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McGRAW, Joseph J., 1924-
A COMPARISON OF MEAN SUBTEST RAW SCORES ON THE WECHSLER INTELLIGENCE SCALE FOR CHILDREN OF REGULAR AND OVER-ACHIEVING READERS WITH UNDER-ACHIEVING READERS.

The University of Oklahoma, Ph.D., 1966
Education, general

University Microfilms, Inc., Ann Arbor, Michigan

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THE UNIVERSITY OF OKLAHOMA

GRADUATE COLLEGE

A COMPARISON OF MEAN SUBTEST RAW SCORES ON THE WECHSLER INTELLIGENCE SCALE FOR CHILDREN OF REGULAR AND OVER-ACHIEVING READERS WITH UNDER-ACHIEVING READERS

A DISSERTATION

SUBMITTED TO THE GRADUATE FACULTY

in partial fulfillment of the requirements for the

degree of

DOCTOR OF PHILOSOPHY

BY

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Norman, Oklahoma

1966

A COMPARISON OF MEAN SUBTEST RAW SCORES ON THE WECHSLER INTELLIGENCE SCALE FOR CHILDREN OF REGULAR AND OVER-ACHIEVING READERS WITH UNDER-ACHIEVING READERS

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ACKNOWLEDGMENTS

The writer wishes to express his sincere appreciation and gratitude to all those whose continual guidance and assistance were invaluable during the period of graduate study. Especially is the writer indebted to Dr. P. T. Teska, who directed the writing of this research project. His scholarly direction, support and encouragement made the graduate years possible and left a lasting impression.

Particular appreciation is extended to Dr. W. B. Ragan, Dr. M. C. Petty, and Dr. Franklin Parker for the invaluable assistance which they rendered the writer in giving so generously of their time and for their helpful advice and encouragement.

The assistance and cooperation of all of the subjects used in this study and their parents is gratefully acknowledged.

The writer further extends appreciation to John Catlett, who assisted in the pilot study and assumed many of the writer's responsibilities thereby freeing him to carry on this study.

Finally, my warmest love goes to my wife, Jerry Ann, and my children, Deanna Mae, Donna Jo, Phillip Calvin, and

Brenda Sue, whose patience, encouragement, and understanding were vital to the success of my entire program.

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A COMPARISON OF MEAN SUBTEST RAW SCORES ON THE WECHSLER INTELLIGENCE SCALE FOR CHILDREN OF REGULAR AND OVER-ACHIEVING READERS WITH UNDER-ACHIEVING READERS

CHAPTER I

INTRODUCTION

A problem of major importance in the education of young children is the teaching of reading, particularly the teaching of remedial reading. Large sums of monies are currently being allocated to establish reading clinics within the schools, to train reading specialists, and to purchase reading materials. A review of the educational philosophy of the teaching of remedial reading discloses the proverbial reading experts who, in the beginning, concerned themselves primarily with the method of teaching to be used. Through the years, the various advocates of the visual, phonetic, kinesthetic, therapeutic, medical, and neurological approaches have loudly proclaimed their successes and have scarcely spoken of their failures. The trend in the basic teaching of reading and remedial reading teaching seems to remain common in that the last decade has seen a blending

of the major approaches to the problem. Out of this eclectic approach there has evolved the realization that remedial reading is a separate entity in itself. There was a time when it was a common belief that if one knew the fundamental skills of reading, he could teach remedial reading. This opinion is no longer adhered to; educators now know that the teacher of remedial reading must be specially trained--must be an expert in the field.

One of the major problems and issues of remedial reading today involves the efficient and proper diagnosis of the particular deficiencies of an individual labeled a retarded reader. Remedial reading may be likened to Kenneth M. Colby's view of psychotherapy: "Psychotherapy--including its most extensive form, psychoanalysis--is repair work."[1] Remedial reading is, likewise, repair work. It is felt that obtaining an IQ, noting reading habits such as reversals, faulty word recognition, faulty word analysis, hesitations, repetitions, or lack of any of the basic word attack skills coupled with checking for problems in vision and/or hearing will not constitute a diagnosis, but rather a summation of symptoms. To treat successfully the reading problems of any individual, it appears to be expedient to start at the beginning--a neuro-psychological approach, if you will. A thorough diagnosis of reading disability should reflect the

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[1]Kenneth M. Colby, A Primer for Psychotherapists (New York: The Ronald Press Company, 1951), p. 3.

deficits, if any, of neurological, developmental, and psychological aspects. After the foregoing deficits are dealt with, then and only then, should a remediation program in reading be started. In order to meet this challenge, new and better evaluating tests must be developed or new purposes and new uses must be made of the ones now in existence.

This study is concerned with an investigation of eleven types of stimuli presentation as exemplified on the Wechsler Intelligence Scale for Children by under-achieving readers and regular and over-achieving readers. This study will examine the following questions: On which of the eleven subtests do the under-achieving readers score low? Is there a syndrome of one, two, or three subtests? Is there a significant difference in the mean Verbal and mean Performance scores? Do the regular and over-achieving readers exhibit a consistent pattern on the eleven subtests?

It seems most appropriate, at this time, to search out what the reading specialists, reading experts, psychiatrists, psychologists, educators, physicians, optometrists, neurologists, and developmentalists perceive as the important facets of reading and the teaching of reading. For the purposes of this study, special emphasis will be placed on the neurological, psychological, and physiological development of the individual. It is felt that the foregoing is necessary in order to have a thorough understanding of just what information the eleven subtests of the Wechsler

Intelligence Scale for Children reveal.

There are literally volumes of written material on the complex problems of learning to read and the teaching of reading. This study is not concerned with or interested in fostering or testing any specific idea of "readiness" or "nonreadiness", or theory of reading, or method of teaching reading. The primary purpose of this study was to determine if there was a statistically significant difference between regular and over-achieving and under-achieving readers as exemplified on the Wechsler Intelligence Scale for Children. However, it was felt that a review of 1) some of the methods for teaching reading, 2) the phenomenas of psychological, developmental and neurological aspects which were developing while reading was being learned and 3) a study of the causative factors for failure in reading would point up the necessity for and the desireability for such a test as the Wechsler Intelligence Scale for Children when evaluating reading disabilities.

There are also hundreds of so called reading experts. It was subsumed that such widely known and distinguished members of the reading profession as Edward W. Dolch, Arthur I. Gates, Guy L. Bond, David H. Russell, Albert J. Harris, Helen M. Robinson, Ruth Strang, Constance M. McCullough and Arthur E. Traxler would readily be recognized and accepted as authorities in their field. Other reading authorities quoted in this study, who because of their contributions to reading are becoming more prominent, were Carl H. Delacato, John Money, Ronald Morris and Fred J. Schonell.

Review of the Literature

In the Supplemental Educational Monographs, Daisy Marvel Jones reviewed the history of reading methods. She cited the A B C method, word method, phonetic method, and the "intrinsic" method. Each of the methods has evidenced both advantages and limitations. Jones stated of the A-B-C method:

> While this method did develop some facility in spelling and encouraged forward movement of the eye, it was highly mechanical, developed short attention span, and produced slow laborious reading.

For the word method, she reported:

> The word method provided for immediate success, increased speed, and a lengthened eye span. It broke down when the memory was filled to capacity, for it provided no means of distinguishing between words similar in structure or for deciphering new words.

This deficiency soon led to the phonetic approach. Jones related that:

> The phonetic method was systematic, helpful in spelling, and conducive to independence. It reverted to the slow, labored processes of the alphabet method; it neglected thought content, was highly abstract, and left the pupil helpless in dealing with the large number of English words that are unphonetic in structure.

Jones appeared to find less fault with the "intrinsic" method. She stated: "The 'intrinsic' method is an attempt to teach mechanics without sacrificing meaning."[2]

The prevalent basic instruction of today is, in part,

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[2]Supplemental Educational Monographs (October, 1948), No. 65-68, Chapter IV, Patterns of Basic Instruction in Reading: Their Advantages and Limitations, pp. 23-24.

a combination of the above methods whereby the teacher attempts to employ the advantages of each method while minimizing the disadvantages. An attempt is made to fit the method to the individual needs of a pupil.

Reading Readiness

Edward W. Dolch, in 1951, in his book Psychology and Teaching of Reading, emphasized the importance of reading readiness. Dolch stated that not only is there a need for readiness in the beginning stage, but there is also a need for readiness at all levels, i.e., beginning readiness, mental age readiness, readiness for different conditions such as size of classes, etc., readiness for public school, and overall emotional adjustment.[3] Twenty years earlier Dolch referred to readiness as "Getting Eagerness to Read." He stated:

> Everyone knows that children learn when they want to learn. The best teacher is the one who is most successful in making the children eager to learn what is planned for them. This process has been called motivation or giving children a motive. More correctly, we may say it is arousing desires or motives that already exist in the children. We merely appeal to the natural tendencies with which every child is born.[4]

When reflecting on the neuro-psychological approach and the abundance of complex problems the remediation expert is faced with, it seems appropriate to question the last two statements made in the above quotation.

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[3]Edward W. Dolch, Psychology and Teaching of Reading (Champaign, Illinois: The Garrard Press, 1951), pp. 48-81.

[4]Ibid., Chapter I, p. 3.

Fred J. Schonell, in 1961, in his book The Psychology and Teaching of Reading, appears to be more cautious, specific, and realistic when he lists the five major factors to be considered in reading. He states that (1) general maturity, (2) level of general intelligence, (3) abilities of visual and auditory recognition and discrimination of word patterns, (4) environmental factors in reading ability, and (5) emotional attitudes of interest, individual application, and confidence are necessary prerequisites to the complex process of reading. Schonell goes on to say:

> A mature, highly intelligent child, with a stable personality, whose perceptual powers are excellent and whose experiences and language background are exceptionally wide, usually learns to read irrespective of method or of the teacher's endeavors. But it will be apparent that there may be children who are ill equipped in every one of the five named factors, or, if not in every one, then in at least two or three separate essentials.[5]

Schonell views the reading approach of today as made up of (1) the phonetic method, (2) the whole word method, or (3) the sentence method, or a combination of the whole or parts of the methods. Schonell lists seven developments in the modern teaching of reading that he feels are psychologically sound. The seven methods are:

> (1) The use of a systematically developed preparatory reading period or reading readiness programme, (2) the use of everyday experiences as a basis for reading material, (3) the use of a controlled vocabulary, (4) the use of properly prepared additional books for

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[5]Fred J. Schonell, The Psychology and Teaching of Reading (New York: Philosophical Library, 1961), pp. 24-46.

> supplementary reading parallel to the basic readers and involving the same vocabulary or a slightly advanced vocabulary, (5) the value of illustrations, (6) the use of specially prepared teaching aids and (7) the place and use of phonic training in the teaching of reading.[6]

The child has no readiness program before he begins to crawl, walk, run, or climb. Adults work with the child, yes, but there is no pre-crawling, pre-walking, pre-running, etc. Normal development and maturation seem to follow closer to the concept that in order for an organism to progress to a higher level of learning it is first necessary for the organism to have established a firm foundation at a lower level. One thing that the parent can do is to build health. Some five- and six-year olds just do not grow as fast as others. In many, there are specific handicaps that require attention; eye glasses to correct vision, hearing aids for faulty hearing, and possible clinical help to lessen strain and stress. Parents may not know or understand about handedness and footedness and eyedness, but they can be observant and seek the proper help, and they can take steps to see that their children are in good physical and emotional condition.

Arthur I. Gates, Guy L. Bond, and David H. Russell concluded, after an extensive study:

> It is therefore unsound to set up a specific mental age (such as 6.0 or 6.5 years) as essential for beginning reading or to classify children for reading instruction on the basis of mental age alone.[7]

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[6] Ibid., pp. 95-112.

[7] Arthur I. Gates, Guy L. Bond, and David H. Russell, Methods of Determining Reading Readiness (New York: Columbia University, Teachers College, 1939), p. 53.

They also felt that failure in reading may well be the result of starting to teach a pupil to read before he is "ready."

Psychological Readiness

There are many changes and factors that a beginning school age youngster may find threatening. Up until age six, children grow at a remarkably fast pace, and then the pace begins to decelerate. The average six-year-old loses his first teeth. He needs more to eat and he eats more. The average six-year-old becomes stronger, better integrated and better coordinated, thus he becomes capable of more complex and manipulative tasks. Sources of conflict and anxiety confront the typical school age child.

> The most common and probably the most important of these are (1) potential rejection by parents and peers, (2) open and direct expression of aggression and rebellion against parents, teachers, and peers, (3) failure to live up to the stereotyped conception of one's sex role, and (4) lack of skills and personal competence.[8]

The child's acceptance by his friends will depend to a large extent on the traits which he has adopted that are appropriate for his sex role. "When peers, parents, and teachers are in agreement about the appropriateness of certain values or actions, few problems arise."[9] However,

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[8]P. H. Mussen, J. J. Conger, and J. Kagan, Child Development and Personality (New York: Harper and Row Publishers, 1963), p. 379.

[9]Ibid., p. 379.

in many cases, the foregoing idealistic values are not forthcoming and the child is confronted with conflict. The degree of success that he experiences in resolving these conflicts depends upon earlier training and the stability of his identification with the parents.

In human beings, learning is basic for adaptation and self-preservation. Patterns of psychological growth for effective human functioning are most readily acquired by imitation and identification. The child is aware of his dependence on adults. He views adults as strong, independent, and self-sufficient. The child desires to become an adult to lessen his insecurity and lessen his feelings of being weak, helpless, and dependent. The child learns for a variety of reasons. Partly, the child learns so he can gain the adult's power, self-sufficiency and apparent freedom. What happens to the youngster who is exposed to conflict and unrest in the home? If strong feelings or emotions such as hate, anger, or fear enter into a relationship, they will impair or alter the process of identification. No one consciously desires to imitate and be like someone they hate. Thus, these strong negative feelings or emotions that develop in one relationship may be carried into other relationships or situations that the child perceives as similar. Conflicts may be present in the child's environment, and he may be the unintentional victim of these conflicts. If serious psychological conflict exists in the family over a period of time,

a child may be too preoccupied with his current survival and security to invest much energy in learning new material. If a child's significant relationships are threatened, he may be too anxious or fearful to attend to academic work; by comparison school work is unimportant in his emotional life.

