea, however, reported that no relationship existed between the rated severity of children's articulation disorders and the personality of the mother.[74] Mowrer's current theory of speech acquisition, however, tends to stress the role of vocalization by the mother and the necessity for verbal and physical interaction between the mother and child.[75] McCarthy's research indicates that children who enjoy only a minimum of individualized adult contact in early childhood have poorer speech and language. She indicates that since the mother is normally

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[72]Dorothea McCarthy, "Language Disorders and Parent-Child Relationships," Journal of Speech and Hearing Disorders, XXX, No. 4 (December, 1954), pp. 514-23

[73]Phyllis Andersland, "Maternal and Environmental Factors Related to Success in Speech Improvement Training," Journal of Speech and Hearing Research, IV, No. 4 (December, 1961), pp. 79-90.

[74]Louis Lerea, "Assessing Language Development," Journal of Speech and Hearing Research, I, No. 1 (March, 1958), pp. 75-85.

[75]O. H. Mowrer, "Speech Development in the Young Child: 1. The Autism Theory of Speech Development and Some Clinical Applications," Journal of Speech and Hearing Disorders, XVII, No. 3 (September, 1952), pp. 263-68.

the child's first language teacher in our culture, "it stands to reason . . . that the kind of nurture the child receives during this important formative period will have much to do with determining the facility with which he acquires speech."[76]

Goodstein cites poorly controlled studies utilizing a very small number of subjects as factors which make reliable conclusions regarding the relationship between personality factors and articulatory disorders as unable to be demonstrated. He reviewed the literature in the Journal of Speech and Hearing Disorders, Psychological Abstracts and Speech Monographs over a 25 year period, ending with December, 1957, issues. He reported that only two systematic investigations of the relationship between parental adjustment and the presence of functional articulatory defects in children had been conducted during the past 25 year period.[77] (However, when the author of this study reviewed the two systematic investigations, it was found that both utilized subjects with organic speech defects, not subjects with functional articulatory problems.) To continue, Goodstein then summarized the studies on the personality and adjustment of children with functional

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[76]McCarthy, op. cit., p. 515.

[77]Leonard Goodstein, "Functional Speech Disorders and Personality: A Survey of the Research," op. cit., pp. 359-73.

articulatory disorders by pointing out that five studies reported a positive relationship between functional articulatory disorders and personality, with all five reporting emotional disturbances in the speech-defective child. The four studies which reported no relationship between personality and articulatory disorders used the children's form of the California Test of Personality, which Goodstein felt was not an instrument appropriate for the task.[78]

Goodstein's survey of the literature does not cover any research which has occurred during the past decade, although his summary statements are still reflected in many, if not most, of the medical, educational, psychological and speech pathology references on this subject. Kessler, for example, points out in her comprehensive compendium of child psychopathology that it is "common professional practice for articulation disorders to be treated by speech therapists alone. For this reason, plus the fact that articulation disorders usually do not have an overwhelming effect on the total personality, " she indicates that psychologists primarily concern themselves with problems of delayed speech and stuttering.[79]

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[78] Ibid.

[79] Jane W. Kessler, op. cit., p. 130.

Pediatricians also tend to feel that unless speech intelligibility is severely reduced, articulatory disorders may be considered as inconsequential, representing only a maturational lag which time will heal. Medical journals often recommend that speech defects "as evidenced by stuttering, cluttering, stammering, or dyslalia should be noted" and included in clinical work-ups, however.[80]

Recent research within the field of speech pathology indicates that speech defective children, particularly those with articulation defects, are somewhat less popular with their peer groups than are normal-speaking children, when measured in school settings by sociometric techniques.[81] In addition, there appears to be a relationship between paternal occupational class and articulatory defectiveness. Paternal status is said to be significantly related to both early speech maturation for upper occupational groups and to severe articulatory disturbances in children for the two lowest occupational classes.[82]

Such references to occupational class and social status appear to be confirmed by current research projects conducted by speech pathologists functioning in

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[80]Keith Hammond and Hans G. Keitel, "Childhood Academic Underachievement," Medical Science, (December, 1964), p. 63.

[81]Marge, loc. cit.

[82]Weaver, Furbee and Everhart, op. cit., p. 174.

Head Start programs. Irwin recently reported on such an experimental program, indicating that 94% of the children in the program (ages 4-5 to 6-0) had articulatory errors, and 71% had moderate to severe articulatory disorders. In addition, Irwin pointed to a language deficit which encompassed a depressed vocabulary as well as numerous misarticulations.[83]

A relationship between articulatory ability and language ability has long been postulated. Over a decade ago, Schneiderman reported that these language variables showed an increase with growth in both mental age and chronological age.[84] Among disadvantaged children, such language factors are reportedly delayed. Head Start therapists reported that since verbal behavior was not sufficiently reinforced in the home, verbal responses tended to be diminished in both quantity and quality upon school entrance. The stimulus deprivation found in the marginal circumstances of individuals in low-income, socio-disadvantaged areas appears to be related to language deficiencies. The environmental milieu

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[83]Ruth Becky Irwin, "A Study of Certain Linguistic Skills of Children in Project Head Start of the South-Western School District," Paper read before the American Speech and Hearing Association's 42nd Annual Convention, Washington, D. C., November 12, 1966.

[84]Norma Schneiderman, "A Study of the Relationship between Articulatory Ability and Language Ability," Journal of Speech and Hearing Disorders, XX, No. 4 (December, 1955), pp. 359-64.

provided in such circumstances may also serve to reduce the attentivity and auditory perceptual skills of such pre-school children. Allen indicates that when a child learns to be inattentive prior to school attendance, this lack of attentivity reduces even further the perception of incoming auditory stimuli.[85]

Verbal language recognition requires that the individual "be able to organize a complexity of acoustic events into multitudinous patterns by certain rules of probability.[86] Both attentional patterns and interpretive ability are thus seen as significant factors in the development of articulatory skills in children. The phonetics Limits Test, devised by Young, is designed to measure both auditory perception and interpretive ability. It provides for phonetic analysis and synthesis relative to a whole word construct without benefit of the total configuration. According to Young, even 3 and 4 year olds who showed little evidence of conscious analysis were able to respond appropriately, thus suggesting that such auditory tasks are perceived as a sudden closure of

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[85]Evelyn Y. Allen, "A speech and Language Development Program for Children in Operation Head Start," Paper read before the American Speech and Hearing Association's 42nd Annual Convention, Washington, D. C., November 12, 1966.

[86]Norton B. Young, "Phonetic Limits of Word Recognition in Children," Paper read before the American Speech and Hearing Association's 42nd Annual Convention, Washington, D. C., November 13, 1966, p. 1.

auditory Gestalten. Children with articulatory disorders exhibited a poorer performance on this listening task than did normal-speaking 4 and 5 year olds. It was postulated that there may be a relationship between the child's auditory perception and integration of certain phonemes and his own specific articulation errors.[87]

Allied studies report a variety of auditory-perceptual performances by speech-defective children which are less adequate than performances by normal children. Kronvall reports that delay in discriminative auditory skills may be due to a slow maturation of this function in children with defective articulation.[88] Masland and Case state that auditory behavior is a "most important aspect of language development, when factors of mental retardation, impairment of hearing acuity, and emotional illness have been ruled out."[89] They considered four facets of auditory memory in their study: (1) Memory span, which included not only duration of auditory attention, but also the number of bits of auditory information which can be recalled in relation to the rate of occurrence, (2) sequence, the order in which auditory events are

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[87] Ibid., pp. 8-9.

[88] Kronvall, loc. cit.

[89] Mary Wooton Masland and Linda W. Case, "Limitation of Auditory Memory as a Factor in Delayed Language Development," De Therapia Vocis et Loquelae, et Phoniatriae, XIII Congressus Vendobonae Anno MCMLXV Acta, p. 81.

recalled, (3) patterning of stress, inflection and rhythm, and (4) patterning of phonetic detail. All of these are presumably related to the process of serial order temporal integration, which is the basis for the language process itself. The authors concluded that children with articulatory difficulties reveal aberrations of auditory memory, as defined in their study.[90]

A well-designed and controlled study, although with a limited N, indicates that children whose verbal communication difficulties are related to maturational lags have both short auditory memory spans and undifferentiated auditory discrimination. Auditory-perceptual Gestalten is reportedly poor and language reception is diffuse. Among other symptoms, these children reveal defective articulation, immature syntax, primitive sentence construction and awkward formulations.[91]

A considerable number of studies also reveal that not only is auditory memory decreased in severely articulatory-defective children, but that selected motor skills are also depressed.[92] In a recent unpublished report,

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[90] Ibid., p. 82.

[91] Katrina De Hirsch, Jeannette Jefferson Jansky and William S. Langford, Predicting Reading Failure: A Preliminary Study, (New York: Harper & Row, 1966), p. 88.

[92] T. David Prins, "Motor and Auditory Abilities in Different Groups of Children with Articulatory Deviations," Journal of Speech and Hearing Research, V, No. 2 (June, 1962), pp. 161-68.

Luper and Price found that children with articulation problems "were differentiated from children with normal speech on tests of auditory perception and auditory motor perception."[93]

There is not unanimity among the studies, however. Sandy states, based on a study involving an N of 132, that

> even though past studies suggest positive relationships, this study indicates that those with many articulation errors compared with those with few do not display (1) more difficulty with auditory discrimination tasks, (2) more incoordination in performance of movements necessary for successful production of speech sounds, (3) no abnormal degree of feelings, or (4) lower IQ's as measured by the Pintner-Cunningham Primary Test.[94]

Winitz and Lawrence in a study of 96 kindergarten children with good and poor articulation found them to be equally facile in learning to perform a sound task consisting of sounds not present in the English language, and concluded that their findings contraindicate the presence of any factors, either physical or psychological, that inhibit or decelerate "sound learning ability."[95]

The area of articulatory skills as related to gross and fine motor abilities has also been explored. Jenkins and Lohr evaluated 80 subjects at the first grade

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[93]Letter from Harold L. Luper, Ph. D., Head of the Department of Audiology and Speech Pathology, The University of Tennessee, Knoxville, Tennessee, December 8, 1966.

[94]Don Sandy, "Auditory discrimination and Articulation Proficiency of Kindergarten Children," Dissertation Abstracts, XXVI, No. 8, p. 4891.

[95]Winitiz and Lawrence, loc. cit.

level, with no known emotional or physical disabilities, utilizing the Oseretsky Test of Motor Proficiency. They reported that the children with severe articulatory defects had more difficulty in motor proficiency than did children without severe articulation disorders.[96]

Difficulty with fine motor tasks, such as that measured by the WISC digit-symbol sub-test, was also found in a study of 18 children with a median age of 9 years who had severe articulatory disturbances. While this study may be viewed as simply another visual-motor task, and the results interpreted as another example of motoric deficiency on the part of severely articulatory-defective children, the authors chose this particular sub-test of the WISC as a measure of anxiety. They based this upon the assumption, held widely in clinical circles, that children with functional articulatory defects frequently suffer from excessive anxiety. They hypothesized that if the severity of the speech disorder was a function of anxiety level, differential performances should be obtained between mild and severely articulatory-deficient children. Using three groups of matched pairs of 18 children each (normal-speaking children, mild articulatory-defective children, and severe articulatory-defective children), They report that the "severe" group did

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[96]Jenkins and Lohr, loc. cit.

significantly less well than did the "mild group or the "normal" group.[97] The psychogenic aspects of articulatory disorders will be further explored in the next section of this chapter.

A discussion of the development of articulation skills would be incomplete without reference to its importance as a primary symptom and a major component of any number of so-called learning disabilities, whose etiological factors are currently being investigated. There is considerable confusion and nosological overlapping among such terms as "general language disability", "specific language disability", "minimal brain damage", "congenital language disability", and others.

Clark defines general language disability, when it occurs "in older children", as an articulation disorder "other than a lisp" and refers to it as a condition based upon constitutional and inheritable neurological factors.[98] Arnold defines specific language disability (known as SLD) as related to congenital language disability and a familial, hereditary and idiopathic syndrome is hypothesized. He defines articulation disorders as encompassing infantile

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[97]E. Philip Trapp and Janet Evans, "Functional Articulatory Defects and Performance on a Nonverbal Task," Journal of Speech and Hearing Disorders, XXV, No. 2 (May, 1960), pp. 176-80.

[98]Ruth Clark, "General Language Disability: Use of Psychological Tests in Diagnosis, " Studies in Tachyphemia, (New York: Speech Rehabilitation Institute, 1965), pp. 87-91.

dyslalia, residual dyslalia, and pararthric speech. Linked with psycho-motor disabilities known as motor infantilism, habitual clumsiness, developmental awkwardness and delayed motor maturation, the articulatory disturbance is transformed into SLD.[99] Other authors may classify the symptomatology differently, referring simply to "learning disorders," the primary symptoms of which may be dyslexia and articulatory errors, frequently with "known brain damage" excluded.[100]

"Central language disorders," as a term, may refer to subjects without central nervous system dysfunction, although the utilization of the term "central" would appear to imply such an organic component. For example, children operationally defined as those "who exhibit specific disabilities in language and communicative skills" are seen as having a central language disorder, but are "not retarded."[101]

Another term in current use is that of "the interjacent child". This is a child who may exhibit marginal

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[99]Godfrey E. Arnold, "I. Present Concepts of Etiological Factors," Studies in Tachyphemia (New York: Speech Rehabilitation Institute, 1965), pp. 6-7.

[100]James C. Coleman and Malathi Sandhu, "Intellectual Level and Background Factors in Learning Disorders," Psychological Reports, XVII, (August, 1965), pp. 69-70.

[101]Matilda McIntire, John Wiley and William Wolski, "Central Language Disorders as Seen in a Mental Retardation Clinic," The Journal-Lancet, LXXXVI, No. 7 (July, 1966), pp. 374-75.

or weak "but not altogether deficient" aptitudes or modality functioning. These children also reveal articulation disorders and "propositional weakness," as well as poor syntactical formulation and vocabulary.[102] The interjacent child would also appear to suffer from a central nervous system disorder, since Doll points out that "his CNS impairment has been called 'neurophrenic,' (and this) . . . implies that his abnormal behavior is related to neuropathology. The organic bases as to site, structure or function have not yet been clearly catalogued. Some pediatric neurologists have reported that present techniques in this field do not permit precise evaluation of the constitutional foundations but rather these must be inferred from behavior symptoms."[103]

Behavioral descriptions abound throughout the clinical and research literature. The language behavior of the types of children described above almost always encompasses an articulation disorder. In congenital language disability, as in many of the other disorders described, it is characteristic to find the verbal IQ significantly lower than the performance IQ.[104]

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[102]Edgar A. Doll, "Education and the Interjacent Child," Paper read before a Vanguard School audience at Roberts Hall, Haverford College, Haverford, Pennsylvania, January 30, 1965, p. 1.

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

[104]Godfrey E. Arnold, "The LLMM Theory of Language Disability," A paper read before the Northern Section of the California Speech and Hearing Association, San Francisco, California, April 4, 1964, p.1.

There is, as yet, no agreement as to whether or not general or specific language disabilities, central language disorders, or even dyslexic children suffer from an organically-based, but presently non-measurable disorder. There is consensus, however, that children with severe misarticulations who are presently classified as "functional articulation problems" are much in evidence among the children suffering from these disabilities.

Psychogenic Aspects of Articulatory Skills

Myklebust, in referring to the child's need for emotional integrity prior to the development of normal language, states that

> unless the child continues to identify with the talking human, unless he finds language enjoyable instead of threatening and anxiety-producing, he might reject the world of talking. This means that disturbed or lack of language development may occur on a psychological basis as a result of emotional disturbance.[104]

It is almost universally assumed that this process of identification and the consequent influence of "mothering" upon young children is an important factor not only in articulation disorders, but in many other types of speech disorders.[105, 106, 107, 108, 109]

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[105] Myklebust, op. cit., p. 164.

[106] Henrikson, loc. cit.

[107] McCarthy, op. cit., p. 515.

[108] Mowrer, loc. cit.

[109] Milisen, op. cit., p. 16.

However, very few of the studies attempting to measure maternal-child interaction and its influence on subsequent articulatory disorders have been eminently successful. Andersland reported that only by analyzing the extremes of the personality test scores given to mothers of articulatory-defective children was she able to find a relationship which indicated a positive correlation. When the mothers were so poorly adjusted as to need psychotherapy, she reported that their attitudes "may have a detrimental effect on their children which might be evidenced by functional articulatory errors. The mothers thus identified were found to have needs for achievement outside the home, to lack motivation for care of others and to show aggressiveness in interpersonal relationships.[110] Moll and Darley, utilizing a similar research design and identical measurement instruments, found that mothers of children with impaired articulation but no retardation in other language areas, scored higher on "breaking the will" and "taking the natural meanness out of the child." These mothers also expressed disapproval of children's activities more than did mothers of normal children or of delayed-speech children. While trends were noted, no significant differences were found. The authors explain it in this manner:

> A more likely explanation of the lack of discrimination is that the generally low reliabilities of these attitude scales make them relatively insensitive to

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[110]Andersland, op. cit., p. 89.

> subtle differences in maternal attitudes. Results of previous research indicate that differences which exist between these three populations are probably fairly small.[111]

Speech pathologists and psychologists with wide clinical backgrounds often report that the child's speech behavior is indirectly related to the parental behavior under discussion. For example, Nichols reports that some children may be willing to pay the price of continuous speech surveillance but that "others may be resentful that their need for love is being exploited to serve the demands of society for clear articulation. Still others may be fighting two battles, one against a perceptual or physical disability and another against parental domination."[112] DeHirsh, with twenty years of clinical and assessment experience, points out that dyslexic and dyslalic children reveal the following kinds of behavior:

> We were struck by the diffuseness of these children and by their difficulty in mobilizing energy in the service of a goal. It is possible, of course, that maternal anxiety played a part here. . . . Such maternal anxiety may flow over to the children and inhibit their freedom to function in a variety of ways.[113]

The maternal personality structure found in studies which

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[111]Moll and Darley, op. cit., p. 384.

[112]Alan C. Nichols, "Allocation of Time in the Articulation Program: Applications of Research," ASHA, VI, No. 1, (January, 1964), p. 9.

[113]DeHirsch, Jansky and Langford, Predicting Reading Failure, op. cit., p. 68.

utilized children with known organic defects, such as cleft palate, however, was found to be undifferentiated from the maternal personality structure of the mothers of normal-speaking children.[114,115]

When considering the speech-defective child, himself, there is considerable agreement among the authorities that speech is not "merely verbal" and speech disorders are not "mere symptoms."[116] Language, it has been pointed out,

> has been viewed by behavioral scientists as a centrally important variable in understanding the behavior of human beings. Cognitive, conceptual and adaptive behaviors have been thought of as depending to a large extent on functional language. The heavy weighting of verbal items on most measures of intelligence bears witness to this fact. The dependence of language development on early sensory and motor experience has been highlighted by the work of such psychologists as Hebb and Piaget.[117]

Dokecki concludes that a related and complementary point of view is

> that language dictates the way in which an individual interacts with his environment. . . . The important point to note here is that the modern psychological zeitgeist does not view language as

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[114]Lerea, loc. cit.

[115]Goodstein, loc. cit.

[116]Wendell Johnson, "Are Speech Disorders 'Superficial' or 'Basic'?" ASHA, III, No. 8 (August, 1961), pp. 233-36.

[117]Paul R. Dokecki, "Verbalism and the Blind: A Critical Review of the Concept and the Literature," Exceptional Children, XXXII, No. 8 (April, 1966), pp. 525-32.

> an ancillary function or one that merely exists alongside others. Rather, language is seen as being an important variable affecting other psychological processes, as well as being affected by these processes. To put it another way, experience is important in determining language, but language is also important in directing the course of experience.[118]

There seems to be some evidence that personality correlates which exist in conjunction with articulation defects may also be effected by age differentials. Templin reported several years ago that the more severe the articulatory defect in the college-age adult, the more aggressive he became. However, the level of aggression was initially very low. In a study of 49 normal speakers, 37 articulatory-defective speakers, 15 defective voice speakers and 19 stutterers, the average aggressiveness of the articulatory defective group was the lowest of the 3 groups of speech defectives and significantly lower than that of the normal group. She concluded that when the degree of the articulation defect was considered, however, the subject tended to become more aggressive as his defect became more severe.[119]

Children with functional articulatory disorders are reported to be socially and emotionally maladjusted, and,

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[118] Ibid.

[119] Mildred Templin, "A Study of Aggressiveness in Normal and Defective Speaking College Students," Journal of Speech Disorders, III, No. 1 (March, 1938), pp. 43-49.

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in particular, to have feelings of inadequacy.[120] Children suffering from severe functional articulatory problems are reported to possess a high level of anxiety,[121] and to be withdrawn and constricted in their social relationships.[122]

In a study of 36 children with functional articulation problems in Grades Four, Five and Six, with matched controls, Greenberg concluded that there was a relationship between personality and articulatory errors although the nature of the relationship could not be determined. He noted tendencies on the part of the speech defective group to be more dependent upon others, to show more defensiveness, to maximize frustration situations, to be less well-adjusted in home and school and to be more insecure generally.[123]

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[120] C. Hill, "Problems Connected with the Intelligence Assessment of Children with Defective Speech," New Zealand Speech Therapists' Journal, IX (September, 1954), pp. 7-10.

[121] Trapp and Evans, loc. cit.

[122] B. A. Deming, "A Study of the Emotional Adjustment of Functional Articulation Cases as Indicated by the Bender-Gestalt Test" (unpublished Master's thesis, University of Oklahoma, 1952), cited by Spriestersbach, loc. cit.

[123] K. R. Greenberg, "A Study of the Relationship between Articulatory Disorders and Personality in the Intermediate Grades" (unpublished Master's Thesis, Ohio State University, 1952), cited by Spriestersbach, loc. cit.

Solomon, in a study of 49 speech defective children with articulation disorders and a matched group of normal speaking children in terms of age, sex, grade placement and intelligence reported that

> . . . the hypothesis that functional defects of articulation are not isolated phenomena but appear as a part of the total adjustment pattern was supported. . . . Infantile and nonassertive behavior could very well serve as anxiety-reducing devices to meet the environmental pressures.[124]

In another study, Solomon reported that children with functional disorders of articulation tended to be passive children who internalized their responses and were characterized by submissiveness, timidity, and a need for approval. He hypothesized that these personality traits might represent a refusal to acquire socially acceptable functions because of unfavorable stress or environmental pressures.[125] Lerea and Ward also found children who had been diagnosed as severe functional articulation defectives as expressing a greater number of avoidant responses than did children with only a few misarticulations. They concluded that the severity of a speech disorder seemed to be related to speech avoidance. They stated

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[124]Solomon, "Personality and Behavior Patterns of Children with Functional Defects of Articulation," loc. cit.

