DOCUMENT RESUME

ED 108 106 CS 001 814

AUTHOR Searls, Evelyn F.
TITLE How to Use WISC Scores in Reading Diagnosis. Reading Aids Series.
INSTITUTION International Reading Association, Newark, Del.
PUB DATE 75
NOTE 50p.
AVAILABLE FROM International Reading Association, 800 Barksdale Road, Newark, Delaware 19711 (Order No. 215, $3.00 non-member, $2.00 member)

EDRS PRICE MF-$0.76 HC-$1.95 PLUS POSTAGE
DESCRIPTORS Elementary Grades; Intelligence; Intelligence Quotient; *Intelligence Tests; Reading; *Reading Ability; *Reading Diagnosis; Reading Skills
IDENTIFIERS *Wechsler Intelligence Scale for Children

ABSTRACT

The purpose of this bulletin is to acquaint the reading teacher with the organization and administration of the Wechsler Intelligence Scale for Children (WISC). Procedures are suggested for analyzing WISC scores in ways that may yield valuable information for teachers who seek to remediate the student's reading disability. The bulletin contains the following chapters: "The Individual IQ Test and Reading Achievement," which discusses how the WISC scores should best be interpreted; "The WISC," which looks at organization, administration, and reporting of scores for the WISC; "WISC Subtests," which looks at the two subtests of the WISC-verbal scale and performance scale; "Analysis of WISC Scores," which discusses full-scale IQ verbal and performance scale IQs, subtest scaled scores, and analysis procedures with actual test scores; "Other Wechsler Scales," which discusses the Wechsler Adult Intelligence Scale and the Wechsler Primary Scale of Intelligence; and "Conclusion," which presents some dos and don'ts about the WISC. Included in the appendixes are the WISC record form, the WISC data sheet, a list of abilities measured by the WISC subtests, and a discussion of the revised WISC (WISC-R). (WR)

reading aids series

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an ira *service bulletin*

international reading association • newark delaware 19711

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Library of Congress Cataloging in Publication Data
Searls, Evelyn F
How to use WISC scores in reading diagnosis
(Reading aids series) (An IRA service bulletin)
Bibliography p
1 Reading–Ability testing. 2 Wechsler intelligence scale for children I Title.
LB1050.46 S43 372.4'3 75-8534
ISBN 0-87207-215-0

CONTENTS

The International Reading Association attempts, through its publications, to provide a forum for a wide spectrum of opinion on reading. This policy permits divergent viewpoints without assuming the endorsement of the Association. Research data on the topic covered in this volume are not available to support some of the instructional procedures recommended or common practices described. The ideas presented are for classroom teachers or school clinicians, especially those who are sometimes provided with test results but little or no help in understanding what the results might mean in terms of diagnosis and instruction

In pointing out that the WISC "must be administered by trained personnel, usually a school psychologist," the author of this volume echoes an essential recommendation in the American Psychological Association's *Standards for Educational and Psychological Tests*: "The principal test users within an organization who are charged with responsibilities related to test use and interpretation (e.g., test administrators) have received training appropriate to those responsibilities" (p. 59). A second statement from the same APA publication illuminates some of the author's suggestions for follow-up instructional activities: "The manual or report form from a scoring service cannot fully prepare the user for interpreting the test. He will sometimes have to make judgments that have not been substantiated by published evidence" (p. 13).

FOREWORD

Investigators have had twenty-five years to explore the relationship between reading skills and scores on the Wechsler Intelligence Scale for Children. In that time a number of observations useful to diagnosticians have been reported. This present volume of the Reading Aids Series offers a concise summary of these findings along with descriptions of the tests and the conditions of their norming.

A drawback of the 1949 edition of the Scale (to some potential users and interpreters) has been the confinement of its norming population to white children. A revised WISC published earlier this year has been normed on a U.S. population including minority group children. Ultimately, with further research, it should be possible to identify in each subtest the items most suitable to children of a given minority group for purposes of reading diagnosis.

For those who wish to engage in further research, this volume provides a background of existing evidence. For those who wish to take a course on the administration and interpretation of the WISC, this book offers a helpful survey and should remove some of the shock of learning the intricacies of the tests and their interrelationships. For teachers who need to know the meaning, for reading, of the psychologist's findings in the case of a given child, the clarity and helpfulness of this presentation are admirable.

The International Reading Association is indebted to Evelyn F. Searls for this gift to the profession. So many bits and pieces of information are lost for want of a scholar willing to assemble them! In this case we are fortunate.

When you have finished reading this book, you can always keep it in the living room. By examining your friends you may find a Phi Beta Kappa who is full of "susceptibility to irrelevant details, negativism, and anxiety which affect attention and concentration." I did! You can ask, "In what way are a saw and a hammer alike," and make a collection of divergent replies such as, "They both hurt your thumb." "They belong to my father."

Or, even better, you may decide to conduct a piece of research on the relationship of the Revised WISC scores to reading.

Constance M. McCullough, *President*
International Reading Association
1974-1975

Chapter 1

THE INDIVIDUAL IQ TEST AND READING ACHIEVEMENT

Intelligence is a necessary prerequisite to the act of reading. Generally speaking, superior intelligence produces superior readers and borderline intelligence, poor readers. There are numerous exceptions to this generalization, however, particularly in the average range of intelligence. A number of investigators have found retarded readers and even nonreaders to have average or above average intelligence as measured on a standardized intelligence test.

When a student has difficulty learning to read, the reading teacher needs a measurement of the student's mental abilities in order to assess the extent of the difficulty. She needs to know whether the student has the capacity to improve in reading achievement. Realizing that a group-measure of intelligence, relying heavily on student ability to read silently with good comprehension and usually under timed conditions, penalizes the poor reader, the teacher requests the administration of an individual intelligence test that does not require reading.

The two individually administered intelligence tests most often used are the Stanford-Binet Intelligence Scale and the Wechsler Intelligence Scale for Children (WISC). The merits of each will not be debated here. Both must be administered by trained personnel, usually a school psychologist, and both yield a global IQ that indicates a level of intellectual functioning based on how the student performed on certain tasks. Neither test measures innate intelligence, i.e., an individual's inherited capacity to perform mental tasks. From the moment of birth this capacity interacts with the environment, thus, only certain aspects of the results of this interaction can be measured.

In addition to a global IQ, the WISC indicates how a student performs on verbal tests, performance tests, and on each separate subtest task. Because the IQ can be subdivided in this manner, the WISC perhaps has been used more often than the Stanford-Binet when the diagnosis of a reading disability is involved. Faced with the fact that retarded readers often have global IQs in the average range or above, investigators began to observe how poor readers scored on different tasks presented by the IQ tests. Summaries of research made by Strang (1968), Farr (1969), and Huelsman (1970) indicate two rather consistent findings. 1) retarded readers tend to score higher on the Performance than on the Verbal Scale,

and 2) poor readers tend to score low on five of the subtests—Information, Arithmetic, Digit Span, Coding, and sometimes Vocabulary.

Since the majority of research with the WISC and reading achievement has been ex post facto (after students have been identified as poor readers), the issue of cause and effect is still debatable. Were the poor readers inherently inadequate in certain aspects of intelligence (as tapped by the subtests on which they scored low), or had they failed to develop in these areas because of their lack of reading ability? Farr concluded from his review of the research that reading disability "negatively affects performance on intelligence tests" (1969:186).

Whether or not this conclusion is accepted, it becomes apparent that the global score, the WISC Full Scale IQ, particularly if it falls within the Average range or above (according to Wechsler's classification), is probably the least important piece of information which the test yields for the teacher working with the student on a daily basis. It tells the teacher that the student has the necessary mental abilities, as measured by a standardized IQ test, to learn to read; it does not give any clues as to why the student is having difficulties with this task. Too often, only the Full Scale IQ is reported to the reading teacher, along with comments and recommendations by the examiner. Even if the Verbal IQ, the Performance IQ, and the subtest scores are reported, these may have little meaning for the teacher if she is not familiar with the WISC.

This bulletin will attempt to acquaint the reading teacher with the organization and administration of the WISC, the tasks involved in each subtest, and what each subtest purports to measure. Procedures will be suggested for analyzing WISC scores in ways that may yield valuable information for the teacher as she seeks to remediate the student's reading disability. Mention will also be made of the other Wechsler Scales for adults and preschool children. Because of the complexities involved in psychological testing, however, teachers who use this Reading Aid may wish to consult a psychometrist or a psychologist (personnel trained in the administration and interpretation of the WISC) for further clarification of details not covered in this bulletin.

Chapter 2

THE WISC

The WISC is an individually administered intelligence test which was published in 1949. It was standardized on a sample of 100 boys and 100 girls at each age level from five through fifteen years; 1,100 boys and 1,100 girls in eleven age groups, a total of 2,200 white children, were examined. Information from the 1940 United States Census was used to decide how many children should be tested from urban areas versus rural areas in four major geographic regions. 1) New England and the Middle Atlantic States, 2) North Central States, 3) South Atlantic and South Central States, and 4) Mountain and Pacific States. The children's fathers were to be occupationally distributed according to all employed white males in the United States in 1940. (See Appendix D for a description of WISC-R, the first revised version of the WISC, published in 1974.)

• Organization

The WISC is divided into two parts, a Verbal Scale and a Performance Scale, each having five required subtests and one subtest usable as a supplement or an alternate.

Verbal Scale

1. Information
2. Comprehension
3. Arithmetic (timed)
4. Similarities
5. Vocabulary
6. Digit Span (Supplement or Alternate)

Performance Scale (all timed)

7. Picture Completion
8. Picture Arrangement
9. Block Design
10. Object Assembly
11. Coding (or Mazes)
12. Mazes (Supplement or Alternate, seldom used)

It is helpful to think of these two scales in terms of input and output, and not as measuring different kinds of intelligence (Wechsler, 1967). The Verbal Scale involves auditory verbal input and vocal verbal output. The examiner reads aloud the questions on all subtests; the student responds

orally. The Performance Scale involves visual, nonverbal input and motor, nonverbal output. Although the examiner gives brief verbal instructions for each task, the student receives visually and nonverbally the information necessary for him to perform the task, and no verbalization is necessary for the motor response.