Developmental Readiness

It is interesting to note Arnold L. Gessell's and Frances L. Ilg's cycle of development which entails infancy, childhood, adolescence, and parenthood. They see the six-year-old as less integrated than he was at age three. He is more like a two-and one-half-year-old who has not fully found either himself or his environment and is therefore in a fluctuating two-way equilibrium.[10]

> The six-year-old likewise is in a bipolar phase, trying at one and the same time to find himself and to find out his new environment. Choice and reconciliation between the two poles create tensions and hesitations. He is solving new problems of development. This is the key to understanding some of his difficulties and instabilities at the threshold of his formal education.
>
> The seven-year-old has himself better in hand. He shows less lability and a greater capacity to absorb and organize his cultural experiences. He establishes more firm relationships with his companions and his teacher. He is decidedly more unipolar. He is better able to take what comes. There is less dis-equilibrium. This is, comparatively speaking, an absorptive and assimilative phase. Day by day he grows in mental stature.
>
> By the age of eight, the budget of income and outgo shows new balances. The child has built up a firmer body of experience and is able to give as well as to take. He shows more initiative and spontaneity in going

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[10]Arnold L. Gessell and Frances L. Ilg, The Child from Five to Ten (New York: Harper and Brothers Publishers, 1946), p. 15.

> out to meet the environment. He can fraternize with his co-equals. At nine he is detaching himself still more from apron strings, and domestic tethers. With a mounting indifference to his elders when he is away from them, he dwells in a culture of his own selection.
>
> By the age of nine and ten, this indifference reaches new heights. Boys and girls alike are amazingly self-dependent. Their self-reliance has grown, and at the same time they have acquired intensified group feelings. Identification with the juvenile group promotes the complex process of detachment from the domestic family group. This is part of the method of maturing.
>
> At the same time, the divergence between the two sexes is widening. By the age of ten, the tendency toward segregation is well defined. Girls, somewhat earlier than boys, enter upon the pre-pubertal period, marked by changes in body proportions, metabolism, and endocrine secretions. These changes become yet more marked during adolescence, which is a prolonged period of diminishing immaturity.[11] The child thus becomes a youth, the youth an adult.

Later, when marriage occurs, the first great sector of the cycle of development comes to full circle.[12]

We, therefore, see that there are many varied and complex activities in force with the child at any given stage of his development. It is difficult to conceive of any serious distortion of these steps or stages of development which would not seriously effect learning. Man is the highest form of life and subsequently his neurological growth, his developmental growth, his activities, and his goals are complex. Surely, we can't expect a complex organism to function properly that suffers from deprivation of its basic needs.

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[11] Ibid. [12] Ibid.

Neurological Readiness

Samuel T. Orton, in 1925, did a brief study of fifteen cases of reading difficulty seen in a mobile mental hygiene clinic in Greene County, Iowa. He later did a somewhat more extended study of one of these cases in the Iowa State Psychopathic Hospital. Orton felt there was a possibility that such children might be handicapped by a physiological variation which made them unfit for progress in reading by the methods currently used in the schools. Orton was not concerned that this deficiency was a gross mental defect or congenital brain defect or perceptual dysfunction nor the result of emotional factors; he was concerned with the fact that the brain was not properly dealing with reading ability from the dominant hemisphere. Orton goes on to state that it is known from clinical studies that damages in the leading or dominant hemisphere results in word blindness, but only if the damage is in the dominant hemisphere. People so effected are able to recognize individual letters and figures, but cannot read printed or written words.[13] Orton assumes from inference that the sub-dominant hemisphere holds records, known as engrams.

> As further elaboration of this concept it seems probably that only one of these antitropic engrams serves as the basis for associative linkage between the visual sphere and the concept, and that if a clear cut unilateral dominance be not established by the elision of one of

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[13] Samuel T. Orton, Genetic Psychology Monographs (October, 1928), Vol. 4, p. 335.

> them, confusion might readily arise which would prevent that immediately successive linkage between the sensory stimulus (printed word) and its meaning (concept) which constitutes reading.[14]

Orton obtained his first clue that there was not an established clear cut dominance from children reversing letters such as "b" and "d." He further ascertained that they read from right to left, and that they exhibited unusual facility for mirror reading and mirror writing.

Carl H. Delacato, 1963, found, after having worked several years as a teacher, school administrator, reading specialist, diagnostician, and psychologist, that debating various systems for teaching reading was fruitless. Each system produces successes and each system produces failures. Delacato lists three biases: (1) educational bias, (2) psychological bias, and (3) psychiatric bias.[15]

Delacato seized upon the idea that one had to deal with the problem of language by dealing with the whole person, the whole organism operating as a unit physiologically, psychologically, and intellectually. Delacato found that many of Orton's theories were in opposition to findings of the fast rising neurological field. It seems that leaders of education and psychology felt it was impossible to form a cohesion of education and neurology. He sought out the

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[14] Ibid., p. 337.

[15] Carl H. Delacato, The Treatment and Prevention of Reading Problems (Springfield, Illinois: Charles C. Thomas Publishers, 1963), p. 4.

Dean of American Neuro-surgeons, Dr. Temple Fay, and studied, watched, and was taught by this esteemed person for four years.[16] From the foregoing tutelage and further study, Delacato originated the neuro-psychological approach to the treatment and prevention of reading problems. Basically, Delacato believes that the organism should be unilateral, clearly dominant, either right or left, and that this status should be reached before any remediation or reading takes place. The writer concurs.

Delacato further states: ". . . the basis of speech and reading is the brain, hence, the treatment of problems of reading and speech should be directed toward the brain."[17]

Studies of Causative Factors

Marion Monroe did an extensive study involving retarded readers, checked by a control group of normal readers. An analysis was made of reading in regard to reversals, total errors, words added, addition of sounds, faulty vowels, repetitions, omission of sounds, faulty consonants, and words refused.

> The errors found to be significantly greater at all grade levels in the retarded group than in the normal are reversals, repetitions, and total errors. Errors of omission of sounds are significantly greater at every level except the second grade, and refused words are significantly less at every level except the

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[16] Ibid., p. 12.

[17] Ibid., p. 24.

second grade.[18]

From this study, a series of analytic tests was constructed to be used as a diagnostic measure for specific reading diability.

Helen M. Robinson, acting as psychologist and reading technician with a distinguished group composed of a social worker, a psychiatrist, a pediatrician, a neurologist, three ophthalmalogists, a speech specialist, an otolaryngalogist, an endoctrinologist, and a reading specialist, studied thirty severely retarded readers with Binet IQ's ranging between 85 and 137.[19] Each specialist made his individual examination and then all specialists met to consider their findings and arrive at a diagnosis for the cause of reading disability. Although it is readily accepted that all of these specialists have obtained a high level of sophistication, the writer immediately ponders (1) the level of prestige of each member as related to the group, (2) the degree of devotion of each to his particular field of study and (3) the need of expediency to arrive at one conclusion due to the limited time of such distinguished members. The foregoing pondering appears, in part, to be substantiated when it is reported that "a number of factors that appeared

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[18]Marion Monroe, Genetic Psychology Monographs (October, 1928), Vol. 4, A Comparison of the Reading Performance of Normal and Retarded Readers, p. 382.

[19]Helen M. Robinson, Why Pupils Fail in Reading (Chicago: The University of Chicago Press, 1957), p. 219.

to be possible causes of reading failure, in the opinion of the specialists, did not prove experimentally to be so."[20] A "cause" was defined as an "anomaly." Anomalies considered to be probable causes were listed in the following manner:

Visual difficulty	50%
Neurological Difficulty	18.1
Auditory Difficulty	9.1
Speech or Discrimination Difficulty	18.1
General Physical Difficulty	4.5
Endocrine Disturbance	9.1
Emotional Maladjustment	31.8
Social Problems	54.5
School Methods	18.1

As can be noted, there was an overlapping of causative factors for some individuals. The pupils who were most seriously retarded in reading exhibited the largest number of anomalies. They were the ones most deviant from the "normal" pattern. Robinson states "the experimental evidence secured in this study indicated that certain types of anomalies operated as causes more frequently than others."[21] Social, visual, and emotional difficulties were first. Inappropriate school methods, neurological difficulties, and speech or functions of auditory difficulties were second. Endocrine disturbances, general physical difficulties, and insufficient auditory acuity were third and appeared to be the least important.[22]

Ronald Morris, 1963, points out the many distractions

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[20] Ibid., p. 211.

[21] Ibid., p. 218.

[22] Ibid., p. 221.

to reading such as television, movies, and the fast pace of civilization today. He further indicates that materials should be carefully graded and have meaning for the pupil:

> From this standpoint, the teacher of reading today, if he is prepared to think broadly about success and failure in learning to read, will find himself concerned not only with levels of reading accomplishment but also with important concomitants of the learning-to-read process.[23]

Albert J. Harris, 1962, states

> ....that most reading disabilities are not caused by special types of mental defect, but arise from causes such as mental or social immaturity, physical handicaps, poor motivation, interrupted schooling, emotional disturbances, and exposure to ineffectual teaching.[24]

It is interesting to note that Robinson perceived physical handicaps as relatively unimportant and that Harris puts it second in his causative factors. Both writers recognize the emotional disturbance factor but seem to view its significance in quite different degrees.

Harris prefers the Stanford Binet to the Wechsler Intelligence Scale for Children or a combination of the Stanford Binet supplemented by the Performance Scale of the Wechsler. He feels the Stanford Binet is more closely related to reading because of the sampling of verbal intellectual abilities.[25] The foregoing seems to indicate that Harris is more interested in an IQ as a piece of information than that

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[23]Ronald Morris, Success and Failure in Learning to Read (London: Oldbourne Book Co., Ltd., 1963), p. 15.

[24]Albert J. Harris, How to Increase Reading Ability (New York: David McKay Company, Inc., 1961), Chapter IX, p. 221.

[25]Ibid., p. 223.

of viewing an intelligence test as a diagnostic tool to determine lack of reading ability.

Although clinical studies tend to find a relationship between lateral dominance and reading disability, Harris states "that surveys of large numbers of school children tend to give negative findings."[26] On the other hand, Harris "has become convinced from his own experience, that there is more than a chance relation between lateral dominance and reading disability."[27]

Ruth Strang, Constance M. McCullough, and Arthur E. Traxler, 1961, report that "Low IQ's obtained by retarded readers may reflect their reading retardation rather than a basic inability to learn."[28]

Robert Cohn, 1961, reports a striking difference in right-left orientation when he compared a group of fifty-six children having reading and writing difficulties with 130 randomly chosen children.[29] Cohn's studies offered evidence that many children with learning disabilities suffer from "minimal brain damage."

Heinz F. R. Prechtl and Charles J. Stemmer, 1959-1962, investigated a group of fifty children selected from

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[26] Ibid., p. 251.

[27] Ibid.

[28] Ruth Strang, Constance M. McCullough, and Arthur E. Traxler, The Improvement of Reading (New York: McGraw-Hill Book Company, 1961), p. 4.

[29] J. Money, Reading Disability (Baltimore, Maryland: The Johns Hopkins Press, 1962), p. 188.

children referred mainly because of poor school performance and who exhibited choreiform movements (slightly jerky movements) and found that in 96 per cent of the children that their eyes were affected, causing disturbances of conjugate movement and difficulty in fixation and reading.[30]

Prechtl further states:

> My suggestion is that some of the children with reading difficulties have these problems because they cannot fixate longer and have a quite serious instability of concentration caused by the choreiform activity. These defects in their neural function may also lead to a lag in the development of cerebral dominance and to a delay in the development of complex functions as, for instance, reading.[31]

The writer has found, in the operation of a remedial reading clinic for four years, that eighty-five per cent of the children attending the remedial reading clinic exhibit signs of emotional disturbances and/or neurological symptoms which cannot be fully explained by reading and spelling tests even though they are both diagnostic and analytic in nature. Delacato stated:

> Such test scores should always be compared with results in arithmetic to ascertain if there is a difference in performance between the languages and mathematical areas. If there is not such a difference, one must suspect an intellectual limitation as the possible etiological factor.[32]

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[30] Ibid., p. 189.

[31] Ibid., p. 193.

[32] Carl H. Delacato, The Diagnosis and Treatment of Speech and Reading Problems (Springfield, Illinois: Charles C. Thomas Publishers, 1963), p. 79.

He further states:

> The use of Intelligence Test results is helpful at this stage. I favor the Wechsler Intelligence Scale for Children in that it not only gives a Verbel IQ (which is invalidated in great part by the existence of a language problem) but it also gives a performance IQ with which the verbal performance can be compared. From the above we can assess the problem, assess present performance and can, in light of intelligence, ascertain the potential for performance.[33]

It would then seem that the review of the literature indicates that authorities, whether they be educators, psychologists, developmentalists, neurologists or remedial experts, share the common belief that a degree of "readiness" is necessary in order to accomplish the skill of reading. It seems that the concept of "readiness" or lack of "readiness" is too broad and too general to give much information about why a student is a good or poor reader. A statistical comparison of the obtained mean raw scores by regular and over-achieving and under-achieving readers on the Wechsler Intelligence Scale for Children should furnish a great deal of information on why one child, in the average range of intelligence, is an adequate reader and a similar child is an inadequate reader. It is felt that the Wechsler Intelligence Scale for Children obtains a broad sampling of the factors that contributes to the normal maturation process.

The lack of experimental evidence comparing the responses of under-achieving and regular and over-achieving

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[33] Ibid., p. 80.

readers on the Wechsler Intelligence Scale for Children points up the appropriateness of this investigation. It is possible that if enlightening results are obtained from the study, the information may be useful in selecting more effective procedures for helping the child who is burdened with reading and learning disabilities.

CHAPTER II

STATEMENT OF THE PROBLEM

The problem of this study was to determine the difference, if any, in the responses to the eleven subtests of the Wechsler Intelligence Scale for Children by two groups of boys and girls in the average range of intelligence and within the age range of ninety-one to one hundred sixty-two months (7 years, seven months through 13 years, 6 months). One of the groups was defined as under-achieving readers and the other group was defined as regular and over-achieving readers. The under-achieving reader group was composed of thirty-two boys and girls who were reading at grade level or above.

The two primary variables presented were (1) the standardized Gates Reading Survey and (2) the standardized Wechsler Intelligence Scale for Children. Was there a syndrome of one, two, or three subtests? Was there a significant difference in the mean Verbal and mean Performance scores? Does the regular and over-achieving reader score significantly high on a given subtest? Does the under-achieving reader score significantly low on a given subtest?

