VITAL and HEALTH STATISTICS
DATA EVALUATION AND METHODS RESEARCH

a study of the

Achievement Test

Used in the Health Examination Surveys of Persons Aged 6 - 17 Years

A methodological study of the Wide Range Achievement Test, one of the measures used in the Health Examination Survey of children (Cycle II) and of adolescents (Cycle III).

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FOREWORD

The psychological programs of the Children's Health Examination Survey (Cycle II) and the Adolescent's Health Examination Survey (Cycle III) aim at providing information concerning the number of psychological problems which exist in the Nation's noninstitutionalized population of persons aged 6 through 17. Achievement testing, therefore, was conducted not to evaluate achievement per se, but because many developmental and psychological problems first come to the attention of teachers, psychologists, physicians, or other caretakers as "achievement problems."

Because of the survey nature of the operation, no one health factor, whether physical, physiological, dental, or psychological, can be evaluated as thoroughly as it would be in a nonsurvey setting. As a result, most of the measurements are collected using either specially designed techniques or abbreviated forms of widely used, longer procedures. By means of methodological studies these special or abbreviated instruments are then evaluated to see what relationship exists between them and established, criterion measures.

The instrument chosen for measuring achievement in reading and arithmetic in the Children's and the Adolescent's Health Examination Surveys was the 1963 revision of the Wide Range Achievement Test (WRAT) originally published by Joseph Jastak in collaboration with Sidney Bijou in 1946. The WRAT is not an abbreviated version of a longer, well established test, nor was it specially developed for use in the survey. It is a hitherto relatively unproven short test for the rapid assessment of achievement skills. It was selected because of its brevity and also because it was held by many clinicians to be a good predictor of performance on the more traditional achievement tests.

Because of the nature of the WRAT, a study was designed to establish the relationship between it and the Stanford Achievement Tests for individuals in grades 1 through 9 and the Metropolitan Achievement Tests for individuals in grades 10 through 12. Hopefully, a description of this relationship will permit the reader to evaluate our forthcoming reports dealing with the incidence of underachievement in the Nation's population of persons aged 6 through 17.

In addition, scientists will have available, for the first time, information concerning the relationship between the Wide Range Achievement Test (reading and arithmetic sections) and appropriate subtests of the Metropolitan and Stanford Achievement Tests. For a test originally published in 1946, such a study is long overdue.

This study is the product of contract number PH 86-65-52 between West Virginia University and the National Center for Health Statistics. The project director was K. Warner Schaie, Ph.D., professor of psychology, West Virginia University; and I was the project officer. Contributions by the examiners and other project personnel are gratefully acknowledged. Their names are listed in Appendix III.

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IN THIS REPORT the suitability of the Wide Range Achievement Test as a valid measure of school achievement for use on a national health survey is discussed.

It was found that the Arithmetic and Reading sections of the 1963 Revised Wide Range Achievement Test have reasonably good construct validity as judged by their relation to the Stanford and the Metropolitan Achievement Tests. The WRAT was found to be suitable for use with children of widely differing socioeconomic backgrounds and different ability levels. The Arithmetic section was found to be valid at both high and low ability levels. The Reading section, however, was not suitable for high school students at the low end of the ability continuum.

The validity of the WRAT as an estimate of grade level placement showed considerable variation. Level I of the Reading and Arithmetic sections has a tendency to overestimate actual grade level and achievement as measured by the Stanford Achievement Test. Level II of the Arithmetic section underestimates actual grade level but is a satisfactory estimate of criterion achievement measures. Level II of the Reading section tends to overestimate actual grade placement and to underestimate performance on the Stanford Achievement Test for junior high school students. For senior high school students it tends to overestimate performance on the Metropolitan Achievement Test and to underestimate grade level placement.

In spite of the fact that the validity coefficients vary considerably, depending on the grade level and geographical region involved, there is sufficient evidence of substantial correlation with criterion measures at every age level investigated to consider the WRAT a satisfactory brief estimate of school achievement.