It should also be noted that the verbal subtests are all untimed with the exception of Arithmetic; conversely, the performance subtests are all timed. The Arithmetic subtest and the performance subtests are problem-solving situations. Ideally, the student works rapidly, quickly sizing up the problem and starting to solve it. Excessive slowness indicates an inability to visualize the solution; excessive speed indicates impulsiveness, a lack of ability to postpone action until the solution is thought out. Therefore, timing is important on these subtests.

Each subtest begins with easy items scaled to the ability of the five-year-old. Each successive question or task is a little more difficult, with the final subtest item aimed at the superior fifteen-year-old.

• Administration

The WISC is administered by a trained examiner on a one-to-one basis to children aged 5 years to 15 years 11 months. The testing should be carried out in a quiet setting, free from distractions, and only after good rapport has been established between the examiner and the testee. It is very important for the examiner in a school setting to be known and accepted by the child to be tested and by others in his group. This may require the examiner to spend some time in the classroom getting acquainted, observing the child in the classroom situation, and establishing a friendly working relationship with the teacher.

The Verbal Scale is administered first with the subtests given in the listed order; then the Performance Scale should be administered as listed. The order of administration is not a strict hierarchy according to the difficulty of the task involved in each subtest; however, the first subtest on each scale does present a simpler task than the last subtest on each scale.

If the score on any one of the subtests is invalidated in some way (such as an error in administration, an external interference, or an unexpected emotional blocking by the subject being tested), an alternate subtest may be substituted. The alternates are Digit Span on the Verbal Scale and Mazes on the Performance Scale. Wechsler decided on the alternates by administering all six subtests of each scale to every subject in the standardization sample; then he chose five of the subtests for calculation of the IQ tables. He omitted Digit Span and Mazes in establishing the IQ tables because these two subtests had slightly lower correlations with the other subtests on their respective scales and, in the case of Mazes, because of the time factor. However, since the IQs will not usually be materially changed, Wechsler strongly advises the inclusion of both tests as supplements whenever possible because of the qualitative and diagnostic data which

they add. When either Digit Span or Mazes is administered as a supplement, the sum of the test scores on the respective scale must be prorated to the equivalent of five tests in order to find the IQ. Wechsler (1949) has provided a table to facilitate such prorating.

Since poor readers often score low on Digit Span, it is usually included as a supplement on the Verbal Scale when a relationship is being investigated between the WISC and reading achievement.

Because Wechsler had almost as many reasons for omitting Coding as he did for omitting Mazes, he decided to give the examiner the option of using either one as the fifth subtest on the Performance Scale. Since Mazes takes longer to administer and score, Coding has generally been used in all instances of WISC testing. This is unfortunate because, as a result, little information is available as to what Mazes measures and what implications can be inferred from high or low scores. However, Coding has been shown to be a subtest which is sensitive to reading disability, so its inclusion on the Performance Scale is advantageous for those interested in analyzing the WISC from the standpoint of reading achievement.

Ten of the subtests begin with easy items, become progressively more difficult, and are discontinued after a specified number of failed items. The two exceptions are Object Assembly and Coding, both on the Performance Scale. Object Assembly moves from easy to difficult, but all four puzzles must be attempted by the subject. Coding has two parts—one intended for subjects under the age of eight and the other for subjects over eight. The subject must try to complete the appropriate part within the time limit. Chapter 3 describes each subtest in detail and explains scoring procedures.

Because most of the subtests are discontinued when the subject fails five or fewer items, younger subjects reach the cutoff point more quickly than older ones and usually spend less time in elaborated verbal responses. Thus, the time required for the administration of the WISC may vary from 45 to 75 minutes, the average being one hour.

The examiner follows the explicit directions in the test manual as to what he should say and do in administering the WISC. He records all verbal responses exactly as given and scores the test after, rather than during, the administration. An hour is probably the minimum time needed by the examiner to score and provide a written interpretation of the WISC results.

• Reporting of Scores

Scores are recorded on the front of the WISC Record Form. If you have access to such a sheet for a child with whom you have worked, you may want to look at the scores as they are discussed here and in Chapter 3. Otherwise, Appendix A presents a WISC Record Form with data filled in.

The WISC yields three types of scores: Full Scale IQ, Verbal and Performance Scale IQs, and the subtest scaled scores. Wechsler (1949) classifies IQs as follows

IQ	Classification	Percent Included
130 and above	Very Superior	2.2
120 – 129	Superior	6.7
110 – 119	Bright Normal	16.1
90 – 109	Average	50 0
80 89	Dull Normal	16.1
70 – 79	Borderline	6.7
69 and below	Mental Defective	2.2

Full Scale IQ

The Full Scale IQ, if within the Average range or above, is probably the least valuable score for the classroom or reading teacher. There are a number of reasons for this. The first is concerned with the nature of measuring devices. All measurement is approximate. Repeated measurements of anything will vary, whether the thing being measured is a physical object, such as a table, or an intangible attribute, such as intelligence. The more exact the measuring instrument, the less variation occurs. Unfortunately, the instruments for measuring intelligence are not very exact, especially compared to those available for physical measurements. Therefore, when we consider a test score, we must take into account the margin of error.

This margin of error is known as the standard error of measurement. Suppose you repeat a certain test measurement one hundred times and take the average of all the scores. That average can be thought of as the true score. You can then take the range of scores which you obtain and mark the points which enclose the middle two-thirds of the scores. These points can be designated as one standard error of measurement above the true score and one standard error of measurement below the true score. You can further mark the points which enclose the middle 95 percent of all the scores which you obtain and these points can be designated as two standard errors of measurement above the true score and two standard errors of measurement below.

Obviously, you cannot administer the same test 100 times in the school situation in order to learn the true score of the person being tested. Therefore, you need something which will give you an idea of how far away from the true score a single score may be. The standard error of measurement can be statistically computed for any test, and all reliable tests will publish the standard error of measurement in the test manual. The standard error of measurement for the WISC has been computed for three different age levels as follows

Standard Error of Measurement			
Scores	Age 7½	Age 10½	Age 13½
WISC Full Scale IQ	4.25	3.36	3.68
WISC Verbal Scale IQ	5.19	3.00	3.00
WISC Performance Scale IQ	5.61	4.98	4.74

Now, look at the Full Scale IQ for the student with whom you have worked or for the student whose scores are recorded in Appendix A. Determine the closest age level. Appendix A presents the scores of a student aged 10. His Full Scale IQ is 114. The standard error of measurement for age 10½ is 3.36. This means that we can say this about his Full Scale IQ of 114. The chances are two out of three that his true IQ lies somewhere between one standard error of measurement below 114 and one standard error of measurement above 114, or between 110.64 and 117.36

114.00	114.00
− 3.36	+ 3.36
110.64	117.36

If we want to be more certain of the range within which his true score lies, we can subtract and add two standard errors of measurement ($2 \times 3.36 = 6.72$).

114.00	114.00
− 6.72	+ 6.72
107.28	120.72

This enables us to say that the chances are 95 in 100 that his true Full Scale IQ lies between 107.28 and 120.72.

If we look at Wechsler's classification of intelligence, we see that the chances are 2 out of 3 that this student is of Bright Normal Intelligence, and 95 out of 100 that he is of Average to Superior Intelligence.

Thus, the first reason for avoiding emphasis on the Full Scale IQ is that it is, at best, only an approximation of the student's true IQ as measured by the WISC. The second reason is that situational variables may have affected the student's score. The extent of rapport between the examiner and testee, the physical setting, how the examiner feels on that particular day, how the student feels and his attitude toward testing—any one of these factors may cause variation of the score from the true IQ.

Another reason for de-emphasizing the Full Scale IQ is that it compares the student to a norm group of white, mostly middle-class, children living in the United States in the late 1940s. In a society in which social changes

are taking place at breakneck speed, a twenty-five-year-old test may not be a valid measure of intellectual ability for any subject. Furthermore, minority groups (such as Blacks, Spanish-Americans, and migratory workers) were excluded from the standardization sample. Thus, the extent to which a student differs from the characteristics of the group on which the test was normed may bias his IQ.

The last reason is that the Full Scale IQ, if within the Average range or above, does not give any clues as to why the student is having difficulty with reading. We assume that a person of Average Intelligence should be able to learn to read well; why he doesn't is not revealed by the Full Scale IQ. Therefore, the Full Scale IQ should be considered only as an indication of the necessary mental ability, or possible lack thereof, to learn to read.

Verbal and Performance Scale IQs

The Verbal and Performance Scale IQs are subject to three of the same limitations as the Full Scale IQ, if they are considered separately. The standard error of measurement for the Verbal Scale varies from 3.00 to 5.19, according to age level. The standard error of measurement for the Performance Scale varies from 4.74 to 5.61. Thus, we must think of these IQs as falling within bands of possible scores. We can add and subtract one standard error of measurement to find the band within which the true score will fall two out of three times. We can add and subtract two standard errors of measurement to find the band within which the true score will fall 95 out of 100 times.

Situational variables and differences from the norm group may also affect Verbal and Performance Scale IQs.

The value of the Verbal and Performance Scale IQs lies in the magnitude of the difference between them. Here the comparison is between how the student functions on verbal tasks as opposed to how he functions on performance tasks. A large difference (15 or more points) may indicate deficiencies in processing information, in modes of expression, or in working under conditions of pressure, all of which may also be involved in reading disability. This will be discussed more fully in Chapter 4.