[125]Solomon, "Emotional and Behavior Problems of First Grade School Children with Functional Defects of Articulation," loc. cit.

that

> anxiety, manifested by expressed emotions and avoidant responses in speaking situations may be operant among the children with severe functional articulation defects.[126]

In a study of children who exhibited poor language achievement at the fourth grade level, Wait reported that the anxiety level of these children was such that it not only may have inhibited language achievement, but expression of verbal defense mechanisms as well.[127]

In a study of children with learning disorders, Coleman and Sandhu reported that of 364 subjects, ages 7-0 to 15-9, seen at a University Remedial Clinic, 25% of the total group exhibited speech problems. They concluded that the intelligence of those subjects tested varied significantly only with the incidence of nail-biting and speech problems. They found that 13% of those children with I.Q.'s above 110 exhibited speech problems; 27% with I.Q.'s between 90 and 109 revealed speech abnormalities; and finally, 30% of those with I.Q.'s of less than 89 also exhibited speech problems.[128] In a

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[126]Lerea and Ward, op. cit., p. 269.

[127]Mary E. Wait, "Language Development, Anxiety and Early Socialization Processes," Dissertation Abstracts, XXVI, No. 9, p. 5255.

[128]Coleman and Sandhu, op. cit., pp. 69-70.

separate study, Tjossen, Hansen and Ripley reported that 58% of the underachievers they evaluated and 66% of the children exhibiting enuresis also had speech problems. Speech was reported as "immature" and characterized by substitutions and omissions of speech sounds.[129]

In a review of schizophrenic speech behavior, Burk and Saxman indicated that objective information about the speech characteristics of schizophrenics is limited and inconclusive. Although much attention has been given to the language and thought patterns of psychotics and to their verbal behavior, the authors indicate that the emphasis has been primarily on the content of speech.[130] They do, however, cite a study by Weiss which indicates that there were sharp differences in disturbances of articulation among various groups of schizophrenics.[131] They also report that Green surveyed the speech of 1,891 psychatric patients and found a mean of 8.45

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[129]T. D. Tjossen, T. J. Hansen, and H. J. Ripley, "An Investigation of Reading Difficulty in Young Children," American Journal of Psychiatry, CXVIII, No. 12 (June, 1962), pp. 1104-1113.

[130]K. W. Burk and J. H. Saxman, Acoustic Analysis of Schizophrenic Speech Behavior, Sponsored by the U.S. Department of Health, Education and Welfare, Public Health Service, National Institutes of Health, National Institute of Mental Health, Grant No. NH 07112, Purdue University (Lafayette, Indiana: By the authors, December, 1965), p. 10.

[131]D. A. Weiss, "Logopedic Observations in a Mental Hospital," Folia Phoniatrica, XVI, pp. 130-138, cited by Burk and Saxman, ibid., p. 11.

articulatory errors.[132]

In a study of the communication patterns of schizophrenic children, focusing clincically on speech and voice production, and sub-grouped as "reactive behavior disorders" and "childhood schizophrenia," it was found that

> in articulation, specific sound distortions are common to both the schizophrenic and behavior disorder groups. Complete omission of normally acquired sounds or substitutions is more frequent, however, among the 12 schizophrenic children.[133]

The author of the present study evaluated the speech and language of 60 emotionally-disturbed, hospitalized children in Kalamazoo, Michigan. Of the 60 children examined, 28 displayed significant articulatory difficulties. In a longitudinal study of this group, it was discovered that 66% of the group had received from one to 7 years of public school speech therapy for "functional articulatory disorders" prior to commitment to the hospital for the insane. When these children were compared with other institutionalized children who did not possess such speech defects, they revealed significantly

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[132]Antje E. Green, "Speech of Psychiatric Patients: A Hospital Survey," (unpublished Master's Thesis, Purdue University, 1962), cited by Burk and Saxman, op. cit., pp. 9-10.

[133]William Goldfarb, Patricia Braunstein, and Irving Lorge, "Childhood Schizophrenia Symposium, 1955: 5. A Study of Speech Patterns in a Group of Schizophrenic Children," Journal of Orthopsychiatry, XXVI, No. 3 (July, 1956), p. 548.

greater self-concept difficulty as measured by a drawing task. It was concluded that inadequate articulatory skills and inadequate self-concept, as well as a high degree to resistance to standard speech therapy techniques, were related.[134]

In another study of speech defective children enrolled in public schools and attending a university speech and hearing center, projective testing revealed that 77% of the children revealed significant interpersonal difficulties. Of the 160 subjects in the study, 15% exhibited a high level of fantasy and unmet dependency needs, while approximately 30% were considered to be aggressive and action-prone. Children exhibiting articulation and delayed speech produced more primitive drawings that did children with voice and stuttering problems, indicating that the latter two categories may be reflecting an emotional etiology, rather than a perceptual-motor dysfunction.[135]

Spriestersbach reports on the variability

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[134]Katharine Butler, "Self-Concept as a Psychological Correlate to the Development of Oral Language Skills," Paper read before the American Speech and Hearing Association's 40th Annual Convention, San Francisco, California, November 21, 1964, pp. 7-8.

[135]Katharine Butler, "Psychological Correlates of Speech Defects as Revealed through Projective Techniques," Paper read before the American Speech and Hearing Association's 41st Annual Convention, Chicago, Illinois, November 1, 1965, pp. 1-5.

of functioning of speech defective children in his review of articulatory disorders and current research, and states

> one must also reckon with the possibility that the adjustment problems of this group of speakers may be highly specific to their speech. Perhaps the frustrations of faulty communication have not become generalized maladjustments. If so, testing instruments designed to measure general maladjustment and anxiety states can hardly be expected to identify the differences between these speakers and normal speakers.[136]

In a study of 30 children, mean age 7-1, who exhibited moderate or severe articulatory disorders and who had attended two years of intensive individual speech therapy at a university speech and hearing center, it was found that children who improved their articulatory skills also improved along other dimensions. These children increased not only in articulatory ability, but in vocabulary, syntax, parts-of-speech, visuo-motor skills, and motor proficiency as well. The number of emotional indicators on the Bender-Gestalt decreased as the oral skills increased. Conversely, those children who failed to make significant gains in speech therapy also showed significant increases in the emotional component of their disorder as measured by the Koppitaz scoring of the Bender-

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[136]Spriestersbach, op. cit., p. 334.

Gestalt. In addition, a trend was noted among the group who made little or no articulatory gains during the two year period toward increased withdrawal from contact with the environment, as measured by 3 projective tests and the Brenner Developmental Gestalt Test of School Readiness.[137]

In conclusion, the review of the literature revealed 3 studies which failed to find significant differences between speech-handicapped children and their normal counterparts. Marge, in a study of social status, found no differences in social position of speech defective and normal speakers and reported that it

> was a surprisng finding since it was expected that the difference would be significantly great in light of the traditional view of the adverse effects of speech handicaps. It was noted that teachers' ratings corroborated the findings of the peers.[138]

While Marge indicates that 6 categories of speech difficulty were part of the research design, results are not related to categories of speech defects.

Nelson studied 35 children with functional articulatory difficulties and reported that his subjects were not more poorly adjusted than normal speakers of the same

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[137]Katharine Butler, "Indicators of Emotional Disturbance in School-Age Children with Articulation and Delayed Speech Problems," Paper read before the American Speech and Hearing Association's 42nd Annual Convention, Washington, D. C., November 20, 1966, pp. 1-3.

[138]Marge, op. cit., p. 175.

age. However, the level of articulatory competency was not noted.[139]

Sandy, who utilized 132 children in his study but failed to define either the type or degree of articlatory defectiveness, found that such children had "no abnormal degree of feelings."[140] The measurement instrument upon which this conclusion was based is not cited.

To summarize, the great majority of studies indicate that children with articulatory disorders of sufficient severity do differ significantly from children with normal or only mildly disturbed articulation skills.

Intelligence Testing Variability as Related to Articulation and Language Skills

Intelligence and language skills are measured in a multitude of ways, both generally and specifically. Attempts to correlate any one of the many aspects of these two global concepts result in diversified patterns. For example, Matthews reports that

> in studies which have related I.Q. and onset of speech, or I.Q. and speech proficiency, low correlations have been reported. Abt, Adler and Bartelme (1929) studied 1,000 children excluding those with I.Q.'s below 70 and those who did not begin to talk until after five years.

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[139]Nelson, loc. cit.

[140]Sandy, loc. cit.

> The correlation between age of onset of speech and Binet I. Q. was —.41, indicating that the earlier the onset of speech is, the more intelligent is the child. Bangs (1942) found that when chronological age was held constant there was a correlation of .39 between speech proficiency and mental age. In a study of twelve birth-injured children with defective speech, Doll (1932) reported a correlation of .02 between I.Q. and severity of speech defect. Schlanger (1953c) found a correlation of .37 between mental age and articulation proficiency. Although all of the correlations are low, they do point to a relationship between intelligence and degree of speech involvement.[141]

Milisen, in reporting on the incidence of articulation disorders points out that

> other factors such as intelligence, influence the incidence of articulation defects; Loutitt and Halls (1936) found 2.5 times as many children in classes for subnormals with articulation defects as in the total school population. Wallin (1926) stated that defects of articulation were 'distinctly more prevalent among mental defectives.' However, as Van Riper (1954) pointed out, the speech problem may contribute to the apparent subnormality. Lima (1927) reported that Binet tests of 402 children with speech defects (type unspecified) in the St. Paul, Minn., schools showed a median I.Q. of 97.7, well within the normal range. This sample, however, must not be considered random, since it was a school population from which the 'uneducable' would have been excluded.[142]

Powers discusses the intellectual variables of

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[141]Jack Matthews, "Speech Problems of the Mentally Retarded," Handbook of Speech Pathology, ed. Lee Edward Travis (New York: Appleton-Century-Crofts, Inc., 1957), pp. 538-39.

[142]Robert Milisen, "The Incidence of Speech Disorders," Handbook of Speech Pathology, ed. Lee Edward Travis (New York: Appleton-Century-Crofts, Inc., 1957), pp. 253-54.

articulatory disorders thoroughly, and reports that "the solution of functional articulatory disorders has been sought by many speech pathologists in differences in general intellectual endowment. . ."[143] However, following an exhaustive review of 11 studies, she concludes that the relationship of intelligence to articulatory deficiencies

> has certainly not been shown to be so close that it has much predictive value except within broad limits. At the same time, results of research are consistent in showing a gross relationship, particularly for the low end of the intelligence range. Except for the greater incidence of articulatory deficiency among mentally retarded individuals, intelligence appears to be relatively unimportant as a determining factor in articulatory disorders, at least above the age range during which most speech learning takes place. In short, during infancy and the preschool years intelligence appears to be an important factor in articulation growth. Above that level intelligence bears only a general relationship to articulatory proficiency except when intelligence is below normal limits when it unquestionably affects speech adequacy.[144]

Powers, in a later review of clinical and educational procedures, indicates her bias regarding the interpretation of I.Q. testing.

> With children handicapped in speech it is necessary to be cautious in interpreting intelligence test results. Even when an articulation problem is not severe enough to inter-

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[143] Powers, op. cit., p. 748.

[144] Ibid., p. 750.

> fere with intelligibility, it may still inhibit the child sufficiently so that he fails to make a maximum effort in giving test responses. The intelligence of speech-handicapped children is frequently underestimated on standardized tests. On the other hand, we cannot assume that a child's intelligence is higher than the obtained test result merely because he has a speech problem. It is always advisable to check the results of a 'verbal' type of test, like the Stanford-Binet, with a 'non-verbal' or 'performance' test. A test such as the Wechsler Intelligence Scale for Children (Wechsler, 1949) has the advantage of including both a verbal and a performance scale, each yielding an independent rating.[145]

Just such a study is reported by Vandemark and Mann. They studied oral language development and achievement in 100 matched subjects, 50 of whom had defective articulation and 50 with normal speech. Language scores were derived from language samples in terms of mean length of response, structural complexity, mean of 5 longest responses, number of different words, type-token ratio, and standard deviation of the response length. Only structural complexity scores provided significant differences between the groups. In addition, the Wechsler Intelligence Scale for Children was administered and the performance of the experimental and control groups compared by analysis of covariance. The Performance Scale of the WISC was chosen as the covariant because it was felt to be less dependent upon verbalization and therefore

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[145]Margaret Hall Powers, "Clinical and Educational Procedures in Functional Disorders of Articulation," Handbook of Speech Pathology, ed. Lee Edward Travis (New York: Appleton-Century-Crofts, Inc., 1957), p. 771.

should have been an intelligence measure that was less influenced by differences in oral language skill. The authors concluded that

> children with defective articulation are not inhibited in terms of the amount of verbal output, but they do perform less well in the areas of grammatical completeness and complexity of responses.[146]

Arnold, in a recent study of children with severe articulatory defects, utilizing the Illinois Test of Psycholinguistic Abilities, reported that

> most children with articulation problems have significantly low scores in one or more basic linguistic functions, as measured by the ITPA. Generally, these are in the areas of automatic-sequential abilities which underlie memory for patterning and in automatic use of grammatical structure of language, which is basic to fluent expression of ideas.[147]

Thus it can be seen that grammatical structure as well as verbal expressive skills of children with articulatory disturbances may be depressed when measured by standardized tests.

Braen and Masling attempted to identify the most commonly used intelligence tests by psychologists in measuring the performance of special groups of children, such as

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[146]Ann Ahlstrand Vandemark and Mary Bachmann Mann, "Oral Language Skills of Children with Defective Articulation," Journal of Speech and Hearing Research, VIII, No. 4 (December, 1965), p. 412.

[147]Arnold, "The ITPA and Severe Articulation Problems," op. cit., p. 789.

the speech defective, deaf, blind, etc. They questioned 125 psychologists in public schools, child guidance clinics and centers for the handicapped and found that 48% utilized the standard form of the Wechsler Intelligence Scale for Children, while an additional 25% utilized the WISC with modifications for speech defective children. The Stanford-Binet, Grace-Arthur, and Wechsler-Bellevue were also used, but to a lesser extent. They expressed the opinion that

> from the results of this survey, it is apparent that a good proportion of the respondents prefer to compare the score a handicapped child achieved with the norms available on normal children.[148]

Darley, in referring specifically to children with communication disorders, points out that the Verbal Scale of the WISC is based upon tasks which require verbal expression, but that the Performance Scale, while not requiring verbal expression, does "require an understanding of language."[149]

Goodstein chose the WISC to measure the intellectual performance of children who exhibited articulation defects as a result of an organic problem. He

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[148]Bernard Braen and Joseph M. Masling, "Intelligence Tests Used with Special Groups of Children," Exceptional Children, XXVI, No. 1 (September, 1959), p. 45.

[149]Frederick Darley, Diagnosis and Appraisal of Communication Disorders (Englewood Cliffs, New Jersey: Prentice-Hall, 1964), pp. 106-107.

concluded that

> it is clearly evident . . . that the intellectual impairment of these children with cleft lips and palates is most substantial in the area of verbal intellectual skills.[150]

As indicated earlier, children from culturally disadvantaged environments reflect not only greater articulatory immaturity, but also reveal difficulty in auditory discrimination. In addition, there are low but significant relationships between individual measures of intelligence, achievement and information, as well as vocabulary, as measured by the WISC.[151]

In an attempt to measure the intellectual patterns of gifted, average, and retarded children on the WISC, Gallagher and Lucito found that mentally retarded children, who are known to have a high percentage of articulatory disorders, also did the most poorly on the Vocabulary and Information sub-tests of the WISC. On the other hand, the gifted children tended to score highest in tests involving verbal comprehension, including Information, Similarities, Comprehension, and Vocabulary. The average child in both the Gallagher and Lucito

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[150] Leonard Goodstein, "Intellectual Impairment in Children withCleft Palates," Journal of Speech and Hearing Research, IV, No. 3 (September, 1961), p. 292.

[151] Doris Loper, "Auditory Discrimination, Intelligence, Achievement and Background of Experience and Information in a Culturally Disadvantaged First Grade Population," Dissertation Abstracts, XXVI, No. 10, p. 5873.

sample and in the original standardization sample as reported by the Psychological Corporation, differs from both the gifted and retarded child. While there was no relationship found between the average and retarded samples, there was a negative relationship between the patterns of the gifted sample and the average group. The authors point out that only the gifted sample appears to excel in verbal skills.[152]

While such differences as noted above were found in general population samples, efforts to utilize the WISC performance to provide a basis for differentiating non-defective brain-damaged children from emotionally disturbed children present certain difficulties, according to Rowley.[153] While he found no differences between groups on Verbal and Performance I. Q., in another study Beck and Lam report that "organics" tend to do more poorly on WISC Performance and Full Scale scores than on the Verbal Scale. The possibility of organicity increases considerably as the I. Q. drops to between 70 and 80 on

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[152]James J. Gallagher and Leonard J. Lucito, "Intellectual Patterns of Gifted Compared with Average and Retarded," Exceptional Children, XXVII, No. 9 (May, 1961), pp. 479-82.

[153]V. N. Rowley, "Analysis of the WISC Performance of Brain Damaged and Emotionally Disturbed Children," Journal of Consulting Psychology, XXV, No. 6 (December, 1961), p. 553.

the WISC.[154] Other authors have reported that such discrepancies between Verbal and Performance sub-scale scores may be related to either personality[155] or to specific traits, such as "withdrawal,""restlessness," "enuresis," etc.[156]

In a comprehensive review of Wechsler's work, Guertin, Rabin and Ladd point out that a Verbal-Performance I. Q. discrepancy of 13 or more points is not likely to be spurious in the sense of a statistical measurement error, but that such "real" differences are not unusual in the general population until they reach the magnitude of 25 I. Q. points or more. They indicate that while Wechsler himself felt that 15 or more I. Q. points differential between Verbal and Performance was diagnostically significant and two or more scaled score units was a convenient cut-off point, their work indicates that subtests must

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[154]H. H. Beck and R. L. Lam, "The Use of the WISC in Predicting Organicity," Journal of Clinical Psychology, XI, No. 2 (April, 1955), pp. 154-58.

[155]Fujiro Shinagawa, "Studies of the Relationship between Intelligence Structure and Personality Traits: An Analysis of WISC Discrepancy," Japanese Psychological Research, V, No. 2, pp. 55-62, cited in Psychological Abstracts, XXXVIII, No. 4 (August, 1964), p. 651.

[156]Fujiro Shinagawa, "A Statistical Study of Discrepancy between Verbal IQ and Performance IQ on WISC," Japanese Journal of Child Psychiatry, I, pp. 403-411, cited in Psychological Abstracts, XXXVI, No. 2 (April, 1962), p. 321.

deviate by at least 5.75 weighted score points from the mean of the remaining subtests in order to be significant at the .05 level.[157] They conclude, however, that

> the frequent occurrence of positive studies may be regarded as evidence that analysis of patterns can be meaningful and that something other than the tool might account for the failure of research to provide consistent and definitive answers.[158]

They also point out that inferring other personality variables from intellectual functioning is really an important avenue to diagnosis, although additional work on "scatter" profiles and patterns has not yet led to more solid "diagnostic ground".[159]

Lessing and Lessing provide yet another view on the analysis of the WISC aubtest variability. They point out that clinical inference has held that the WISC underestimates mental ability when the pattern of subtest IQ scores is markedly uneven. In a study in which 188 subjects' WISC subtest scores were reviewed, they concluded that subtest variability does not assist in determining if the child's potential and obtained WISC IQ underestimates

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[157]W. H. Guertin, A. Rabin and C. Ladd, "Research with the Wechsler Intelligence Scale for Adults: 1955-1960," Psychological Bulletin, LIX, No. 1 (January, 1962), pp. 1-25.

[158]Ibid., p. 19.

[159]Ibid., pp. 2-21.

that potential. The authors report that the obtained IQ can be considered as the measure of the child's potential ability level.[160]

For the most part, however, those interested in subtest pattern variability report that potential and obtained WISC IQ's are possible and reflect both intellectual and personality variables.[161, 162, 163, 164] The most clinically oriented maintain that even each subtest item on standardized intelligence tests can tap wide personality dimensions. Fromm, Hartmann, and Marschak, for example, report that such tests tap reality awareness, reality mastery, sensory perception, integrative behavior, the ego ideal, anxiety (either as an affect or as an ego defense) and ego defenses.[165] In an empirical review of the Wechsler, Frank points out that inconclusive and

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[160]E. E. Lessing and J. C. Lessing, "WISC Subtest Variability and Validity of the WISC IQ," Journal of Clinical Psychology, XIX, No. 1 (January, 1963), pp. 92-5.

[161]J. O. Field, "Two Types of Tables for Use with Wechsler's Intelligence Scales," Journal of Clinical Psychology, XVI, No. 1 (January, 1960), pp. 3-7.

[162]Kenneth D. Hopkins and William B. Michael, "The Diagnostic Use of WISC Subtest Patterns," California Journal of Educational Research, XII, No. 3 (May, 1961), pp. 116-30.

[163]G. H. Frank, "Empirical Critique of Research with the Wechsler-Bellevue in Differential Psychodiagnosis," Journal of Clinical Psychology, XI, No. 3 (July, 1955), pp. 291-93.

[164]From, Hartmann, and Marschak, op. cit., p. 142-44.

[165]Ibid.

inconsistent results from utilization of such a test as the Wechsler-Bellevue is not the "fault" of the instrument, but rather the selection of subjects by such criterion measures as psychiatric diagnosis.[166] In addition, Hopkins and Michael indicate that those researchers who generalize findings from group comparisons to the individual case, without making adequate provisions for the great increase in differential required for significance with a sample of one become vulnerable to commission of a Type I error. They conclude, "Obviously, before offering diagnostic interpretations, one should be reasonable sure that there is something other than chance variation to interpret.[167]

In summary, the Wechsler Intelligence Scale for Children, with its Verbal and Performance Scales and its numerous subtests, provides an opportunity for measuring the articulatory-defective child in both language and non-language areas. It has been indicated that children who possess a number of misarticulations also possess some language deficits, and that language deficits may be reflected in complex learning and concept formation difficulties. As Mussen points out

> Language functions primarily as a means of communication at the outset, but gradually becomes the most

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[166]Frank, op. cit., p. 130.

[167]Hopkins and Michael, op. cit., p. 130.

> important mediator and regulator of behavior. . . . From the age of five-and-a-half, almost all new learning involves language.[168]

In stressing the importance of language, he adds

> According to the Russian research reports, behavior that is learned with the use of language is acquired quickly, is highly stable, and generalizes widely, whereas reactions learned without verbal participation are relatively unstable, depend on constant reinforcement, and are easily forgotten. Children over five years of age function and control their behavior primarily by means of verbal stimulation; that is, . . . mediated generalization or verbal mediation.[169]

In considering language skills and the measurement of intelligence, Mussen concludes that "all useful, valid intelligence tests are highly correlated with, and probably depend on, facility in language."[170] What, then, of the child who lacks this "facility in language", this measure of intelligence, at a chronological age level where such facility is taken for granted?