A STUDY OF THE

ACHIEVEMENT TEST

USED IN THE HEALTH EXAMINATION SURVEYS

OF PERSONS AGED 6-17 YEARS

K. Warner Schaie, Ph.D., *West Virginia University*

INTRODUCTION

The purpose of this study is to assess the validity of the Wide Range Achievement Test (WRAT) in terms of its ability to predict grade level placement on the Metropolitan and the Stanford Achievement Tests (MAT and SAT), which are the criterion measures. Attention is given to the discrepancies which exist between the WRAT grade level ratings and performance on the criterion measures, in terms of grade levels. This was done by analyzing the relationships which exist between the WRAT and the criterion measures.

To control for the bias which might be introduced by the geographic location of a sample, one sample was chosen which consisted of a population of children in grades 1 through 12, all of whom were students in a single school system. Data from this sample were then compared with data obtained from a sample consisting of students from widely separated sections of the country.

Because of the nature of the population investigated, this study had been divided into three parts. Thus, after the general design, criterion measures, and selection of subjects are described, the results will be reported in

detail, grouped separately for the analysis of the relation between the WRAT and criterion measures (1) in elementary grades, (2) for the junior high school population, and (3) for the senior high school group. In each instance, data and appropriate comparisons will be presented based on children in the geographically homogeneous sample (Monongalia County) and on children in control samples from widely separated geographic regions.

A technical study of the type here reported requires samples which should be reasonably representative of the general population. This does not imply that concerted attempts should be made to attain the exact replication of the population census or to provide random samples of the total population. It is of greater importance to ensure the adequate representation of groups at all levels of ability in order to be able to assess properly the success of achievement tests in evaluating typical as well as atypical performance. Considerable effort was directed, therefore, toward the objective of achieving representativeness by appropriate selection of samples.

I. DESIGN OF THE STUDY

GENERAL FORMAT

The Arithmetic and Reading sections of the Wide Range Achievement Test (WRAT) formed the basic research instrument and were given to all subjects. A group-administered achievement battery was also given to each subject. The two group tests chosen as the criterion measures with which the WRAT was compared were the Metropolitan Achievement Test for use with grades 10 through 12 and the Stanford Achievement Test for use with grades 1 through 9. With the Stanford Achievement Test the form given varied with grade placement.

In addition to the Arithmetic and Reading sections of the Wide Range Achievement Test and the group achievement tests, information was collected on the socioeconomic characteristics of the pupils, and scores on general ability tests were recorded.

SUBJECTS

Monongalia County Sample

The first sample selected was a relatively homogeneous school system chosen for the purpose of providing data concerning the efficacy of the WRAT across the different grades. The schools were selected to include the broadest representation possible of urban and rural children with a wide range of socioeconomic backgrounds. Schools having a marked concentration of university faculty children were not included in the sample.

To achieve adequate representation and to permit separate analyses at each grade level, approximately 50 boys and 50 girls were selected from each grade level. Data for the Monongalia County, W. Va., sample were obtained in three elementary schools, each of which covered grades 1-6; one junior high school (grades 7-9); one junior-senior high school (grades 7-12); and one senior high school (grades 10-12).

For administrative reasons, as well as to avoid the possibility that selection schemes might artificially truncate the distribution of talent in the sample, all children in the elementary schools, the junior-senior high school, and the junior high school were tested. Since the high school sample was predominantly rural, it was decided to supplement it by randomly selected cases from the University High School, which served an urban area. Here names were picked at random from the grade rosters until each grade quota was completed.

Approximately 10 percent oversampling was conducted to provide some insurance against the contingency that some children were likely to drop out or fail to be available for either the individual test or the group test. The practical necessity of including entire classrooms in the testing procedures in some instances required the testing of some additional children. Tables 1 and 2 give the total number of children included in the Monongalia County elementary and secondary samples to whom either a group or an individual test was given as well as the number of children included in the final sample. These latter figures indicate the number of subjects on whom scorable records were obtained in both individual and group testing situations and on whom data are included in the statistical analyses.