Subtest Scaled Scores

The subtest scaled scores are the most important scores the WISC yields for the classroom or reading teacher. While subject to the same limitations of error of measurement, situational variables, and difference from the norm group, subtest scores may be analyzed for the intra-student variations they may reveal. The norm mean of each subtest is 10, but more important is the student's own subtest mean on the Verbal Scale and on the Performance Scale, and how much he varies from these means on the separate subtests of each scale. In other words, the student's performance is not compared to what others have done; it is compared to his own performance on the other subtests of the scale. Does he show highs and

lows in accomplishing the different tasks presented by the subtests? Glasser and Zimmerman (1967.2) have stated:

> As conceptualization of interpretation of test results has developed in current thinking, the notion of *level* of intelligence has become progressively less important .... That a youngster is of average ability may be comforting to the parent–but why can't he read? ... What we tend to be more and more concerned with, then, is the application of what we learn of the child's cognitive and affective processes as they relate specifically to various kinds of home and classroom behavior.

This type of analysis tends to concentrate on the student's individual performance and is less subject to distortion by errors of measurement, administration, or test construction. How such an analysis may be made will be detailed in Chapter 4.

Chapter 3

WISC SUBTESTS

Each WISC subtest is discussed in this chapter in the order of administration. (See Chapter 2 for the complete list of subtests.) Information for each subtest includes a brief description, an illustrative question or task, the abilities measured, the method of scoring, time limits (if any), possible indications from high or low scores, and what relationship may exist between the subtest and reading disability. *The examples of test items are similar to those on the WISC but are not identical.* They were supplied by The Psychological Corporation, publishers of the WISC. The statements regarding abilities measured have been compiled from Wechsler (1958), Glasser and Zimmerman (1967), and lectures by Richard L. Carner, Director of the Reading Clinic, University of Miami (1969).

The possible indications from high or low scores and relationships with reading disability have been suggested by researchers who have worked with the WISC in the 25 years since its publication. These indications and relationships are not intended to be exclusive. They have simply been the most productive hypotheses in seeking explanations of students' learning behaviors. The perceptive teacher will find and explore other hypotheses in individual cases.

If you are looking at the scaled scores of a student with whom you have worked or at the scores in Appendix A, you can consider the norm mean of 10 as an average scaled score on each subtest; a score of 13 or above as high, and a score of 7 or below as low. However, since this compares the student to what others have done, it is not as valuable as the intra-student comparisons which will be made in Chapter 4.

• Verbal Scale

1. Information

This subtest consists of 30 questions in ascending order of difficulty. The questions are factual, requiring very brief answers (usually one to five words). These are basic facts assumed to be generally available to children within the major culture (white, middle class).

Examples "What is steam made of?"
"Who wrote *Paradise Lost*?"

What the subtest measures The Information subtest measures memory

of general information gained from experience and education. The subject is not required to find relationships between facts but only to demonstrate whether he has stored these facts as general knowledge The subtest may also measure intellectual aggressiveness or drive.

Method of scoring. Each question is scored 1 or 0, untimed; the subtest is discontinued after 5 consecutive failures.

Indications from scores. High scores may indicate a good memory, an enriched background of a high cultural level with wide reading, and/or an alertness and interest in the surrounding environment. High scores may also suggest a child who is intellectually ambitious. Low scores may indicate poor memory, hostility to a school-type task, a tendency to give up easily, a foreign language background, and/or a culturally deprived environment. Low scores may also reflect an orientation toward non-achievement.

Relationship to reading. As stated in Chapter 1, poor readers have tended to score low on five of the WISC subtests, of which Information is one. Glasser and Zimmerman stated: "Items on this subtest basically represent typical school-influenced education, although it does measure more broadly based knowledge before age 7" (1967·43). Since most of the research concerned with the WISC and reading disability has been carried out after children were identified as poor readers (usually third grade or above), the possibility exists that their inability to read well has limited their opportunities to increase their fund of general information. On the other hand, the inability to store information (poor memory) may have hindered their progress in reading. Whether the student's best learning modality is auditory or visual may also be a factor. The student who learns best through his ear rather than his eye may have difficulty in reading (though not necessarily), but he may still accumulate information rapidly from television, films, and discussions. Thus, there have been poor readers who made average or above scores on the Information subtest, indicating that they have been alert enough to pick up these facts in spite of their reading disability.

2. Comprehension

The title of this subtest is misleading to teachers who are accustomed to thinking of comprehension as a component of the reading act. Perhaps a better title would be "Common Sense" or "Practical Judgment." The subtest is composed of 14 problem questions designed to find out whether the child has a fund of practical information which he can use to cope with and solve problems of social behavior.

Examples "What should you do if you see someone forget his book when he leaves his seat in a restaurant?"

"Why should you keep your money in a bank?"

What the subtest measures. This subtest measures the extent to which the child has acquired the social and moral values of the major American culture through everyday living experiences in both home and school. It also measures his ability to use practical knowledge and judgment in social situations and reflects his knowledge of conventional standards of behavior.

Method of scoring. Each question is scored 2, 1, or 0, untimed; the subtest is discontinued after three consecutive failures. The first five questions are "what to do" problem situations; one point is given if the subject knows what to do and two points if he assumes personal responsibility for doing it. The remaining nine "why" questions must be answered with two correct reasons to gain two points; one reason rates one point.

Indications from scores. High scores may indicate wide experience, ability to organize knowledge, social maturity, and/or an ability to verbalize well. High scores may also indicate a child who has learned the rules of conventional behavior in our society, who knows the "right" answers, but who does not necessarily put them into practice. Low scores may indicate overdependency (failure to take personal responsibility), overly concrete thinking, inability to express ideas verbally, and/or a creative individual looking for unusual solutions. (A child whose background lies outside the major culture may be penalized since the correct answers are based on middle-class behavior standards.)

High Information/low Comprehension scores may indicate a child who is not able to synthesize and use information to solve problems. Low Information/high Comprehension scores may indicate underexposure to informative experiences.

Relationship to reading. Poor readers are usually not penalized by the Comprehension subtest, as this is the type of information which can be acquired through practical experience and oral discussion.

3. Arithmetic

This subtest includes 16 word problems requiring mental computation (no pencil and paper allowed). The first three problems are to be solved using blocks; these problems are administered only to subjects under the age of 8 or to suspected mental defectives. Problems 1 through 13 are read aloud by the examiner. Problems 14, 15, and 16 (the most difficult) are presented on cards for the subject to read aloud before the timing begins. He may refer to the problems as he works out the answers mentally.

Examples "Sam had three pieces of candy and Joe gave him four more How many pieces did Sam have altogether?"

"If two apples cost 15¢, what will be the cost of a dozen apples?"

What the subtest measures. The Arithmetic subtest measures the ability

to attend and to focus concentration in order to extract the relations involved between the numbers. *Concentration* may be defined as an "active relationship with reality," in which the individual consciously keeps out all material--cognitive and emotional--not directly pertinent to the task (Rapaport, 1945). The subject must also be able to deal with abstract concepts of numbers and to perform the basic numerical operations of addition, subtraction, multiplication, and division. These basic operations are presented in order of difficulty so that a child is never required to perform an operation to which he has not been exposed many times at school. For example, a subject aged 10½, who would normally be in the fifth grade, can make an average score by answering eight addition or subtraction problems and one simple multiplication problem. In other words, the emphasis in this subtest is not placed on mathematical knowledge, per se, but is placed on mental alertness and concentration.

Method of scoring. Each problem is scored 1 or 0 and timed separately, ranging from 30 seconds to 120 seconds per problem, depending on the difficulty. The Arithmetic subtest is discontinued after 3 consecutive failures.

Indications from scores. Glasser and Zimmerman (1967:59) stated: "Arithmetic is more likely than some of the other subtests to reveal important clues to personality and attitudes toward school achievement. For instance, the authority dominated youngster who is eager to please may do quite well, while the resistant child who refuses even to try may do very poorly." Thus, high scores may indicate an obedient teacher-oriented student, good concentration, and/or facility in mental arithmetic. Low scores may indicate poor attention, distractability, anxiety over a school-like task, and/or a mental block towards anything having to do with mathematics. Low scores may also indicate poor school achievement because of rebellion against authority or because of cultural disadvantage. Transient emotional reactions may depress the score as well if, for example, the child is worried about some personal problem.

Relationship to reading. Research indicates that groups of poor readers are more apt to score low on the Arithmetic subtest than on any other WISC subtest; unfortunately, research has not investigated possible causes. It may be that, because this subtest requires the use of noncognitive functions (attention and concentration) combined with the use of cognitive functions (manipulating abstract concepts, knowledge and use of numerical operations), it doubly penalizes the poor reader. Because most poor readers are not tested when they begin school but only after they have developed a reading problem, it is impossible to tell whether reading disability has prevented their acquiring in school the knowledge necessary for success on this subtest, or whether their inability to concentrate has affected learning in both areas of reading and mathematics. Farr (1969) concluded that the Information, Arithmetic, and Vocabulary subtests were probably the ones most affected by the lack of ability to broaden knowl-

edge through reading. In a study conducted by the writer, children who were poor readers at the end of first grade had made average scores on the WISC Arithmetic subtest at the beginning of the year; however, good readers had made Arithmetic scores significantly above average at the beginning of the year (Searls, 1972).

4. Similarities

This subtest consists of two parts. The first has four incomplete sentences (see first example) which call for learned associations; this part is administered only to children under age 8 or suspected mental defectives. The second part contains 12 pairs of words which require the identification of likenesses, either essential or superficial, between objects, substances, facts, or ideas.

Examples "You see with your eyes and hear with your _____."

"In what way are a saw and a hammer alike?"

"In what way are a circle and a triangle alike?"

What the subtest measures. The Similarities subtest assumes that the subject has obtained facts and ideas from exposure to information at both home and school and should be able to see essential relationships between them. The subtest thus measures remote memory, concept formation, ability to see associational relationships, and logical and abstract thinking. It also measures the ability to select and verbalize relationships between two concepts which seem dissimilar at first. (As the items become more difficult, the superficial dissimilarity becomes greater.)