Dyslalia and Dyslexia as Related Linguistic Functions

Children exhibiting dyslalia, i. e. defective articulation due to faulty learning, also reveal many attributes of the dyslexic child as well as the child

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[168]Paul H. Mussen, The Psychological Development of the Child, (Englewood Cliffs, New Jersey: Prentice-Hall, Inc.), (1963), pp. 45-6.

[169]Ibid., p. 46.

[170]Ibid.

with specific learning disorders as noted in Chapter I. Weaver, Furbee and Everhart state that speech and reading are closely associated in the linguistic process involving symbolic formulation, evaluation and expression.[171] In a study of 638 children at the first grade level, they report that there was a significant and continuous drop in reading readiness as the number of articulatory errors increased. They concluded that reading readiness and acquisition of adequate speech are to some extent related, although the proportion of variance common to reading readiness measures and articulation measures is small.[172]

In another study of first-graders, selected from 54 first grades due to their articulatory disorders, Sommers reports that speech improvement was found to significantly affect reading skills, as expressed in reading factor scores. However, reading comprehension scores for children with misarticulations and for children with normal articulation were not significantly changed by speech correction procedures. They indicate that there was one exception. Twenty-five children who exhibited severe articulatory defects, defined as 6 or more errors in the 10 consonant sounds used in the study, did show significant changes in both reading comprehension and reading skills,

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[171] C. H. Weaver, Catherine Furbee and Rodney W. Everhart, "Articulatory Competency and Reading Readiness," Journal of Speech and Hearing Research, III, No. 3 (June, 1960), pp. 174-80.

[172] Ibid.

as well as improved articulatory skills.[173]

Yedinack reported considerable overlap between children with articulatory and reading disabilities, indicating that 40% of a group of second grade "poor readers" also had articulatory defects and 38% of a group of cases identified as having articulatory defects also suffered from reading disabilities.[174] Cass found that children with reading problems were deficient in sound-blending, as defined by the 1932 Monroe test, more familiarly known to speech pathologists as synthesis and analysis of phonemes. While these children revealed no known defects in auditory or visual acuity, they were unable to identify a series of separated sounds which form a word. This deficiency was at the .001 level of significance.[175]

As in the discussion of articulatory skills, the current research in the area of dyslexia also has a number of proponents who feel that poor or non-readers have a subtle central nervous system disorder. Penn reviews

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[173]Ronald K. Sommers, et. al., "Effects of Speech Therapy and Speech Improvement upon Articulation and Reading", Op. cit., pp. 27-38.

[174]J. G. Yedinack, "A Study of Linguistic Functioning of Children with Articulation and Reading Disabilities," Journal of Genetic Psychology, LXXIV, 1st half, (March, 1949), pp. 23-59.

[175]Corrine Kass, "Psycholinguistic Disabilities of Children with Reading Problems," Exceptional Children, XXXII, No. 8 (April, 1966), pp. 533-39.

specific dyslexia in medical literature, genetic studies of reading disability, and concludes that

> the evidence speaks strongly in favor of a majority of cases . . . (approaching 75 percent) being caused by neurological impairment or neurological maturational delay.[176]

In a well-designed study of the test performance of 50 brain-damaged children ranging in age from 10 to 14 years of age, and matched in pairs with 50 normally functioning children on the variable of age, Reed, Reitan and Hallgrim found that the brain-damaged children performed significantly less well than the controls on all tests, with differences between the two groups occurring more frequently on tests of language function than on other testing procedures.[177] Of particular importance was the Wechsler performance of the experimental group. Results indicate that Verbal and Performance total scores, the Total I.Q. score, as well as Information, Comprehension, Digit Span, Arithmetic, Similarities, Block Design and Digit Symbol all were significantly depressed (at the .001 level) for the brain-damaged children. At the .01 level

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[176]Julia M. Penn, "Reading Disability: A Neurological Deficit?" Exceptional Children, XXXIII, No. 4 (December, 1966), pp. 243-50.

[177]Homer B. C. Reed, Ralph M. Reitan, and Kløve Hallgrim, "Influence of Cerebral Lesions on Psychological Test Performance of Older Children," Journal of Consulting Psychology, XXXX, No. 3 (June, 1965), pp. 247-51.

was Picture Arrangement and at the .02 level was Picture Completion.[178] Thus, while all of the verbal scale was significantly related to cerebral lesions, some portions of the performance scale were not significantly effected at the .02 or greater level.

Proponents of learning disabilities as expressions of inner conflicts point out that "a great many learning disabilities are closely connected with intellectual dysfunctioning" and add that learning disabilities are differentiated from general intellectual dysfunctioning only in the fact that learning disabilities reflect intellectual inhibition which is limited to scholastic situations only.[179] Fromm and Hartman conclude that

> there is a difference between intellectual lack and intellectual dysfunctioning. The latter is often taken for the former, but should not be. Learning disabilities may be due to a native lack of intelligence. But many learning disabilities are not due to a lack of intelligence; they are a specific form of neurotic dysfunction, a symptom of a total personality disturbance. Their background may be either traumatic, or it may reveal chronically disturbing experiences, preventing normal, anxiety-free development of the individual.[180]

Support for this view is set forth by Blatt, Allison and Baker who report that

when Wechsler originally developed the intelligence

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[178] Ibid., p. 249.

[179] Fromm and Hartman, op. cit., p. 24.

[180] Ibid., p. 25.

> scales, he saw their primary function as a valid and reliable evaluation of global intelligence and only secondarily as a technique for personality assessment. With the development of ego psychology, however, intelligence has been more clearly conceptualized as an integral part of the total personality structure. One of the basic assumptions in psychoanalytic ego psychology is that cognitive processes, as expressed in a variety of problem-solving situations, reflect important dimensions of personality organization.
>
> . . . . . .
>
> The Wechsler scales present relatively neutral and highly structure situations, and the scales assess the relative integration and balance of a variety of ego functions such as memory, judgment, anticipation, planning, visual-motor integration, concept formation, attention, and concentration.[181]

In a study of anxiety related to Object Assembly on the Wechsler, the above authors reported that those patients showing anxiety in terms of bodily concern also "scored significantly lower on Object Assembly than on any other Performance item of the Wechsler.[182]

Griffiths hypothesized that the Digit Span subtest would be adversely affected by the presence of anxiety, and found that both Digit Span and Information were significantly inferior under the influence of anxiety. Having induced anxiety in 60 college Freshmen by experimental means, he reported that the Digit Span interference was interpreted as occurring primarily during perception

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[181]Sidney J. Blatt, Joel Allison, and Bruce L. Baker, "The Wechsler Object Assembly Subtest and Bodily Concerns," Journal of Consulting Psychology, XXIX, No. 3 (June, 1965), pp. 223.

[182]Ibid., pp. 223-30.

and retention, rather than during recall. The nature of the interference was found to be intrusion of inappropriate thought, loss of interest, change of attitude and/or an active psychological withdrawal from the testing situation.[183]

In a study of the Children's Manifest Anxiety Scale and Performance on the WISC, Hafner, Pollie and Wapner report that correlations between the CMAS and WISC scales and subtests were all negative except for the Picture Completion subtest. They add, however, that only the correlations between the CMAS and the Block Design and Coding reached significance at the .05 level, pointing out that these two performance tests are most frequently interpreted clinically as being susceptible to the influence of anxiety.[184] A study by Matarazzo, with adult subjects, utilizing the Taylor Manifest Anxiety Scale and the Wechsler-Bellevue, failed to reveal any significant relationships, a result which he reports as

> surprising in view of the long and widely held belief among clinicians that Digit Span especially, and perhaps Object Assembly to a lesser extent, are

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[183]J. S. Griffiths, "The Effect of Experimentally Induced Anxiety on Certain Subtests of the Wechsler-Bellevue," Dissertation Abstracts, XVIII, 1958, pp. 655-66.

[184]A. J. Hafner, D. M Pollie, I. Wapner, "The Relationship between CMAS and WISC Functioning," Journal of Clinical Psychology, XVI, No. 3 (July, 1960), pp. 322-23.

vulnerable to anxiety.[185]

Perhaps it is the age differential which significantly effected these two studies, since there seems to be some evidence that children with speech and reading difficulties do exhibit significant variability of performance on the Wechsler Intelligence Scale for Children.

In a study of children ranging in age from 7-0 to 12-9 with no known organic problems, Tjossen, Hansen and Ripley report that "low scores on the Digit Span and Coding subtests of the WISC appear as possible indicators of reading difficulty."[186] In analyzing the frequency of developmental problems and behavioral signs of these 24 subject who read at "fourteen grades below normal grade placement," they reported the following:

Motor awkwardness	10	Nervous Habits	14
Speech problems	14*	Allergic Reaction	9
Developmental delay	5	Headaches and stomach aches	13
		Accidents	9

*Speech is characterized by substitution and omissions of speech sounds and as "immature."[187]

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[185]R. G. Matarazzo, "The Relationship of Manifest Anxiety to Wechsler-Bellevue Subtest Performance," Journal of Consulting Psychology, XIX, No. 3 (June, 1955), p. 218.

[186]Tjossen, Hansen and Ripley, op. cit., p. 1112.

[187]Ibid., p. 1109.

It can be seen that 58% of the subjects in the above study revealed articulatory disorders and that the prevalence of the speech disorder was the most commonly occurring developmental problem.

Research concerning patterns of WISC subtest scores for poor or retarded readers has specific meaning for this study, since defective speech and defective reading are related factors in the communication or language process. Too, considerable research has been done in the area of reading retardation as related to standardized intellectual measures, whereas little or no literature is as yet available regarding dyslalic children and their subtest scatter on such instruments.

In an exhaustive review (1945-1965) of research concerning patterns of retarded readers on the WISC, Deal reports that

> in many of these studies the results and conclusions are difficult to interpret and evaluate. In most of the studies, the inferences have been based on data collected on a small number of subjects. Ways of determining retardation in reading have been varied. Some of the ways used in determining the amount of retardation were: from the expected grade placement level, from the expected level as determined by the results of the WISC, from the level as determined by mental age, and percentage below expected grade level as determined by standardized tests.[188]

In summarizing the twelve best studies, she reports that the subtests of Arithmetic, Vocabulary and Digit Span

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[188]Margaret Deal, "A Summary of Research Concerning Patterns of WISC Subtest Scores of Retarded Readers," Reading Specialist, (May, 1965), pp. 107.

contribute heavily to reading success, as do Comprehension, Object Assembly and Coding. However, low Arithmetic scores were found to be indicative of retarded readers, as were low scores on Information, Coding and Vocabulary. Other subtests were variously reported, with Picture Completion being both "high" and "low" for retarded readers. Three of the 12 studies reported no significant differences between Verbal and Performance IQ, with three others reporting such a difference as existing, in favor of the Performance over the Verbal Scale.[189]

Hirst reports that in comparing "mildly retarded" and "severely retarded readers," the latter were significantly lower than the former on Digit Span, Vocabulary and Similarities.[190] Sawyer reported that while it was possible to distinguish between mildly disabled and severely disabled readers on the basis of WISC subtests, such differentiation was more effective at younger ages.[191]

While subtest patterns differed, Altus reported that no significant difference was found between Verbal and Performance IQ in a study of 25 children reading two

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[189] Ibid., pp. 101-11.

[190] Lynn Shellberg Hirst, "The Usefulness of a Two-Way Analysis of WISC Subtests in the Diagnosis of Remedial Reading Problems," Journal of Experimental Education, XXIX, No. 2 (December, 1960), pp. 153-60.

[191] Rita Sawyer, "A Study of Discrimination by the Subtests of the WISC between Mildly Disabled and Severely Disabled Readers Diagnosed at the Syracuse Reading Center, September, 1958 to June, 1963," Dissertation Abstracts, XXVI, No. 5, p. 2594.

years or more below expected level. However, there were significant subtest differences, with Coding and Arithmetic being the lowest.[192] DiNello found no reliable differences in WISC Verbal and Performance total scales when comparing high and low readers, with IQ controlled. While he reported that no unique subtest patterns were revealed, he also reported that end-of-the-year reading achievement was better predicted by a combination of Information, Digit Span and Object Assembly than by the use of reading tests.[193]

Burks and Bruce hypothesized that poor readers would be relatively weak in those parts of intelligence tests which resemble vital characteristics inherent in written language. With an N of 11 good readers and 21 poor readers, they administered the Wide Range Achievement Test and the WISC. They concluded that poor readers were significantly low on Information, Arithmetic and Coding subtests, but significantly high on Picture Arrangement, Block Design and Comprehension. Good readers were reported to be significantly high on Similarities. They concluded that poor readers, as a group, approach learning situations in a more concrete manner because of an inability to

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[192]Grace T. Altus, "A WISC Profile for Retarded Readers," Journal of Consulting Psychology, XX, No. 2 (April, 1956), pp. 155-56.

[193]Mario C. DiNello, "WISC Subtest Patterns as Predictors of Reading Achievement of First Grade Boys," Dissertation Abstracts, XXVI, No. 10, p. 5862.

handle abstractions.[194]

In a more comprehensive study of 116 subjects whose WISC IQ's ranged from 80 to 120, McLeod reported that when adjustments were made for differences in Verbal or Full Scale IQ, retarded readers scored significantly lower than successful readers in Information, Vocabulary, Arithmetic, Digit Span and Coding, and higher on Picture Completion. It was McLeod's assumption that Coding and Picture Arrangement, which also differentiated good and bad readers, were "verbal" rather than performance tests. He also reported that both Full Scale IQ and Verbal IQ correlated significantly with Information, Vocabulary and Arithmetic for both groups.[195]

In a study of children ranging in age from 12 to 16 (N of 110), Flanary reports that retarded readers have poor memory functions, conceptual ability, attention span, and in addition, reveal a meager vocabulary, poor planning ability and slow psychomotor speed. He bases his assumptions on his findings that Information, Comprehension, Digit Span, Arithmetic, Similarities, Vocabulary, Picture Arrangement, and Digit Symbol are the tests which most

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[194]Harold F. Burks and Paul Bruce, "The Characteristics of Poor and Good Readers as Disclosed by the WISC," Journal of Educational Psychology, XXXXVI, No. 8 (December, 1955), pp. 488-93.

[195]J. McLeod, "A Comparison of WISC Subtest Scores of Pre-Adolescent Successful and Unsuccessful Readers," Australian Journal of Psychology, XVII, No. 3 (December, 1965), pp. 22-28.

clearly differentiate the retarded from the normal reader.[196] An essentially similar study is reported by Ellis, utilizing 96 unsuccessful readers, who scored 25% or more below their mean grade level on the Wide Range Achievement Test. His study differs only in that he found Picture Arrangement to be above the mean performance of the retarded reader rather than significantly lower, as reported by Flanary.[197]

While there has been the general assumption among researchers who use the Wechsler Intelligence Scale for Children, the Wechsler Adult Intelligence Scale, and the Wechsler-Bellevue Scales that these instruments measure the intellectual properties as defined by Wechsler, there have been a few studies which challenge this assumption. For example, a study which purported to compare the WISC Similarities with a "comparable conceptual task", reports that normal and educationally retarded subjects do not differ on such a task. Results clustered around average correlation within a restricted range, regardless of age or intelligence level. The concluded that the results suggest that Similarities is not an adequate measure of

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[196]Woodrow Flanary, "A Study of the Possible Use of the Wechsler-Bellevue Scale in Diagnosis of Reading Difficulties," Dissertation Abstracts, XIV, p. 1045.

[197]Ellis Graham, "Wechsler-Bellevue and WISC Scattergrams of Unsuccessful Readers," Journal of Consulting Psychology, XVI, No. 4 (August, 1952), pp. 268-71.

verbal conceptual ability, although they do not define the comparable conceptual task with which they compared the Similarities subtest.[198] In a study of Picture Completion items, Saunders reports that success with these items, at least for the 228 male high school and college students studied, depended upon 3 orthogonal factors, (1) maintenance of contact (2) maintenance of perspective and (3) effect of uncertainty, while Wechsler reported that it measured basic perceptual and conceptual abilities involved in visual recognition and identification of familiar objects and forms.[199] On the other hand, a few studies have analyzed other subtests and found additional bases for Wechsler's choice of items. For example, the Digit Span subtest utilizes only non-repeated digits in each series. Wickelgren reports that digit sequences containing repeated items are retained differently in short-term memory from sequences containing no repeated items. He found a negative effect with repeated items, and a positive effect for non-repeated items, although the temporal sequence was 5 per second rather than 1 per second.[200] On the whole, however,

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[198]H. G. Furth and N. A. Milgram, "Verbal Factors in Performance on WISC Similarities," Journal of Clinical Psychology, XXI, No. 4 (October, 1965), pp. 424-27.

[199]David A. Saunders, "A Factor Analysis of the Picture Completion Items of the WAIS," Journal of Clinical Psychology, XVI, No. 2 (April, 1960), pp. 146-49.

[200]Wayne A Wickelgren, "Short-Term Memory for Repeated and Non-Repeated Items," Quarterly Journal of Experimental Psychology, XVII, Part 1 (February, 1965), pp. 14-25.

research has proceeded on the basis of the WISC's consistently demonstrated reliability and validity, especially as compared to other standardized intelligence tests.

In reviewing the contribution of the WISC to the psychological evaluation of a child who exhibits specific handicaps, Spraings points out that

> the psychologist does this with three realizations in his mind. First of all, the I. Q. obtained often does not describe with accuracy the specific problems causing the impairment in performance. Secondly, that often we see wide variability in a child's ability in verbal and performance areas, and thirdly, more important the I. Q. obtained, will be the areas of strength and deficits revealed in the intratest variability.[201]

Thus we may conclude that the use of the WISC as a measurement instrument, and the use of the WISC subtests as a measure of intra-test variability, is admirably suited to the purpose of this study, wherein the evaluation of children with severe articulatory disturbances is anticipated to reveal considerable intra-test variability. Discussion in this section has disclosed that such intra-test variability exists when the performance of children with reading problems is measured in like manner. Speaking and reading are inextricably linked in the communication process.

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[201]Violet Spraings, "Implications of Psychologic Testing for the Detection and Education of Neurologically Handicapped Children," Paper read before the Seminare on Expanding Horizons for the Neurologically Handicapped Child, San Francisco, California, October 31, 1963, p.3.

The Influence of Parent-Child Interaction Upon Functional Articulatory Disorders

While there has been considerable research in speech pathology regarding the parent interaction with stuttering children, very little has been done with regard to such interaction where children with articulatory problems are concerned.

Simon reviews the development of speech and points out that speech-learning occurs within a total energy field of interaction between internal and external energy systems.[202] Further describing the learning process, Simon adds:

> The human infant thus appears as an organism with a wide range of abilities and potentiality for an infinite variety of responses, maturing in an environment of multifold possibilities and demands; growing and developing in an external energy system of social pressures which impinge upon the organism with increasing strength as the child grows older. In the interaction, therefore, between the child's potentiality for infinite variety of responses and the presures, forces and demands of the environment, both differentiation and selection establish new and adaptive patterns of response. From the generalized, undifferentiated vocal responses of early life, the dynamic interaction between a maturing organism and an external energy field selects and integrates the relatively simple response of speech sounds to respond symbolically to an infinitely complex range of stimuli.[203]

Milisen reports that dysfunctions of oral language may involve either the participation of the environment and the

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[202]Clarence T. Simon, "The Development of Speech," Handbook of Speech Pathology, ed. Lee Edward Travis (New York: Appleton-Century-Crofts, Inc., 1957), p. 28.

[203]Ibid., pp. 33-34.

involvement of the child's physical inadequacy. He sees as an "environmental precipitant" the following behaviors on the part of the parental figure:

1. Failure to associate the care of the infant with the noises and movements which he makes during early infancy. . . .
2. Failure to reinforce the infant's vocal play sounds. this results in a reduction in the number and skill of oral movements developed by the infant.
3. Failure to accompany care of the infant with verbal output. This failure to talk to the infant reduces its comprehension of speech, since comprehension will come only with the association of speech with meaningful behavior.
4. Failure to provide, for imitation, sounds which are new to the infant. Thus, a skill in producing new sounds is not developed and practice in making sounds is reduced.
5. Failure to comprehend, accept and positively reinforce the first speech attempts. This is likely to result in a refusal of the infant to use speech as a medium of expression.
6. Overacceptance and encouragement of pantomime as a tool of expression. . . .
7. Acceptance and reinforcement of irrelevant conditions associated by chance with the speech act. This results in the maintenance of this undesirable habit.
8. Acceptance and reinforcement of infantile speech behavior, which will result in the maintenance of this type of behavior.
9. Undue penalty associated with the speech act. . . .
10. . . . in some cases there may be a generalized dearth of reinforcement of communication and other learned behavior. . . .[204]

Powers points out that such statements as above are the result of pooled clinical experience. Some have the support of research findings as well; others remain

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[204]Robert Milisen, "Methods of Evaluation and Diagnosis of Speech Disorders," Handbook of Speech Pathology, e. Lee Edward Travis (New York: Appleton-Century-Crofts, Inc., 1957), pp. 268-69.

unverified. She indicates that

> a child's speech adequacy is conditioned by the speech patterns surrounding him. These patterns in turn are thought to be conditioned by other factors such as the educational and cultural level of the parents, urban versus rural living, and foreign language background or bilingualism. Other factors in the speech environment alleged to be influential are the number of siblings and their ages relative to the child under consideration, speech defects in members of the family, and to a lesser degree, speech defects in playmates and teachers. . . . The methods of child-training used by parents, particularly their methods of speech-training, parental attitudes toward speech, the degree and kind of attention given the child's speech, are all mentioned frequently as being of great influence in determining the various aspects of his speech and language development.[205]

Powers concludes that while stuttering and emotional factors have long been linked in the literature, functional articulatory disorders "are beginning belatedly to receive more attention as possibly symptomatic of personality structure and emotional adjustment."[206] In her review of the research, she indicates that studies in the 1930's variously reported (1) no relationship between speech sound development and introversion-extroversion in children ages 2 to 6; (2) normal speaking children were rated more "talkative" and "spontaneous" than children with defective articulation, who were more shy and negativistic than good speakers, and (3) adults with articulatory

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[205] Powers, "Disorders of Articulation--Etiology," op. cit., p. 752.