Control Sample

In order to avoid the possibility of obtaining data which would reflect the peculiar circumstances of a single homogeneous school system, additional data were collected on children in widely dispersed portions of the United States. Rather than testing smaller samples, it was decided to replicate the sample size but to collect data on only four grades in each of three different locations. Since the principal sample was collected in the mideastern part of the country, the control samples were placed in the midwestern, Rocky Mountain, and west coast areas.

Control sample A covered the first, fourth, seventh, and tenth grades and involved two elementary schools, a junior high school, and a senior high school in Milwaukee County, Wis. The schools were selected so as to be at the

Table 1. Number of elementary school subjects included in the Monongalia County sample and number on whom complete records were obtained, by sex and grade

Grade	Total	Boys	Girls	Total	Boys	Girls
	Number in sample			Number with complete records		
Total elementary school sample-------	736	368	368	683	342	341
Grade 1------------------------------------	116	56	60	114	54	60
Grade 2------------------------------------	117	62	55	111	59	52
Grade 3------------------------------------	121	60	61	113	54	59
Grade 4------------------------------------	127	73	54	121	71	50
Grade 5------------------------------------	111	52	59	105	50	55
Grade 6------------------------------------	144	65	79	119	54	65

Table 2. Number of secondary school subjects included in the Monongalia County sample and number on whom complete records were obtained, by sex and age

Grade	Total	Boys	Girls	Total	Boys	Girls
	Number in sample			Number with complete records		
Total secondary school sample--------	706	355	351	633	314	319
Total junior high---------------------	376	192	184	330	166	164
Grade 7-------------------------------	125	72	53	111	61	50
Grade 8-------------------------------	117	63	54	101	51	50
Grade 9-------------------------------	134	57	77	118	54	64
Total senior high---------------------	330	163	167	303	148	155
Grade 10------------------------------	109	54	55	97	48	49
Grade 11------------------------------	110	56	54	103	51	52
Grade 12------------------------------	111	53	58	103	49	54

Table 3. Number of elementary school subjects in the control sample and number on whom complete records were obtained, by sex, grade, and location of sample

Grade and location	Total	Boys	Girls	Total	Boys	Girls
	Number in sample			Number with complete records		
Total elementary school sample-------	680	338	342	627	317	310
Grade 1 (Wisconsin)--------------------	103	50	53	103	50	53
Grade 2 (California)-------------------	120	62	58	104	54	50
Grade 3 (Colorado)---------------------	113	60	53	104	56	48
Grade 4 (Wisconsin)--------------------	104	50	54	100	50	50
Grade 5 (California)-------------------	123	55	68	110	50	60
Grade 6 (Colorado)---------------------	117	61	56	106	57	49

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periphery of the metropolitan area and thus are assumed to be reasonably comparable in socioeconomic distribution to the other samples.

Control sample B included the second, fifth, eighth, and eleventh grades and was collected in Duarte, a suburban semirural school district in Los Angeles County, Calif. This district also had some similarities with the main sample in that it had a small sprinkling of rural and minority group children. Here, also, data were collected in two elementary schools, one junior high, and one senior high school.

Control sample C, finally, covered the third, sixth, ninth, and twelfth grades and was collected in Fort Collins, Colo. Fort Collins is a college town close to rural and mining areas with a metropolitan area similar in size to the Monongalia County situation. Again two elementary schools, a junior high, and a senior high school furnished the subjects for this sample.

Tables 3 and 4 give the number of elementary and secondary school children in the control sample, and table 5 gives, by geographic location, the number of children who were included in the sample and for whom complete records are available.