In order to determine the difference, if any, the following null hypotheses were tested:

1. For subjects in the age range 7 years, 7 months through 13 years, 6 months, there is no statistically significant difference in the mean total verbal raw scored on the Wechsler Intelligence Scale for Children obtained by regular and over-achieving readers in the average range of intelligence, when compared to the means total verbal raw scores obtained by under-achieving readers in the average range of intelligence.

2. For subjects in the age range 7 years, 7 months through 13 years, 6 months, there is no statistically significant difference in the mean total Performance raw scores on the Wechsler Intelligence Scale for Children obtained by regular and over-achieving readers in the average range of intelligence when compared to the mean total Performance raw scores obtained by under-achieving readers in the average range of intelligence.

3. For subjects in the age range 7 years, 7 months through 13 years, 6 months, there is no statistically significant difference in the Information raw scores obtained by regular and over-achieving readers in the average range of intelligence on the Wechsler Intelligence Scale for Children when compared to a similar group of under-achieving readers.

4. For subjects in the age range 7 years, 7 months

through 13 years, 6 months, there is no statistically significant difference in the mean Comprehension raw scores obtained by a group of regular and over-achieving readers in the average range of intelligence on the Wechsler Intelligence Scale for Children when compared to a similar group of under-achieving readers.

5. For subjects in the age range 7 years, 7 months through 13 years, 6 months, there is no statistically significant difference in the mean Arithmetic raw scores obtained by a group of regular and over-achieving readers in the average range of intelligence on the Wechsler Intelligence Scale for Children when compared to a similar group of under-achieving readers.

6. For subjects in the age range 7 years, 7 months through 13 years, 6 months, there is no statistically significant difference in the mean Similarities raw scores obtained by a group of regular and over-achieving readers in the average range of intelligence on the Wechsler Intelligence Scale for Children when compared to a similar group of under-achieving readers.

7. For subjects in the age range 7 years, 7 months through 13 years, 6 months, there is no statistically significant difference in the mean Vocabulary raw scores obtained by a group of regular and over-achieving readers in the average range of intelligence on the Wechsler Intelligence Scale for Children when compared to a similar group

of under-achieving readers.

8. For subjects in the age range 7 years, 7 months through 13 years, 6 months, there is no statistically significant difference in the mean Digit Span raw scores obtained by a group of regular and over-achieving readers in the average range of intelligence on the Wechsler Intelligence Scale for Children when compared to a similar group of under-achieving readers.

9. For subjects in the age range 7 years, 7 months through 13 years, 6 months, there is no statistically significant difference in the mean Picture Completion raw scores obtained by a group of regular and over-achieving readers in the average range of intelligence on the Wechsler Intelligence Scale for Children when compared to a similar group of under-achieving readers.

10. For subjects in the age range 7 years, 7 months through 13 years, 6 months, there is no statistically significant difference in the mean Picture Arrangement raw scores obtained by a group of regular and over-achieving readers in the average range of intelligence on the Wechsler Intelligence Scale for Children when compared to a similar group of under-achieving readers.

11. For subjects in the age range 7 years, 7 months through 13 years, 6 months, there is no statistically significant difference in the mean Block Design raw scores obtained by a group of regular and over-achieving readers in

the average range of intelligence on the Wechsler Intelligence Scale for Children when compared to a similar group of under-achieving readers.

12. For subjects in the age range 7 years, 7 months through 13 years, 6 months, there is no statistically significant difference in the mean Object Assembly raw scores obtained by a group of regular and over-achieving readers in the average range of intelligence on the Wechsler Intelligence Scale for Children when compared to a similar group of under-achieving readers.

13. For subjects in the age range 7 years, 7 months through 13 years, 6 months, there is no statistically significant difference in the mean Coding raw scores obtained by a group of regular and over-achieving readers in the average range of intelligence on the Wechsler Intelligence Scale for Children when compared to a similar group of under-achieving readers.

14. For subjects in the age range 7 years, 7 months through 13 years, 6 months, there is no statistically significant difference in the mean Verbal raw scores minus mean Performance raw scores obtained by a group of regular and over-achieving readers in the average range of intelligence on the Wechsler Intelligence Scale for Children when compared to a similar group of under-achieving readers.

CHAPTER III

PROCEDURE OF THE STUDY

The Pilot Study

Records were kept on children diagnosed as underachieving readers over a two-year-period until a sampling would be taken from one hundred test protocols of the Wechsler Intelligence Scale for Children. The pilot study included seventy-four boys and twenty-six girls with ages ranging from seven through fifteen. The range of intelligence was from 70-120 I.Q. During this two-year-period, there were some five referrals who did not have reading deficiencies. When these five test protocols which were not accompanied by reading disability were compared with test protocols of children who had reading disabilities, there appeared to be a marked difference in the subtest scaled scores. Was it, then, possible to diagnose reading problems with the Wechsler? Could the psychiatrist, psychologist, or psychometrician be alerted to a new development that would save him hours of study and result in a more valid diagnosis? It seemed appropriate to pursue the study further.

The Subjects

The bases for the selection of subjects for this study were age, sex, level of intelligence, and reading ability. The rationale of these criteria is set forth in the following paragraphs.

Age.--Each subject used in this study was within the range of ninety-one to one hundred sixty-two months of age. It was deemed necessary to obtain a sampling at the early grade levels and not to go beyond the junior high level because other factors and variables would possibly interfere in the assessment of the study. It is quite possible that the most salient factors of interference at a higher chronological age would be the adolescent and teenage period of adjustment. It was felt that a lower chronological age would not have allowed the subjects sufficient exposure to the complex facets of reading. The selected age range of this study afforded a study of the youngster in the very beginning stages of reading, the transitional period between grades three and four, and in the higher grades of five, six, seven, and eight, where a youngster may experience limited success or failure in reading or find himself enthralled in the joys of becoming an accomplished reader.

Sex.--It is a well-known fact that boys experience more difficulty with the reading process than do girls. There are many concepts and suppositions about the fact that boys have considerably more trouble with learning to read;

among these ideas the following three appear to be more realistic: (1) girls mature earlier than boys, (2) boys tend to be more aggressive and interested in rough and tumble games, whereas, girls tend to be more passive and are more interested in quiet activities such as reading, and, finally, (3) books tend to be slanted more towards girls' interests than boys' interests. However, a surprisingly abundant number of girls experience difficulty in learning to read adequately. The subjects of this study were composed of approximately sixty-five per cent boys and thirty-five per cent girls.

Intelligence.--All subjects were of average intelligence. This requirement was made in the interest of acquiring a more representative sampling of the average classroom or school. The students in the average range of intelligence, 90-110 IQ, comprise approximately fifty per cent of the enrollment in most public schools. Students of low and high IQ's make up the remaining portions. Likewise, the majority of students in community or private remedial reading clinics are in the average range of intelligence. The writer also found, during a year's internship in psychology at a psychiatric receiving center, that the majority of children referred to the Department of Child Psychiatry were in the average range of intelligence. It is exceedingly difficult and, for practical purposes, almost impossible to obtain children below 75 IQ who read at grade level beyond the

fourth grade. By the same token, although it is true that there are children in the 130 IQ range of intelligence who experience reading disabilities, it is also true that such cases are extremely rare and are usually accompanied by unique symptoms which would not be in common with this study. Because of the foregoing limitations and inaccessibility of students in the two extreme ranges of intelligence and because the writer did not want to limit the study, it seemed most appropriate and meaningful to confine the study to the average range of intelligence.

Reading Ability.--All of the subjects, with the exception of two, used in this study were defined as under-achieving readers or regular and over-achieving readers by individual testing with the standardized Gates Reading Survey. The Gates Reading Survey consists of three reading tests: (1) a speed and accuracy test, (2) a vocabulary test, and (3) a level of comprehension test. A time limit of six minutes was allowed for the speed and accuracy test for grades three, four, and five. A time limit of four minutes was allowed on the speed and accuracy test for grades six and up. No exact time allowances were set up for the vocabulary test and the level of comprehension test; however, the instructions stated that twenty minutes or a little more was sufficient. Raw scores were obtained on each reading test. When the raw scores were applied to the standardized norms, a grade score and corresponding age score were obtained on

each test and when the grade scores and age scores were totaled and divided by three, an average grade score and an average age score were obtained.

The two subjects who did not take the Gates Reading Survey were evaluated with the standardized Gates Paragraph Reading Test and the Gates Word Recognition Test. The results of these two reading tests were also compared with the standardized norms for an average grade level and an average reading age.

The sixty-four subjects were divided into two groups consisting of thirty-two subjects in each group. Those subjects who scored six months or more below grade level were defined as under-achieving readers. Those subjects who scored at grade level or above were defined as regular and over-achieving readers.

The Test Instrument

The instrument used in this study to determine the intellectual level of each subject and also to furnish the data for the study was the Wechsler Intelligence Scale for Children. This test was chosen because of its excellent categorization of the items that it is believed measure intelligence. The test is structured in such a way that it gives a Verbal IQ, a Performance IQ, and a Full Scale IQ. The Wechsler Intelligence Scale for Children contains five subtests and one auxiliary test on the Verbal portion and five subtests and one auxiliary test on the Performance

portion. The five Verbal subtests are: Information, Comprehension, Arithmetic, Similarities, and Vocabulary. The auxiliary Verbal subtest is Digit Span. The five Performance subtests are: Picture Completion, Picture Arrangement, Block Design, Object Assembly, and Coding. The auxiliary Performance subtest is Mazes.

The Procedure

The enrollment records of a remedial reading clinic were used to select the group of thirty-two under-achieving readers. The group of thirty-two regular and over-achieving readers were selected from subjects who had been asked to come to the clinic for testing. It was necessary to test a rather large number of children in order to obtain the regular and over-achieving readers' group. Many of the subjects were disqualified because they scored two or three IQ points above or below the average range of intelligence. Not a small number of children subsumed to be regular and over-achieving readers turned out to be inadequate readers. It was thought desirable to obtain as wide and randomly selected a sample as possible. Consequently, the under-achieving readers' group is composed of students from twenty-four different schools. The regular and over-achieving readers' group represents twenty-six different schools.

Each subject was tested individually in a small, comfortable, quiet, well-ventilated, and well-lighted room

at the remedial reading clinic. Each subject was brought to the clinic by one or both of his parents. The subject was asked to sit to the left of the examiner at a right angle to the examiner at the end of a table.

The following instructions were given to each subject:

> Here is a reading test. Now let's look at the directions. (The booklet was placed in the proper position for the subject and the examiner read upside down.) It says: 'Read these paragraphs. Draw a line under the word which best answers the question or completes the sentence. Draw a line under one word only. Do the exercises as rapidly as you can without making errors.' Now, how about your reading the sample aloud to me? (After the subject had read the sample, the examiner would make an appropriate statement of 'Good' or 'perhaps you will do better on the next one.') Now, on the next two pages are similar paragraphs. When I tell you to begin, do as many of them as you can. Do them in order, 1, 2, 3, etc. If you get through on this page, go right on to the next page and continue until I say 'Stop.' Begin.

The subject was then allowed to use his allotted time and stopped on command. Timing was kept with a stop watch which had a sweep second hand. There was a brief pause while the examiner turned the page of the test booklet to the Vocabulary Test. The instructions for the Vocabulary Test were explained until it was evident that the subject clearly understood what he was to do. The subject was then told:

> This is not a timed test, but you should work vigorously until you are through. Try to do as many as you possibly can. Begin.

After the Vocabulary Test was completed, the

directions for the Level of Comprehension Test were read. When it was assured that the subject clearly understood what was expected of him, he was told:

> This is not a timed test; however, you should work as rapidly as you can. Try to do as many as you can and let me know when you are through. Begin.

When the subject had completed the Speed and Accuracy Test, the Vocabulary Test, and the Level of Comprehension Test, he was informed that the reading portion of the test was over and that there would be a short respite before beginning the rest of the examination.

No effort was made to evaluate or grade the reading examination in the presence of the subject. Later, the reading test was graded by the aforementioned means, and it was then determined whether the subject would be added to the under-achieving readers' group or regular and over-achieving group or not used.

At the beginning of the test with the Wechsler Intelligence Scale for Children, the following materials were on hand: (1) the complete Wechsler Intelligence Scale for Children Kit which included the test manual, the picture arrangement cards, the small booklet of arithmetic problems, picture completion cards, block design cards, the four boxes of the object assembly puzzles, the box containing the nine multicolored blocks, the vocabulary card, the shield card for the object assembly test, and the scoring key for coding, (2) the Wechsler Intelligence Scale for Children test blank, (3) pencils, (4) stop watch, and (5) the examiner and the subject. The following instructions were given to the subject:

> Now, I am going to be asking you a whole bunch of questions; some you will know the answers to, some you may not. Don't be too concerned about the ones you don't know the answers to because you're not supposed to know them all. However, at the same time, you want to do as well as you can. Okay?

It is felt that failure to establish proper rapport before the formalized testing begins is quite possibly and probably one of the most limiting factors in gathering data. Children quite readily understand and feel comfortable with words such as "a whole bunch" and "okay." It seems feasible that tension and anxiety are relieved when a youngster not only understands that there may be questions that he will not be able to answer but that he is not expected to know all the answers. The foregoing statements are, of course, biased; however, these concepts seem to be sustained when they have enabled an examiner to accomplish formalized testing with a youngster who has defied other clinical personnel in their futile attempts during a full hour's time to engage the subject in one word of conversation.

When the subject clearly understood what was expected of him, the testing was started. The order of the subjects, as given to the examinee, was: Information, Comprehension, Arithmetic, Similarities, Vocabulary, Digit Span, Picture Completion, Picture Arrangement, Block Design, Object Assembly, and Coding. The position of the test blank and the manner of scoring were such that no undue concern was raised on the part of the subject in regard to just how he was succeeding on the test. No attempt was made to formally

score the test during the testing session nor in the presence of the examinee. When the testing was completed, the subject was thanked for his cooperation and excused from the room.

The Wechsler Intelligence Scale for Children was then scored in the customary manner. This resulted in the raw scores of each subtest which were converted to scaled scores, and the summation of the scaled scores were converted to a Verbal IQ and a Performance IQ. These scores were then totaled for a Full Scale IQ. For the purposes of this study, the scaled scores were of little use because of the fact that the scaled scores given on the Wechsler are weighted scores. The primary interest of this study was to use the raw scores, thereby giving the subject exact credit for what he had done.

It was then necessary to compute the proper norms for a particular chronological age from the test age equivalents for Wechsler Intelligence Scale for Children raw scores as set forth in the table of the test manual on page 113. The norms are recorded in three separate segments for each chronological year, i.e., 10.2 - 10.6 - 10.10, etc. The norma extend from the chronological age of 5.2 through 15.10.