[206] Ibid., p. 756.

defects tended to have much less aggression than normal adults.[207]

The study of emotional adjustment and children with functional articulatory defects carried out in the 1940's, as reviewed by Powers, is highlighted by 4 studies with only one of the 4 showing children with this disorder to be above average in adjustment. The other 3 found these children to be somewhat withdrawn, less demanding of attention than children with normal speech and to cry easily. In relationship to maternal behavior, the Bernreuter test scores differed significantly from test norms, showing the mothers as a group to be more neurotic, more submissive, and more self-conscious. Fathers as a group did not differ significantly from the Bernreuter norms. Maternal scores on the California Test of Personality also differed significantly from test norms, the mothers ranking lower in self-adjustment, social adjustment and total adjustment. On this instrument (CTP), the fathers rated significantly lower in self-adjustment. It is reported that the social standards of the mothers were very high in comparison with other adjustment scores, and it was concluded that children with functional articulation disorders were expected to meet a set of very high stand-

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[207] Ibid., p. 757.

ards in an atmosphere of emotionality.[208]

Powers concludes by discussing the Mowerian theory of speech acquisition, pointing out that

> the implication . . . is that when the mother is not a source of pleasure and gratification to the child the sounds associated with her become negatively conditioned and the child tends to reject and withdraw from them. He is not motivated, . . . to produce sounds himself and is thus delayed and handicapped to various degrees in his own speech development.[209]

It is of importance to note that Wood found that parents of children with functional articulatory problems used overly-severe techniques of child-discipline, and when these parents were provided with parental counseling, the children's articulatory skills improved in therapy with greater rapidity than did the speech of children whose parents were not receiving such counseling.[210]

It has also been found that children placed under a stressful condition, such as delayed speech feedback, will not only speak more slowly but will make more articulation errors.[211] Whether the stress is provided by

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[208] Ibid., pp. 757-8.

[209] Ibid.

[210] Kenneth S. Wood, "Parental Maladjustment and Functional Articulatory Disorders in Children," Journal of Speech Disorders, XI, No. 1 (September, 1945), pp. 255-75.

[211] Stanley Ratner, John Gawronski, and Edward Rice, "The Variable of Concurrent Action in the Language of Children—Effect of Delayed Speech Feedback," Psychological Record, XIV, No. 1 (January, 1964), pp. 47-56.

one's self, as a concurrent auditory event, or by the stress of parental discipline and its emotional context, children with functional articulatory problems are seen as being deficient in both personality functioning and communication skills.[212] Wolpe reports that

> since the primary function of speech is social communication which in itself implies an interdependence in personal relationships, . . . disturbances in speech would occur primarily when the interdependent relationship is off balance. . . . Functional disturbances in speech, therefore, would indicate an interference in the normal speech process because of difficulties encountered in the dynamic interaction between the ego and its surrounding forces. . . . Speech is part of the very acculturation of the child and carries with it, therefore, the emotional impacts that any interaction involves.[213]

Wolpe feels that both the child and the parent must be treated. She views speech as an integral part of the personality structure of the individual, and suggests that treatment be examined in the light of the entire integrated organism, not the isolated symptom of speech disturbance. In addition, she states that initial cues may be derived from the parental attitudes, commenting that

> the mother's attempt to conceal the problem may indeed be a manifestation of her own anxiety, her overprotectiveness, and her need to foster

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[212]Zelda S. Wolpe, "Play Therapy, Psychodrama, and Parent Counseling, "Handbook of Speech Pathology, ed. Lee Edward Travis (New York: Appleton-Century-Crofts, Inc., 1957), pp. 991-1024.

[213]Ibid., pp. 992-93,

> the overdependency relationship so often seen in children with speech difficulties.[214]

In conclusion, research regarding the influence of parent-child interaction upon functional articulatory disorders is somewhat limited, relying primarily upon clinical opinion and experience. Little research, well-controlled or otherwise, is available, but the trend noted would appear to substantiate the need for further evaluation and exploration of this variable.

Summary

In this chapter several aspects of articulation which have attracted the attention of researchers over the past three decades were mentioned: (1) the development of articulatory skills, (2) the psychogenic aspects of articulatory skills, (3) intelligence testing variability as related to articulation and language, (4) dyslalia and dyslexia as related to linguistic functions, and (5) the influence of parent-child interaction upon functional articulatory disorders.

The above were deemed appropriate to the focus of this study, wherein the effect of a functional articulation disorder upon the sub-scale scores of the Wechsler Intelligence Test for Children will be considered.

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[214] *Ibid.*, pp. 995-97.

For the most part, attention in this chapter has been focused upon the various factors related to the physiological and psychological integrity of the child with normal speech as contrasted to the child suffering from a severe functional articulatory disorder. Such a disorder was viewed as having an impact upon all aspects of the child's behavior and performance, particularly during the elementary school years. The personality of the speech defective child and his parents as currently revealed by a rather minimal amount of research was also described. Where research was lacking, the reports of clinical inferences were utilized.

CHAPTER III

SUBJECTS, TEST INSTRUMENT AND PROCEDURES

As was mentioned previously, the present study deals with the performance of speech defective children who exhibit severe functional articulatory disorders as measured by a standardized intelligence test which has both verbal and performance components.

Subjects

Fifty children, ranging in age from 6-0 to 12-0, served as subjects for this study. There were 14 females and 36 males, all of whom were enrolled in regular classrooms in the public schools at the elementary school level. Median age was 7-11; mean age, 8-0. Ages were computed by determining the exact birthdate and the date of testing, with age computed by subtraction for years and months, not days, in accordance with the WISC manual.[215] All subjects were at grade level and exhibited no known auditory, visual, organic, or central nervous system disorder. Children with known "soft" neurological signs were

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[215]Wechsler, WISC Manual, op. cit., pp. 22-23.

specifically excluded.

Mentally-retarded and gifted children were also excluded, with the I.Q. range of the subjects restricted to 80 to 126. Mean I.Q. for all subjects was 97, well within the average range of 90 to 110 I. Q. Subjects were monolingual and from lower-middle and middle-middle socioeconomic levels.

Subjects were diagnosed as possessing a functional articulatory defect of a severe degree following a complete articulation examination, an oral peripheral examination, audiometric screening, and gross and fine motor testing. Each subject had been previously enrolled in public school speech therapy for a minimum of one year, and at the time of the study, speech production was characterized by 5 or more misarticulated phonemes, occurring consistently in at least two of the 3 consonant positions (initial, medial, and final) in single word utterances. Audiometric screening was conducted by a qualified audiologist and the speech evaluation was conducted by a speech pathologist holding the Certificate of Clinical Competency (formerly Advanced Speech Certification) in the American Speech and Hearing Association.

Test Instrument

The Wechsler Intelligence Scale for Children was administered to the 50 subjects in accordance with standard procedures by a qualified psychologist, as licensed

by the Psychologist's Registration Act of Michigan. Eleven of the 12 sub-tests were administered, with Mazes being omitted. Of the 500 subtests administered, it was possible to complete all but 8, those being terminated due to subject fatigue or examination interruption. In this study, the control group scores are those of the standardization population of the Wechsler Intelligence Scale for Children.

As previously noted, the Wechsler Intelligence Scale is composed of a series of sub-tests divided into Verbal and Performance Scales. The presumptive meaning of these tests, as indicated by Wechsler and others, is summarized below.

Information Test

This test is said to reveal a subject's range of information and to indicate his alertness towards the world about him, as well as to reflect social and cultural values. It presupposes a normal or average opportunity to receive verbal information according to some examiners. Wechsler reports that this test has proved "one of the most satisfactory in the battery."[216] Experienced

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[216] David Wechsler, The Measurement and Appraisal of Adult Intelligence, (Baltimore, Maryland: The Williams & Wilkins Company, 1958), p. 67.

examiners have found that passive subjects tend to have inconsistent success-failure patterns on the Information sub-test.[217]

Comprehension Test

Wechsler points out that this test might be termed a test of "common sense" since "success. . . depends on the possession of a certain amount of practical information and a general ability to evaluate past experience."[218] He points out, too, that this test measures sterotypes with a broad common base, although poor verbalizers often make low scores. He indicates that this test supplies the examiner with clinical data, including information on the subject's social and cultural background.[219] McPherson points out that Comprehension reveals a great deal of personalized material and appears to be particularly sensitive to emotional disorders.[220]

Arithmetical Reasoning Test

Wechsler indicates that the ability to solve arithmetical problems has long been recognized as a sign of mental alertness and that this test correlates highly

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[217]Marion McPherson, Ph. D., "The Wechsler Intelligence Scale for Children," Lecture at Western Michigan University, Kalamazoo, Michigan, November 10, 1960.

[218]Wechsler, The Measurement and Appraisal of Adult Intelligence, op. cit., pp. 68-9.

[219]Ibid., p. 67.

[220]McPherson, op. cit.

with global intelligence. He points out that the tests have been devised so as to avoid verbalization or reading difficulties. He adds

> it appears that children who do poorly in arithmetical reasoning often have difficulty with other subjects. A number of examiners reported they were sometimes able to diagnose educational abilities on the basis of scores obtained on this test.[221]

He also states that when Arithmetical Reasoning is combined with the general Information Test, the combined scores frequently furnish an accurate estimate of the subject's scholastic achievement.[222]

Memory Span for Digits

Wechsler points out that this is a poor test of general intelligence since "the ability involved contains little of g and, as Spearman has shown, is more or less independent of this general factor."[223] While it is recognized as a poor measure of general intelligence, it is an extremely good test at the lower levels. Wechsler points out that when the low scores on this test are not associated with organic defects, these scores can be due

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[221]Wechsler, Measurement and Appraisal, op. cit., 69-70.

[222]Ibid., pp. 71

[223]Ibid., pp. 70-71.

to anxiety, or inattention, and correlate with the lack of ability to perform tasks requiring concentrated effort.[224]

Similarities Test

Wechsler states that while Similarities would appear to be greatly influenced by language and word knowledge, experience has shown that while some verbal comprehension is necessary for minimal performance, sheer word knowledge is only a minor factor. This test measures the ability to perceive common elements of comparative terms, and, at the higher levels of the test, measures the ability to bring two terms under a single concept. In addition, it reveals the logical character of the subject's thinking processes and his ability to discriminate between essential and superficial likenesses.[225] McPherson points out that while this test measures the ability to abstract and to form concepts at a verbal level, the early items on the test are quite concrete. Thus, some subjects who score poorly may still be able to "abstract" about concrete objects.[226]

Vocabulary Test

Wechsler states that a subject's vocabulary skills

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[224] Ibid.

[225] Ibid., p. 73.

[226] McPherson, op. cit.

measure his learning ability, fund of verbal information and general range of ideas. It is however influenced by the subject's educational and cultural opportunities. He points out that the qualitative aspects of the test also have clinical value, since the semantic character of a definition reveals thought processes. Wechsler stresses that syntax in a polished form is not necessary, stating that "what counts is the number of words he knows. Any recognized meaning is acceptable, and there is no penalty for inelegance of language."[227]

Picture Arrangement Test

Wechsler feels that while this test, consisting of a series of pictures which, when placed in the correct sequence, tell a story, is an effective measure of a subject's ability to comprehend social situations. He states that his point of view is that "social intelligence" is general intelligence applied to social settings.[228]

Picture Completion Test

This test requires the subject to discover and name the missing part of an incompletely drawn picture. Wechsler states that "ostensibly" it measures the indi-

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[227]Wechsler, op. cit., pp. 84-5.

[228]Ibid., p. 75.

vidual's basic perceptual and conceptual abilities which are involved in risual recognition and identification of certain familiar objects and forms.[229] This test usually shows the highest loading under the visual-motor factor, but is also related to the subject's familiarity with the drawn items. McPherson suggests that it is sometimes useful when the subject reveals borderline intelligence, brain damage, or severe anxiety, since a low score on this sub-test tends to confirm such diagnoses.[230]

Block Design Test

Wechsler based his Block Design test upon the Kohs blocks, which were felt to measure non-verbal intelligence at a comprehensive level. He points out that he has altered and adapted this test so that administration time is lessened. He states that difficulty with this subtest may reveal brain disease, since the difficulty seems to be due to a lack of synthesizing ability, "or loss of the 'abstract approach,' in K. Goldstein's sense of the term."[231] Wechsler, however, feels that the abstract approach has been greatly overestimated, and that low scores on Block Design are due to difficulty

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[229] Ibid., p. 75.

[230] McPherson, op. cit.

[231] Wechsler, op. cit., pp. 79-80.

in visual-motor organization.[232] Essentially, the test measures the ability to break a gestalt into its parts and then synthesize it into a non-familiar pattern.

Digit Symbol (Coding)

This test requires the subject to associate one set of symbols with another set of symbols. Wechsler indicates that it is the speed and accuracy with which the subject does this which serves as a measure of intellectual ability. Visual acuity, motor coordination and speed also play a part in the performance of this task. He emphasizes the over-riding importance of motor speed, except in cases of subjects with either visual defects or specific motor disabilities. He also reports that neurotic and unstable individuals tend to do poorly on this test, due perhaps to associative inflexibility, mental confusion, difficulty in concentration, or perhaps emotional reactivity.[233] McPherson indicates that there is a strong relationship between a poor score on the Coding test and a poor reading performance.[234]

Object Assembly

This test consists of four figure form-boards

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[232] Ibid., p. 80.

[233] Ibid., p. 81.

[234] McPherson, op. cit.

and the subject is required to assemble the pieces into a familiar configuration. Wechsler reports that such form boards have considerable merit when administered to children, and such administration reveals a good deal about the child's immediate perception of the whole, accompanied by a critical understanding of the relation of the individual parts. In addition, its clinical value also lies in the degree of trial-and-error methods and the subject's reactions to mistakes.[235]

Mazes

Wechsler reports that he considers both Digit Span and Mazes (or Coding) to be supplementary tests to be added "when time permits, or used as alternate tests when some other test in the appropriate part is invalidated."[236] Coding has been utilized in this study rather than Mazes due to Coding's presumed relationship with reading and visual-motor functioning.

Standardization Sample Procedures

Specific Wechsler procedures for the Children's Scale have been reported by Seashore, Wesman and

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[235]Wechsler, op. cit., pp. 82-3.

[236]Wechsler, WISC Manual, op. cit., p. 6.

Doppelt.[237] They report that the WISC was standardized on a sample of 100 boys and 100 girls at each age from 5 through 15 years. There were 1,100 boys and 1,100 girls in 11 age groups, a total of 2,200 cases. Each age and the total sample met certain sampling requirements based on U.S. Census Bureau data for 1940, with correction for the westward shift of population. Tables presented reveal the sample distribution by geographic area, urban-rural residence, occupation of fathers, correlations of each test with the Verbal, Performance and Full Scale Scores of the total sample, median correlation coefficients between tests and the Verbal, Performance and Full Scale scores. In addition, reliability and standard error of measurement of all the sub-tests for the three ages of $7\frac{1}{2}$, $10\frac{1}{2}$ and $13\frac{1}{2}$ are presented.

It is pointed out that the Verbal tests correlate more highly with the Verbal score than with the Performance score, and likewise, the Performance tests correlate more highly with total performance. These correlations indicate considerable common variance,yet are low enough to suggest that the abilities included cannot be inferred for each other, according to the authors. Data suggested

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[237]Harold Seashore, Alexander Wesman and Jerome Doppelt, "The Standardization of the Wechsler Intelligence Scale for Children," Journal of Consulting Psychology, XIV, No. 2 (April, 1950), pp. 99-110.

that digit span production was least like the other Verbal tests and it was thus made an alternate test. Coding and Mazes were equally eligible to remain the Performance items of choice. Coding was chosen only on the basis of ease of scoring and brevity.

The authors point out the need for clinical caution in regard to scatter of sub-scale scores due to the variable reliability, but point out that the composite Verbal, Performance and Full Scale Scores are highly reliable. They add that comparison of differences between individual test proviles should take into consideration the standard error of measurement by test and by age, and indicate that the unsophisticated reader of their tables may be confused by certain discrepancies, specifically, the discrepancies between the individual tests, where the SE_m is in scaled score units, and the 3 I.Q. scores, where the SE_m is in I.Q. units.[238]

Scaled Scores

The scaled scores of the Wechsler Intelligence Scale for Children have been derived in such a manner that those scores provide, at each age, and for each of the subtests, a mean scaled score of 10 and a standard deviation of 3. Seashore, Wesman and Doppelt indicate that

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[238] Ibid., pp. 99-104.

> this was accomplished by preparing a cumulative frequency distribution of raw scores for each test at each age level and setting each percentile point at its appropriate standard score value on a theoretical normal curve with a mean of 10 and a standard deviation of 3. Scores for all ages on a single test were then listed in parallel columns and minor irregularities in the progression of scaled score equivalents from age to age were smoothed. The assumption that these irregularities were chance results of population sampling seemed to be the only tenable position. Few instances of such minor deviations were found, and the Scales are essentially a direct translation from raw scores to a normalized distribution of scaled scores with a mean of 10 points and standard deviation of 3.[239]

Based upon the above statistical bases, it was found that in the final I.Q.'s, the mean I.Q. was 100 and the standard deviation was 15. While there were some small differences in mean I.Q.'s of boys and girls, the authors' state:

> All in all, the preliminary studies leading to inclusion of test items and the sampling itself were fortunate enough to result in mean I.Q.'s of boys and girls which are essentially equal. For all practical purposes the clinical examiner can ignore sex differences. A difference in means of three points, for example, is really a plus or minus difference of $1\frac{1}{2}$ points from the actual norms based on both sexes.[240]

Experimental Group Procedures

Each of the 50 subjects, previously screened and evaluated in terms of speech, hearing, and motor skills as detailed in the section on Subjects, were given the Wechsler

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[239] Ibid., pp. 104-5.

[240] Ibid., p. 107.

Intelligence Scale for Children under standard testing conditions as recommended by the test manual, in a testing cubicle 6 feet by 10 feet, outfitted with table and chairs of appropriate size. No distracting stimuli were present.

The examiner recorded all verbal responses of the subjects and noted all motor responses on the WISC test forms. Subjects' responses were tabulated. The raw data for analysis consisted of the sub-scale and total scale raw scores which were then converted into standard sub-scale and full scale scores following the scaled score equivalents for raw scores as provided in the Wechsler manual. Appropriate conversions were made when 6, rather than 5, subtests were utilized in the Verbal Performance Scale, following standard procedures for the pro-rating of such scaled scores as indicated by Wechsler in the Manual.

CHAPTER IV

RESULTS AND DISCUSSION

Each subject was administered the 11 sub-tests of the Wechsler Intelligence Scale for Children under the standardized testing conditions described by the writer in Chapter III. The Verbal subtests given consist of Information (Info.), Comprehension (Comp.), Arithmetic (Arith.), Similarities (Sim.), Vocabulary (Voc.), and Digit Span (D.S.). As indicated earlier, although the Digit Span may be considered a supplementary test, it was included in the experimental design due to its usefulness in identifying fluctuations in attention, inability to concentrate, and immediate memory difficulties. The Performance subtests consist of Picture Completion (P.C.), Picture Arrangement (P.A.), Block Design (B.D.), Object Assembly (O.A.), and Coding (Cod.).

As a group, the experimental subjects were tested on a total of 550 subtests. Eight individual subtest administrations were incomplete due to extraneous factors, and thus a total of 542 subtest scale scores were calculated, following conversion from the raw score data.

In addition, each individual administration yielded 3 intelligence quotients, based upon a deviation I.Q. of 100 with a standard deviation of 15. Thus, the 3 quotients, Verbal I.Q., Performance I.Q., and Full Scale I.Q. yielded a total of 150 I.Q. scale scores representing the performance of the experimental population. Statistical conversion of the total Verbal and Performance Scale raw scores to obtain the 3 I.Q.'s was done in accordance with the procedures as outlined by Wechsler.[241]

It is to be noted that the Scaled Scores are derived as to provide, at each age and for each of the separate subtests which go to make up the Scales, a mean Scaled Score of 10 and a standard deviation of 3, as described by Wechsler.[242] Thus the subtests and Scales and the I.Q. measures are based upon different means and standard deviations.

In this study, the 692 converted scores were compiled and subjected to statistical analysis. (The summary table of the WISC scale scores for all subjects in the experimental group is presented in Apendix A.)

Statistical Analyses. This study involved utilization of the following: (1) a test of significance of the

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[241]Wechsler, The Measurement and Appraisal of Adult Intelligence, op. cit., pp. 34-37.

[242]Wechsler, WISC Manual, op. cit., p. 15.

difference between means of the intelligence test performance for the speech defective and normative populations, (2) tests of significance of the difference between means of subtest performance on both the Verbal and Performance Scales for the defective and normative populations, (3) a test of significance of the difference between the mean scores of the Vocabulary subtest of the experimental (speech-defective) population, (4) a test of significance of the directionality of means of the Verbal and Performance deviation I.Q.'s for the experimental population, and (5) ranking of all subtest scale scores as deviations from average total subtest scores of the experimental group.

The scale scores were subjected to a series of tests of significance (F statistics) to determine whether there was a significant variability among and between scaled scores and subtest scores of the speech defective and normal populations, followed by application of the *t*-ratio. In addition, tests of significance were applied to determine whether there existed significant variability among the mean scores of the experimental subjects themselves on the 11 subtests.

The statistical design is derived from the assumption that the speech defective group, as a sample population, is independently drawn from a normal population. Based upon prior examination of the data, it was determined

that the experimental sample and the normative sample were not significantly different on the index of skewness, both representing independent samples of the normal population. Therefore, the Central Limits Theorem applies, which states that for a wide variety of populations, statistics based on large samples are distributed normally, and that "this applies to nearly all populations which are likely to be considered in practice."[243] Thus parametric statistics, represented by the t-ratio, were utilized, with the heterogeneity or homogeneity of variance for n≠n being taken into account through application of specialized formulas for the t-test based upon F distributions as described by Edwards.[244] The statistical analyses will be found in Tables I through IX.

Inspection of the results of the above analyses revealed significant differences between the two populations, in regard to Verbal I.Q., as well as the following sub-tests: Information, Arithmetic, Vocabulary, Digit Span, and Picture Completion. In addition, the Vocabulary sub-test scaled scores were significantly below the Verbal mean not only for the normative group, but for the speech

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[243] Helen M. Walker and Joseph Lev, "Inferences Concerning the Mean or the Difference between Two Means," Statistical Inference (New York: Holt, Rinehart and Winston, 1953), p. 141.

[244] Allen L. Edwards, Experimental Design in Psychological Research (New York: Holt, Rinehart and Winston, 1960), pp. 94, 105-107.

defective group as well. Rejection or acceptance of the postulated null nypotheses is as follows:

1. The null hypothesis that there are no significant differences in functioning between speech defective children, as defined in this study, and normal children on the Full Scale Intelligence Quotient of the Wechsler Intelligence Scale for Children is accepted.

TABLE I

MEAN FULL SCALE INTELLIGENCE QUOTIENTS FOR SPEECH DEFECTIVE AND NORMAL CHILDREN

Group	Mean Full Scale I.Q.	S.D.	Variance	F	t
Speech Def. Subjects (N=50)	97.56	10.85	120.30		
				1.72[a]	1.42[b]
Normal Subjects (N=200)	100.05	14.35	205.92		

[a] F significant at 1.57 for the .05 level of confidence.