Socioeconomic Characteristics

Parents' occupations and students' ability levels were determined in order to ascertain whether the sample selected actually covered a representative range and to permit appropriate statistical adjustment if necessary. Occupational level for the head of household was coded according to the following scheme:

0 - unskilled laborers[1]
1 - domestic laborers (including gardeners and janitors)
2 - operators (factory, and similar work requiring no special training)
3 - service occupations (including mailmen, service station employees, dry cleaners, etc., all requiring only limited training)[1]

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[1]Special cases—disabled and unemployed workers were classified as 0, retired workers as 3, undergraduate students as 7, and graduate students as level 8.

4 - protective occupations (policemen, firemen, guards, soldiers; however, sergeants were classified as 6 and commissioned officers as 8)
5 - craftsmen (including all trades requiring an apprenticeship or formal training)
6 - clerical and sales (excluding news vendors, grocery checkers, dime store clerks, who were classified as 3)
7 - managerial and proprietors (including independent farmer-operators; tenant farmers and farm laborers, however, come under classifications 1 and 0, respectively)[1]
8 - semiprofessional (including most occupations requiring college training but not more than 2 years of graduate work)[1]
9 - professional (all occupations requiring 2 or more years of graduate work, including lawyers, social workers, all college instructors, and school administrators. Teachers and nurses would ordinarily be classified in level 8 unless they have administrative positions)

The scheme used is a modification of the major headings used in the 1950 census. It was first used in Measuring Behavioral Rigidity: A Factorial Investigation of Some Tests of Rigid Behavior (K. Warner Schaie, unpublished M.A. thesis, University of Washington, 1953).

The distribution of parents' occupations for the subjects included in the Monongalia County elementary school sample is given in table 6. It may be seen that the distribution was quite uniform throughout the six grades included in this sample and would seem to be reasonably representative of the socioeconomic structure of the local community. Table 7 gives a similar distribution for the Monongalia County secondary school sample. The distribution again was quite uniform throughout the six grades examined. There was, however, some underrepresentation at the upper level due to the fact that the area where most university people live was avoided. Tables 8 and 9 give the socioeconomic characteristics of the control samples. The distribution for the elementary school samples was similar to that obtained in Monongalia County. The

Table 4. Number of secondary school subjects in the control sample and number on whom complete records were obtained, by sex, grade, and location of sample

Grade and location	Total	Boys	Girls	Total	Boys	Girls
	Number in sample			Number with complete records		
Total secondary school sample--------	791	402	389	596	291	305
Total junior high ---------------------	511	272	239	327	165	162
Grade 7 (Wisconsin)-----------------------	104	51	53	104	51	53
Grade 8 (California)-----------------------	128	65	63	109	57	52
Grade 9 (Colorado)------------------------	279	156	123	114	57	57
Total senior high---------------------	280	130	150	269	126	143
Grade 10 (Wisconsin)-----------------------	103	52	51	102	52	50
Grade 11 (California)-----------------------	106	52	54	98	48	50
Grade 12 (Colorado)------------------------	71	26	45	69	26	43

Table 5. Number of subjects in the control samples and number on whom complete records were obtained, by sex and location of sample

Location	Total	Boys	Girls	Total	Boys	Girls
	Number in sample			Number with complete records		
Combined samples---------------------	2,913	1,463	1,450	2,539	1,264	1,275
Total control sample-------------------	1,471	740	731	1,223	608	615
California-------------------------------	477	234	243	421	209	212
Colorado---------------------------------	580	303	277	393	196	197
Wisconsin--------------------------------	414	203	211	409	203	206
Total Monongalia County sample---------	1,442	723	719	1,316	656	660

Table 6. Number of elementary school subjects in the Monongalia County samples, by grade of subject and occupational level of parent

Occupational level of parent	Grade of subject						
	Total	1	2	3	4	5	6
	Number of subjects						
0-Unskilled laborers-----------------------------------	61	18	9	11	16	2	5
1-Domestic laborers-----------------------------------	24	3	5	4	2	8	2
2-Operatives---	29	4	2	4	-	9	10
3-Service occupations---------------------------------	119	18	24	17	23	20	17
4-Protective occupations------------------------------	22	4	5	1	7	1	4
5-Craftsmen---	146	14	27	23	29	28	25
6-Clerical and sales---------------------------------	80	15	9	18	11	12	15
7-Managerial and proprietors--------------------------	100	18	15	17	15	12	23
8-Semiprofessional-----------------------------------	63	12	8	12	14	7	10
9-Professional--	39	8	7	6	4	6	8