Method of scoring. The first four incomplete sentences are scored 1 or 0, untimed; the 12 word pairs are scored 2, 1, or 0, untimed. The subtest is discontinued after 3 consecutive failures. One point is given if the subject gives a likeness at the concrete level, either descriptive ("a saw and a hammer are both made of metal and wood") or functional ("a saw and a hammer are both used to work with"). Two points are given for a more abstract likeness ("they are both tools for building").

Indications from scores. High scores may indicate many items associated at the concrete level and/or fewer items associated at the abstract level. (Only the examiner can give this information, as the score alone will not differentiate.) The level of concept formation achieved is important since the more abstract the response, the higher the level of intelligence. Low scores may indicate an overly concrete mode of approach (subject cannot get beyond the concrete level of similarity), rigidity of thought processes (subject cannot find relationships when the two objects appear to be dissimilar), and/or negativism (subject insists that the objects are not alike).

Relationship to reading. Poor readers do not seem to be unduly penalized by this subtest, since they can obtain the facts and ideas necessary for

concept formation in ways other than reading. Also, poor readers can get credit for the concrete level of abstraction if they are unable to function at the higher level.

5. Vocabulary

This subtest is composed of 40 words to be defined; words are arranged in ascending order of difficulty. Thirty of the words are nouns; the remainder are verbs or adjectives.

Examples "What is a_____?"
"What does_____mean?"

What the subtest measures. Vocabulary is considered to be the best single verbal measure of general intelligence on the WISC. It measures learning ability, word knowledge acquired from experience and education, richness of ideas, kind and quality of language, and level of abstract thinking. Home background and educational opportunity can affect the score to a great extent.

Method of scoring. Each definition is scored 2 or 0 for the first five words (all nouns), then 2, 1, or 0 for the remaining words, untimed. The subtest is discontinued after five consecutive failures (responses scored 0). Beginning with word number 6 a two-point answer would be one giving a good synonym, a major use, or a general classification. Poverty of content is penalized in that one point is given for a vague or less pertinent synonym or a minor use. This subtest is probably one of the most difficult to score objectively in spite of the pages of sample answers given in the test manual.

Indications from scores. High scores often indicate a good family/cultural background and/or good schooling, as well as the ability to conceptualize. Low scores may indicate limited educational or family background and/or the inability to verbalize. Children from foreign language backgrounds or those from cultures where they have not been encouraged to express themselves verbally may have depressed scores.

The Vocabulary subtest may be compared to the Similarities subtest. Both measure level of abstract thinking and ability to form concepts; but the Similarities subtest is perhaps a purer measure and less likely to be depressed by reading disability. An average or above average Similarities score combined with a low vocabulary score would suggest that the subject has the mental ability to do abstract thinking, but that his opportunities to learn new words have been restricted.

Relationship to reading. Research is inconclusive regarding poor readers' performances on this subtest. In some studies poor readers made low vocabulary scores, in others they did not. The determining factor may be the child's ability and opportunity to develop his vocabulary and level of conceptualization from his aural experiences rather than depend on reading experiences

6. Digit Span

This subtest consists of two parts. The first calls for a repetition of unrelated Digits Forward beginning with a series of three digits and continuing through a series of nine digits. The second part requires the repetition of unrelated Digits Backward, ranging from a series of two digits through a series of eight digits.

Example 2 - 5 - 6 - 1 - 8 - 3

What the subtest measures. The Digit Span subtest measures attention span, concentration (Digits Backward), immediate auditory memory, and auditory sequencing. *Attention* may be defined as the free use of energies not specifically tied up with any particular emotion, interest, or drive; these energies are at the disposal of the subject to be used in thinking and dealing with reality. Attention is both automatic and involuntary, as opposed to concentration which is conscious and voluntary (Rapaport, 1945).

Method of scoring. Each subject begins with the series of three digits forward, repeating them after the examiner has said all three digits. The subject has two trials with each series. The score is the highest series of digits repeated without error on either trial of that series. For example, the subject may fail the first trial of five digits but succeed with the second trial. He may then fail both trials of the six-digit series, so that his score on Digits Forward remains at 5. The same procedure is followed for Digits Backward and the scores on both parts of the subtest are added together for the final score. The subtest is untimed as far as the subject's response is concerned, although the examiner says the digits at the rate of approximately one per second. Digit Span is discontinued after failure on both trials of a given series.

Indications from scores High scores may indicate good rote memory and immediate recall, with ability to attend well in a testing situation. Low scores may indicate high anxiety in a testing situation, a possible hearing deficit, disability in auditory sequencing, and/or high susceptibility to fatigue. According to Glasser and Zimmerman (1967), the most common cause of low scores has been found to be anxiety which impaired the attention span. Anxiety in the testing situation is mentioned as a possible cause of low scores on several of the WISC subtests. The teacher will need to confer with the examiner as to his observation of the student's behavior during the administration of the test, as specific test anxiety may be manifested in a variety of ways.

It would be useful to know whether there is a difference of more than two points in the Digits Forward and Digits Backward scores. (Only the examiner can give this information since the two scores are totaled for the reported subtest score.) The higher Digits Forward score may indicate that the subject either did not put forth the extra effort to accomplish the

more difficult task of Digits Backward, or that he could not comprehend the meaning of *backward.* A higher Digits Backward score may indicate flexibility, good tolerance for stress, or excellent concentration since the student must hold the mental image of the numerical sequence longer and manipulate it before restating it.

Because Digit Span is administered at the end of the Verbal Scale, the possibility of "peak out" should be considered as a factor in low scores If the auditory verbal input of the Verbal Scale has been difficult for the subject, he may have already passed the point of his best ability to hold and manipulate mental images without any visual aids to help him.

Relationship to reading. Research indicates that groups of poor readers have often scored low on the Digit Span subtest. Like the Arithmetic subtest, Digit Span requires attention and concentration, two noncognitive functions with which the poor reader often has difficulty. Since Digit Span relies more on attention span and Arithmetic more on concentration, the two scores should be compared for possible discrepancies.

• Performance Scale

7. Picture Completion

This subtest consists of twenty pictures, each of which has an important missing element to be identified. The pictures are presented to the subject on separate cards. The difficulty of the task increases unevenly because success is affected by the subject's familiarity with the objects pictured. Certain items favor one sex over the other or one type of environment over another.

Example A picture of a dog with one leg missing
(The commercial game, "What's Missing Lotto," presents a similar task)

What the subtest measures. Picture Completion measures alertness to the environment, visual memory, attention to detail, and visual perception (closure) It further measures the ability to identify and isolate essential from nonessential characteristics.

Method of scoring. Picture Completion is scored 1 or 0 and timed, the subject having to respond to each picture within 15 seconds. Credit is given only for the essential missing part. The subtest is discontinued after four consecutive failures

Indications from scores. High scores may indicate experience with similar commercial games, the ability to establish a learning set quickly, familiarity with the objects pictured, and/or good perception and concentration Low scores may indicate susceptibility to irrelevant details, negativism (insistence that "nothing is missing"), and/or anxiety which affects attention and concentration Probably the commonest source of low

scores is poor attention and concentration due to anxiety (Glasser and Zimmerman, 1967·75).

The Picture Completion score may be compared to that on Block Design (Subtest No. 9). An average or above average score on Picture Completion as compared to a low score on Block Design may indicate a child whose visual perception is adequate but who has difficulty reproducing designs by visual-motor means.

Relationship to reading. Poor readers often do well on this subtest in spite of the fact that it requires attention and concentration. The gamelike nature of the task may reduce tension and anxiety for this group; pictures of objects may be less threatening than words. Also, this is the first subtest on the Performance Scale. Thus, the input has changed from the auditory verbal of the Verbal Scale to visual nonverbal, and the output from vocal verbal to motor nonverbal. It provides a relaxation of tension for those subjects who may have found the Verbal Scale stressful. This may well include the poor reader since four of the subtests on which poor readers have scored low are on the Verbal Scale (Information, Arithmetic, Digit Span, and sometimes Vocabulary).

8. Picture Arrangement

This subtest consists of three cut up pictures to be put together as simple jigsaw puzzles and eight picture sequences (graded in order of difficulty) to be put in the right order to tell a logical story of actions or consequences. Subjects age eight or older begin with the picture sequences, which range from the easiest with three picture cards to the most difficult with six picture cards. For four of the sequences there are two or three correct solutions.

Example — The picture cards resemble comic strip panels which have been cut apart

What the subtest measures. Picture Arrangement measures cause/effect relationships, visual sequencing, attention to details, visual perception, and concept formation. It may also indicate social alertness and common sense.

Method of scoring. The three cut up pictures are scored 2, 1, or 0, according to success on first or second trial (for first picture) or according to the order of arrangement of the pieces. The first picture sequence is scored 2 or 0, according to the order of arrangement. The remaining seven picture sequences are scored 4 points for completing the sequence in a correct solution with up to 3 bonus points given for speed of response. Each sequence is timed with limits ranging from 45" to 75". The subtest is discontinued after two consecutive failures.

Indications from scores. High scores may indicate alertness to detail, forethought, planning ability, logical sequential thought processes, and/or ability to synthesize parts into intelligible wholes. Low scores may indicate

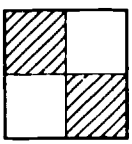
a problem in visual organization (sequencing), inattentiveness, anxiety, failure to use minimal cues, and/or lack of background experience with the situations depicted.

The score on Picture Arrangement may be compared to that on Picture Completion, since both stress perception of details, with Picture Arrangement further requiring the logical manipulation of details. Picture Arrangement may also be compared to scores on Picture Completion together with Block Design (Subtest No. 9), all require visual perception but Picture Arrangement involves sequencing. In addition, Picture Arrangement may be compared to Object Assembly (Subtest No. 10) in that both require synthesis into wholes without a model to follow, but Picture Arrangement involves sequencing as well. Finally, the score of Picture Arrangement, when combined with the score on the Block Design subtest, provides a good nonverbal measure of general intelligence.