Occasional lacunae were encountered, and it was then necessary to follow the explicit instructions of the manual, i.e., (1) if the raw score applies to only two successive ages, use the lower age; (2) if there are more than two, use a median value. Since this study was not

primarily concerned with ages, the appropriate norms were selected by using the method described above.

Tables were then prepared which listed the norms for each separate sub-test at each chronological age of the sixty-four subjects. The subjects were then divided into two groups of thirty-two subjects each. One group was for thirty-two under achieving readers. Another group was composed of thirty-two regular and over-achieving readers. The subjects of each group were determined by their respective scores on the standardized Gates reading tests as previously described. Additional tables were prepared which grouped all of the under-achieving readers; their raw scores were obtained on each of the eleven subtests of the Wechsler Intelligence Scale for Children. Similar tables were constructed for the group of regular and over-achieving readers. Eleven subtests were used because it is felt that Digit Span is an important subtest in the diagnosis of reading problems.

The Obtained Data

The following data were obtained for each of the sixty-four subjects participating in the study: name of child, grade level and reading age for the Speed and Accuracy reading test, grade level and reading age for the Vocabulary reading test, grade level and reading age for the Level of Comprehension reading test, an average reading grade level and an average reading age.

Further data included those gathered from the Wechsler Intelligence Scale for Children. They were: chronological age, intelligence quotient, responses to each test item, raw scores for each of the eleven subtests, total raw scores for the verbal subtests, total raw scores for the performance subtests, and age norms for each subtest at each chronological age.

CHAPTER IV

THE RESULTS

Two groups of thirty-two children in the average range of intelligence, 90-110 IQ, participated in this study. One group was composed of children designated as regular and over-achieving readers who were functioning at grade level or above grade level in reading. The other group was made up of children who were reading six months or more below grade level, and they were designated as under-achieving readers. The designated group participation was determined by individually administered standardized reading tests. The purpose of the investigation was to determine whether or not there was a statistically significant difference in the Wechsler Intelligence Scale for Children mean raw scores obtained by the two groups. In this study the required level of statistical significant difference was placed at .05.

In order to determine whether or not the variances were equal, the following method was used:

$$\frac{\text{Largest } S^2}{\text{Smallest } S^2} = (\text{Look up in F table}) \frac{df}{df} \quad \frac{31}{31} \quad \frac{(N_1 - 1)}{(N_2 - 1)}$$

TABLE I

REGULAR AND OVER-ACHIEVING READERS

C.A.	Grade	Speed and Accuracy	Reading Age	Vocab.	Reading Age	Comp.	Reading Age	Average Grade	Average Rdg. Age
7-7	2	2.0*	7.2	2.0*	7.2				7.2
8-1	3	3.3	8.6	3.8	9.0	3.6	8.9	3.6	8.8
8-4	3	4.0	9.2	3.4	8.7	3.8	9.0	3.7	9.0
8-6	3	3.0	8.2	3.1	8.3	3.1	8.3	3.1	8.3
8-9	3	3.3	8.6	2.9	8.1	3.3	8.6	3.2	8.4
8-10	3	3.8	9.0	4.0	9.2	3.8	9.0	3.9	9.1
9-3	4	4.8	10.0	5.0	10.2	4.8	10.0	4.9	10.1
9-9	4	6.2	11.5	5.4	10.6	5.0	10.2	5.5	10.8
9-9	4	4.0	9.2	4.4	9.7	4.8	10.0	4.4	9.6
10-1	4	5.5	10.7	3.8	9.0	3.8	9.0	4.3	9.6
10-2	4	6.3	11.6	4.5	9.8	2.9	8.1	4.6	9.8
10-4	4	5.5	10.7	6.0	11.2	5.8	10.10	5.8	10.10
10-5	4	5.2	10.4	5.0	10.2	4.8	10.0	5.0	10.2
10-5	4	5.5	10.7	5.2	10.4	4.8	10.0	5.2	10.4
10-7	5	5.5	10.7	6.0	11.2	5.0	10.2	5.5	10.7
10-8	5	6.5	11.9	5.4	10.6	5.0	10.2	5.6	10.9
10-8	4	6.0	11.2	5.5	10.7	3.8	9.0	5.1	10.3
10-11	5	6.5	11.9	5.2	10.4	5.2	10.4	5.6	10.9
11-5	6	6.5	11.9	6.2	11.5	5.8	10.10	6.2	11.5
11-5	5	6.0	11.2	6.2	11.5	5.0	10.2	5.7	10.10
11-6	5	7.7	13.0	5.4	10.6	6.9	12.2	6.7	11.9
11-6	5	6.0	11.2	6.6	11.10	7.6	12.11	6.7	12.1
11-6	5	6.7	12.0	4.5	9.8	6.9	12.2	6.0	11.3
11-10	6	6.3	11.6	7.0	12.3	5.6	10.8	6.3	11.5
12-1	6	7.1	12.4	7.7	13.0	7.2	12.6	7.3	12.7
12-3	6	6.1	11.3	6.6	11.10	6.5	11.9	6.4	11.7
12-3	5	6.1	11.3	5.2	10.4	5.2	10.4	5.5	10.7
12-5	6	8.2	13.5	6.4	11.8	7.2	12.6	7.3	12.7
12-6	6	6.5	11.9	7.0	12.3	7.2	12.6	6.9	12.3
12-10	8	7.8	13.1	8.8	14.0	8.2	13.6	8.3	13.6
13-0	6	6.1	11.3	6.0	11.2	11.1	16.6	7.7	13.0
13-1	8	7.8	13.1	8.5	13.9	8.6	13.10	8.3	13.7

TABLE 2

UNDER-ACHIEVING READERS

C.A.	Grade	Speed and Accuracy	Reading Age	Vocab.	Reading Age	Comp.	Reading Age	Average Grade	Average Rdg. Age
7-11	3	2.0	7.2	2.6	7.10	2.1	7.3	2.2	7.5
8-4	3	2.0*	7.2	2.1*	7.3	*	*	2.0	7.3
8-6	3	2.4	7.7	2.3	7.6	2.1	7.3	2.3	7.5
9-3	3	2.4	7.7	2.6	7.10	2.2	7.4	2.4	7.3
9-4	3	2.5	7.8	2.4	7.7	2.2	7.4	2.4	7.6
9-5	3	2.4	7.7	2.5	7.8	2.2	7.4	2.4	7.6
9-5	4	3.0	8.2	3.1	8.3	2.7	7.11	2.9	7.9
9-7	4	2.8	8.0	3.4	8.7	3.1	8.3	3.1	8.4
9-7	3	2.4	7.7	2.5	7.8	2.1	7.3	2.3	7.8
9-7	4	3.3	8.6	3.1	8.3	2.2	7.4	2.9	8.1
9-9	4	2.8	8.0	3.4	8.7	3.3	8.6	3.2	8.4
9-11	4	2.7	7.11	3.6	8.9	3.3	8.6	3.2	8.4
10-0	5	3.0	8.2	2.0	7.2	2.2	7.4	2.4	7.6
10-1	5	4.2	9.4	4.0	9.2	3.6	8.9	3.9	9.2
10-4	5	6.3	11.6	3.8	9.0	2.9	8.1	4.3	9.5
10-6	5	3.0	8.2	4.2	9.4	3.6	8.9	3.6	8.8
10-9	4	2.4	7.7	2.6	7.10	2.2	7.4	2.4	7.7
10-10	6	4.8	10.0	4.4	9.7	4.3	9.6	4.5	9.7
10-10	5	2.7	7.11	2.7	7.11	3.6	8.9	3.0	8.0
10-11	5	2.7	7.11	2.9	8.1	2.0	7.2	2.5	7.8
11-0	6	4.2	9.5	5.0	10.2	4.3	9.6	4.5	9.7
11-1	6	4.5	9.8	3.3	8.6	2.8	8.0	3.5	8.8
11-3	5	6.0	11.2	4.2	9.4	2.7	7.11	4.3	9.6
11-8	7	4.8	10.0	4.5	9.8	3.3	8.6	4.2	9.5
11-9	5	2.8	8.0	2.6	7.10	3.8	9.0	3.1	8.3
12-1	6	5.3	10.5	5.4	10.6	5.0	10.2	5.2	10.4
12-1	6	5.8	10.10	5.0	10.2	5.0	10.2	5.2	10.4
12-11	7	4.8	10.0	3.4	8.7	4.3	9.6	4.2	9.5
12-11	7	5.8	10.10	6.0	11.2	5.0	10.2	5.6	10.8
13-3	8	4.5	9.8	4.4	9.7	3.6	8.9	4.2	9.5
13-5	8	6.5	11.9	6.0	11.2	5.2	10.4	5.9	11.2
13-6	8	4.8	10.0	5.8	10.10	4.4	9.7	5.0	10.2

If the variances were equal, the following formula was used:

$$t = \frac{\bar{X}_1 - \bar{X}_2}{\sqrt{s^2 \frac{N_1 + N_2}{(N_1)(N_2)}}}$$

If the variances were unequal, another formula was used.[34] It is as follows:

$$t = \frac{\bar{X}_1 - \bar{X}_2}{\sqrt{\frac{s2_1}{N_1} + \frac{s2_2}{N_2}}}$$

In order to determine if a statistically significant difference existed between the mean total verbal raw scores of the respective groups a *t* test was computed. The first null hypothesis tested was that in subjects ranging in age from 7 years, 7 months, through 13 years, 6 months, there was no statistically significant difference between the mean total verbal raw scores on the Wechsler Intelligence Scale for Children obtained by regular and over-achieving readers in the average range of intelligence and under-achieving readers in the average range of intelligence. The obtained *t* value of 1.47 was not significant at $p < .05$ level. Therefore, the null hypothesis of no difference was accepted which suggests that the under-achieving readers score approximately the same as regular and over-achieving readers on the mean total verbal raw scores of the Wechsler Intelligence for Children.

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[34] R. M Walker and Joseph Lev, Statistical Inference (New York: Henry Holt and Company, 1953), p. 156.

Since there were some fourteen null hypotheses tested in this study, it seemed appropriate not to include the actual calculations for each hypothesis in this chapter; however, for those so interested, there is a complete summary of calculations in Table 7.

Another *t* test was performed for hypothesis 2 which stated that in subjects ranging in age from 7 years, 7 months through 13 years, 6 months there is no statistically significant difference in the mean total performance raw scores on the Wechsler Intelligence Scale for Children obtained by regular and over-achieving readers in the average range of intelligence when compared to the mean total performance raw scores obtained by under-achieving readers in the average range of intelligence. The *t* test indicates *t* at .162 which is not significant at $p < .05$ level. Therefore, null hypothesis 2 is accepted.

The acceptance of hypotheses 1 and 2 indicate that there is very little difference in the Wechsler protocols of regular and over-achieving and under-achieving readers. However, it should be kept in mind that these two hypotheses dealt only with mean total raw scores. The findings are quite interesting in that it is often felt that under-achieving readers consistently score low on verbal tests.

Hypothesis 3 states that in subjects ranging in age from 7 years, 7 months through 13 years, 6 months, there is no statistically significant difference in the mean information raw scores obtained by regular and over-achieving

Table 3

AVERAGES AND DIFFERENCES

	Regular and Over-Achieving	Under Achieving
Ranges of Ages	7.7 to 13.1	7.11 to 13.6
Mean Chronological Age	10.68	10.57
Mean Reading Age	10.7	8.8
Range of Grade Scores	Grade Level to + 1.8	-.6 to -3.8
Grade Level of 5.5 corresponds to Rdg. Age		10.7
Grade Level of 3.5 corresponds to Rdg. Age		8.8
Mean of Actual Grade Placement	4.7	5.0
Mean of Earned Grade Placement	5.5	3.5
Difference	+.8	-1.5

readers in the average range of intelligence on the Wechsler Intelligence Scale for Children when compared to a similar group of under-achieving readers. The t test indicates t = .62 which is not significant at the $p < .05$ level. Thus null hypothesis 3 is accepted.

The conclusion drawn from this is that children are acquiring more and more "global intelligence" from the ever present television set, movies, freedom of interactions involving adult figures, etc. Consequently, they utilize many avenues of learning by intellectualization.

TABLE 4

THE AGE EQUIVALENTS FOR WISC RAW SCORES

Test Age	Information	Comprehension	Arithmetic	Similarities	Vocabulary	Digit Span	Picture Completion	Picture Arrangement	Block Design	Object Assembly	Code A	Code B	Mazes
5-2	5	5	3	3	15	5	6	-	4	8-9	15-16	--	5
5-6	-	5	-	3	15	5	6	4	4	8-9	17-20	--	5
5-10	6	-	4	4	16-17	6	6	5	-	10-11	21-24	10 & below	6
6-2	-	-	4	4	16-17	6	-	6	-	10-11	25-27	11-12	7
6-6	7	6	-	-	18	7	7	7-9	5	12-13	28-31	13-16	8
6-10	-	7	5	5	19-20	-	7	10-11	-	12-13	32-33	17-20	9
7-2	8	7	5	5	19-20	-	-	12-13	6	14-15	33-34	-	10
7-6	-	8	-	6	21-22	8	8	14-16	6	14-15	35-37	21-22	11
7-10	9	-	6	6	23-24	8	-	17-19	7-8	15-16	35-37	23-24	12
8-2	-	9	-	-	23-24	-	-	20-21	8-9	16-17	38-39	25-26	13
8-6	10	9	7	7	25-26	-	9	22-23	9-10	17-18	40-41	25-26	14
8-10	11	10	-	7	26-27	-	9	23-24	10-11	17-18	-	27-29	14
9-2	11	10	-	8	27-28	9	10	24-25	11-12	19-20	42-43	27-29	15
9-6	--	11	8	8	28-29	9	10	25-26	13-15	19-20	44-45	30-32	15
9-10	12	11	8	8	29-30	9	10	25-26	13-15	19-20	-	33-35	15

(Table continued on next page)

The Age Equivalents for WISC Raw Scores--Continued

Test Age	Information	Comprehension	Arithmetic	Similarities	Vocabulary	Digit Span	Picture Completion	Picture Arrangement	Block Design	Object Assembly	Code A	Code B	Mazes
10-20	12	12	-	9	31-32	9	11	27-28	16-20	21-22	46	33-35	16
10-6	13	12	9	9	32-33	-	11	27-28	16-20	21-22	--	36-37	16
10-10	13	12	9	9	34-35	-	11	27-28	16-20	21-22	--	38-39	16
11-2	14	13	10	10	34-35	10	12	29	21-24	23	47	40	17
11-6	14	13	10	10	36-37	10	12	29	21-24	23	--	41	17
11-10	15	14	10	10	38	10	12	29	21-24	23	--	42-43	17
12-2	16	15	11	11-12	39	10	--	30	25-28	24	48	44	17
12-6	17	15	11	11-12	39	10	--	30	29-30	24	--	45-46	17
12-10	17	15	11	11-12	40-41	10	--	30	29-30	24	--	47	17
13-2	18	16	12	13	42	10	13	31-33	31	24	--	48-49	17
13-6	18	16	12	13	43-44	10	13	31-33	32-33	24	--	48-49	17
13-10	18	16	12	13	43-44	10	13	31-33	32-33	24	--	50-51	17
14-2	19	16	12	13	45-46	11	13	34	34-35	25	--	52-53	17
14-6	19	16	12	13	45-46	11	13	34	34-35	25	--	54-55	--
14-10	19	17	12	14	45-46	11	13	34	34-35	25	--	54-55	--

(Table continued on next page)

The Age Equivalents for WISC Raw Scores--Continued

Test Age	Information	Comprehension	Arithmetic	Similarities	Vocabulary	Digit Span	Picture Completion	Picture Arrangement	Block Design	Object Assembly	Code A	Code B	Mazes
15-2	20	17	--	14	47-49	11	14	35-36	36-39	26	--	56-57	18
15-6	20	17	--	14	47-49	11	14	35-36	36-39	26	--	56-57	18
15-10	20	17	--	14	47-49	11	14	35-36	36-39	26	--	56-57	18

[35]Wechsler, David. Wechsler Intelligence Scale for Children Manual. New York: Test Division, the Psychological Corporation, May 25, 1949.