[b] Critical $t_{.05}$ is 1.998.

It is evident that the significant F statistic reflects the heterogeneity of variance of these two means. With the application of the appropriate formula for variance of the difference between two means, with a known heterogeneity of variance and unequal n's, the t of 1.42 does not reach the .05 level of significance. Thus, the groups do not significantly differ from one another in respect to

Full Scale I.Q.

2. The null hypothesis that there are no significant differences in functioning between speech-defective children and normal children on the Verbal Scale of the Wechsler Intelligence Scale for Children is rejected.

TABLE II

MEAN VERBAL SCALE INTELLIGENCE QUOTIENTS FOR SPEECH DEFECTIVE AND NORMAL CHILDREN

Group	Mean Verbal Scale I.Q.	S.D.	Variance	F	t
Speech Def. Subjects (N=50)	94.18	10.04	98.77		
				2.14[a]	3.26[b]
Normal Subjects (N=200)	99.89	14.53	211.12		

[a] F significant at 2.12 for the .01 level of confidence.

[b] Critical $t_{.05}$ is 2.65 at the .01 level.

It is again evident that the significant F statistic reflects the heterogeneity of variance of the means. In this sample, however, the difference between the two means is significant at the .01 level, indicating that it is highly probable that the speech defective subjects differ significantly from the normative subjects on the Verbal I.Q. Scale variable, and that the null hypothesis may be rejected with great confidence.

3. The null hypothesis that there are no significant differences between speech-defective children and normal children on the Performance Scale of the Wechsler Intelligence Scale for Children is accepted.

TABLE III

MEAN PERFORMANCE SCALE INTELLIGENCE QUOTIENTS FOR SPEECH DEFECTIVE AND NORMAL CHILDREN

Group	Mean Performance Scale I.Q.	S.D.	Variance	F	t
Speech Def. Subjects (N=50)	101.72	12.66	147.70		
				1.45[a]	.74[b]
Normal Subjects (N=200)	100.22	14.66	214.91		

[a] F significant at 1.57 for the .05 level of confidence.

[b] t of 1.96 is required for significance at the .05 level.

The F is not significant, indicating homogeneity of variance. Applying the appropriate formula, the t-ratio is also not significant, thus indicating that the experimental and normative groups do not significantly differ from one another in terms of the Performance Scale I.Q.

4. The null hypothesis that there are not significant differences between speech-defective children and normal children on subtest scaled scores (and, in particular, the Vocabulary subtest of the Verbal Scale) is rejected for 5 of the 11 subtests and accepted for the remaining 6.

Table IV, on page 113, displays the mean verbal subtest scores on the WISC for both speech defective and normative samples. It will be noted that speech-defective children differ significantly from normal children on 4 of the 6 Verbal subtests. Children with functional articulatory problems differ most significantly (at the .001 level of confidence) in the areas of Information and Vocabulary and at the .01 level of confidence in the areas of Arithmetic and Digit Span. There appears to be no significant difference between the two sample populations on Comprehension and Similarities.

Table V, on page 114, presents the mean performance subtest scores on the WISC for speech-defective and normal children. Analysis of the means in terms of the standard error of difference reveals that the two groups are essentially similar, except for the subtest referred to as Sentence Completion. On this subtest, the speech defective group is significantly elevated (at the .001 level), and it is the only subtest which is relatively elevated over the subtest performance of the normative group as well as the experimental group.

TABLE IV

MEAN VERBAL SUBTEST SCORES ON THE WISC FOR SPEECH DEFECTIVE AND NORMATIVE SAMPLE

Subtest	Subjects	Mean	S.D.	Diff.	t
Information	Defective	8.54	2.7	-1.46	5.62[a]
	Normative	10.00	2.9		
Comprehension	Defective	9.56	2.7	- .44	1.87
	Normative	10.00	2.8		
Arithmetic	Defective	9.36	2.5	- .74	3.16[b]
	Normative	10.10	2.7		
Similarities	Defective	9.45	2.8	- .45	1.76
	Normative	9.90	2.8		
Vocabulary	Defective	8.58	2.7	-1.52	5.87[a]
	Normative	10.10	2.6		
Digit Span	Defective	9.01	2.9	- .75	2.66[b]
	Normative	9.80	2.7		

[a] *t* of 3.291 is significant at the .001 level.

[b] *t* of 2.587 is significant at the .01 level, while a *t* of 1.970 is significant at the .05 level.

TABLE V

MEAN PERFORMANCE SUBTEST SCORES ON THE WISC FOR SPEECH DEFECTIVE AND NORMATIVE SAMPLES

Subtest	Subjects	Mean	S.D.	Diff.	t
Picture Completion	Defective	10.92	2.6	.92	3.53[a]
	Normative	10.00	2.8		
Picture Arrangement	Defective	10.27	2.7	.17	.64[b]
	Normative	10.10	2.9		
Block Design	Defective	10.02	2.6	-.08	.31[b]
	Normative	10.10	2.8		
Object Assembly	Defective	10.04	3.1	.14	.51[b]
	Normative	9.90	3.0		
Coding	Defective	9.83	2.5	-.47	1.84[b]
	Normative	10.10	3.1		

[a] *t* of 3.291 is significant at the .001 level.

[b] *t* of 2.587 is significant at the .01 level and 1.970 is significant at the .05 level, thus the above *t*'s are not significant.

The mean verbal and performance subtest scores for the speech defective and normative samples by age groups may be found in Appendix B.

Figures 1 through 6 represent a summary of the data referred to above in histogram form, and may be found on pages 116-20. The histograms define the mean verbal and performance subtest scaled scores for the normal and defective speakers by the six age groups represented in the study.

Table VI considers the Vocabulary subtest scores and the mean Verbal scores of the speech-defective sample in two ways: (1) the significance of the difference between the means of the Vocabulary subtest and the Verbal Tests, excluding Vocabulary from the computations, and (2) the significance of the difference between the means of the Vocabulary subtest and the Verbal Tests, including Vocabulary, in the computations.

TABLE VI

VOCABULARY SUBTEST SCORES AND MEAN VERBAL TEST SCORES OF THE EXPERIMENTAL GROUP AS RELATED TO TOTAL VERBAL FUNCTIONING

Item	Mean	S.D.	*t*
Vocabulary Subtest	8.85	2.7	
			2.11[a]
Verbal Tests[a] (Excluding Vocabulary)	9.23	2.6	
			.82
Verbal Tests (Including Vocabulary)	9.02	2.7	

[a] *t* of 2.010 is significant at the .05 level.

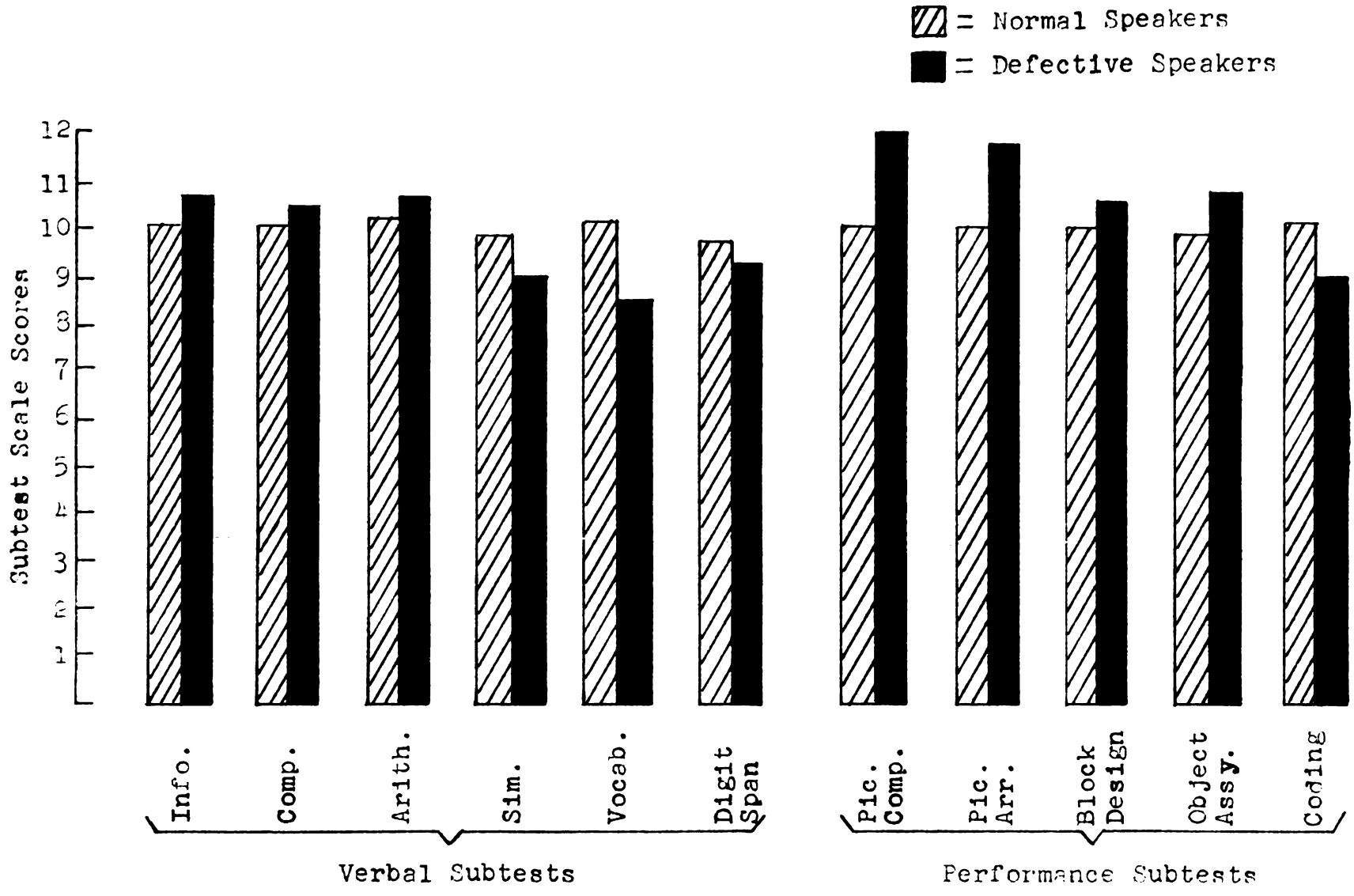

FIGURE 1.--Mean Verbal and Performance Subtest Scale Scores for Normal and Defective Speakers, Ages 6-0 to 7-0.

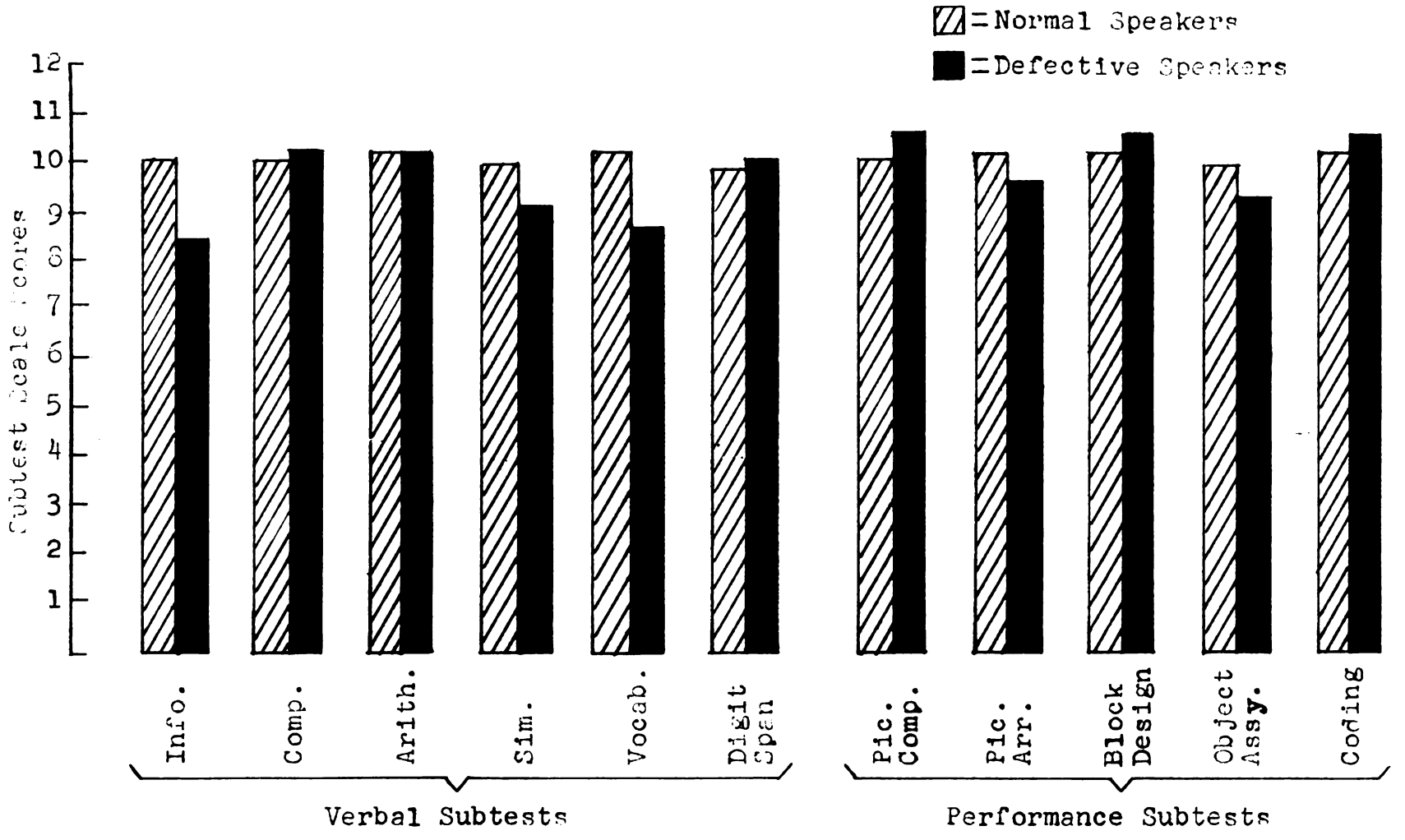

FIGURE 2.--Mean Verbal and Performance Subtest Scale Scores for Normal and Defective Speakers, Ages 7-0 to 8-0.

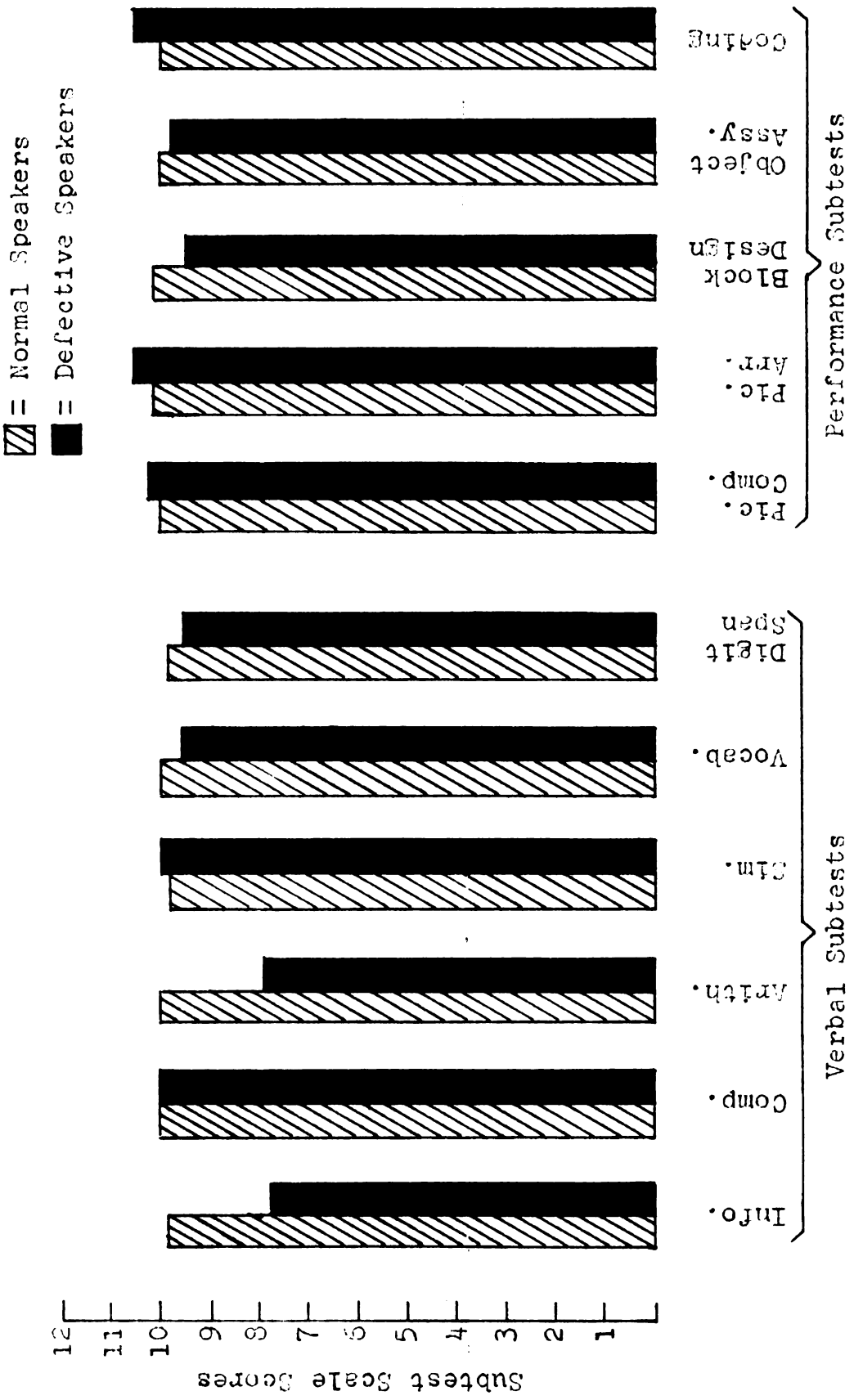

FIGURE 3.--Mean Verbal and Performance Subtest Scale Scores for Normal and Defective Speakers, Ages 8-0 to 9-0.

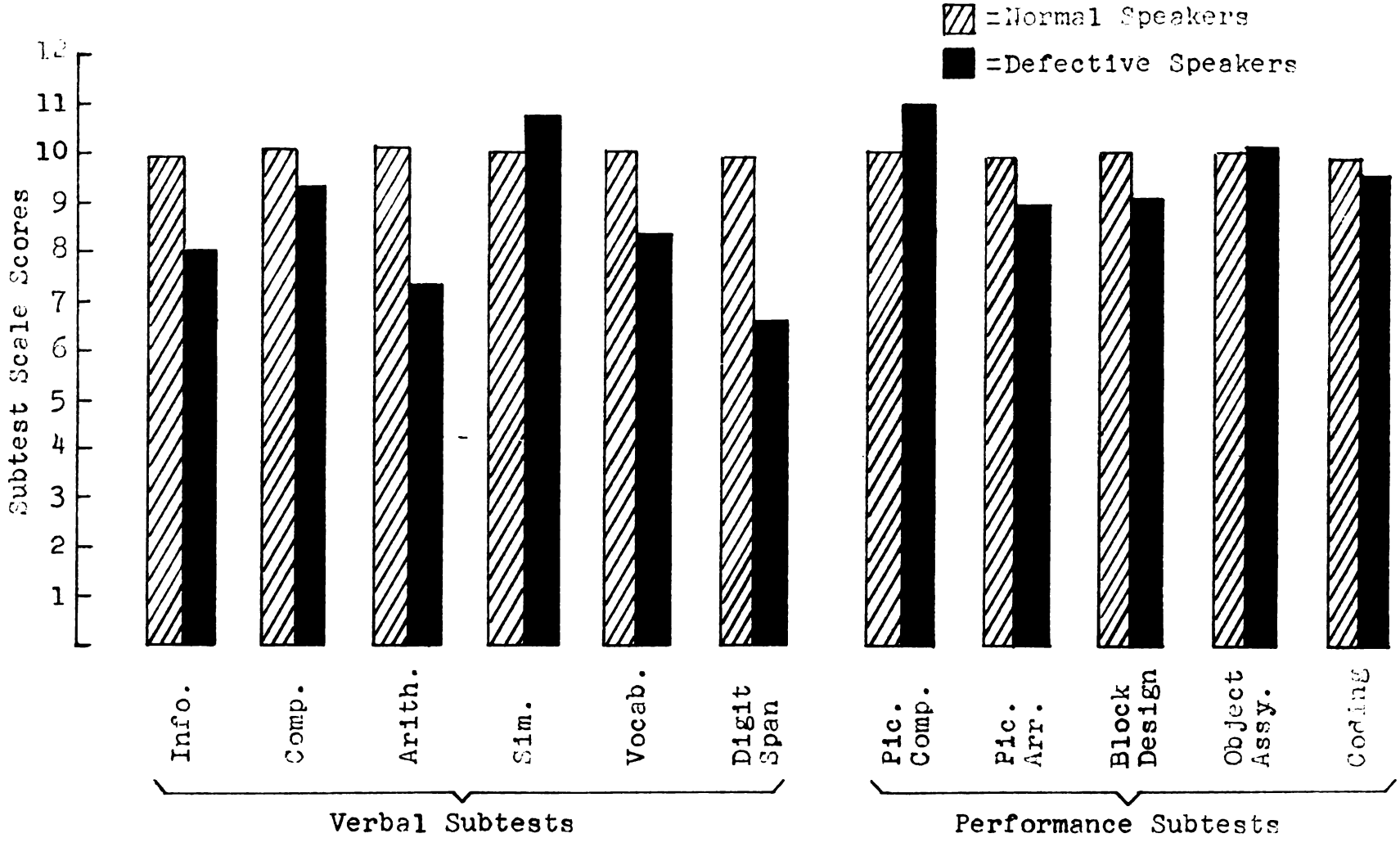

FIGURE 3.--Mean Verbal and Performance Subtest Scale Scores for Normal and Defective Speakers, Ages 5-0 to 10-0.