Relationship to reading. Poor readers do not seem to be penalized by this subtest, according to research. The comic strip format is attractive and the situations presented are generally familiar to most children. While perception of details and logical sequencing are certainly abilities involved in the reading task, the concept of picture progression needed in this subtest requires a mental age of eight only. Thus, the subtest has a low ceiling for older children.

9. Block Design

This subtest consists of ten two-dimensional designs to be reproduced with multicolored blocks. The first two designs are copied from a block model constructed by the examiner and are administered only to subjects under age eight or suspected mental defectives. The remaining eight designs are reproduced from a one-dimensional model (picture). The first seven patterns utilize four blocks; the last three use nine blocks. All the patterns use only the same two of the four colors found on the blocks.

Example  Subject is shown this picture on a card. He must reproduce the design with the blocks

What the subtest measures. Block Design is considered the best single nonverbal measure of general intelligence on the WISC. It measures the perception, analysis, synthesis, and reproduction of abstract designs. It requires logic and reasoning to be applied to space relationships. It also involves nonverbal concept formation and visual-motor-spatial coordination. The subject must perceive the design on the card, analyze the component parts (making the transfer from one dimension to two dimensions), and put the parts together to reproduce the design, using only the red and white sides of the blocks.

Method of scoring. The first three designs are scored 2 for success on the first trial, 1 for success on the second trial, or 0. The remaining seven designs are scored 4 points for each pattern correctly reproduced, with up to 3 points given for speed. Each design is timed with limits ranging from 75" to 150" The subtest is discontinued after two consecutive failures.

Indications from scores. High scores may indicate good conceptualizing ability, analyzing and synthesizing talents, speed and accuracy in sizing up a problem, successful use of trial and error, flexibility in problem solving, and/or excellent finger-eye coordination. Low scores may indicate a visual perceptual problem, poor spatial conceptualization, a visual-motor problem, and/or possible color blindness.

Block Design may be compared to Object Assembly (Subtest No. 10); both measure perceptual organization and spatial visualization ability. However, in Block Design the subject uses deductive reasoning, working from the whole to the parts, while in Object Assembly the subject uses inductive reasoning, working toward the whole from the parts. Block Design provides a model; Object Assembly does not. A low Block Design/high Picture Completion contrast may indicate adequate visual perception hampered by a visual-motor problem.

Relationship to reading. Poor readers are not necessarily penalized by this subtest. For subjects who are unable to express themselves verbally, Block Design provides a good measure of reasoning. It is also the most culturally fair of the subtests.

10. Object Assembly

This subtest has four jigsaw puzzles, each of a single object, to be assembled. The puzzles must be put together with no clues beyond naming the objects on the first two puzzles. The puzzles are progressively more difficult and all must be attempted by the subject.

Example — The pieces of each puzzle are laid out in a specified manner before the subject. The number of pieces varies from five to seven. The pieces are not interlocking, so the subject must rely more on his visualization of the whole object than on the shape of the pieces

What the subtest measures. Object Assembly measures part/whole relationships using visual anticipation, simple assembly skills, and visual-motor-spatial coordination The subject must work toward the whole without a model to follow and, on the last two puzzles, without any concept of the object

Method of scoring The Object Assembly subtest is scored as follows: 4 points for the first puzzle (timed 120"), 6 points each for the remaining three puzzles (timed 180" each), with up to 3 bonus points given for speed

on each of the four puzzles. There is no discontinuance point. All puzzles must be attempted.

Indications from scores. High scores may indicate experience in assembling puzzles, good motor skills, successful use of trial and error, and/or ability to visualize the whole from the parts. Low scores may indicate minimal experience in construction tasks, lack of planning ability and/or visual-perceptual or visual-motor deficiencies. Low scores may also indicate a highly verbal subject who lacks interest in assembly tasks.

Relationship to reading. Poor readers do not seem to be penalized. Object Assembly is gamelike and has intrinsic appeal to children. It is not difficult for children who are oriented toward concrete thinking or toward action. Subjects from low socioeconomic backgrounds often do well on this subtest because of the lack of verbal culture loading.

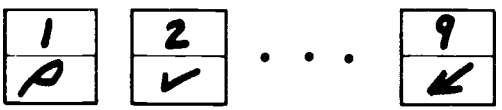
11. Coding

This subtest requires the subject to match and copy symbols in blank spaces provided on the test sheet. There are two parts, Coding A and Coding B. Coding A is for children under eight, with 45 symbols to be filled in, using a guide of symbols associated with simple shapes. Coding B is for children over eight, with 93 symbols to be filled in, using a guide of symbols associated with numerals. It requires the ability to use a pencil.

Example Coding A

Below the guide are rows of the above shapes in random order. Subjects must match the shape and write the correct symbol inside.

Coding B



Below this guide are rows containing the numerals 1 through 9 in random order. Subjects must match the numeral and write below each one the symbol associated with it.

What the subtest measures. Coding measures visual-motor dexterity and the association of meaning with a symbol. It also measures the ability to memorize quickly so that looking back at the guide is not necessary. Finally, it measures the ability to learn from visual plus kinesthetic stimuli since the subject must write it down as well as look.

Method of scoring. The subtest is scored 1 point for each square correctly filled in and timed, with 120" allowed for completion of all squares. Up to 5 bonus points may be earned for speed on Coding A. The subtest is all at one level of difficulty and there is no discontinuance until the time limit is reached.

Indications from scores. High scores may indicate high motivation and a great degree of concentration and sustained energy. They may also indicate visual-motor dexterity or the ability to learn new material associatively and reproduce it with speed and accuracy. Low scores may indicate specific visual defects, visual-motor coordination problems, poor pencil control, and/or disinterest in a school-like task. Sometimes a low score is caused by excessive concern in reproducing the symbols exactly, thus slowing down the performance.

Relationship to reading. Coding is the only subtest on the Performance Scale on which groups of poor readers have consistently scored low. Coding, like Arithmetic, is a timed, school-like task. Furthermore, the subject must concentrate, must move his eyes quickly from the guide to the rows below, must write, and must associate meaning with a symbol. Coding also requires left-to-right progression. All these factors often make the task difficult for the disabled reader.

12. Mazes

This subtest consists of eight mazes of increasing difficulty. It requires the use of a pencil which must not be lifted from the paper once the maze has been begun

Example The mazes are similar to those found in children's commercial puzzle books.

What the subtest measures. Mazes measures planning and foresight, pencil control, and visual-motor coordination.

Method of scoring. The mazes are scored 3, 2, 1, or 0, according to the number of errors (going into blind alleys, crossing lines, or lifting the pencil) and timed from 30" to 120" on each maze. The subtest is discontinued after two consecutive failures (score of 0).

Indications from scores. High scores may indicate planning efficiency, ability to follow instructions even though they make the task more difficult, i.e., not lifting the pencil, and/or good pencil control combined with speed and accuracy. Low scores may indicate inability to delay impulsive action or poor visual-motor coordination.

Relationship to reading. Unfortunately, the Mazes subtest has been so infrequently used that no relationship to poor reading has been suggested.

- **Summary**

With the exception of Mazes the WISC subtests have been researched and written about extensively in educational literature. For more detailed information about the subtests, the reader is referred to one rather comprehensive source, Glasser and Zimmerman (1967), from which much of the material in this chapter has been adapted.

Chapter 4

ANALYSIS OF WISC SCORES

If the diagnosis of a reading disability takes place in a clinical setting, the WISC is only one of a battery of tests utilized by the reading specialist to assess the physical, emotional, and intellectual characteristics of the student. In the school setting the classroom or reading teacher relies on direct observation (considered the most valuable diagnostic tool by many authorities), use of school records, informal testing of noted skill deficiencies, and an assessment of intellectual potential whenever the latter is available. If the WISC is administered by a school psychologist, the psychologist may, depending on his experience and background in the field of reading, be able to suggest implications from WISC scores as to the deficiencies that may be hindering the student's progress in reading. However, the reading teacher can make her own analysis of WISC scores, using her knowledge of the reading process.

Strang (1968) pointed out that diagnosis parallels the reading process—a communication process which involves decoding the printed symbols, giving them meaning acquired through the reader's previous experience, and expressing the ideas acquired in speaking, drawing, writing, or other motor responses. Underlying the decoding process are visual and auditory acuity and perception. Investing meaning requires the abilities to see similarities, to note differences, and to form concepts. Expression of ideas involves the quality of oral language and visual-motor-spatial coordination. The procedures suggested below may help the reading teacher to analyze WISC scores in terms of these physical and mental abilities that underlie the reading process.

• Full Scale IQ

Four reasons have been advanced for avoiding emphasis on the Full Scale IQ: 1) it is at best an approximation of the student's true IQ as measured by the WISC; 2) situational variables may have affected the student's score; 3) it compares the student to a norm group of white, middle-class children in the 1940s and the student may have characteristics quite different from this norm group, and 4) the Full Scale IQ does not give any clues as to why the student is having difficulty with reading.

It was pointed out in Chapter 1 that poor readers have tended to score low on five WISC subtests: Information, Arithmetic, Digit Span, Coding, and sometimes Vocabulary. This fairly consistent pattern has emerged

from summaries of research by Searls (1972), Farr (1969), Huelsman (1970), and others It follows then, as Farr has stated very clearly, that if groups of poor readers have a Full Scale IQ in the Average range, they must have scored higher on other subtests to counteract the lower scores on the subtests affected by their reading disability Therefore, the Full Scale IQ may be an *under-estimate* of a student's mental ability if a reading disability is depressing his scores on certain subtests Since there are no other criterion measures which can be used to measure true intelligence and serve as a basis for assessing the individual IQ test itself (Farr, 1969), the following procedures are recommended

1. If the Full Scale IQ is in the Average range (90-109) or above, proceed to the analysis of Verbal and Performance Scale IQs.