TABLE 5

THE OBTAINED RAW SCORES ON THE WECHSLER INTELLIGENCE SCALE FOR CHILDREN BY REGULAR AND OVER-ACHIEVING READERS

Chronological Age	Information	Comprehension	Arithmetic	Similarities	Vocabulary	Digit Span	Picture Completion	Picture Arrangement	Block Design	Object Assembly	Coding
7-7	7	8	4	4	19	6	9	6	6	19	42
8-1	9	12	6	8	16	8	9	20	14	10	18
8-4	9	11	8	9	36	8	9	19	6	23	30
8-6	8	5	8	3	24	7	10	12	13	22	22
8-9	10	8	7	7	32	8	8	31	6	22	29
8-10	7	7	7	7	28	5	9	14	5	21	32
9-3	11	11	9	9	32	6	12	27	19	19	27
9-9	12	11	8	9	39	7	5	27	6	6	27
9-9	13	12	9	5	42	8	9	29	24	21	37
10-1	11	6	7	6	26	6	10	29	6	19	39
10-2	12	10	10	11	33	10	10	28	12	18	38
10-4	14	11	10	10	42	8	14	26	6	26	44
10-5	13	15	10	15	40	10	10	39	10	20	41
10-5	14	9	10	7	36	10	13	21	32	37	51
10-7	10	19	7	13	29	8	16	23	22	26	38
10-8	16	13	11	14	34	10	10	24	24	20	32
10-8	12	13	7	9	39	5	7	12	9	25	49
10-11	10	11	9	7	27	10	11	30	9	24	52
11-5	13	10	11	11	29	10	10	29	10	22	42
11-5	15	11	9	12	33	9	12	34	33	22	41
11-6	16	13	9	14	45	13	13	33	33	23	41
11-6	15	17	9	14	42	11	13	26	23	22	44
11-6	17	13	10	10	33	7	15	36	21	25	45
11-10	16	17	11	24	39	38	14	35	21	23	37
12-0	16	18	13	20	41	10	10	25	6	16	47
12-3	16	10	11	11	42	8	17	31	43	17	38
12-3	13	14	11	17	39	8	11	26	19	22	49
12-5	16	16	12	11	40	11	10	41	45	28	57
12-6	17	17	8	12	45	8	13	34	35	18	53
12-10	18	8	10	16	42	10	15	31	30	28	41
13-0	15	17	8	5	38	8	11	28	23	27	53
13-1	23	11	12	18	47	13	12	38	12	23	56

TABLE 6

THE OBTAINED RAW SCORES ON THE WECHSLER INTELLIGENCE SCALE FOR CHILDREN BY UNDER-ACHIEVING READERS

Chronological Age	Information	Comprehension	Arithmetic	Similarities	Vocabulary	Digit Span	Picture Completion	Picture Arrangement	Block Design	Object Assembly	Coding
7-11	8	8	6	6	28	6	12	20	5	15	33
8-4	11	11	5	7	31	11	11	28	6	22	17
8-6	10	8	6	7	34	8	7	21	14	15	25
9-3	11	11	4	8	31	7	13	27	6	19	24
9-4	10	7	8	7	21	6	11	36	24	22	33
9-5	7	9	6	3	15	6	13	26	13	19	41
9-5	12	9	6	9	31	9	8	25	21	22	31
9-11	9	7	7	10	33	8	12	18	14	16	49
9-7	12	12	8	9	31	8	12	29	24	23	31
9-9	9	8	8	6	22	7	9	12	30	23	35
9-11	12	9	10	6	36	9	8	27	13	21	36
9-11	13	15	8	10	34	7	13	31	12	16	33
10-0	12	12	6	9	42	7	14	37	12	26	33
10-1	12	10	8	9	27	6	7	29	6	19	33
10-4	11	9	8	8	29	9	10	19	13	24	49
10-6	13	12	9	10	32	8	8	25	23	7	31
10-0	11	11	8	11	34	9	15	34	10	17	34
10-10	13	7	9	10	35	8	12	27	22	25	50
10-10	12	10	8	9	33	7	11	26	30	18	32
10-11	12	10	8	7	26	8	10	30	42	27	38
11-0	17	11	9	12	29	8	8	29	5	22	44
11-1	15	11	9	8	31	7	14	21	21	21	38
11-3	15	7	8	6	35	9	13	25	5	22	48
11-8	12	10	10	8	38	10	11	19	12	24	42
11-9	10	20	5	10	24	6	14	25	12	26	42
12-1	21	22	9	15	47	11	13	26	26	23	37
12-1	20	12	12	13	42	11	10	35	16	25	36
12-11	16	15	12	6	36	8	15	29	40	26	44
12-11	19	13	12	8	47	11	12	31	36	25	45
13-3	16	19	12	13	38	10	17	39	30	26	62
13-3	14	13	9	7	40	9	8	25	34	26	54
13-6	18	17	10	14	34	13	13	16	34	21	38

The comprehension subtest on the Wechsler is usually considered, in part, a measure of judgment and ability to make decisions. Hypothesis 4 states that in subjects ranging in age from 7 years, 7 months through 13 years, 6 months, there is no statistically significant difference in the mean Comprehension raw scores obtained by a group of regular and over-achieving readers in the average range of intelligence on the Wechsler Intelligence Scale for Children when compared to a similar group of under-achieving readers. A *t* test was performed on the mean comprehension raw scores and it was found that *t* equaled .64 which is not significant at $p < .05$ level. Hypothesis 4 is then accepted.

It is speculated that children with reading disabilities experience considerable difficulty in adding a row of figures and then dividing them. Delacato, in speaking of diagnostic procedures and symptoms of retarded readers, states:

> A further clarification of symptoms is the use of standardized tests for reading and spelling. Such test scores should always be compared with results in arithmetic to ascertain if there is a difference in performance between the language and mathematical areas. If there is not such a difference, one must suspect an intellectual limitation as the possible etiological factor.[36]

The results of Hypothesis 5 appeared to indicate the need for further study in this area. Hypothesis 5 states that in subjects ranging in age from 7 years, 7 months through 13 years, 6 months, there is no statistically

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[36]Delacato, *op. cit.*, p. 80.

significant difference in the mean arithmetic raw scores obtained by a group of regular and over-achieving readers in the average range of intelligence on the Wechsler Intelligence Scale for Children when compared to a similar group of under-achieving readers. Hypothesis 5 was tested by means of a *t* test and *t* was equated at *t* = 2.18 which is significant at $p < .05$ level. Thus, hypothesis 5 is rejected. There is a significant difference between the mean arithmetic raw scores of the regular and over-achieving reader and under-achieving reader.

The Simiarities Test on the Wechsler is usually thought of, in part, as a test to measure the ability or inability to perceive how one thing is related to another. The ability to see and understand how and why separate letters grouped together are no longer merely letters, but actually form words and words form sentences, is a very necessary skill in learning to read. In other words, the ability to see how one thing is related to another is extremely important. Hypothesis 6 proposes that in subjects ranging in age from 7 years, 7 months through 13 years, 6 months there is no statistically significant difference in the mean similarities raw scores obtained by a group of regular and over-achieving readers in the average range of intelligence on the Wechsler Intelligence Scale for Children when compared to a similar group of under-achieving readers. The results of a *t* test show that *t* = 2.32 which is significant at $p < .05$ level. Thus, hypothesis 6 is rejected. There is a significant difference in mean similarities raw scores of regular and

over-achieving and under-achieving readers.

Hypothesis 7 states that in subjects ranging in age from 7 years, 7 months through 13 years, 6 months, there is no statistically significant difference in the mean Vocabulary raw scores obtained by a group of regular and over-achieving readers in the average range of intelligence on the Wechsler Intelligence Scale for Children when compared to a similar group of under-achieving readers. The results of the *t* test indicate that $t = 1.7$ which is significant at $p < .05$ level. Hypothesis 7 is, therefore, rejected.

Digit Span on the Wechsler measures the attention span of a subject, i.e., the ability to stick to a task or to concentrate on a specific item, issue, or thought for a suffucient length of time. It is suspected that Digit Span has been overly emphasized in its relationship to reading. Oftentimes a youngster may be observed to have intense concentration as he struggles through words, yet he is a poor reader; conversely, some children seem to have the ability to read fluently while seemingly dividing their attention.

Hypothesis 8 states that in subjects ranging in age from 7 years, 7 months through 13 years, 6 months, there is no statistically significant difference in the mean Digit Span raw scores obtained by a group of regular and over-achieving readers in the average range of intelligence on the Wechsler Intelligence Scale for Children when compared to a similar group of under-achieving readers. Another *t* test tells us that $t = .216$ which is not significant at

$p < .05$ level. Thus, hypothesis 8 is accepted.

The Picture Completion Test measures the ability, among other things, of a subject to note the missing items or parts of a supposed whole. The foregoing would seem to be most desirable for reading. Hypothesis 9 states that in subjects ranging in age from 7 years, 7 months through 13 years, 6 months, there is no statistically significant difference in the mean Picture Comeletion raw scores obtained by a group of regular and over-achieving readers in the normal range of intelligence on the Wechsler Intelligence Scale for Children when compared to a similar group of under-achieving readers. Analysis of the t test substantiates this hypothesis as $t = .199$ which is not significant at $p < .05$ level. Thus, hypothesis 9 is accepted.

The Picture Arrangement subtest on the Wechsler tests the subject's social awareness and his visual motor coordination. Many experts feel that the poor readers also have poor self-concepts. It then seems logical that they also have a poor concept of social awareness. When t test was performed, it was found that $t = .364$ which is not significant at $p < .05$ level. Thus, hypothesis 10 which states that in subjects ranging in age from 7 years, 7 months through 13 years, 6 months there is no statistically significant difference in the mean Picture Arrangement raw scores obtained by a group of regular and over-achieving readers in the average range of intelligence on the Wechsler Intelligence Scale for Children when compared to a similar group of under-achieving

readers, is accepted.

Hypothesis 11 states that in subjects ranging in age from 7 years, 7 months through 13 years, [illegible] is no statistically significant difference in the mean Block Design raw scores obtained by a group of regular and [illegible] achieving readers in the average range of intelligence on the Wechsler Intelligence Scale for Children when compared to a similar group of under-achieving readers. It was originally suspected at the beginning of the study that there would be a great difference in the results of mean block design scores for the two groups. Block Design appears to be one of the most difficult items on the Wechsler [illegible] children. The t test gave a t of .70 which is not significant at $p < .05$ level. It then stands that hypothesis is accepted.

A good Object Assembly score requires a child to be able to fit pieces of a puzzle together. He must also should possess the ability to visualize how and where several pieces fit. As on Arithmetic, Picture Arrangement and Block Design, the subject may earn bonus points if he does it quickly.

Hypothesis 12 states that in subjects ranging in age from 7 years, 7 months through 13 years, [illegible] no statistically significant difference in the mean Object Assembly raw scores obtained by a group of regular and [illegible] achieving readers in the average range of intelligence on the Wechsler Intelligence Scale for Children when compared

readers, is accepted.

Hypothesis 11 states that in subjects ranging in age from 7 years, 7 months through 13 years, 6 months, there is no statistically significant difference in the mean Block Design raw scores obtained by a group of regular and over-achieving readers in the average range of intelligence on the Wechsler Intelligence Scale for Children when compared to a similar group of under-achieving readers. It was strongly suspected at the beginning of the study that there would be a great difference in the results of mean block design raw scores for the two groups. Block Design appears to be one of the most difficult items on the Wechsler, especially for children. The t test gave a t of .70 which is not significant at $p < .05$ level. It then stands that hypothesis 11 is accepted.

A good Object Assembly score requires a subject to be able to fit pieces of a puzzle together. The subject should possess the ability to visualize how and where the several pieces fit. As on Arithmetic, Picture Arrangements, and Block Design, the subject may earn bonus points by working quickly.

Hypothesis 12 states that in subjects ranging in age from 7 years, 7 months through 13 years, 6 months there is no statistically significant difference in the mean Object Assembly raw scores obtained by a group of regular and over-achieving readers in the average range of intelligence on the Wechsler Intelligence Scale for Children when compared

to a similar group of under-achieving readers. The *t* test confirms hypothesis 12 when *t* is found to be .314 which is not significant at $p < .05$ level. Thus, hypothesis 12 is accepted.

The Coding subtest on the Wechsler measures the ability of a subject to do new and imitative type learning, e.g., typing. The foregoing requires skill in visual motor coordination.