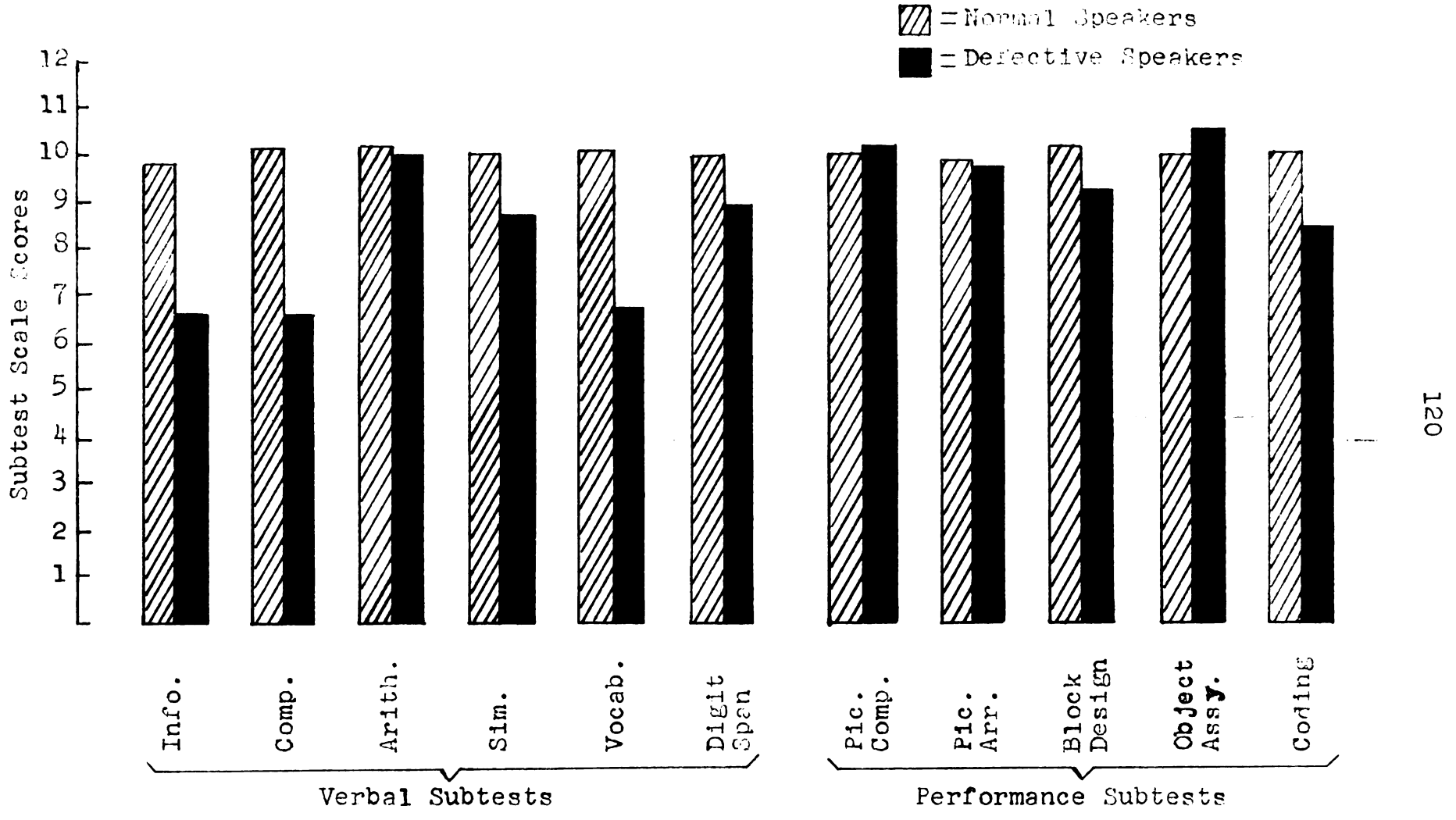

FIGURE 5.-- Mean Verbal and Performance Subtest Scale Scores for Normal and Defective Speakers, Ages 10-0 to 11-0.

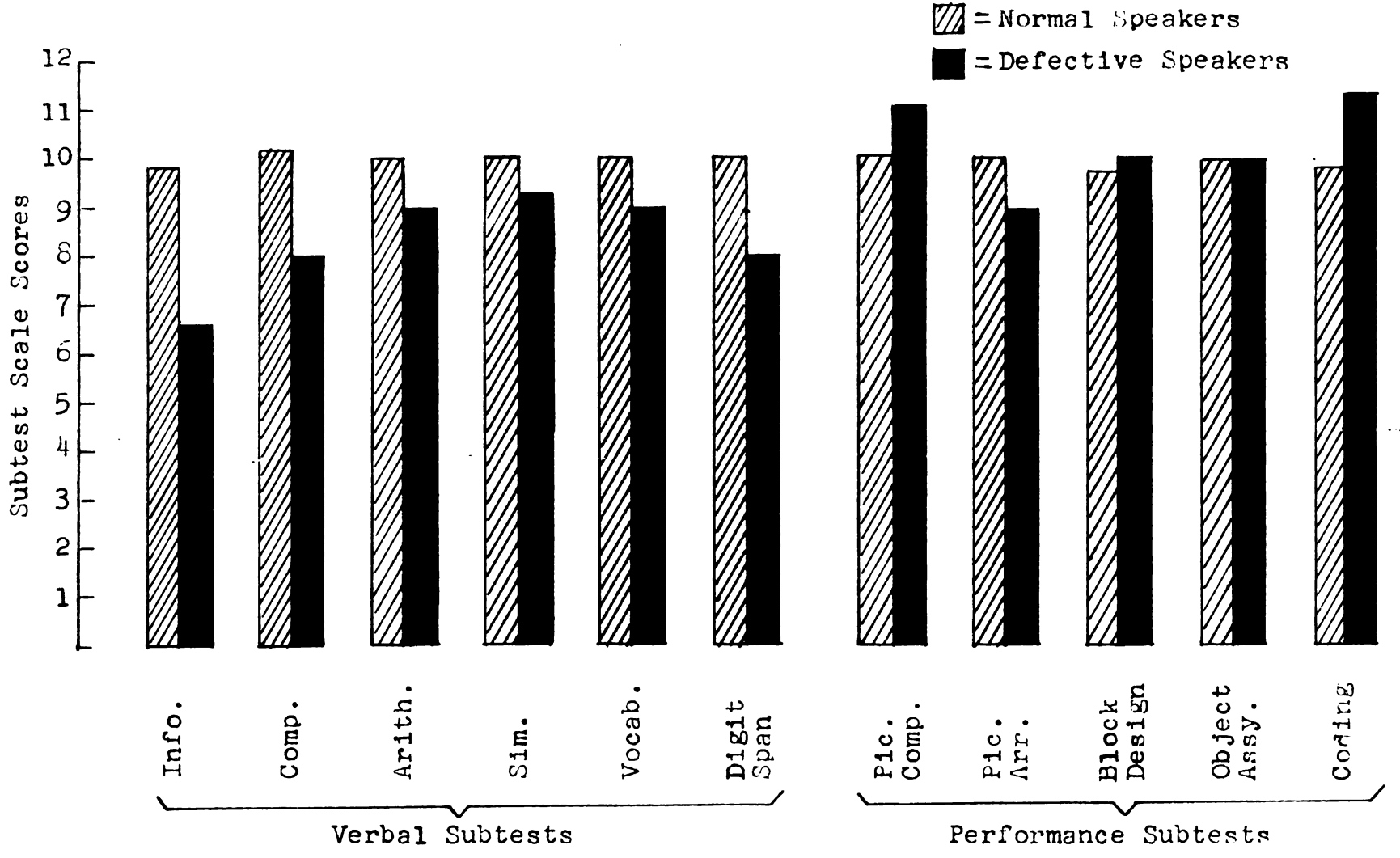

FIGURE 6.-- Mean Verbal and Performance Subtest Scale Scores for Normal and Defective Speakers, Ages 11-0 to 12-0.

It can be seen that the speech defective group's vocabulary level is significantly depressed below the mean of the experimental group's other Verbal tests when Vocabulary is excluded from the computations. If a significant difference had been found when Vocabulary was included in the statistical treatment of the significance of the difference between the means, Vocabulary alone would then serve as a predictor of verbal performance rather than the Verbal Scale in its entirety.

In view of the significant difference in means of the Verbal Scale of the speech-defective and normative samples, analysis of the difference in means of the Verbal and Performance scales of the experimental group alone was attempted, not only for the examination of such a difference, but also in order to derive the directionality of the mean differences and the error of the differences. The results of this analysis are presented in Table VII.

TABLE VII

ANALYSIS OF DIRECTIONALITY OF VERBAL AND PERFORMANCE SCALE I.Q.'S FOR THE EXPERIMENTAL GROUP

Direction of Difference	Proportion of N	Mean Differences	Diff.$_E$	t
Verbal>Performance	13	4.23	6.98	-4.881[a]
Verbal<Performance	33	12.85		
Verbal=Performance	4	—		

[a] t of -3.596 is significant at the .001 level

A summary table of individual Verbal and Performance I.Q. scaled scores with the computed mean differences between these two scores may be found in Appendix C.

Due to the obtained significance between the means of 5 of the 11 WISC subtests, Verbal and Performance subtest raw scores were transformed into Test Age Equivalents (TAE), following Wechsler's TAE statistical formula, with appropriate equivalencies inserted for the occasional lacunae encountered.[245] It was thus possible to construct a Mean Test Age (MTA) in months for the experimental group, and to derive, by ranking a subtest deviation from the average total score for Verbal and Performance subtests for each subject, for each age group, and for the experimental group as a whole. This information is contained in Table VIII, which also reveals the leptokurtic nature of the sample and the rounding errors necessitated by conversion of raw scores into Test Age Equivalents. With few exceptions, however, it is essentially similar to Tables IV and V in assaying the significance of the Verbal and Performance subtests, although it reveals, in addition, the composite scatter of the WISC subtests for the experimental group. The Picture

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[245]Wechsler, WISC Manual, op. cit., pp. 112-13.

Completion subtest ranks first, and Vocabulary last.

TABLE VIII

RANKING OF WISC SUBTEST SCORES BY DEVIATION FROM AVERAGE TOTAL SCORES FOR THE EXPERIMENTAL GROUP

Subtest Rank Order	Deviation from Av. Total Score by Months	MTA
1. Picture Comp.	+5	
2. Comprehension	+2	
3. Similarities	+1	
4. Object Assembly	+1	
5. Arithmetic	0	92.1 mos.[a]
6. Picture Arrange.	0	
7. Block Design	-3	
8. Information	-5	
9. Digit Span	-13	
10. Coding	-14	101.7 mos.[b]
11. Vocabulary	-15	

[a]Mental Test Age for 50 experimental subjects is 92.1 for combined Verbal subtests.

[b]Mental Test Age for 50 experimental subjects is 101.7 mos. for combined Performance subtests.

It will be noted that the relative level of significance between subtests as seen in Tables IV and V are reproduced by ranking in terms of the deviations from the average total score by months. Conversion of the latter indicates that the Mean Test Age for the experimental sample is 7 years, 8 months on the Verbal subtests, and 8 years, 6 months on the Performance subtests. It will be recalled that mean chronological age for the 50 subjects was 8 years, 0 months.

Ranking of the WISC subtest scores by deviation from the average test age scores by the 6 age groups which make up the experimental population may be found in Appendix D. A summary table of the individual Test Age Equivalents and group Test Age Equivalents on the 11 subtests of the WISC for the speech-defective sample may be found in Appendix E.

The WISC performance variability when considered by age grouping may be further evaluated by intra-test scale score scatter of the individual subjects in the experimental group. Such an analysis may be seen in Table IX, which reveals an intra-test scaled score ranking for the combined age groups of speech-defective children. As may be noted, 6 of the WISC subtests, 4 of which are non-verbal in nature, appear significantly more often among the highest 3 scaled scores of the experimental group. Conversely, the 3 subtests appearing significantly more often as the lowest 3 subtests are verbal in nature.

Of particular importance are the subtests Picture Completion, Vocabulary, Information, and Similarities, all of which reveal significant differences at the .001 level. Picture Completion is significantly elevated, while Vocabulary, Information and Similarities are significantly depressed, at the above-noted level. A total of 5 other tests are significantly depressed at the .01 and .05 level of significance.

TABLE IX

INTRA-TEST SCALED SCORE RANKING FOR COMBINED AGE GROUPS

Rank	Subtest	χ^2
Highest	Picture Completion	30.848[a]
Second Highest	Picture Arrangement	11.443[b]
	Similarities	11.443[b]
	Block Design	11.443[b]
	Object Assembly	11.443[b]
Third Highest	Comprehension	9.459[c]
Third Lowest	Similarities	20.666[a]
Second Lowest	Information	23.428[a]
Lowest	Vocabulary	29.471[a]

[a]Chi square of 16.268 is significant at .001 P.

[b]Chi square of 11.345 is significant at .01 P.

[c]Chi square of 9.837 is significant at .05 P.

Discussion

Full-Scale Intellectual Functioning. Table I reveals that the mean Full-Scale I.Q. of the experimental group is not significantly different from that of the normative group. Thus, over-all intellectual functioning may be viewed as essentially similar, as the obtained *t* of 1.42 did not reach the required significance level of

1.57 at the .05 level of confidence. It must be recalled that the design of the WISC permits wide variability in the Verbal and Performance I.Q. scales which are the statistical components of the Full-Scale I.Q. This variability between Verbal and Performance is of the utmost importance in defining the actual level at which the individual subject may function under a variety of conditions. Wechsler reports that the Full Scale I.Q. is "the best single measure of intelligence," and points out that the great advantage of using the statistical concept of the deviation I.Q. is that it reflects the relative position of the intellectual performance at a statistically significant level.[246]

Wechsler does caution, however, that the Full Scale I.Q. is not "the only nor a complete measure" of intelligence and that "intelligence, like personality, is too complicated an entity to be defined by a single number."[247] Thus, while the meaning of the Full-Scale I.Q. may be limited to a statistical reference to a hypothetical mean, it truly reflects relative position of intellectual functioning.

It will be recalled that in Power's review of

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[246] Wechsler, The Measurement and Appraisal of Adult Intelligence, op. cit., p. 47.

[247] Ibid.

the relationship of functional articulation disorders and general intelligence, she found that research indicated that such a relationship was not "so close that it has much predictive value within broad limits" and that it was "relatively unimportant as a determining factor in articulation disorders . . . above the preschool years."[248] She also infers that the intelligence of speech handicapped children is underestimated unless an instrument such as the Wechsler is utilized, since a great many intelligence tests reflect a preponderance of verbal items. The present study would appear to support her thesis that over-all I.Q. bears no direct relationship to severe articulatory disturbances above the preschool years.

Goodstein, in his study of children with articulatory disorders of an organic nature, reported that children with cleft lips and palates were significantly lower (chi square probability at the .01 level) on Full Scale I.Q. scores than were the control group scores.[249] Since his matched group study was not controlled on the variable of hearing impairment, such a significant depression of Full Scale I.Q. may be due to factors other than

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[248]Powers, op. cit., p. 748.

[249]Goodstein, "Intellectual Impairment in Children with Cleft Palates," op. cit., p. 292.

the cleft palate component, but may be related to an unmeasured peripheral hearing loss, which also reduces measured I.Q. The results of this study, cited on page 109 (Table I), are in disagreement with his findings regarding children with articulatory disorders, albiet of organic origin.

It may be concluded, therefore, that this study is in accordance with past research which indicates that functional articulatory disorders, of whatever degree of severity, are not reflected in over-all intellectual functioning as measured by a standardized test, such as the WISC, which has both Verbal and Performance components.

Verbal Functioning. The experimental sample of speech-defective children obtained significantly depressed Verbal I.Q. scores when compared with the normative sample, as inspection of Table II reveals. The obtained t of 3.26 was significant at the .01 level.

This conclusion tends to lend substance to the reported postulated relationship between inadequate articulatory ability and depressed verbal skills suggested by Irwin,[250] Schniederman,[251] and Allen.[252]

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[250]Irwin, op. cit., p. 3.

[251]Schneiderman, op. cit., p. 63.

[252]Allen, op. cit., p. 5.

While Doll found such verbally-depressed functioning as characteristic of the "interjacent child", he reported that he felt the verbal behavior noted reflected an unknown neuropathology.[253] While this study may support his observation of the correlation between depressed verbal ability, as measured by total Verbal I.Q., and misarticulations, the etiological significance of the disorder was only grossly measured in the experimental population by means of excluding known organically-damaged children and those with hearing losses, and I.Q.'s on any of the 3 scales of 79 or below. Inspection of Doll's research indicates that his observations regarding an "organic basis" for the misarticulations are not "clearly catalogued . . . Techniques in this field do not permit precise evaluation."[254] Thus, neither Doll's study or this study provides a statistical basis for predicting the etiological significance of the observed results. The effect of subtle neuropathologies upon childhood misarticulations and language skills in general awaits the development of suitable measurement techniques in the field of neurology. All else is speculation.

Recent research utilizing linguistic instruments, such as the ITPA, indicates that a "majority" of children

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[253] Doll, op. cit., p. 5.

[254] Ibid., p. 1.

with articulation problems are found to have significantly lower scores for verbal expressive skills.[255] Insofar as the Verbal I.Q. subtest components are related to linguistic factors and revealed in the Verbal I.Q. itself, this study tends to support Arnold's hypothesis.

It is relevant to note, perhaps, that Arnold's clinical research indicates that in "congenital language disability,"it is characteristic to "find the Verbal I.Q. significantly lower than the Performance I.Q."[256] As can be seen from inspection of Tables II and III, similar differentiation may be observed in the obtained group mean scores of this study. However, it is also relevant to note that gross differences in Verbal and Performance I.Q. scores may be found among the mentally retarded group and the gifted group,[257] neither of whom were deemed appropriate subjects for this study. Thus, it is not only the significant difference between Verbal and Performance I.Q. which must be considered by the intellectual performance level as well.

Gallagher and Lucito indicated in their statistical analysis of Wechsler's normative data that only gifted children tend to excel in verbal skills, i.e., are signifi-

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[255]Arnold, Genivieve, op. cit., p. 789.

[256]Arnold, op. cit., p. 1.

[257]Mathews, op. cit., p. 542.

cantly above the mean verbal performance of the normative sample. "Average children," defined as 90-110 I.Q., are not significantly above or below the group mean in Verbal I.Q., while mentally retarded children reflect significant depression in the Verbal Scale.[258] Gallagher and Lucito's study will be further analyzed when specific subtest performance is described in a later section. However, it may be noted that the present study reflects a significant deviation from the reported Wechsler data in terms of the normative sample for average children in the direction of the Verbal I.Q. performance of dull-normal (I.Q. 80-89) and borderline intelligence (I.Q. 70-79). It must be recalled that Guertin, Rabin and Ladd reported that a Verbal-Performance I.Q. discrepancy of 13 points was required for a statistically meaningful difference in such data, and that such a discrepancy is not spurious in a statistical sense, but that "such 'real' differences are not unusual in the general population until they reach the magnitude of 25 I.Q. points or more.[259] Perusal of the Summary table in Appendix A indicates that only two subjects from the experimental sample of this study meet such a criteria. An obtained discrepancy of 13 or more points, which Wechsler cites as significant, was found for 14 of the 50 subjects. Thus, inspection of the data in terms of Wechsler and of

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[258]Gallagher and Lucito, op. cit., p. 481.

[259]Guertin, Rabin and Ladd, op. cit., p. 5.

Guertin, Rabin and Ladd's analysis of level of significance indicates that the experimental group reflects the so-called "average" or normal Wechsler group in terms of Performance and Full Scale I.Q.'s but not in Verbal I.Q. While the data does not reflect the performance of mentally retarded children, whose I.Q. classification is 69 points or below, a depressed Verbal I.Q. scale tends to be characteristic of children with lower than "average" I.Q.'s in general.

Non-Verbal, or Performance, Functioning. The mean Performance I.Q.'s of the experimental subjects did not differ significantly from the normative subjects. Inspection of Table III reveals an obtained t of 1.74, while a t of 1.96 was required for significance at the .05 confidence level. Thus, it can be seen that the speech-defective children were most like "average" children in Performance I.Q.

This result tends to agree with the Vandemark and Mann study reported earlier, wherein articulatory-defective children were measured on the Performance Scale of the WISC and on a variety of language tasks. They reported that their subjects were significantly below the "average" on language skills, but not on Performance I.Q.[260] Sandy also reports that children who have "many" articulation errors do not have lower I.Q.'s based upon a

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[260]Vandemark and Mann, op. cit., p. 412.

standardized non-verbal intelligence test.[261] Little other research is available for analysis, since the utilization of the Performance I.Q. as a co-variant seems to be limited to the studies mentioned above. Only one other study, that of Lessing and Lessing,[262] appears applicable. They report that the obtained I.Q. measure on the WISC rates both the subject's potential and present functioning. It is possible, then, to conclude that the Performance I.Q. of the speech-defective children who served as subjects for this study is both statistically valid and reliable.

Subtest Variability. Inspection of Table IV indicates that speech-defective children differ significantly from normal children in terms of specific subtests of the WISC. Children with functional articulatory disorders as a group reflect a highly significant depression of Information and Vocabulary, as indicated by the significant *t*'s of 5.62 and 5.87, both well above the figure of 3.291 required for significance at the .001 level of confidence. Significant at the .01 level were the subtests involving Arithmetic and Digit Span. Comprehension and Similarities failed to reach the .05 significance level of 1.970, resultant *t*'s being 1.87 and 1.76 respectively.

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[261] Sandy, op. cit.

[262] Lessing and Lessing, op. cit.

All tests of significance were two-tailed, since such tests are sensitive to the absolute value of the difference between means and provides protection "against the possibility of $Mean_1 > Mean_2$ and also the possibility of $Mean_1 < Mean_2$," and decreases the probability of a Type II error, according to Edwards.[263]

As indicated under the discussion of the subtests themselves in Chapter III, Information measures range-of-information and alertness to the environment, and may reflect passivity if the scaled score is depressed.[264] Vocabulary is reported to measure learning ability, fund of verbal information, range of ideas, and is influenced by the subject's educational and cultural opportunities, according to Wechsler.[265] Considering these stated objectives of the tests, it would appear that speech-defective children exhibiting severe articulatory problems will perform most poorly in these two areas.

It is interesting to note that both of the above subtests are also significantly low for children from culturally-disadvantaged homes,[266] those with central

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[263] Edwards, op. cit., pp. 94-96.

[264] Wechsler, The Measurement and Appraisal of Adult Intelligence, op. cit., p. 67.

[265] Ibid., p. 73.

[266] Irwin, op. cit.

language disorders,[267] those exhibiting anxiety in connection with "poor language achievement",[268] those with auditory discrimination difficulties,[269] and, finally, mentally-retarded children.[270] Since the children in the experimental group did not come from disadvantaged homes, nor display central language disorders or mental retardation, it may be assumed that speech-defective children with functional articulatory problems may also be revealing both auditory discrimination difficulties and measurable anxiety which is interfering with the learning of both vocabulary and information. In addition, there is considerable agreement among research workers that articulatory disorders are related to environmental and educational conditions. Reduced vocabulary levels and reduced educational exposure appear to be correlated, according to a number of studies.[271,272, 273]

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[267]Arnold, Godfrey, Studies in Tachyphemia, op. cit., pp.6-7.