2. If the Full Scale IQ is below Average, follow the psychologist's recommendations as to how the academic program may be adapted to the level of the student's ability to learn Then proceed as in step 1.

• Verbal and Performance Scale IQs

As has been stated, the importance of these IQs lies in the possible difference between them. If the difference is large, it may indicate that the student performs better on verbal tasks than on performance tasks, or vice versa. This is particularly true if the lower score is the result of consistently low scores on all subtests of the scale, rather than being due to two or three very low scores on certain subtests.

1. If the numerical difference between the Verbal and Performance IQs is 15 or more, focus on the input-output modalities of the lower score as shown below

Verbal Scale	Modalities
Input Auditory, verbal	Auditory acuity Auditory perception
Output Vocal, verbal	Verbalization
Performance Scale	
Input Visual, nonverbal	Visual acuity Visual perception
Output Motor, nonverbal	Motor coordination

2. Check or recheck the following about the student where applicable.
   a. Hearing (speech reception threshold in decibels, possibility of nerve loss)
   b. Auditory perception, including discrimination and sequencing
   c. Ability to express himself verbally Describe a picture, tell the

events of a story in sequence, define words at his reading level, etc.

d. Vision (far-point, near-point, fusion, depth perception)

e. Visual perception, including discrimination and sequencing

f. Motor coordination of small muscles in handwriting and construction tasks

3. Generate a hypothesis as to why the student's IQ was depressed on either scale.

4. Tentatively assume that the higher scale is more representative of the student's true level of functioning.

• Subtest Scaled Scores

For the reading teacher these are the most important scores on the WISC. Make certain that you receive them from the psychologist. Here again, it is the range of differences that matters. Although the scaled norm mean of each subtest is 10, the student's own mean on each of the two parts of the WISC is more important.

1. Find the student's own subtest mean on the Verbal Scale and list those subtests on which he scored 2.5 or more points above or below his own mean.

2. Complete the same procedure for the Performance Scale.

3. If the difference between the Verbal and Performance IQs was 15 or more, use the mean of the higher scale and list any additional subtests on the lower scale which are 2.5 points or lower than this higher mean (on the assumption that the higher mean is more representative).

4. Considering the tasks involved in the high and low subtests, and what each subtest purports to measure, generate hypotheses as to the student's strengths and weaknesses. Look for abilities that are common to two or more of the subtests. A partial list follows.

a. Visual perception. Picture Completion, Picture Arrangement

b. Visual-motor coordination· Coding, Mazes

c. Visual-motor-spatial coordination Block Design, Object Assembly

d. Attention. Digit Span, Picture Completion

e. Attention plus concentration. Arithmetic, Picture Arrangement, Coding

f. Conceptualizing ability Information, Comprehension, Similarities, Vocabulary, Picture Arrangement, Block Design

g School-acquired knowledge Information Arithmetic, Vocabulary

h. Abstract thinking Similarities, Vocabulary, Block Design

i. Sequencing ability Digit Span, Picture Arrangement, Coding

j. Accomplishing school-like tasks Arithmetic, Coding

k. Visualizing the whole without a model Picture Arrangement, Object Assembly

l. Use of trial-and-error, not giving up when faced with failure Block Design, Object Assembly, Mazes

m. Immediate memory. Digit Span, Arithmetic, Coding

n. Remote memory Information, Comprehension, Similarities, Vocabulary

o. Attention to details Picture Completion, Picture Arrangement, Object Assembly

p. Ability to profit from environment and experience Information, Comprehension, Vocabulary, Picture Completion

5. Make comparisons between specific subtests as suggested in Chapter Three. (See chart Comparisons Between Specific Subtests)

a. Information versus Comprehension compares amount of information retained to the ability to use information in practical situation.

b. Similarities versus Vocabulary both measure the level of abstraction in concept formation. Similarities is the purer measure of this, while Vocabulary indicates a wider range of learning ability.

c. Arithmetic versus Digit Span. Arithmetic relies more on concentration and Digit Span more on attention span. A discrepancy between the two scores may indicate which function is giving the subject more difficulty.

d. Picture Completion versus Picture Arrangement both require attention to details but Picture Arrangement further requires the logical manipulation of details.

e. Picture Completion and Block Design versus Picture Arrangement all three subtests require good visual perception but Picture Arrangement requires sequencing as well.

f. Object Assembly versus Picture Arrangement both involve inductive reasoning (working with parts toward an unknown whole), but, in addition, Picture Arrangement involves sequencing.

g. Picture Completion versus Block Design both require good visual perception but Block Design involves reproduction of designs by visual-motor means.

h. Object Assembly versus Block Design, both measure perceptual organization and spatial visualization ability. However, in Block Design the subject uses deductive reasoning, working from the whole to the parts and back again to the whole, using a model. In Object Assembly the subject uses inductive reasoning, working toward the whole from the parts without having a model.

COMPARISONS BETWEEN SPECIFIC SUBTESTS

	Comprehension	Vocabulary	Digit Span	Picture Arrangement	Block Design
Information	Amount of information retained versus ability to use information				
Similarities		Level of concept formation plus range of learning ability			
Arithmetic			Concentration versus attention		
Picture Completion				Attention to details plus manipulation of details	
Picture Completion and Block Design				Visual perception plus visual sequencing	
Object Assembly				Inductive reasoning plus sequencing	
Picture Completion					Visual perception plus visual-motor-spatial coordination
Object Assembly					Inductive reasoning versus deductive reasoning

• Demonstration of Analysis Procedures with Actual Test Scores

The examiner who administers the WISC records the scores on the WISC Record Sheet. He usually then transfers the scores to another sheet for the student's record. Providing the examiner with a blank data sheet in advance is a good way to get the information you need. The WISC Data Sheet which follows is an example (see Appendix B for a blank WISC Data Sheet which may be reproduced). In order to see how the suggested analysis procedures might be used, look at the test scores filled in on the following Data Sheet. These were the scores of a boy tested by the author.

Full Scale IQ

The Full Scale IQ is 124, falling within the "superior" classification. This boy clearly has the mental ability to learn to read and read well. Yet he was reading two and one-half years below his grade level.

Verbal and Performance Scale IQs

The difference between the Verbal and Performance IQs is 15, with the Performance IQ the lower. This scale relies on the visual modality, so the student should be given further tests for visual acuity and perception. The scale also relies on motor coordination. The reading teacher would want samples of handwriting and some indication from parents or the classroom teacher as to how the student performs on construction tasks. In addition, all Performance subtests are timed. The question should be raised as to whether the pressure of time limits caused anxiety or hurried movements which affected his scores. Can he perform similar tasks successfully under untimed conditions?

Subtest Scaled Scores

Besides furnishing the Full Scale, Verbal, and Performance Scale IQs, the psychologist should also have filled in the subtest scaled scores. From these you can compute the sum of the verbal tests and find the mean by dividing by 6, the number of subtests administered on that scale. The sum of the performance tests should be divided by 5 to find the mean. The mean of the Verbal Scale is 14.5. The student scored 2.5 or more points higher than his own mean on four of the subtests of the Verbal Scale (Information, Comprehension, Similarities, and Vocabulary), and lower on two (Arithmetic and Digit Span). The mean of the Performance Scale is 12. The student scored 2.5 or more points higher than his own mean on one subtest (Picture Completion) and lower on one (Coding).

Since the difference between Verbal and Performance Scale IQs was 15, and the Verbal Scale was higher, look at the Performance subtests in relation to this higher mean, 14.5. There are two subtests on which the student scored 2.5 or more points lower than the higher Verbal mean: Picture Arrangement and Object Assembly.

WISC DATA SHEET

Name of Subject RICHARD D. Age 11-11 Date 5-18-69

Examiner SEARLS Sex M Grade 6

Full Scale IQ 124 Wechsler Classification of Intelligence

Verbal IQ 129 SUPERIOR

Performance IQ 114 Difference between V and P IQs 15

Subtest Scaled Scores

VERBAL SCALE		Diff. from Scale Mean (14.5)	Lower than Higher Mean
1. Information	17	+2.5	
2. Comprehension	18	+3	
3. Arithmetic	11	-3.5	
4. Similarities	17	+2.5	
5. Vocabulary	17	+2.5	
6. Digit Span	7	-7.5	
Sum of Verbal Tests	6)87		
Verbal Mean	14.5		

PERFORMANCE SCALE			
7. Picture Completion	16	+4 (12)	(14.5)
8. Picture Arrangement	10		-4.5
9. Block Design	14		
10. Object Assembly	12		-2.5
11. Coding	8	-4	
12. Mazes Not Administered	—	—	—
Sum of Perf. Tests	5)60		
Performance Mean	12		

High and Low Subtests

Another way of looking at these highs and lows is to use a worksheet similar to the List of Abilities Measured by WISC Subtests which follows (see Appendix C for a blank worksheet which may be reproduced). Circle the abilities measured by the high subtests with one color of marking pen and those measured by the low subtests with another color. (In the sample shown here a triangle is used to indicate one color for highs and a square to indicate another color for lows.) It then becomes easy to see the student's strengths and weaknesses in terms of the abilities measured. Those abilities on which the student had both a high score and a low (because of contrasting scores on two or more subtests which measured the same ability) should be circled together for added attention.

Accordingly, this student seems to have these definite strengths conceptualizing ability, abstract thinking, remote memory, and ability to profit from his environment and experience. Except for Arithmetic he is strong in school-acquired knowledge. Further testing would reveal whether he could solve the Arithmetic problems in an untimed situation or by reading them himself instead of hearing them read.

The student's weaknesses seem to be: attention plus concentration, sequencing (both auditory and visual), accomplishing school-like tasks, visualizing the whole without a model, and immediate memory.