Hypothesis 13 states that in subjects ranging in age from 7 years, 7 months through 13 years, 6 months, there is no statistically significant difference in the mean Coding raw scores obtained by a group of regular and over-achieving readers in the average range of intelligence on the Wechsler Intelligence Scale for Children when compared to a similar group of under-achieving readers. Hypothesis 13 was tested by means of a *t* test and *t* was .97 which is not significant at $p < .05$ level. Therefore, hypothesis 13 is accepted.

Hypothesis 14 states that in subjects ranging in age from 7 years, 7 months through 13 years, 6 months, there is no statistically significant difference in the mean verbal raw scores minus mean performance raw scores obtained by a group of regular and over-achieving readers in the average range of intelligence on the Wechsler Intelligence Scale for Children when compared to a similar group of under-achieving readers.

Hypothesis 14 was formulated because it was wondered whether or not the regular and over-achieving reader's mean verbal raw scores minus the mean performance raw scores would

exhibit a significant difference. It was expected that with the regular and over-achieving readers the mean verbal and mean performance raw scores would be approximately the same, i.e., the average difference would be zero. In fact, this was the case as the mean difference was .78 which is almost zero. As for the under-achieving readers, it was expected that the verbal facilitation would be lower than the performance, i.e., there would be a difference greater than zero. In fact, this was the case as the average difference was -3.92. A t test was performed between these two means. However, due to the large variability, the t .707 was not significant at $p < .05$ level. It was felt that if it had not been for the great variability, it would have been significant.

The findings of this study indicated that there was a statistically significant difference on the subtests of Arithmetic, Similarities and Vocabulary of the Wechsler Intelligence Scale for Children when comparing regular and over-achieving and under-achieving readers in the average range of intelligence. Although there was a great degree of variability exhibited in the mean raw scores of the Block Design and Coding subtests there was no statistically significant difference. The findings of this study also seemed to support the supposition that the Wechsler Intelligence Scale for Children was an excellent tool to be used in conjunction with other tests in the diagnosis of reading disabilities.

CHAPTER V

CONCLUSIONS AND SUMMARY

Conclusions

The conclusion that there is no significant difference in the mean total verbal raw scores and the mean total performance raw scores on the Wechsler Intelligence Scale for Children by regular and over-achieving and under-achieving readers in the average range of intelligence must be accepted by the findings of this study.

The eleven subtest raw scores of the Wechsler were tested by means of a t test, and it was found that there was no significant difference in the obtained mean raw scores of regular and over-achieving and under-achieving readers in regard to (1) information, (2) comprehension, (3) digit span, (4) picture completion, (5) picture arrangement, (6) block design, (7) object assembly, and (8) coding. However, the t tests did indicate that there was a significant difference between regular and over-achieving and under-achieving readers mean raw scores on (1) arithmetic, (2) similarities, and (3) vocabulary.

Certainly it would not be proposed that arithmetic and reading are identical processes, however, the acquiring

of adequate arithmetic skills does not appear to be vastly different from the procedure followed in the attempt to master reading. For instance, in both arithmetic and reading it is very desireable that the subject have the ability to recognize and manipulate printed symbols. It is also necessary for the student to master these early basic skills in both arithmetic and reading to an extent that will allow him to progress smoothly to more complicated exercises. In each of these academic subjects there is a need for the pupil to have a realistic concept of why he is performing the task at hand, he further needs to understand what the numbers or words are asking of him, and what the numbers or words are telling him and finally it is most desireable that he have an adequate understanding of the completed exercise. It is further felt that if a student does not maintain the proper pace in arithmetic and reading or is faced with inappropriate interruptions, for one reason or another, that he likely will become disinterested, confused and subsequently will rebel or simply assume an air of indifference.

It seems logical to assume that a child who has difficulty in dealing with similarity problems such as indicating the likeness of a plum and a peach, a cat and a mouse etc., while at the same time holding in abeyance the fact that they are also different, will probably experience similar problems in coping with such higher levels of thinking as an a and an e are alike because they are both vowels. It

also seems feasible to assume that a child who experiences difficulty with basic similarity problems such as those listed on the similarity subtest of the Wechsler would also experience considerable difficulty in understanding fully the consequences of interchanging the vowels a, e, i, o, and u in words like pan and pen, tin and ten, hot and hut, hut and hat etc. Students who are not quite as sharp and alert as their contemporaries in regard to similarities and differences have more than average trouble with words such as when, what, where, which, whether, who, whom, why and many others such as would, could, should, cold, from, for, far, form, and front etc.

Children who, for one reason or another, have been deprived of early basic skills will have great difficulty in formulating an adequate vocabulary. Such deprived children usually acquire vocabulary primarily through intellectualization and imitation of peers; unfortunately the bulk of such a vocabulary contributes very little to the skill of reading.

The findings of this study strongly support the advocates of reading readiness. An attempt to teach a child reading before he is ready seems quite futile and almost certainly doomed to failure. The results of this study furnish valuable information to the psychologist, psychiatrist, psychometrician, and educator because the findings of this study indicated that the Wechsler Intelligence Scale

for Children can be and should be a primary tool for use in obtaining a better understanding of the underlying causes of reading disability.

As William B. Ragan so aptly states, "educational services of the public schools should include kindergarten and nursery school ages."[37] Kindergartens and nursery schools would be an excellent place for detecting the lack of certain basic skills in a child. Games and drills should be formulated that would enhance the development of clear cut dominance. For instance, boys like guns; if a boy tends to be left handed he should be encouraged to play with a gun that requires a left handed holster, etc. Simple and effective tests should be devised to detect and pinpoint the early basic skills and qualities which are lacking in a child. Early detection and remediation at the kindergarten level could save countless dollars, hours of anxiety, and long hours of less effective remediation later on.

Summary

This study was conducted on a sampling of sixty-four boys and girls in the average range of intelligence in an effort to determine whether or not there is any significant difference in the mean raw scores obtained on the Wechsler Intelligence Scale for Children. The experiment was conducted by individually administering a standardized reading test that produced results which indicated the necessity

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[37] W. B. Ragan, Modern Elementary Curriculum (Revised edition; New York: Holt, Rinehart and Winston, Inc., 1960), Appendix, p. 493.

for forming two groups: (1) regular and over-achieving readers and (2) under-achieving readers.

Each subject was individually administered the Wechsler Intelligence Scale for Children. It was found that there was no significant difference in the mean total verbal raw scores, mean total performance raw scores, or mean total verbal scores minus the mean total performance raw scores. There was no significant difference in information, comprehension, digit span, picture completion, picture arrangement, block design, object assembly and coding subtests raw scores.

However, it was found that there was a significant difference in arithmetic, similarities, and vocabulary mean subtest raw scores. It was further noted that there was a great degree of variability exhibited in the mean raw scores of block design, and coding but there was no statistically significant difference.

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APPENDIX A. SUMMARY OF *t* TESTS FOR EACH HYPOTHESIS

TABLE 7

SUMMARY OF $\underline{t}$ TESTS FOR EACH HYPOTHESIS

Hypothesis 1 Total Raw Scores of Verbal

$N_1 = 32, N_2 = 32$

$\Sigma X_1 = 97.5 \quad \Sigma X_2 = 34$

$\bar{X}_1 = +3.04 \quad \bar{X}_2 = -1.06$

$\Sigma X_1^2 = 3592.5 \quad \Sigma X_2^2 = 4467$

$S_1^2 = 106.3 \quad S_2^2 = 142.93$

$$\underline{t} = \frac{+3.04 - (-1.06)}{\sqrt{(124.61)(.0624)}} = \frac{4.1}{\sqrt{7.78}} = 2.788 \quad t = 1.47 \quad \text{N.S. at .05}$$

Hypothesis 2 Total Raw Scores of Performance

$N_1 = 32 \quad N_2 = 32$

$\Sigma X_1 = 112.5 \quad \Sigma X_2 = 93.00$

$\bar{X}_1 = +3.51 \quad \bar{X}_2 = +2.90$

$\Sigma X_1^2 = 7965.75 \quad \Sigma X_2^2 = 6718.00$

$S_1^2 = 244.2 \quad S_2^2 = 207.99$

$$\underline{t} = \frac{+3.51 - (+2.9)}{\sqrt{(226.09)(.0624)}}$$

$$\underline{t} = \frac{.61}{\sqrt{14.11}} = \frac{.61}{3.76} \quad \underline{t} = .162 \quad \text{N. S. at .05}$$

Table 7 (continued)

Hypothesis 3 Information

$N_1 = 32 \qquad N_2 = 32$

$\Sigma X_1 = 6 \qquad \Sigma X_2 = -5$

$\bar{X}_1 = .187 \qquad \bar{X}_2 = -.156$

$\Sigma X_1^2 = 132 \qquad \Sigma X_2^2 = 175$

$S_1^2 = 4.22 \qquad S_2^2 = 5.61$

$t = \frac{.343}{.553} \qquad t = .62 \qquad$ N. S. at .05

Hypothesis 4 Comprehension

$N_1 = 32 \qquad N_2 = 32$

$\Sigma X_1 = -3.00 \qquad \Sigma X_2 = -19$

$\bar{X}_1 = -.093 \qquad \bar{X}_2 = -.59$

$\Sigma X_1^2 = 323 \qquad \Sigma X_2^2 = 279$

$S_1^2 = 10.41 \qquad S_2^2 = 9.01$

$t = \frac{(-.093) - (-.59)}{\sqrt{(9.71)(.0624)}} \quad \frac{.497}{.778} \quad t = .64 \quad$ N. S. at .05

Hypothesis 5 Arithmetic

$N_1 = 32 \qquad N_2 = 32$

$\Sigma X_1 = 8 \qquad \Sigma X_2 = -19$

$\bar{X}_1 = .250 \qquad \bar{X}_2 = -59$

$\Sigma X_1^2 = 86.00 \qquad \Sigma X_2^2 = 75$

$S_1^2 = 2.7 \qquad S_2^2 = 2.05$

$t = \frac{(+.25) - (-.59)}{\sqrt{(2.37)(.0624)}} \qquad t = 2.18$ Significant at $p < .05$ level.

Table 7 (continued)

Hypothesis 6 Similarities

$N_1 = 32$ $N_2 = 32$

$\Sigma X_1 = +44.5$ $\Sigma X_2 = -11$

$\bar{X}_1 = +1.39$ $\bar{X}_2 = -.34$

$\Sigma X_1^2 = 416.75$ $\Sigma X_2^2 = 196.5$

$S_1^2 = 11.44$ $S_2^2 = 6.21$

$t = 2.32$ Significant at $p < .05$ level.

Hypothesis 7 Vocabulary

$N_1 = 32$ $N_2 = 32$

$\Sigma X_1 = +82$ $\Sigma X_2 = +2.00$

$\bar{X}_1 = +2.56$ $\bar{X} = +.06$

$\Sigma X_1^2 = 1216.50$ $\Sigma X_2^2 = 1263.50$

$S_1^2 = 32.46$ $S_2^2 = 40.75$

$t = 1.7$ Significant at $p < .05$ level.

Hypothesis 8 Digit Span

$N_1 = 32$ $N_2 = 32$

$\Sigma X_1 = -24$ $\Sigma X_2 = -27$

$\bar{X}_1 = -.75$ $\bar{X}_2 = -.84$

$\Sigma X_1^2 = 110$ $\Sigma X_2^2 = 103$

$S_1^2 = 2.96$ $S_2^2 = 2.58$

$t = .216$ N. S. at .05

Table 7 (continued)

Hypothesis 9 Picture Completion

$N_1 = 32$ $N_2 = 32$

$\Sigma X_1 = -10$ $\Sigma X_2 = +14$

$\bar{X}_1 = +.31$ $\bar{X}_2 = +.43$

$\Sigma X_1^2 = 156$ $\Sigma X_2^2 = 6.7$

$\underline{t} = .199$ N. S. at .05.

Hypothesis 10 Picture Arrangement

$N_1 = 32$ $N_2 = 32$

$\Sigma X_1 = +9.5$ $\Sigma X_2 = -9.5$

$\bar{X}_1 = +.29$ $\bar{X}_2 = -.29$

$\Sigma X_1^2 = 1198.25$ $\Sigma X_2^2 = 1329.25$

$\underline{t} = .364$ N. S. at .05.

Hypothesis 11 Block Design

$N_1 = 32$ $N_2 = 32$

$\Sigma X_1 = -23.5$ $\Sigma X_2 = +28.5$

$\bar{X}_1 = -.73$ $\bar{X}_2 = +.89$

$\Sigma X_1^2 = 2778.25$ $\Sigma X_2^2 = 2562.50$

$S_1^2 = 89.06$ $S_2^2 = 81.84$

$\underline{t} = .70$ N. S. at .05.

Table 7 (continued)

Hypothesis 12 Object Assembly

$N_1 = 32$ $N_2 = 32$

$\Sigma X_1 = +19$ $\Sigma X_2 = +7.5$

$\bar{X}_1 = +.59$ $\bar{X}_2 = +.23$

$\Sigma X_1^2 = 821.50$ $\Sigma X_2^2 = 497.25$

$S_1^2 = 26.13$ $S_2^2 = 15.98$

$t = .314$ N. S. at .05.

Hypothesis 13 Coding

$N_1 = 32$ $N_2 = 32$

$\Sigma X_1 = +100.00$ $\Sigma X_2 = +46$

$\bar{X}_1 = +3.12$ $\bar{X}_2 = +1.43$

$\Sigma X_1^2 = 1866.00$ $\Sigma X_2^2 = 1540.50$

$S_1^2 = 50.11$ $S_2^2 = 47.56$

$t = .97$ N. S. at .05.

Hypothesis 14 Verbal-Performance Good Readers vs Poor Readers

$N_1 = 32$ $N_2 = 32$

$\Sigma X_1 = -25$ $\Sigma X_2 = 125.00$

$\bar{X}_1 = -.78$ $\bar{X}_2 = -3.92$

$\Sigma X_1^2 = 7366.00$ $\Sigma X_2^2 = 12,754.25$

$S_1^2 = 236.98$ $S_2^2 = 395.67$

$t = .707$ N. S. at .05.