[268]Wait, op. cit.

[269]Loper, op. cit.

[270]Gallagher and Lucito, op. cit.

[271]Henrickson, op. cit., pp. 95-102.

[272]Everhart, "The Relationship between Articulation and Other Developmental Factors," op. cit., p. 332.

[273]Powers, op. cit., p. 711.

However, all children in the experimental sample were enrolled in public school at grade level, and it might appear that reduced educational exposure was not a factor in this study.

Acquisition of language, and particularly, of vocabulary, is seen as a reflection of early mother-child relationships, according to Mowrer,[274] and McCarthy.[275] This rationale is currently unsupported by research of any magnitude, since it involves longitudinal designs of exteme complexity. If the postulated relationship between mother-child interaction and vocabulary were to eventuate, it might be hypothesized that children exhibiting severe functional articulatory disorders are subject to inadequate or inconsistent maternal relationships.

A depressed vocabulary score may also have other psychological implications, as indicated by Lerea and Ward who found that the severity of the speech disorder seemed to be related to "speech avoidance."[276] They reported avoidant responses in speaking situations (i.e., little use of syntax, vocabulary, etc.), and related this condition

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[274] Mowrer, op. cit., pp. 263-68.

[275] McCarthy, op. cit., pp. 514-23.

[276] Lerea and Ward, op. cit., pp. 265-70.

to the presence of anxiety.

Inspection of Table VI reveals that the speech defective group's mean vocabulary score is significantly depressed below the mean score of the verbal tests of the experimental subjects as a whole, with a *t* of 2.11 reported at the .05 level of confidence. When the statistical analysis was corrected for spuriousness by omission of the Vocabulary subtest from the computation of the total Verbal tests, it was found that Vocabulary, while not serving as a single predictor of depressed verbal skills, was a highly significant portion of the verbal battery.

The reader is referred to Appendix D, wherein the ranked scores by deviation from average test age reveal that the age groups 6 to 7, 7 to 8, 10 to 11, and 11 to 12 all show significantly depressed Vocabulary scores. Information appears similarly depressed in all age groups with the exception of the 6 to 7-year-old group. It is unfortunate that a paucity of information in terms of well-controlled research exists in regard to the specific meaning of depressed Information scores. Clinical impressions seem to point to the hypothesis that when Vocabulary is below the mean, areas which measure educational opportunities and learning environments are similarly affected.

Support for such a hypothesis may be found in the current study, since it will be noted that Arithmetic

mean scores also revealed a deficit. Wechsler has pointed out that Information and Arithmetic may be used as indicators of scholastic achievement and adds, "Children who do poorly in arithmetical reasoning often have difficulty with other subjects."[277] It was also indicated that Arithmetic does not require a great deal of verbalization although it is in the Verbal Scale of the WISC. He reported that Arithmetic is felt to measure mental alertness and to correlate highly with global measures of intelligence.[278]

Thus, the subjects of the experimental sample, whose scores reveal depressed Vocabulary, Information, Arithmetic and Digit Span scores on the Verbal Scale, may be considered to function inadequately in the areas of academic achievement, mental alertness, and "global measures" of intelligence. However, a review of the literature failed to reveal any specific studies regarding speech-defective children and their performance on arithmetical tasks, and the results of the current study must stand alone in this regard.

As was noted previously, the Digit Span scores of the speech-defective group are significantly depressed

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[277] Wechsler, op. cit., p. 69.

[278] Ibid.

as revealed by a *t* of 2.66 which is significant at the .01 level of confidence, and these results tend to support the mass of data regarding the presence of anxiety among children suffering from severe speech handicaps.[279, 280] There is also a considerable amount of research which indicates that the identification of anxiety, per se, is somewhat amorphous.[281, 282] The preponderance of the data, however, appears to indicate a positive relationship between defective articulation and the presence of anxiety in children as measured by a variety of tasks. This study provides further evidence that on those tasks which require immediate recall of familiar material, the speech-defective child may exhibit considerable difficulty.

It must also be noted, however, that the oral reproduction of digits also requires an adequate degree of attention to the verbally-presented stimuli. The variables of recall and attention are presumably based upon the child's ability to adequately receive auditory-perceptual Gestalten. A considerable number of investigators present evidence that such perceptual integration may not exist among children who possess a severe articulatory dis-

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[279] DeHirsch, Jansky and Langford, *op. cit.*, p. 68.

[280] Trapp and Evans, *loc. cit.*

[281] Nelson, *loc. cit.*

[282] Marge, *op. cit.*, p. 165.

orders.[283, 284, 285, 286] Thus, the depressed Digit Span mean score for the experimental group cannot be solely related to either anxiety or inadequate auditory-perceptual Gestalten. The statistical fact of the deficit in recall of digits remains; the etiological significance may only be proferred, since such analyses cannot verify a presumed cause-and-effect relationship.

Before leaving the Verbal subtests, it may be appropriate to comment on the two tests which did not fall below the mean performance of the normative group, namely, Comprehension and Similarities. The "average" performance of the experimental group on these tasks was somewhat surprising in view of Wechsler's stated measurement indices. It may be recalled that Wechsler reported that Comprehension was not only a measure of practical information and evaluative judgment, but that "poor verbalizers often make low scores on the test."[287] Similarities is similarly based upon a degree of verbal comprehension, as well as the ability to conceptualize, first in concrete, then in

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[283] Young, loc. cit.

[284] Kronvall, loc. cit.

[285] Masland and Case, loc. cit.

[286] Prins, op. cit., pp. 161-68.

[287] Wechsler, op. cit., pp. 68-69.

abstract terms.[288] This study is not in agreement with Wechsler's findings, particularly in relationship to the Comprehension subtest. There appears to be little or no research in the area of functional articulatory disorders and Comprehension tasks in the literature to either support or negate the findings in regard to the current study. From this study alone, it would appear that children with severe articulatory disorders are adequate in the areas of practical information, general ability to evaluate past experience, and,if Wechsler's terminology is used, "the ability to perceive the common elements of comparative terms, . . . and . . . to bring these terms under a single concept."[289]

Subtest Variability Related to Non-Verbal Skills. Inspection of Table V reveals that only one of the 5 subtests in the Performance Scale reached a significant difference in means between the speech-defective group and the normative group. Picture Completion varies significantly from the mean performance, and is elevated above all other Performance and Verbal subtest means of the experimental group, with an observed mean of 10.92, and a t of 3.53, which was significant at the .001 level.

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[288] Ibid., p. 73.

[289] Ibid., pp. 73-74.

Since Picture Completion ostensibly measures visual recognition and identification,[290] and reportedly shows the highest loading under the visual-motor factor,[291] one might anticipate that an elevated score in Picture Completion would be accompanied by an elevated score in Coding, which is also related to visual-motor performance, with the added factor of speed of performance.[292] Such is not the case, although Coding, with a *t* of 1.84, falls between the .10 and .05 levels of confidence, indicating merely a trend in the direction of depressed, rather than elevated, performance. A review of the research indicates merely that there have been no reported studies on Picture Completion and speech-defective subjects, and that the studies which exist in the area of dyslexia report that Picture Completion is "both high and low for retarded readers."[293]

It will be remembered that Saunders reported that Picture Completion items, for the 228 male high school and college students in his sample, did not reflect Wechsler's reported bases of conceptual and perceptual

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[290] *Ibid.*, p. 81.

[291] *Ibid.*

[292] *Ibid.*

[293] Deal, *op. cit.*, p. 107.

recognition, but rather reflected maintenance of contact, perspective and the effect of uncertainty.[294] Since the construct of the test itself appears to be in doubt, the interpretation of the elevated score must remain nebulous.

The ranking of Picture Completion as the highest subtest score obtained by the experimental group may, however, be evaluated in terms of similar rankings of the Wechsler normative data by Gallagher and Lucito.[295] While no direct statistical comparisons are possible, the Wechsler data and the data resulting from this study are presented on the following page (Table X). Inspection of this table indicates that Picture Completion is one of the lowest subtests of gifted subjects, and one of the highest of mentally retarded subjects. Therefore, in Picture Completion as well as in Vocabulary and Information speech-defective children in this sample are similar to mentally retarded children in the three areas even while functioning over-all at the average level.

Dyslalic and Dyslexic Intratest Variability.

As indicated in Chapter II, research clearly shows that intratest variability of specific types exists

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[294] Saunder, op. cit., pp. 146-49.

[295] Gallagher and Lucito, loc. cit.

TABLE X

RANKED MEANS OF GROUPS OF GIFTED, AVERAGE, MENTALLY RETARDED AND SPEECH DEFECTIVE CHILDREN ON THE HIGH AND LOW SUBTESTS OF THE WECHSLER INTELLIGENCE SCALE FOR CHILDREN

Subtest Ranking	Gifted Children (Wechsler Data) N = 43 C.A. 7 to 11	Average Children (Wechsler Data) N = 565 C.A. 7 to 11	M. R. Children (Wechsler Data) N = 52 C.A. 7 to 11	Speech Defects Butler Data N = 50 C.A. 6 to 12[a]
Three Highest Subtests	Similarities	Arithmetic	Object Assembly	Pict. Completion
	Information	Digit Symbol	Digit Span	P.A., Sim., O.A., B.D.
	Vocabulary	Picture Arr.	Picture Comp.	Comprehension
Three Lowest Subtests	Pict. Comp.	Block Design	Vocabulary	Vocabulary
	Pict. Arrangement	Information	Information	Information
	Digit Span	Similarities	Pict. Arrangement	Similarities

[a]See Table IX for intratest ranking and tests of significance of means.

for dyslexic groups of children. Certain similarities between dyslexic and dyslalic groups now seem to be apparent. Flanary, for example, reported that retarded readers reveal a meager vocabulary, poor planning, and poor conceptual and memory functions.[296] Burks and Bruce report that poor readers have significantly low scores on Information, Arithmetic and Coding subtests.[297] Altus reports significantly low Digit Span, Vocabulary and Similarities scores, while Hirst reports significantly low Arithmetic and Coding.[298, 299] There would appear to be some areas of agreement, such as the lowered Information, Arithmetic and Vocabulary subscale mean scores, which, of course, are identical with those reported in this study of dyslalic children.

However, since the studies of retarded readers are so diverse in design and, in general, reflect small N's and simple ranking procedures, interpretation of the results must be cautiously attempted. It is probable

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[296]Flanary, op. cit., p. 1045.

[297]Burks and Bruce, op. cit., pp. 488-93.

[298]Altus, loc. cit.

[299]Hirst, op. cit., pp. 153-60.

that there is a small positive relationship between both dyslalia and dyslexia, as reported by Tjossen, Hansen and Ripley,[300] and that the consistently positive results found in terms of Vocabulary depression on the part of dyslexic groups and retarded readers may also be found at a highly significant level with severely disordered speech-defective children. The results of the present study would tend to support such a hypothesis, if it were restricted to children meeting the criteria of severity of this study.

Intratest Variability and Personality Functioning. While there has been considerable speculation in the fields of psychology and speech pathology regarding the personality functioning of both the speech defective child and his parents, the utilization of a standardized intelligence test is useful only insofar as the extent and scatter of the test and the qualitative analysis of the protocols provides interpretive data rendered by a skilled examiner. It will be recalled that scatter was defined as the "interrelationship of functions underlying the individual's achievement on the various subtests."[301] Wechsler himself cautions the use of the test, pointing out that such a scatter, or "configuration" is "both arbitrary and

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[300]Tjossen, Hansen and Ripley, op. cit., pp. 1109-12.

[301]Fromm and Hartmann, op. cit., pp. 45-6.

ephemeral. It should be noted that in test profiling it is essentially the magnitude of the test score rather than their configuration with which the investigator is ostensibly concerned."[302] Qualitative interpretation is therefore usually limited to group measures, in order to yield statistically significant data.

Trapp and Evans utilized the Digit-Symbol (Coding) subtest as a measure of anxiety with 18 children who exhibited severe articulatory disturbances as compared with children with mild articulation problems, and reported that the "severe" group did significantly less well on Coding, and therefore, presumably were more anxietous.[303] It will be noted by examining Table V that Coding was not found to be a significantly depressed subtest when means of the experimental and normative groups were examined, nor does Coding appear among the 3 lowest subtests in Table IX, when all subtests were examined for significance of difference between the means on an observed and theoretical probability basis. On the other hand, Coding was found to be the tenth of 11 subtests when ranked by deviation from average total scores, as in Table VIII. Thus, the observed differences

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[302]Wechsler, The Measurement and Appraisal of Adult Intelligence, op. cit., p. 165.

[303]Trapp and Evans, op. cit., pp. 176-80.

in relative placement may well be a function of the level of statistical complexity applied to the task. Simple ranking would appear to give significantly different results, which may account for the disagreement between the above-described study and the present research.

The personality functioning of speech defective children with articulatory disorders was discussed in Chapter II, and it was indicated that a great majority of the studies cited reported that these children differed significantly from children with normal or only mildly disturbed articulatory skills. It may now be said, however, that the statistical bases for these studies was of limited scope and that few studies utilizing the WISC as the instrument are available, other than in the area of Coding and its presumed relationship to anxiety.

The results of this study, as seen in Tables IV and V, would appear to indicate that insofar as depressed verbal skills may be related to aberrant personality functioning, to that extent this study provides support for a significantly different level of functioning between speech-defective and normal children. The relationship is perhaps more clearly drawn between the significant depression of Vocabulary, Information, Arithmetic, and Digit Span and inadequate school functioning.

Since non-verbal skills, as revealed by the Performance subtests, are not significantly different from the normative population, it may be assumed that the speech-defective population is not significantly different from the comparable normative group in the areas of "social intelligence" (Picture Arrangement), non-verbal intelligence, (Block Design), visual acuity, motor coordination and speed (Digit Symbol-Coding), or perception of visual Gestalts (Object Assembly).[304]

If it may be assumed that the speech defective group functions adequately in the above areas, considerable personality strengths may be hypothesized based upon these essentially non-verbal performances. It may be that studies which report that speech-defective children do not reveal personality dysfunction may be tapping these areas, at least in part, while those studies which report deviant personality functioning may be tapping verbal areas of weakness.

The results of this study, when compared with the clinical research reviewed in Chapter II, would not appear to reject the null hypothesis of no difference between speech-defective and normal children in personality areas as indirectly measured the Full Scale I.Q. of the WISC.

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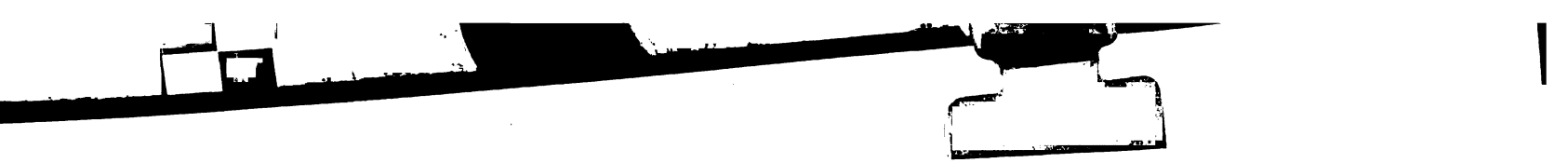
[304]Wechsler, Measurement and Appraisal of Adult Intelligence, op. cit., pp. 79-83.

CHAPTER V

SUMMARY AND CONCLUSIONS

While there has been a considerable amount of research over the years in the area of speech and language, and in the technical aspects of identifying and remediating disordered speech and language, comparatively little is known regarding the relationship of functional articulatory disorders and verbal skills as measured by a standardized instrument which assesses not only several aspects of verbal performance, but some aspects of nonverbal performance as well. Speech pathologists are well aware of the acoustic manifestations of articulatory deviancy, but perhaps much less aware of their meaning within the large, more inclusive Gestalt of language functioning and verbal skills.

A review of the research indicates that general intelligence is not a unitary trait but is part of a larger whole, namely, personality. In addition, intellectual functioning, language, cognition, and personality are felt to represent a reciprocal interweaving of processes and developmental patterns which may well include specific aspects of speech performance.



Researchers have been particularly active in the following areas: (1) measurement of the development of articulatory skills, (2) the psychological aspect of articulatory development, (3) intelligence testing variability as related to articulation and language, (4) deviant verbal and written skills, as exemplified by dyslalia and dyslexia, and (5) the influence of parent-child relationships upon functional articulatory disorders. However, the research in many of the above areas has been based upon non-standardized tests, inadequate experimental samples, and little or no differentiation of the speech-defective child based upon the degree of severity of the articulation disorder. It was found that considerable confusion reigned regarding the meaning of the simple term, "severe functional articulation disorder."

In the present study there has been an attempt made to provide considerably more rigid controls in terms of sample selection, identification of the variables to be measured, as well as the utilization of a test measurement device which was not only standardized, but reliable and valid as well.

The purpose of this study was to evaluate the functioning of children exhibiting severe articulatory defects in terms of their verbal skills, based upon the utilization of the Wechsler Intelligence Scale for Children,

as compared to the performance of non-defective children as represented by the mean performances of the standardization groups on the above tests.

The following hypotheses were proposed, stated in null form: Would there be significant differences in functioning between speech-defective children and normal children on the Full Scale, Verbal Scale and Performance Scale I.Q. of the WISC? Would there be significant differences in functioning between speech defective children and normal children on the subtest scaled scores? Of particular interest was the Vocabulary subtest, since this test would appear to be the subtest most likely correlated with articulatory disorders.

Fifty children, ranging in age from 6-0 to 12-0, served as subjects for this study. Subjects' mean age was 8-0; median age was 7-11. All subjects were at grade level and exhibited no known auditory, visual, organic, or central nervous system problems. Children with known "soft" neurological signs were specifically excluded, as were mentally-retarded and gifted children. I.Q. range of the subjects was restricted to 80 to 126 I.Q. Mean Full Scale I.Q. for all subjects was 97, well within the average range of 90-110 I.Q. Subjects were monolingual and from middle-class families. Subjects were diagnosed as possessing a functional articulation defect of severe

degree, based upon a complete oral-peripheral examination, articulation testing, audiometric screening, and gross and fine motor testing. Speech production was characterized by a minimum of 5 or more misarticulated phonemes, occurring consistently in at least two of the 3 consonant positions in single word utterances, and by decreased intelligibility.

The Wechsler Intelligence Scale for Children was administered to the 50 subjects, with 11 of the 12 subtests being utilized, Mazes being omitted. Each subject was tested in an examining room 6' by 10', outfitted with appropriately-sized tables and chairs. All distracting stimuli were removed. The examiner recorded all verbal responses of the subjects and noted all motor responses on the WISC protocols. Subjects' responses were tabulated and the raw data for analysis consisted of the subscale and total scale raw scores which were converted into standard subscale and full scale scores, following the procedure provided in the Wechsler manual. Appropriate conversions were made when 6, rather than 5, subtests were utilized in the Verbal Performance Scale.

The raw data consisted of 542 subtest scaled scores and 150 I.Q. scaled scores, which were subjected to a series of tests of significance for the difference between the means of the groups. It was found that there were significant differences between the two populations in re-

gard to both Verbal I.Q. and several of the subtests, including one subtest of the Performance Scale.

Conclusions

Within the limitations of the present study, the following conclusions seem warranted:

1. Children with psychogenic speech defects and those with normal speech reveal no differences in performance in "general intelligence" on the Full Scale I.Q. as determined by the Wechlser Intelligence Scale for Children.

2. Children with psychogenic speech defects reveal I.Q. scores that are significantly lower in the area of verbal skills than do children with normal speech.

3. Verbal subtests of the WISC, as achieved by children with psychogenic speech defects, namely, Information, Vocabulary, Arithmetic and Digit Span, are significantly lower than those achieved by children with normal speech. However, children with psychogenic speech problems reveal significantly better performance on Picture Completion, a subtest of the Performance Scale, than do children with normal speech who are of average intelligence.

4. There are no significant differences between children with psychogenic speech defects and children with normal speech for the subtests which measure Picture Arrangement, Block Design, Object Assembly, and Coding on the Performance Scale of the Wechsler Intelligence Scale for Children.

Implications for Future Research

While considerable research utilizing the Wechsler Intelligence Scale for Children has been conducted by those interested in evaluating reading disorders, very little use of this instrument has yet been made in evaluating speech disorders. Since reading and speech are aspects of a common modality, the need for such exploration would appear to be evident. In addition, the WISC permits the examiner to explore 10 to 12 areas of functioning within a relatively limited time, usually one hour or less.

Specifically, the following areas are suggested for future study:

1. General intellectual functioning of specific sub-groups of speech-defective children and adults, utilizing the Wechsler, should be studied. Most currently quoted research on intellectual functioning draws upon Binet testing accomplished in the 1920's and 1930's. The Binet, then as now, reflects a primarily verbal level of intellectual functioning. The Wechsler, on the other hand, will provide additional information by measuring non-verbal intellectual functioning as well.

2. Since maturation and developmental skills are closely related to articulatory stabilization, subtest pattern study of WISC scores of speech-defective children at various age levels may prove rewarding. The introduction of another version of the Wechsler, the WSSPI, designed for

children of pre-school age, may prove to be a valuable test instrument. The current focus on pre-school speech problems in various Head Start and nursery school program planning should serve as an impetus for exploration of the variables of socio-economic conditions, parent-child relationships, and the specific effects of language training administered under controlled conditions to 3 and 4 year old children prior to school entrance.

3. While there has been some research conducted within the past few years on the performance of brain-injured children in both verbal and non-verbal areas, little has been done in the specific area of identification of articulatory disorders, and measurement of language skills both for the known neurologically-handicapped child, and the child suspected of cerebral dysfunction. It may be that initial attempts to measure such groups on the WISC will utilize "behavioral" diagnoses, rather than neurological diagnoses due to the problems cited in Chapter II.

4. The inter-relationship between the Wechsler subtests on both Verbal and Performance Scales and the subtests of such new instruments as the Illinois Test of Psycholinguistic Abilities (ITPA) is in need of definition. There is reason to believe that the Wechsler will remain the most important standardized instrument and that such tests as the ITPA will prove to be fruitful additional

resources in the armamentarium of the examiner and the researcher.

5. There is a need for well-controlled research in establishing the correlation between such subtests of the WISC as Information, Arithmetic and Vocabulary and the the presence of a severe articulatory defect. As a concomitant problem, the need for a classification system which will clearly differentiate between the levels of articulatory disturbance is greatly needed. A review of the literature indicates that even by phonemic count, a child who exhibits one misarticulation may be classified as "severely defective" whereas another may exhibit 5 misarticulations and be classified as "normal." Research which has been conducted utilizing a group of "mild" and a group of "severe" articulatory-defective children has consistently found differential performance, although the basis for the original differential diagnosis of "mild" and "severe" is relatively ambiguous.