The data are conflicting in these areas: visual perception, attention, and attention to detail. In visual perception the student scored high when the task was easy on Picture Completion, but he scored low on the more difficult task of Picture Arrangement. In light of the one low score in visual-motor coordination (Coding) and one in visual-motor-spatial coordination (Object Assembly), the whole area of visual perception should be explored, as was recommended when the 15-point lower Performance IQ was noted. The low score in paying attention on Digit Span contrasts with a high one on Picture Completion. Two modalities are involved—auditory and visual. Also, Digit Span is untimed; Picture Completion is timed. Further tests would be necessary to discover which factor is depressing one score. Attention to detail is high on the easy task of Picture Completion, but it is low on the more difficult tasks of Picture Arrangement and Object Assembly where more abilities are involved. It may be that the complexity of the tasks plus the pressure of time limits caused the student to skip details.

Specific Subtest Comparisons

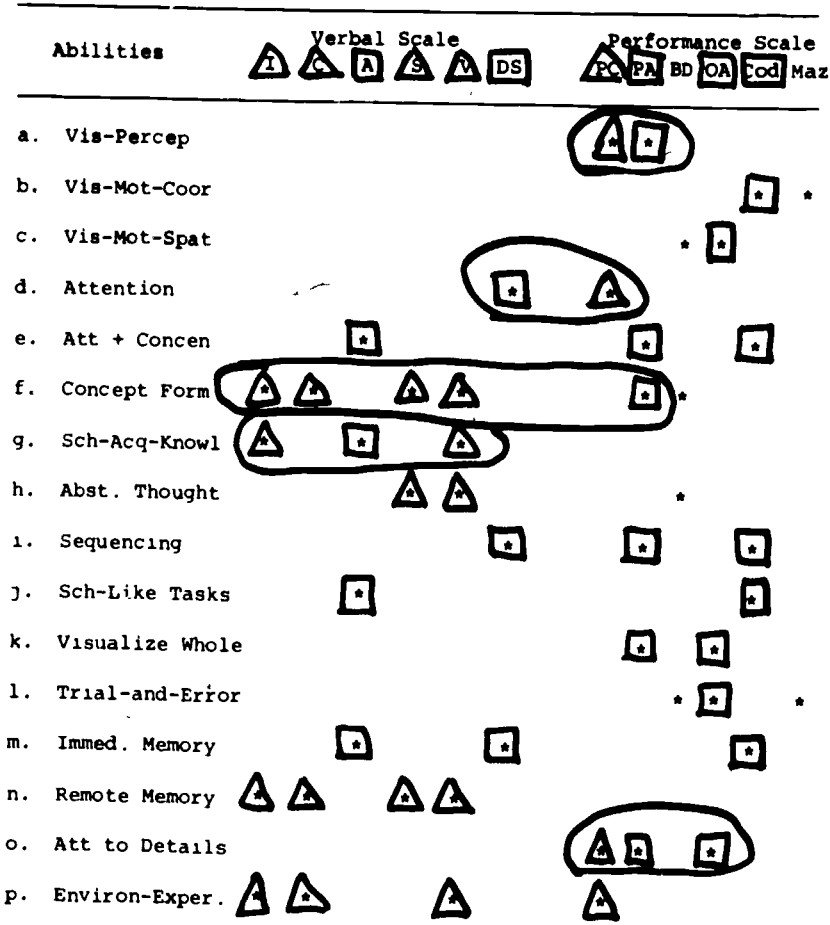
a. Information and Comprehension are within one point of each other.

b. Similarities and Vocabulary have the same score.

c. Arithmetic and Digit Span Both subtests are low for this student, but Digit Span is 4 points lower than Arithmetic, indicating that auditory attention span may be giving him more difficulty.

LIST OF ABILITIES MEASURED BY WISC SUBTESTS

Name of Subject RICHARD D. Date 5-18-69



△ = High subtests (strengths)

□ = Low subtests (weaknesses)

d. Picture Arrangement and Picture Completion There is a 6-point difference in favor of Picture Completion, indicating that the student does not perform as well when he must manipulate details as he does when he has to attend to details only.

e. Picture Completion and Block Design versus Picture Arrangement: Picture Completion and Block Design are not low, but Picture Arrangement is low, indicating that visual perception is adequate, but visual sequencing may be a problem.

f. Object Assembly and Picture Arrangement are both low but they are only 2 points apart, indicating that inability to visualize the whole without a model may be depressing both scores.

g. Picture Completion and Block Design are within 2 points of each other, indicating that visual perception is probably not affected by the visual-motor task on Block Design.

h. Object Assembly and Block Design are within 2 points of each other, indicating that the student can use inductive reasoning almost as well as deductive reasoning.

Recommended Instructional Strategies

On the basis of information gained from this analysis of WISC scores, the following instructional procedures could be immediately employed, to be modified or changed as the results of the recommended further testing became available.

1. Reduce pressures of time limits whenever possible. Richard is intelligent enough to learn to set his own goals in conference with the teacher and to estimate realistically what he can accomplish in a block of time.

2. Capitalize on his strengths of remote memory, conceptualization, and abstract thinking. Ask him to watch a TV documentary, film, filmstrip, or listen to a radio broadcast in an area of his interest and report to the class. He can thus acquire information and share it at a conceptual level far above that of the material he is able to read.

3. Be sure that his reading materials are at Instructional Level (knows 95 percent of the words) rather than at Frustration Level (knows less than 90 percent). Try to find Independent Level Materials (knows 99 percent of the words) commensurate with his interests and conceptual ability.

4. Arrange for him to work with a first or second grade student who needs help in reading and/or arithmetic. This will increase his self esteem and provide review of basic material. He is strong in school-acquired knowledge (except arithmetic, and removal of time pressures may help that), but he is weak in accomplishing school-like tasks. Providing successful experiences is essential.

5. Give practice in auditory attention and sequencing with a dots/dashes code on a telegraph key made from a dry cell. Working with a partner, Richard can send and receive messages.

6. Let him practice following a series of oral instructions. "Please go to Miss White's room with this message, then to the office to get registration forms, and then go to the lunchroom for a copy of today's menu." A group game can be played with two teams. If a team member forgets part or gets the sequence wrong, the other team gets a point.

7. Work on concentration and memory in game situations: *Concentration* (a teacher-made version of the television game), *What's On the Table?* (a number of items exposed for 30 seconds, then covered with a sheet to see who can remember the most things); or *Lineup* (10 students stage a police lineup in front of the room, the person who is IT comes into the room to look for 45-60 seconds, goes out until all are seated, and then returns to reform the lineup). A game of *Scrambled Sentences* can be played with partners vying with each other to be the first to reconstruct a cutup sentence. Also, partners can compete with each other on recognition of sequences of unrelated letters or numbers flashed in a tachistoscopic device.

8. Use jigsaw puzzles for visualizing the whole. Working with younger children would be good at the beginning, to provide practice on simpler puzzles without stigma attached. The upper one-half of a word or phrase can be flashed for the student to identify the whole. Cutup comic strips give practice in both visualizing the whole and sequencing.

Further suggestions for remediation procedures applicable to specific WISC subtest deficiencies, as well as lists of resource materials, may be found in Ferinden and Jacobson (1969) and Banas and Wills (1972).

• Summary

The foregoing procedures are intended to serve as possible ways that the reading teacher can look at a student's WISC scores as she seeks to gather information. It is hoped that the teacher will adapt them to her own purposes and perhaps will generate other purposes as she becomes more familiar with the abilities involved in the WISC tasks. (Teachers may want to use the data in Appendix A and the blanks in Appendices B and C to practice making an analysis of WISC scores.)

Chapter 5

OTHER WECHSLER SCALES

It would perhaps be well to mention briefly the other Wechsler Scales, the Wechsler Adult Intelligence Scale (WAIS) and the Wechsler Preschool and Primary Scale of Intelligence (WPPSI). The former may be used for ages sixteen to adult and the latter for ages four to six and one-half.

• WAIS

The WAIS is almost identical in organization, administration, and scoring to the WISC. It consists of two parts, a Verbal Scale with six required subtests, and a Performance Scale with five required subtests. There are no alternate or supplemental subtests. The test is administered in the following order.

Verbal Scale

1. Information
2. Comprehension
3. Arithmetic (timed)
4. Similarities
5. Digit Span
6. Vocabulary

Performance Scale (all timed)

7. Digit Symbol (equivalent to WISC Coding)
8. Picture Completion
9. Block Design
10. Picture Arrangement
11. Object Assembly

The principal difference between the WISC and WAIS is that, on the latter, Digit Span is required and Mazes is omitted. The tasks are the same on both WAIS and WISC, as are the underlying abilities. The same procedures for analyzing the scores which were proposed in this bulletin could be used with older teenagers and adults.

• WPPSI

The WPPSI consists of eleven subtests; only ten of these are to be used in computing the IQ. The test is also divided into Verbal and Performance Scales; however, the Verbal and Performance subtests are intermixed

during the test administration so that the variety of tasks helps to maintain the young child's interest. Eight of the WPPSI subtests are downward extensions and adaptations of WISC subtests; three new subtests are substitutions or replacements for four WISC subtests which were considered unsuitable for the younger age range. The following list of subtests is *not* in the order of administration

Verbal Scale

1. Information
2. Comprehension
3. Arithmetic (timed)
4. Similarities
5. Vocabulary
6. Sentences (similar to Digit Span but used only as an alternate)

Performance Scale

7. Picture Completion (untimed)
8. Block Design (timed)
9. Animal House (similar to Coding, timed)
10. Mazes (timed)
11. Geometric Design (new, untimed)

The Verbal Scale is very similar to that of the WISC, particularly if Digit Span is not included in the administration of the WISC. However, there are two important differences. While Digit Span may always be included in the computation of the IQ on the WISC, the Sentences subtest can be included only if it is substituted for another Verbal subtest. If Sentences is administered in addition to the other Verbal subtests, the information is supplemental in nature only. The second difference is in the nature of the task required of the child. The Digit Span subtest consists of two parts calling for the repetition of digits forward and digits backward, both presented in random order. These tasks require constant attention to the examiner. Any error in recall of a numerical sequence constitutes failure of the item. The subtest, Sentences, requires the repetition of words in sentences. The complete thought presented by the sentence provides an organizing principle which can help the child remember. Partial credit is given if the child remembers most of the sentence and makes only a few substitutions. Therefore, the task in Sentences would appear to be less abstract and less demanding of attention span than the corresponding WISC subtest, Digit Span.