APPENDIX B. SUBTEST RAW SCORES

TABLE 8

TOTAL VERBAL

Regular and Over-Achieving Readers				Under-Achieving Readers		
Subject	Raw Score	Norm	Difference R.S.-Norm	Raw Score	Norm	Difference R.S.-Norm
1	48	56.5	-8.5	62	60.5	+1.5
2	59	60.5	- .5	76	61.5	+14.5
3	81	61.5	+19.5	73	66.5	+ 6.5
4	55	66.5	-11.5	72	72.5	- .5
5	72	66.5	+ 5.5	59	72.5	-13.5
6	61	69.5	- 8.5	46	72.5	-26.5
7	78	72.5	+ 5.5	76	72.5	+ 3.5
8	86	75.5	+10.5	74	75.5	- 1.5
9	89	75.5	+13.5	80	75.5	+ 4.5
10	62	77.5	-15.5	60	75.5	-15.5
11	86	81.5	+ 4.5	82	77.5	+ 6.5
12	95	81.5	+13.5	87	77.5	+ 9.5
13	103	81.5	+21.5	88	77.5	+10.5
14	86	81.5	+ 4.5	72	77.5	- 5.5
15	86	84.5	+ 1.5	74	81.5	- 7.5
16	98	84.5	+13.5	84	84.5	- .5
17	85	84.5	+ .5	84	84.5	- .5
18	74	86.5	-12.5	82	86.5	- 4.5
19	84	91.5	- 7.5	79	86.5	- 7.5
20	89	91.5	- 2.5	71	86.5	-15.5
21	110	93.5	+16.5	86	86.5	- .5
22	106	93.5	+12.5	81	86.5	- 5.5
23	90	93.5	- 3.5	80	91.5	-11.5
24	105	97.0	+ 8.0	88	93.5	- 5.5
25	118	97.0	+11.0	75	93.5	-18.5
26	98	102.5	- 4.5	125	93.5	+31.5
27	102	102.5	- 3.5	110	93.5	+16.5
28	106	102.5	+ 3.5	92	105.0	-13.0
29	107	103.5	+ 3.5	110	105.0	+ 5.0
30	104	105.0	- 1.0	108	111.0	- 3.0
31	91	105.0	-14.0	92	111.0	+19.0
32	124	105.0	+19.0	106	112.5	- 6.5

TABLE 9

TOTAL PERFORMANCE

Regular and Over-Achieving Readers				Under-Achieving Readers		
Subject	Raw Score	Norm	Difference R.S.-Norm	Raw Score	Norm	Difference R.S.-Norm
1	82	79.5	+ 2.5	85	85.0	0
2	71	85.0	-14.0	84	79.0	+ 5.0
3	87	79.0	+ 8.0	82	84.0	- 2.0
4	79	84.0	- 5.0	89	93.5	- 4.5
5	96	84.0	+12.0	126	93.5	+32.5
6	81	88.5	- 7.5	112	93.5	+18.5
7	104	93.5	+10.5	107	93.5	+13.5
8	71	100.0	-29.0	109	100.0	+ 9.0
9	120	100.0	+20.0	119	100.0	+19.0
10	103	103.0	0.0	109	100.0	+ 9.0
11	106	112.0	- 6.0	105	103.0	+ 2.0
12	116	112.0	+ 4.0	105	103.0	+ 2.0
13	120	112.0	+ 8.0	121	103.0	+18.0
14	154	112.0	+42.0	94	103.0	- 9.0
15	125	114.5	+10.5	115	112.0	+ 3.0
16	110	114.5	- 4.5	94	114.5	-10.5
17	104	116.5	-12.5	110	116.5	- 4.5
18	126	127.0	+ 9.5	136	116.5	+19.5
19	113	127.0	-14.0	117	116.5	+ .5
20	142	128.0	+15.0	147	116.5	+30.5
21	143	128.0	+15.0	108	116.5	- 8.5
22	128	128.0	- 0.0	115	116.5	- 1.5
23	142	129.5	+16.0	113	127.0	-14.5
24	130	129.5	+ .5	108	128.0	-20.0
25	104	136.5	-25.5	119	128.0	-19.0
26	146	136.5	+ 9.5	125	128.0	- 3.0
27	127	136.5	- 9.5	122	128.0	- 6.0
28	181	141.0	+44.5	154	142.5	+11.5
29	153	142.5	+12.0	149	142.5	+ 6.5
30	145	142.5	+ 2.5	174	148.5	+25.5
31	142	142.5	- .5	147	148.5	- 1.5
32	141	142.5	- 1.5	122	150.0	-28.0

TABLE 10

INFORMATION

Regular and Over-Achieving Readers				Under-Achieving Readers		
Subject	Raw Score	Norm	Difference R.S.-Norm	Raw Score	Norm	Difference R.S.-Norm
1	7	8	- 1	8	9	- 1
2	9	9	0	11	9	+ 2
3	9	9	0	10	10	0
4	8	10	- 2	11	11	0
5	10	10	0	10	11	- 1
6	7	11	- 4	7	11	- 4
7	11	11	0	12	11	+ 1
8	12	11	+ 1	9	11	- 2
9	13	11	+ 2	12	11	+ 1
10	11	12	- 1	9	11	- 2
11	12	12	0	12	12	0
12	14	12	+ 2	13	12	+ 1
13	13	12	+ 1	12	12	0
14	14	12	+ 2	12	12	0
15	10	13	- 3	11	12	- 1
16	16	13	+ 3	13	13	0
17	12	13	- 1	11	13	- 2
18	10	13	- 3	13	13	0
19	13	14	- 1	12	13	- 1
20	15	14	+ 1	12	13	- 1
21	16	14	+ 1	13	13	0
22	15	14	+ 1	15	13	+ 2
23	17	14	+ 3	15	14	+ 1
24	16	15	+ 1	12	14	- 2
25	16	15	+ 1	10	14	- 4
26	16	16	0	21	14	+ 7
27	13	16	- 3	20	14	+ 6
28	16	16	0	16	17	- 1
29	17	17	0	19	17	+ 2
30	18	17	+ 1	16	18	- 2
31	15	17	- 2	14	18	- 4
32	23	17	+ 6	18	18	0

TABLE 11

COMPREHENSION

Regular and Over-Achieving Readers				Under-Achieving Readers		
Subject	Raw Score	Norm	Difference R.S.-Norm	Raw Score	Norm	Difference R.S.-Norm
1	8	8	0	8	8	0
2	12	8	+ 4	11	9	+ 2
3	11	9	+ 2	8	9	- 1
4	5	9	- 4	11	10	+ 1
5	8	9	- 1	7	10	- 3
6	7	10	- 3	9	10	- 1
7	11	10	+ 1	9	10	- 1
8	11	11	0	7	11	- 4
9	12	11	+ 1	12	11	+ 1
10	6	11	- 5	8	11	- 3
11	10	12	- 2	9	11	- 2
12	11	12	- 1	15	11	+ 4
13	15	12	+ 3	12	11	+ 1
14	9	12	- 3	10	11	- 1
15	19	12	+ 7	9	12	- 3
16	13	12	+ 1	12	12	0
17	13	12	+ 1	11	12	- 1
18	11	12	- 1	7	12	- 5
19	10	13	- 3	10	12	- 2
20	11	13	- 2	10	12	- 2
21	13	13	0	11	12	- 1
22	17	13	+ 4	11	12	- 1
23	13	13	0	7	13	- 6
24	17	14	+ 3	10	13	- 3
25	18	14	+ 4	20	13	+ 6
26	10	15	- 5	22	13	+ 8
27	14	15	- 1	12	13	- 1
28	16	15	+ 1	15	15	0
29	17	15	+ 5	13	15	- 2
30	8	15	- 7	19	16	+ 3
31	17	15	+ 2	13	16	- 3
32	11	15	- 4	17	16	+ 1

TABLE 12

ARITHMETIC

Regular and Over-Achieving Readers				Under-Achieving Readers		
Subject	Raw Score	Norm	Difference R.S.-Norm	Raw Score	Norm	Difference R.S.-Norm
1	4	5	- 1	6	6	0
2	6	6	0	5	6	- 1
3	8	6	+ 2	6	7	- 1
4	8	7	+ 1	4	7	- 3
5	7	7	0	8	7	+ 1
6	7	7	0	6	7	- 1
7	9	7	+ 2	6	7	- 1
8	8	8	0	7	8	- 1
9	9	8	+ 1	8	8	0
10	7	8	- 1	8	8	0
11	10	8	+ 2	10	8	+ 2
12	10	8	+ 2	8	8	0
13	10	8	+ 2	6	8	- 2
14	10	8	+ 2	8	8	0
15	7	9	- 2	8	8	0
16	11	9	+ 2	9	9	0
17	7	9	- 2	8	9	- 1
18	9	9	0	9	9	0
19	11	10	+ 1	8	9	- 1
20	9	10	- 1	8	9	- 1
21	9	10	- 1	9	9	0
22	9	10	- 1	9	9	0
23	10	10	0	8	10	- 2
24	11	10	+ 1	10	10	0
25	13	10	+ 3	5	10	- 5
26	11	11	0	9	10	- 1
27	11	11	0	12	10	+ 2
28	12	12	0	12	11	+ 1
29	8	11	- 3	12	11	+ 1
30	10	11	- 1	12	12	0
31	8	11	- 3	9	12	- 3
32	12	11	+ 1	10	12	- 2

TABLE 13

SIMILARITIES

Regular and Over-Achieving Readers				Under-Achieving Readers		
Subject	Raw Score	Norm	Difference R.S.-Norm	Raw Score	Norm	Difference R.S.-Norm
1	4	6	- 2	6	6	0
2	8	6	+ 2	7	6	+ 1
3	9	6	+ 3	7	6	+ 1
4	3	7	- 4	8	8	0
5	7	7	0	7	8	- 1
6	7	7	0	3	8	- 5
7	9	8	+ 1	9	8	+ 1
8	9	8	+ 1	10	8	+ 2
9	5	8	- 3	9	8	+ 2
10	6	8	- 2	6	8	- 2
11	11	9	+ 2	6	8	- 2
12	10	9	+ 1	10	8	+ 2
13	15	9	+ 6	9	8	+ 1
14	7	9	- 2	9	8	+ 1
15	13	9	+ 4	8	9	- 1
16	14	9	+ 5	10	9	+ 1
17	9	9	0	11	9	+ 2
18	7	9	- 2	10	9	+ 1
19	11	10	+ 1	9	9	0
20	12	10	+ 2	7	9	- 2
21	14	10	+ 4	12	9	+ 3
22	14	10	+ 4	8	9	- 1
23	10	10	0	6	10	- 4
24	14	10	+ 4	8	10	- 2
25	20	10	+10	10	10	0
26	11	11.5	- .5	15	10	+ 5
27	17	11.5	+ 5.5	13	10	+ 3
28	11	11.5	- 1.5	6	11.5	- 5.5
29	12	11.5	+ .5	8	11.5	- 3.5
30	16	11.5	+ 4.5	13	13	0
31	5	11.5	- 5.5	7	13	- 6
32	18	11.5	+ 6.5	14	13	+ 1

TABLE 14

VOCABULARY

Regular and Over-Achieving Readers				Under-Achieving Readers		
Subject	Raw Score	Norm	Difference R.S.-Norm	Raw Score	Norm	Difference R.S.-Norm
1	19	21.5	- 2.5	28	23.5	+ 4.5
2	16	23.5	- 7.5	32	23.5	+ 7.5
3	36	23.5	+12.5	34	25.5	+ 8.5
4	24	25.5	- 1.5	31	27.5	+ 3.5
5	32	25.5	+ 6.5	21	27.5	- 6.5
6	28	26.5	+ 1.5	15	27.5	-12.5
7	32	27.5	+ 4.5	31	27.5	+ 3.5
8	39	28.5	+10.5	33	28.5	+ 4.5
9	42	28.5	+13.5	31	28.5	+ 2.5
10	26	29.5	- 3.5	22	28.5	- 6.5
11	33	31.5	+ 1.5	36	29.5	+ 6.5
12	42	31.5	+10.5	34	29.5	+ 4.5
13	40	31.5	+ 8.5	42	29.5	+12.5
14	36	31.5	+ 4.5	27	29.5	- 2.5
15	29	32.5	- 3.5	29	31.5	- 2.5
16	34	32.5	+ 1.5	32	32.5	- .5
17	39	32.5	+ 6.5	34	32.5	+ 1.5
18	27	34.5	- 7.5	35	34.5	+ .5
19	29	34.5	- 5.5	33	34.5	- 1.5
20	33	34.5	- 1.5	26	34.5	- 8.5
21	45	36.5	+ 8.5	29	34.5	- 5.5
22	42	36.5	+ 5.5	31	34.5	- 3.5
23	33	36.5	- 3.5	35	34.5	+ .5
24	39	38.0	+ 1.0	38	36.5	+ 1.5
25	41	38.0	+ 3.0	24	36.5	-12.5
26	42	39.0	+ 3.0	47	36.5	+10.5
27	39	39.0	0	42	36.5	+ 5.5
28	40	39.0	+ 1.0	36	40.5	- 4.5
29	45	37.0	+ 8.0	47	40.5	+ 6.5
30	42	40.5	+ 1.5	38	42.0	- 4.0
31	38	40.5	- 2.5	40	42.0	- 2.0
32	47	40.5	+ 6.5	34	43.5	- 9.5

TABLE 15

DIGIT SPAN

Regular and Over-Achieving Readers				Under-Achieving Readers		
Subject	Raw Score	Norm	Difference R.S.-Norm	Raw Score	Norm	Difference R.S.-Norm
1	6	8	- 2	6	8	- 2
2	8	8	0	11	8	+ 3
3	8	8	0	8	8	0
4	7	8	- 1	7	9	- 2
5	8	8	0	6	9	- 3
6	5	8	- 3	6	9	- 3
7	6	9	- 3	9	9	0
8	7	9	- 2	8	9	- 1
9	8	9	- 1	8	9	- 1
10	6	9	- 3	7	9	- 2
11	10	9	+ 1	9	9	0
12	8	9	- 1	7	9	- 2
13	10	9	+ 1	7	9	- 2
14	10	9	+ 1	6	9	- 3
15	8	9	- 1	9	9	0
16	10	9	+ 1	8	9	- 1
17	5	9	- 4	9	9	0
18	10	9	+ 1	8	9	- 1
19	10	10	0	7	9	- 2
20	9	10	- 1	8	9	- 1
21	13	10	+ 3	9	9	0
22	9	10	- 1	7	9	- 2
23	7	10	- 3	9	10	- 1
24	8	10	- 2	10	10	0
25	10	10	0	6	10	- 4
26	8	10	- 2	11	10	+ 1
27	8	10	- 2	11	10	+ 1
28	11	10	+ 1	8	10	- 2
29	8	10	- 2	11	10	+ 1
30	10	10	0	10	10	0
31	8	10	- 2	9	10	- 1
32	13	10	+ 3	13	10	+ 3