6. While past research tends to suggest that anxiety may play an important role in depressing the speech-defective child's performance in verbal and communicative roles, current measures of anxiety are limited by the instruments of measurement. Additional effort must be expended in this direction before the concept is statistically abandoned. The known importance of anxiety in

interference with appropriate responses, both verbal and non-verbal, needs to be translated into measurable units and applied to speech-defective children of all types.

7. While this study failed to reveal a significant depression in Comprehension scores on the WISC, there is little or no research with the particular construct embodied in this subtest, i.e., evaluative judgment and range of practical information, which has been attempted with speech-defective children. Both Wechsler and others interested in dyslexia have reported finding significant relationships between Comprehension and the variable under study. Thus, it would seem that further exploration may be fruitful.

8. The utilization of the WISC as an instrument reflecting the verbal skills of other types of speech disorders, such as stuttering, cluttering, voice, and delayed speech, is advocated. There appear to be no research studies applying this instrument to such disparate sub-groups of speech disorders. It might be suspected that considerable variation in the over-all patterning may be found between the various sub-groups. In addition, such patterning may provide useful clues to the personality functioning of each of the sub-group subjects, if the studies provide well-designed, well-controlled opportunities for exploration, with sufficiently large N's to make meaningful comparisons.

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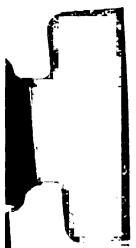

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APPENDIX A

SUMMARY TABLE OF WISC SCORES FOR EXPERIMENTAL GROUP

SUMMARY TABLE OF THE WECHSLER INTELLIGENCE SCALE FOR CHILDREN SCORES FOR THE ARTICULATORY-DEFECTIVE CHILDREN IN THE EXPERIMENTAL GROUP

Age	Case Number & Sex	Verbal Subtests						Perf. Subtests					Verbal I. Q.	Performance I. Q.	Full Scale I. Q.
		Info.	Comp.	Arith.	Sim.	Vocab.	Digit Span	Pic. Comp.	Pic. Arr.	Block Design	Obj. Assby.	Coding			
6-0 to 7-0	1-M	8	9	9	11	7	10	11	11	8	8	8	94	94	93
	2-F	9	3	12	9	3	10	14	6	13	6	6	85	93	88
	3-F	6	8	10	7	6	7	11	13	11	8	-	84	106	93
	4-M	13	9	14	8	4	-	15	12	14	12	10	97	118	108
	5-M	9	15	6	4	16	6	17	10	5	12	10	96	106	101
	6-M	10	13	8	12	6	6	14	9	11	12	7	95	104	99
	7-F	10	11	9	11	9	14	9	14	8	6	11	104	97	101
	8-M	15	12	11	10	7	14	12	18	13	14	13	110	128	120
	9-M	15	16	11	12	14	10	14	16	17	14	10	119	129	126
	10-F	8	13	9	5	12	5	9	9	7	10	8	91	90	90
	11-M	11	10	13	11	10	11	11	12	8	10	8	106	99	103
	12-M	14	10	16	11	9	8	13	9	9	16	9	109	114	112
	13-F	11	6	10	6	7	-	7	11	13	12	7	87	100	93
8-0 to 9-0	14-F	7	6	11	6	5	14	14	-	12	15	12	89	122	105
	15-M	9	11	10	13	10	9	11	9	12	9	10	103	101	102
	16-F	9	10	10	5	8	11	6	7	6	8	12	92	85	88
	17-M	8	10	9	6	9	7	13	6	8	5	5	89	82	84
	18-M	6	11	11	8	11	-	13	12	15	11	15	96	122	109
	19-M	7	11	10	6	8	8	9	11	12	13	9	90	106	97
	20-M	7	10	8	11	10	13	8	8	10	7	14	99	96	97
	21-M	13	11	12	10	13	12	14	11	14	12	10	111	115	115
	22-F	10	12	8	9	11	8	8	11	9	8	9	97	93	95
	23-M	8	12	12	8	6	12	11	8	9	11	11	97	100	99
	24-F	10	11	12	16	6	11	11	10	13	5	10	106	99	103
	25-F	10	6	10	10	10	11	12	12	10	8	9	97	101	99
	26-F	5	10	8	9	6	4	6	10	9	8	11	81	92	85
8-0 to 9-0	27-M	12	9	7	6	9	7	9	7	10	5	9	90	86	87
	28-F	7	11	6	12	7	-	10	11	8	11	10	91	100	95
	29-F	7	8	8	8	9	13	8	10	11	12	13	92	106	99
	30-F	7	10	6	8	8	14	8	13	10	11	15	92	110	101
	31-M	7	13	11	9	10	7	11	9	10	9	9	97	97	97
	32-M	5	6	5	7	9	9	7	9	10	9	10	80	93	85
	33-M	7	10	9	10	11	7	13	13	8	4	8	94	94	93
	34-M	8	10	7	14	11	13	12	9	7	12	10	104	100	102
	35-M	10	13	12	16	13	7	14	14	11	15	-	111	125	120
9-0 to 10-0	36-M	5	10	5	9	7	6	9	7	5	5	12	81	83	80
	37-M	11	9	10	14	7	6	10	13	13	15	13	97	120	109
	38-M	12	13	10	14	11	12	14	12	12	11	8	113	110	112
	39-M	6	7	8	9	10	6	11	7	10	10	9	85	96	89
	40-M	7	9	5	8	7	5	14	7	7	8	8	80	92	84
	41-M	6	6	6	10	7	6	7	9	7	9	12	80	90	83
	42-M	9	11	7	12	9	6	12	8	10	13	6	94	99	96
10-0 to 11-0	43-M	6	7	9	6	5	8	10	9	11	9	9	80	97	87
	44-M	6	4	11	12	8	11	9	8	10	15	11	91	104	97
	45-M	7	5	7	10	5	12	10	8	9	10	11	85	97	90
	46-M	5	10	10	7	7	9	9	11	8	7	4	85	85	83
	47-M	9	7	13	9	9	6	13	13	8	12	7	95	104	99
11-0 to 12-0	48-M	6	9	7	7	9	-	7	7	8	7	8	85	82	82
	49-M	4	7	8	10	5	8	11	10	9	14	11	80	100	88
	50-M	10	8	12	11	13		15	10	13	14	15	103	124	114

APPENDIX B

SUMMARY TABLES OF MEAN VERBAL AND PERFORMANCE SUBSCALE SCORES AND S.D.'S FOR ALL SUBJECTS BY AGE GROUPS

SUMMARY OF MEAN VERBAL SUBSCALE SCORES AND S.D.'S FOR ALL SUBJECTS IN THE SPEECH DEFECTIVE AND NORMATIVE SAMPLES BY AGE GROUPS

Ages	Group*	Verbal Subtests												Verbal Subscale	
		Info.		Comp.		Arith.		Sim.		Voc.		D. S.			
		Mean	S.D.	Mean	S.D.	Mean	S.D.	Mean	S.D.	Mean	S.D.	Mean	S.D.	Mean	S.D.
6-0 to 7-0	A	10.7	2.7	10.4	3.4	10.6	2.6	9.0	2.4	8.5	3.6	9.2	3.0	48.61	8.2
	B	10.0	3.0	10.0	2.9	10.1	2.7	9.9	2.8	10.1	2.6	9.8	2.7	50.20	12.6
7-0 to 8-0	A	8.4	2.0	10.1	1.7	10.1	1.3	9.0	3.0	8.7	2.1	10.0	2.7	46.85	6.1
	B	10.0	2.9	10.0	2.8	10.1	2.7	9.9	2.8	10.1	2.6	9.8	2.7	50.0	10.3
8-0 to 9-0	A	7.8	1.8	10.0	1.8	7.9	2.2	10.0	3.2	9.7	2.8	9.6	2.9	45.8	6.7
	B	9.9	3.0	10.0	2.9	10.0	2.8	9.9	2.9	10.0	3.0	9.9	2.8	50.1	11.2

*Group A represents the Speech Defective Group; Group B represents the Normative Group.

SUMMARY OF MEAN VERBAL SUBSCALE SCORES AND S.D.'S FOR ALL SUBJECTS IN THE SPEECH DEFECTIVE AND NORMATIVE SAMPLES BY AGE GROUPS

Ages	Group*	Verbal Subtests												Verbal Subscale	
		Info.		Comp.		Arith.		Sim.		Voc.		D. S.			
		Mean	S.D.	Mean	S.D.	Mean	S.D.	Mean	S.D.	Mean	S.D.	Mean	S.D.	Mean	S.D.
9-0 to 10-0	A	8.0	2.7	9.3	2.1	7.3	1.9	10.8	2.6	8.3	1.6	6.7	2.2	42.0	9.1
	B	9.9	2.9	10.1	2.8	10.1	3.0	10.0	3.0	10.0	2.9	9.9	2.9	50.0	11.5
10-0 to 11-0	A	6.6	1.4	6.6	2.1	10.0	2.0	8.8	2.1	6.8	1.6	9.0	2.2	39.8	4.2
	B	9.9	2.9	10.1	3.1	10.2	3.1	10.0	3.0	10.1	3.1	10.0	2.9	50.2	12.8
11-0 to 12-0	A	6.7	2.4	8.0	.8	9.0	2.2	9.3	1.9	9.0	3.3	8.0	0.0	41.3	7.7
	B	9.9	3.0	10.2	3.2	10.0	2.8	10.0	3.2	10.0	2.9	10.0	2.8	50.1	12.4

*Group A represents the Speech Defective Group; Group B represents the Normative Group.

SUMMARY OF MEAN PERFORMANCE SUBSCALE SCORES AND S.D.'S FOR ALL SUBJECTS IN THE SPEECH DEFECTIVE AND NORMATIVE SAMPLE BY AGE GROUPS

Ages	Group*	Performance Subtests										Performance Scale	
		P.C.		P.A.		B.D.		O.A.		Cod.			
		Mean	S.D.	Mean	S.D.	Mean	S.D.	Mean	S.D.	Mean	S.D.	Mean	S.D.
6-0 to 7-0	A	12.0	3.0	11.8	3.5	10.5	3.4	10.8	2.9	9.0	1.4	54.3	8.8
	B	10.0	2.9	9.9	2.9	10.0	2.7	10.0	3.1	10.1	2.8	50.0	9.9
7-0 to 8-0	A	10.5	2.6	9.6	1.8	10.6	2.8	9.2	3.0	10.5	2.6	50.8	8.0
	B	10.0	2.8	10.1	2.9	10.1	2.8	9.9	3.0	10.1	3.1	50.3	9.8
8-0 to 9-0	A	10.2	2.4	10.6	2.0	9.5	.9	9.8	3.2	10.5	2.2	50.9	7.7
	B	10.1	2.9	10.0	2.9	10.1	3.0	9.9	2.8	10.0	3.1	50.1	10.4

*Group A represents the Speech Defective Group; Group B represents the Normative Group.

SUMMARY OF MEAN PERFORMANCE SUBSCALE SCORES AND S.D.'S FOR ALL SUBJECTS IN THE SPEECH DEFECTIVE AND NORMATIVE SAMPLE BY AGE GROUPS

Ages	Group*	Performance Subtests										Performance Scale	
		P.C.		P.A.		B.D.		O.A.		Cod.			
		Mean	S.D.	Mean	S.D.	Mean	S.D.	Mean	S.D.	Mean	S.D.	Mean	S.D.
9-0 to 10-0	A	11.0	2.4	9.0	2.3	9.1	2.8	10.1	3.2	9.7	2.5	48.9	8.2
	B	9.9	3.0	9.9	3.0	10.0	2.8	10.1	3.0	10.0	2.9	50.0	11.5
10-0 to 11-0	A	10.2	1.5	9.8	1.9	9.2	1.5	10.6	2.7	8.4	2.6	48.2	5.1
	B	10.0	3.0	9.9	3.1	10.1	3.0	10.0	2.9	10.0	3.1	50.0	10.5
11-0 to 12-0	A	11.0	3.3	9.0	1.4	10.0	2.1	10.0	1.4	11.3	3.0	51.7	11.8
	B	10.1	2.9	10.0	3.1	9.8	3.1	10.0	3.0	9.9	3.1	49.7	11.1

*Group A represents the Speech Defective Group; Group B represents the normative group.

APPENDIX C

SUMMARY TABLE OF INDIVIDUAL VERBAL AND PERFORMANCE I.Q. SCALE SCORES — DIRECTIONALITY OF MEANS

SUMMARY TABLE OF DIRECTIONALITY OF VERBAL AND PERFORMANCE
I.Q.'S FOR THE EXPERIMENTAL GROUP

Case	Verbal I.Q.	Perform. I.Q.	V>P	V<P	V=P	Case	Verbal I.Q.	Perform. I.Q.	V>P	V<P	V=P
1	94	94			0	26	81	92		9	
2	85	93		8		27	90	86	4		
3	84	106		22		28	91	100		9	
4	97	118		21		29	92	106		14	
5	96	106		10		30	92	110		18	
6	95	104		9		31	97	97			0
7	104	97	7			32	80	93		13	
8	110	128		18		33	94	94			0
9	119	129		10		34	104	100	4		
10	91	90	1			35	111	125		14	
11	106	103	3			36	81	83		2	
12	109	114		5		37	97	120		23	
13	87	100		3		38	113	110	3		
14	89	122		33		39	85	96		11	
15	103	101	2			40	80	92		12	
16	92	85	7			41	80	90		10	
17	89	92		7		42	94	99		5	
18	96	122		26		43	80	97		17	
19	90	106		16		44	91	104		13	
20	99	96	3			45	85	97		12	
21	111	115		4		46	85	85			0
22	97	93	4			47	95	104		9	
23	97	100		3		48	85	82	2		
24	106	99	7			49	80	100		20	
25	97	101		4		50	103	124		21	

NOTE: Total Verbal and Perf. Scores and Mean Differences are in Table VII.

APPENDIX D

RANKING OF THE WISC SUBTEST SCORES BY DEVIATION FROM AVERAGE TEST AGE SCORES FOR THE SIX AGE GROUPS, EXPERIMENTAL SAMPLE

RANKING OF THE WISC SUBTEST SCORES BY DEVIATION FROM AVERAGE TEST AGE SCORES FOR THE SIX AGE GROUPS, EXPERIMENTAL SAMPLE

Age	Subtest Rank	Dev. from Av. Total Score by Months
6-0 to 7-0[a]	1. Pict. Arr.	+ 8
	2. Comprehension	+ 6
	3. Block Design	+ 5
	4. Information	+ 3
	5. Pict. Comp.	0
	6. Arithmetic	0
	7. Digit Span	0
	8. Object Assembly	- 1
	9. Vocabulary	- 5
	10. Similarities	- 6
	11. Coding	- 9
7-0 to 8-0[b]	1. Coding	+ 6
	2. Arithmetic	+ 4
	3. Comprehension	+ 4
	4. Block Design	+ 2
	5. Pict. Comp.	0
	6. Digit Span	- 1
	7. Information	- 4
	8. Similarities	- 4
	9. Obj. Assembly	- 5
	10. Vocabulary	- 5
	11. Pict. Arr.	- 6
8-0 to 9-0[c]	1. Comprehension	+13
	2. Pict. Arr.	+11
	3. Similarities	+ 3
	4. Object Assembly	+ 1
	5. Pict. Comp.	0
	6. Vocabulary	0
	7. Digit Span	- 2
	8. Coding	- 3
	9. Information	- 4
	10. Arithmetic	- 7
	11. Block Design	- 8
9-0 to 10-0[d]	1. Similiarities	+18
	2. Pict. Comp.	+10
	3. Comprehension	+ 7
	4. Obj. Assembly	+ 5
	5. Vocabulary	0
	6. Pict. Arr.	- 1
	7. Information	- 3
	8. Arithmetic	- 3
	9. Coding	- 3
	10. Block Design	- 8
	11. Digit Span	-15

[a]MTA: Ver.= 77.0 mos.; Perf.=83.3 mos.

[b]MTA: Ver.=83.8 mos.; Perf.=92.6 mos.

[c]MTA: Ver.= 97.0 mos.; Perf.= 115.1 mos.

[d]MTA: Ver.=101.3 mos.; Perf.=115.1 mos.

(Continued)

RANKING OF THE WISC SUBTEST SCORES BY DEVIATION FROM AVERAGE TEST AGE SCORES FOR THE SIX AGE GROUPS, EXPERIMENTAL SAMPLE

Age	Subtest Rank	Dev. from Av. Total Score by Months
10-0 to 11-0[e]	1. Arithmetic	+20
	2. Obj. Assembly	+18
	3. Pict. Comp.	+ 8
	4. Similarities	+ 5
	5. Digit Span	+ 5
	6. Pict. Arr.	- 4
	7. Block Design	- 4
	8. Vocabulary	- 7
	9. Information	- 9
	10. Coding	-12
	11. Comprehension	-15
11-0 to 12-0[f]	1. Coding	+10
	2. Pict. Comp.	+ 5
	3. Similarities	+ 5
	4. Vocabulary	0
	5. Obj. Assembly	0
	6. Block Design	- 1
	7. Arithmetic	- 1
	8. Comprehension	- 8
	9. Pict. Arr.	-14
	10. Information	-20
	11. Digit Span	-36

[e]MTA: Ver.=107.2 mos.; Perf.=124.4 mos.

[f]MTA: Ver.=126.0 mos.; Perf.=139.6 mos.

APPENDIX E

TEST AGE EQUIVALENTS ON SUBTESTS OF THE WISC BY MONTHS FOR DEFECTIVE SPEAKERS

TEST AGE EQUIVALENTS ON SUBTESTS OF THE WISC BY MONTHS FOR DEFECTIVE SPEAKERS

Age Groups	Subject Number	Verbal							Performance					
		Test Age	Info.	Comp.	Arith.	Sim.	Vocab.	Digit Span	Test Age	Picture Comp.	Picture Arr.	Block Design	Object Assy.	Coding
	1	63	62	70	62	62	58	66	68	82	78	58	58	66
	2	67	70	58	74	62	58	70	73	98	58	94	58	58
6-0	3	66	58	58	74	58	58	58	76	82	86	76	58	—
	4	77	86	98	94	58	58	—	81	114	84	108	86	74
	5	75	70	98	58	58	108	58	89	146	82	58	86	74
to	6	66	70	90	62	82	58	58	74	78	70	74	86	62
	7	83	78	82	70	82	70	118	75	66	98	70	58	84
	8	88	102	90	82	78	58	116	108	90	126	102	114	106
7-0	9	95	102	114	84	90	102	78	113	114	114	142	110	78
	10	74	70	98	70	58	90	58	71	70	74	58	80	70
	11	90	86	82	94	90	84	90	80	90	94	62	78	74
	12	90	102	82	102	90	76	70	100	102	98	78	138	78
	13	68	86	58	82	58	58	—	75	58	88	96	64	70
	Tot.	1022	1042	1078	998	926	936	840	1083	1190	1150	1076	1074	894
	14	74	70	58	82	58	58	118	116	126	—	104	126	106
	15	85	78	90	82	98	82	78	88	90	78	106	80	86
7-0	16	75	78	82	82	58	84	78	73	58	70	58	74	106
	17	77	78	90	82	62	82	70	75	102	68	78	58	68
to	18	85	70	98	94	70	94	—	117	114	98	138	100	134
	19	82	78	98	94	62	80	78	101	90	100	80	110	126
8-0	20	89	70	82	94	90	82	116	82	66	75	86	62	122
	21	101	106	98	102	90	104	106	113	126	100	134	114	90

TEST AGE EQUIVALENTS ON SUBTESTS OF THE WISC BY MONTHS FOR DEFECTIVE SPEAKERS

Age Groups	Subject Number	Verbal							Performance					
		Test Age	Info.	Comp.	Arith.	Sim.	Vocab.	Digit Span	Test Age	Picture Comp.	Picture Arr.	Block Design	Object Assy.	Coding
7-0 to 8-0	22	91	94	106	82	82	102	78	86	78	100	86	78	86
	23	90	86	106	102	70	58	118	94	102	84	86	102	98
	24	93	86	90	94	138	58	90	85	90	84	114	98	88
	25	80	86	58	82	82	82	90	84	90	94	86	70	78
	26	68	62	82	70	78	58	58	80	74	84	78	70	94
	Tot.	1090	1042	1138	1142	1038	1014	1078	1204	1206	1036	1234	1142	1282
8-0 to 9-0	27	85	106	90	82	62	90	78	84	90	78	96	62	94
	28	96	86	106	82	126	78	—	107	114	122	86	114	98
	29	99	86	90	94	82	94	150	109	90	102	114	126	114
	30	103	86	98	82	82	90	170	114	90	132	102	114	130
	31	93	78	114	102	90	94	78	94	102	92	96	86	94
	32	78	70	72	70	70	94	90	94	78	98	102	96	98
	33	96	86	106	102	90	116	78	104	138	156	86	58	92
	34	107	86	98	82	138	102	134	101	114	92	78	120	102
	35	116	100	128	114	158	122	78	144	138	156	120	162	—
	Tot.	873	784	902	810	898	880	856	951	954	1028	880	938	822

TEST AGE EQUIVALENTS ON SUBTESTS OF THE WISC BY MONTHS FOR DEFECTIVE SPEAKERS

Age Groups	Subject Number	Verbal							Performance					
		Test Age	Info.	Comp.	Arith.	Sim.	Vocab.	Digit Span	Test Age	Picture Comp.	Picture Arr.	Block Design	Object Assy.	Coding
9-0 to 10-0	36	89	78	106	82	102	90	78	88	102	92	62	68	118
	37	109	118	106	114	150	90	78	147	114	162	146	182	132
	38	131	126	142	114	150	122	134	136	158	156	140	126	98
	39	95	86	90	102	102	114	78	110	126	92	114	114	106
	40	89	94	106	82	90	90	74	106	158	92	86	96	96
	41	107	106	126	98	138	110	78	126	138	100	114	156	132
	42	89	78	82	94	114	90	78	93	78	106	86	102	92
	Tot.	709	686	758	686	846	706	598	806	874	800	748	844	774
10-0 to 11-0	43	93	94	98	114	82	78	90	122	126	114	140	114	114
	44	115	94	62	138	150	110	134	134	114	104	126	190	134
	45	110	102	78	102	126	82	170	115	126	104	114	126	106
	46	102	86	126	126	90	106	78	109	126	104	114	126	106
	47	117	118	98	156	114	124	90	142	168	174	106	156	104
	Tot.	537	494	462	636	562	500	562	622	648	640	592	680	544
11-0 to 12-0	48	137	102	126	102	102	122	—	107	102	100	112	102	118
	49	106	82	106	114	138	90	—	134	142	138	124	126	142
	50	135	134	114	154	150	166	90	178	190	138	180	190	190
	Tot.	378	318	346	370	390	378	90	419	434	376	416	418	450
Grand Total	N=50	4609	4360	4684	4642	4660	3488	3462	5085	5318	4990	4954	5128	4222


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