On the WPPSI Performance Scale two WISC subtests were omitted. Picture Arrangement proved to be too difficult for four- and five-year-olds; Object Assembly was dropped because of its low test reliability at these age levels. Picture Completion remains virtually the same on the WPPSI with the exception that it is untimed. However, the child may not take as long as he wants on each card; the examiner is instructed to turn to the

next card if the child has made no effort to respond within fifteen seconds (the time limit on the WISC Picture Completion).

The WPPSI Block Design subtest has been made easier for young children by the use of two-color flat blocks and by the use of a block model from which the child works on the first seven designs. Only the last three designs are made from a picture model.

The Animal House subtest was substituted for Coding as an associative learning task. However, Coding is a pencil-and-paper task, school-like in nature, whereas Animal House is much more game-like in its approach. It requires the child to place the correct color of disk in a board as the "house" for one of four animals pictured at the top of the board. Children often ask to "play the game again." Thus, attention and concentration are enhanced by the motivational nature of the task.

Although simplified for young children, Mazes on the WPPSI measures the same abilities of planning, foresight, and visual-motor coordination. Also, it is always included in the administration of the WPPSI.

Geometric Design is the only completely new subtest on the Performance Scale of the WPPSI. The child is asked to copy ten designs made of circles and/or straight lines. There are no time limits. It measures visual-motor-spatial coordination and nonverbal concept formation. Little emphasis is put on motor steadiness.

Because the upper age limit of the WPPSI is six and one-half, there is little expectation that this test will be much used for the diagnosis of reading disability. Some research has explored the possibility of using the WPPSI to predict reading achievement, but the results have been inconclusive.

Chapter 6

CONCLUSION

The Wechsler Intelligence Scale for Children (WISC) is an individually administered intelligence test designed for subjects aged 5 to 15. It was published in 1949 and normed on white, mostly middle-class children. The United States Census figures for 1940 were used to determine quotas for four geographic regions, urban and rural areas, and fathers' occupations, from which the sample was to be drawn.

The WISC is divided into two parts, a Verbal Scale and a Performance Scale, each one having five required subtests and one subtest usable as a supplement or alternate. The WISC yields three kinds of scores. A Full Scale IQ, Verbal and Performance Scale IQs, and subtest scaled scores.

The WISC has often been used in the assessment of mental ability when the diagnosis of a reading disability is involved. Groups of poor readers have tended to score low on five WISC subtests Information, Arithmetic, Digit Span, Coding, and sometimes Vocabulary.

Certain procedures may be helpful to the reading teacher as she seeks to analyze WISC scores in an effort to discover deficiencies that may be hindering a student's progress in reading. These procedures are outlined below.

A. Full Scale IQ
   1. If the Full Scale IQ is in the Average range (90-109) or above, proceed to the analysis of Verbal and Performance Scale IQs.
   2. If the Full Scale IQ is below Average, follow the psychologist's recommendations as to how the academic program may be adapted to the level of the student's ability to learn. Then proceed as in step 1.

B. Verbal and Performance Scale IQs
   1. If the numerical difference between the Verbal and Performance IQs is 15 or more, focus on the input-output modalities of the lower score. (See table, Chapter 3.)
   2. Check or recheck the following about the student where applicable.
      a. Hearing
      b. Auditory perception
      c. Ability to express himself verbally

d. Vision
e. Visual perception
f. Motor coordination of small muscles

3. Generate a hypothesis as to why the student's IQ was depressed on either scale.
4. Tentatively assume that the higher scale is more representative of the student's true level of functioning.

C. Subtest Scale Scores

1. Find the student's own subtest mean on the Verbal Scale and list those subtests on which he scored 2.5 or more points above or below his own mean.
2. Complete the same procedure for the Performance Scale.
3. If the difference between the Verbal and Performance IQs was 15 or more, use the mean of the higher scale and list any additional subtests on the lower scale which are 2.5 points or more lower than this higher mean.
4. Considering the tasks involved in the high and low subtests and what each subtest purports to measure, generate hypotheses as to the student's strengths and weaknesses. Look for abilities that are common to two or more of the subtests. (See list, Chapter 4.)
5. Make comparisons between specific subtests. (See list and chart, Chapter 4.)

There are two other Wechsler Scales which are similar to the WISC in construction and abilities measured. The Wechsler Adult Intelligence Scale (WAIS) may be used for ages 16 to adult. The Wechsler Preschool and Primary Scale of Intelligence (WPPSI) may be used for ages four to six and one-half. It is expected that the WISC (and the 1974 revision, WISC-R) will continue to be the tests most used in the diagnosis of reading disability because they cover the age range during which such an investigation would generally occur.

• Don'ts and Do's About the WISC

DON'T think of the IQ as some mystical number to be entered forever on a student's cumulative record.

DO remember that the WISC, although one of the best IQ test instruments available, is still imperfect and measures only a small part of what constitutes human intelligence.

DON'T forget that it is a waste of time and money to have the WISC administered if the results are not used or are misused.

DO become familiar with the behaviors that are sampled by the WISC and the abilities necessary to perform the tasks successfully.

DON'T be satisfied with reports only of the Full Scale and Verbal and Performance IQs.

DO insist on a report of the subtest scaled scores; look for the highs and lows of a student's performance.

DON'T make the mistake of thinking that the WISC will tell you everything you need to know about the student's learning abilities.

DO carry out further informal testing to determine more specifically where the deficiencies lie.

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APPENDIX A

WISC RECORD FORM

NAME John AGE 10-1 SEX M

ADDRESS

PARENT'S NAME

SCHOOL GRADE 3

REFERRED BY Classroom teacher

	Year	Month	Day		Scaled Score	IQ
Date Tested	69	11	5	Verbal Scale	51	101
Date of Birth	59	10	5	Performance Scale	68	125
Age	10	1	0	Full Scale	119	114

*Prorated if necessary

	Raw Score	Scaled Score
VERBAL TESTS		
Information	10	7
Comprehension	14	12
Arithmetic	7	7
Similarities	13	14
Vocabulary	40	14
(Digit Span)	7	7
Sum of Verbal Tests		61 *
PERFORMANCE TESTS		
Picture Completion	15	16
Picture Arrangement	31	12
Block Design	36	15
Object Assembly	28	16
Coding	31	9
(Mazes)	Not admin.	
Sum of Performance Tests		68

NOTES

*Sum of Verbal Tests 61 = 51 (prorated)
This is necessary in order to convert to IQ.
However, the sum of Verbal Tests may be used for finding the individual's own mean $\frac{61}{10}$

E. Sears

Examiner

APPENDIX B

WISC Data Sheet

Name of Subject_____ Age_____ Date_____

Examiner_____ Sex_____ Grade_____

Full Scale IQ _____ Wechsler Classification of Intelligence

Verbal IQ _____ _____

Performance IQ_____ Difference between V and P IQs_____

Subtest Scaled Scores

VERBAL SCALE		Diff. from Scale Mean	Lower than Higher Mean
1. Information	_____	_____	_____
2. Comprehension	_____	_____	_____
3. Arithmetic	_____	_____	_____
4. Similarities	_____	_____	_____
5. Vocabulary	_____	_____	_____
6. Digit Span	_____	_____	_____
Sum of Verbal Tests	_____		
Verbal Mean	_____		

PERFORMANCE SCALE			
7. Picture Completion	_____	_____	_____
8. Picture Arrangement	_____	_____	_____
9. Block Design	_____	_____	_____
10. Object Assembly	_____	_____	_____
11. Coding	_____	_____	_____
12. Mazes	_____	_____	_____
Sum of Perf. Tests	_____		
Performance Mean	_____		

APPENDIX C

List of Abilities Measured by WISC Subtests

Name of Subject_____ Date_____

Abilities	Verbal Scale						Performance Scale					
	I	C	A	S	V	DS	PC	PA	BD	OA	Cod	Maz
a. Vis-Percep							*	*				
b. Vis-Mot-Coor											*	*
c. Vis-Mot-Spat									*	*		
d. Attention						*	*					
e. Att + Concen			*					*			*	
f. Concept Form	*	*		*	*			*	*			
g. Sch-Acq-Knowl	*		*		*							
h. Abst. Thought				*	*				*			
i. Sequencing						*		*			*	
j. Sch-Like Tasks			*								*	
k. Visualize Whole								*		*		
l. Trial-and-Error									*	*		*
m. Immed. Memory			*			*					*	
n. Remote Memory	*	*		*	*							
o. Att to Details							*	*		*		
p. Environ-Exper.	*	*			*		*					

* = High subtests (strengths)

* = Low subtests (weaknesses)

APPENDIX D

The Revised WISC (WISC-R)

The Wechsler Intelligence Scale for Children-Revised (WISC-R) was published early in 1974. It is an updated and renormed version, organized into the same two scales and twelve subtests as the original WISC. In each subtest some items were retained from the 1949 WISC, some were modified, and the rest were replaced by new items. Six of the subtests were lengthened by the addition of from one to three questions or tasks; Picture Completion was extended by six new items; and Vocabulary was reduced from 40 to 32 words.

The administration is similar to that of the WPPSI in that the Verbal and Performance tests are alternated to help hold the child's interest. The age limits are from 6 years to 16 years 11 months, as opposed to 5 years to 15 years 11 months for the 1949 WISC. The WISC-R is normed on a representative sample of the 1970 United States population, including minority group children.