TABLE 16

PICTURE COMPLETION

Regular and Over-Achieving Readers				Under-Achieving Readers		
Subject	Raw Score	Norm	Difference R.S.-Norm	Raw Score	Norm	Difference R.S.-Norm
1	9	8	+ 1	12	8	+ 4
2	9	8	+ 1	11	8	+ 3
3	9	8	+ 1	7	9	- 2
4	10	9	+ 1	13	10	+ 3
5	8	9	- 1	11	10	+ 1
6	9	9	0	13	10	+ 3
7	12	10	+ 2	8	10	- 2
8	5	10	- 5	12	10	+ 2
9	9	10	- 1	12	10	+ 2
10	10	10	0	9	10	- 1
11	10	11	- 1	8	10	- 2
12	14	11	+ 3	13	10	+ 3
13	10	11	- 1	14	10	+ 4
14	13	11	+ 2	7	10	- 3
15	16	11	+ 5	10	11	- 1
16	10	11	- 1	8	11	- 3
17	7	11	- 4	15	11	+ 4
18	11	11	0	12	11	- 3
19	10	12	- 2	11	11	0
20	12	12	0	10	11	- 1
21	13	12	+ 1	8	11	- 3
22	13	12	+ 1	14	11	+ 3
23	15	12	+ 3	13	12	+ 1
24	14	12	+ 2	11	12	- 1
25	10	12	- 2	14	12	+ 2
26	17	12	+ 5	13	12	+ 1
27	11	12	- 1	10	12	- 2
28	10	12	- 2	15	12	+ 3
29	13	12	+ 1	12	12	0
30	15	12	+ 3	17	13	+ 4
31	11	12	- 1	8	13	- 5
32	12	12	0	13	13	0

TABLE 17

PICTURE ARRANGEMENT

Regular and Over-Achieving Readers				Under-Achieving Readers		
Subject	Raw Score	Norm	Difference R.S.-Norm	Raw Score	Norm	Difference R.S.-Norm
1	6	14.5	- 8.5	20	17.5	+ 2.5
2	20	18.0	+ 2.0	28	20.5	+ 7.5
3	17	20.5	- .5	21	22.5	- 1.5
4	12	22.5	-10.5	27	24.5	+ 2.5
5	31	22.5	+ 7.5	36	24.5	+11.5
6	14	23.5	- 9.5	26	24.5	+ 1.5
7	27	24.5	+ 2.5	25	24.5	+ .5
8	27	25.5	+ 1.5	18	25.5	- 7.5
9	29	25.5	+ 3.5	29	25.5	+ 3.5
10	29	25.5	+ 3.5	12	25.5	-13.5
11	28	27.5	+ 1.5	27	25.5	+ 1.5
12	26	27.5	- 1.5	31	25.5	+ 5.5
13	39	27.5	+11.5	37	25.5	+11.5
14	21	27.5	- 6.5	29	25.5	+ 3.5
15	23	27.5	- 4.5	19	27.5	- 8.5
16	24	27.5	- 3.5	25	27.5	- 2.5
17	12	27.5	-15.5	34	27.5	+ 6.5
18	30	27.5	+ 2.5	27	27.5	- .5
19	29	29.0	0	26	27.5	- 1.5
20	34	29.0	+ 5.0	30	27.5	+ 2.5
21	33	29.0	+ 4.0	29	27.5	- 2.5
22	26	29.0	- 3.0	21	27.5	- 6.5
23	36	29.0	+ 7.0	25	29.0	+ 4.0
24	35	29.0	+ 6.0	19	29.0	-10.0
25	25	29.0	- 4.0	25	29.0	- 4.0
26	31	30.0	+ 1.0	26	29.0	- 3.0
27	26	30.0	- 4.0	35	29.0	+ 6.0
28	41	30.0	+11.0	29	30.0	- 1.0
29	34	30.0	+ 4.0	31	30.0	+ 1.0
30	31	30.0	+ 1.0	39	31.5	+ 7.5
31	28	30.0	- 2.0	25	31.5	- 6.5
32	38	30.0	+ 8.0	16	31.5	-15.5

TABLE 18

BLOCK DESIGN

Regular and Over-Achieving Readers				Under-Achieving Readers		
Subject	Raw Score	Norm	Difference R.S.-Norm	Raw Score	Norm	Difference R.S.-Norm
1	6	6.0	0.0	5	7.5	- 2.5
2	14	7.5	+ 6.5	6	8.5	- 2.5
3	6	8.5	- 2.5	14	9.5	+ 4.5
4	13	9.5	+ 3.5	6	11.5	- 5.5
5	6	9.5	- 3.5	24	11.5	+12.5
6	5	10.5	- 5.5	13	11.5	+ 1.5
7	19	11.5	+ 7.5	21	11.5	+ 9.5
8	6	14.0	- 8.0	14	14.0	0
9	24	14.0	+10.0	24	14.0	+10.0
10	6	14.0	- 8.0	30	14.0	+16.0
11	12	18.0	- 6.0	13	14.0	- 1.0
12	6	18.0	-12.0	12	14.0	- 2.0
13	10	18.0	- 8.0	11	14.0	- 3.0
14	32	18.0	+14.0	6	14.0	- 8.0
15	22	18.0	+14.0	13	18.0	- 5.0
16	24	18.0	+ 6.0	23	18.0	+ 5.0
17	9	18.0	- 9.0	10	18.0	- 8.0
18	9	18.0	- 9.0	22	18.0	+ 4.0
19	10	23.0	-13.0	30	18.0	+12.0
20	33	22.0	+11.0	42	18.0	+24.0
21	33	23.0	+10.0	5	18.0	-13.0
22	23	23.0	0.0	21	18.0	+ 3.0
23	21	23.0	- 2.0	5	23.0	-18.0
24	21	23.0	- 2.0	12	23.0	-11.0
25	6	23.0	-17.0	12	23.0	-11.0
26	43	26.5	+16.5	26	23.0	+ 3.0
27	19	26.5	- 7.5	16	23.0	- 7.0
28	45	26.5	+18.5	40	29.5	+10.5
29	35	29.5	+ 5.5	36	29.5	+ 6.5
30	30	29.5	+ .5	30	31.0	- 1.0
31	23	29.5	- 6.5	34	31.0	+ 3.0
32	12	29.5	-17.5	34	32.5	+ 1.5

TABLE 19

OBJECT ASSEMBLY

Regular and Over-Achieving Readers				Under-Achieving Readers		
Subject	Raw Score	Norm	Difference R.S.-Norm	Raw Score	Norm	Difference R.S.-Norm
1	19	14.5	+ 4.5	15	15.5	- .5
2	10	15.5	- 5.5	22	16.5	+ 5.5
3	23	16.5	+ 6.5	15	17.5	- 2.5
4	22	17.5	+ 4.5	19	19.5	- .5
5	22	17.5	+ 4.5	22	19.5	+ 2.5
6	21	17.5	+ 3.5	19	19.5	- .5
7	19	19.5	- .5	22	19.5	+ 2.5
8	6	19.5	-13.5	16	19.5	- 3.5
9	21	19.5	+ 1.5	23	19.5	+ 3.5
10	19	19.5	- .5	23	19.5	+ 3.5
11	18	21.5	- 3.5	21	19.5	+ 1.5
12	26	21.5	+ 4.5	16	19.5	- 3.5
13	20	21.5	- 1.5	26	19.5	+ 6.5
14	37	21.5	+15.5	19	19.5	- .5
15	26	21.5	+ 4.5	24	21.5	+ 2.5
16	20	21.5	- 1.5	7	21.5	-14.5
17	25	21.5	+ 3.5	17	21.5	- 4.5
18	24	21.5	+ 2.5	25	21.5	+ 3.5
19	22	23.0	- 1.0	18	21.5	- 3.5
20	22	23.0	- 1.0	27	21.5	+ 5.5
21	23	23.0	0	22	21.5	+ .5
22	22	23.0	- 1.0	21	21.5	- .5
23	25	23.0	+ 2.0	22	23.0	- 1.0
24	23	23.0	0	24	23.0	+ 1.0
25	16	23.0	- 7.0	26	23.0	+ 3.0
26	17	24.0	- 7.0	23	23.0	0
27	22	24.0	- 2.0	25	23.0	+ 2.0
28	28	24.0	+ 4.0	26	24.0	+ 2.0
29	18	24.0	- 6.0	25	24.0	+ 1.0
30	28	24.0	+ 4.0	26	24.0	+ 2.0
31	27	24.0	+ 3.0	26	24.0	+ 2.0
32	23	24.0	- 1.0	21	24.0	- 3.0

TABLE 20

CODING

Regular and Over-Achieving Readers				Under-Achieving Readers		
Subject	Raw Score	Norm	Difference R.S.-Norm	Raw Score	Norm	Difference R.S.-Norm
1	42	36.0	+ 6.0	33	36.0	- 3.0
2	18	36.0	-18.0	17	25.5	- 8.5
3	30	25.5	+ 4.5	25	25.5	- .5
4	22	25.5	- 3.5	24	28.0	- 4.0
5	29	28.0	+ 1.0	33	28.0	+ 5.0
6	32	28.0	+ 4.0	41	28.0	+13.0
7	27	28.0	- 1.0	31	28.0	+ 3.0
8	27	31.0	- 4.0	49	31.0	+18.0
9	37	31.0	+ 6.0	31	31.0	0
10	39	34.0	+ 5.0	35	31.0	+ 4.0
11	38	34.0	+ 4.0	36	34.0	+ 2.0
12	44	34.0	+10.0	33	34.0	- 1.0
13	41	34.0	+ 7.0	33	34.0	- 1.0
14	51	34.0	+17.0	33	34.0	- 1.0
15	38	36.5	+ 1.5	49	34.0	+15.0
16	32	36.5	- 4.5	31	36.5	- 5.5
17	49	36.5	+12.5	34	36.5	- 2.5
18	52	37.0	+15.0	50	38.5	+11.5
19	42	40.0	+ 2.0	32	38.5	- 6.5
20	41	40.0	+ 1.0	38	38.5	- .5
21	41	41.0	0	44	38.5	+ 5.5
22	44	41.0	+ 3.0	38	38.5	- .5
23	45	41.0	+ 4.0	48	40.0	+ 8.0
24	37	42.5	- 5.5	42	41.0	+ 1.0
25	47	42.5	+ 4.5	42	41.0	+ 1.0
26	38	44.0	- 6.0	37	41.0	- 4.0
27	49	44.0	+ 5.0	36	41.0	- 5.0
28	57	44.0	+13.0	44	47.0	- 3.0
29	53	45.5	+ 7.5	45	47.0	- 2.0
30	41	47.0	- 6.0	62	48.5	+13.5
31	53	47.0	+ 6.0	54	48.5	+ 5.5
32	56	47.0	+ 9.0	38	48.5	-10.5

TABLE 21

VERBAL PERFORMANCE

Regular and Over - Achieving Readers				Under-Achieving Readers		
Subject	Verb. Diff. Raw Scores	Perf. Diff. Raw Scores	Diff.	Verb. Diff. Raw Scores	Perf. Diff. Raw Scores	Diff.
1	- 8.5	+ 2.5	-11.0 - 6.0	+15.0	0.0	+ 1.5
2	- .5	-14.0	+13.5 -14.5	+14.5	+ 5.0	+ 9.5
3	+19.5	+ 8.0	+11.5	+ 6.5	- 2.0	- 8.5 + 4.0
4	-11.5	- 5.0	- 6.5 -16.5	- .5	- 4.5	- 5.0
5	+ 5.5	+12.0	- 6.5	-13.5	+32.5	-46.0
6	- 8.5	- 7.5	- 1.0 -16.0	-26.5	+18.5	-45.0
7	+ 5.5	+10.5	- 5.0	+ 3.5	+13.5	-10.0
8	+10.5	-29.0	+39.5 -18.5	- 1.5	+ 9.0	-10.5
9	+13.5	+20.0	- 6.5	+ 4.5	+19.0	-14.5
10	-15.5	0	-15.5	-15.5	+ 9.0	-24.5
11	+ 4.5	- 6.0	+10.5 - 1.5	+ 6.5	+ 2.0	+ 4.5
12	+13.5	+ 4.0	+ 9.5	+ 9.5	+ 2.0	+ 7.5
13	+21.5	+ 8.0	+13.5	+10.5	+18.0	- 7.5
14	+ 4.5	+42.0	-37.5	- 5.5	- 9.0	+ 3.5 -14.5
15	+ 1.5	+10.5	- 9.0	- 7.5	+ 3.0	-10.5 -11.0
16	+13.5	- 4.5	+18.0 + 9.0	- .5	-10.5	+10.0
17	+ .5	-12.5	+13.0 -12.0	- .5	- 4.5	+ 4.0 - 5.0
18	-12.5	+ 9.5	-22.0 - 3.0	- 4.5	+19.5	-24.0
19	- 7.5	-14.0	- 6.5 -21.5	- 7.5	+ .5	- 8.0

Table 21 (continued)

Regular and Over-Achieving Readers				Under-Achieving Readers		
Subject	Verb. Diff. Raw Scores	Perf. Diff. Raw Scores	Diff.	Verb. Diff. Raw Scores	Perf. Diff. Raw Scores	Diff.
20	- 2.5	+15.0	-17.5 +12.5	-15.5	+30.5	-46.0
21	+16.5	+15.0	+ 1.5	- .5	- 8.5	+ 8.0 - 9.0
22	+12.5	0	+12.5	- 5.5	- 1.5	- 3.5 - 7.0
23	- 3.5	+16.0	-19.5 +19.5	-11.5	-14.5	+ 2.5 -26.0
24	+ 8.0	+ .5	+ 7.5	- 5.5	-20.0	+14.5 -25.5
25	+11.0	-25.5	+26.5 -14.5	-18.5	-19.0	+ .5 -37.5
26	- 4.5	+ 9.5	-14.0 - 5.0	+31.5	- 3.0	+34.5
27	- .5	- 9.5	+ 9.0 -10.0	+16.5	- 6.0	+22.5
28	+ 3.5	+44.5	-41.0	-13.0	+11.5	-24.5
29	+ 3.5	+12.0	- 8.5	+ 5.0	+ 6.5	- 1.5
30	- 1.0	+ 2.5	- 3.5	- 3.0	+25.5	-28.5
31	-14.0	- .5	-13.5	+19.0	- 1.5	+20.5
32	+19.0	- 1.5	+20.5	- 6.5	-28.0	-34.5 +21.5