Table 7. Number of secondary school subjects in the Monongalia County samples, by grade of subject and occupational level of parent

Occupational level of parent	Grade of subject						
	Total	7	8	9	10	11	12
	Number of subjects						
0-Unskilled laborers	118	21	19	25	17	17	19
1-Domestic laborers	45	4	9	5	5	13	9
2-Operatives	19	4	3	9	2	-	1
3-Service occupations	119	28	17	21	22	13	18
4-Protective occupations	5	2	1	-	1	1	-
5-Craftsmen	202	24	26	39	36	43	34
6-Clerical and sales	34	5	5	6	3	5	10
7-Managerial and proprietors	53	14	4	10	8	7	10
8-Semiprofessional	21	3	6	3	3	4	2
9-Professional	7	6	1	-	-	-	-

secondary school samples in the control group, however, tended to have higher socioeconomic levels, possibly suggesting different patterns of high school attrition. This was particularly noteworthy for the Colorado samples. The rural portions of the Colorado samples were likely to be children of farm laborers for whom high school dropout would be higher than for the West Virginia children. This factor resulted in a higher average socioeconomic level for the children who remained in the Colorado samples.

General Ability Level

The distribution of general ability in the samples was studied by determining the score on the most recent group intelligence test which a given child had taken. This meant that scores were used on tests which had been given anywhere from 3 months to 2 years prior to the present study and that several different tests or test forms might have been utilized. Most scores, however, were from the California Mental Maturity Test

Table 8. Number of elementary school subjects in the control samples, by grade of subject and occupational level of parent

Occupational level of parent	Grade of subject						
	Total	1	2	3	4	5	6
	Number of subjects						
0-Unskilled laborers	110	23	12	22	27	11	15
1-Domestic laborers	7	1	3	1	-	2	-
2-Operatives	19	5	1	-	4	7	2
3-Service occupations	114	9	33	20	10	26	16
4-Protective occupations	15	1	3	2	3	3	3
5-Craftsmen	139	30	28	17	21	22	21
6-Clerical and sales	57	8	8	8	13	11	9
7-Managerial and proprietors	73	9	10	21	10	9	14
8-Semiprofessional	71	17	6	9	10	17	12
9-Professional	22	-	-	4	2	2	14

Table 9. Number of secondary school subjects in the control samples, by grade of subject and occupational level of parent

Occupational level of parent	Total	7	8	9	10	11	12
				Number of subjects			
0-Unskilled laborers	60	8	10	11	13	14	4
1-Domestic laborers	6	1	1	-	1	2	1
2-Operatives	11	1	4	1	1	4	-
3-Service occupations	127	12	25	34	15	28	13
4-Protective occupations	11	1	5	2	1	1	1
5-Craftsmen	118	22	28	14	19	20	15
6-Clerical and sales	74	20	12	13	11	10	8
7-Managerial and proprietors	106	25	14	18	23	16	10
8-Semiprofessional	52	11	9	9	14	2	7
9-Professional	29	3	1	11	4	-	10

and the Otis Group Intelligence Tests. Because of the variety of intelligence tests which were used, it was decided that only gross classifications were in order. Ability levels were therefore recorded on a 7-point scale. Assuming that the tests used all had a standard deviation of 15 points, the intervals for the 7-point scale were set at intervals comparable to the descriptions being used for the interpretation of individual intelligence tests. The meaning of the ability levels used was as follows:

1 - mentally defective (IQ of 70 or below)
2 - borderline (IQ of 71 to 80)
3 - dull normal (IQ of 81 to 90)
4 - average (IQ of 91 to 110)
5 - bright normal (IQ of 111 to 120)
6 - superior (IQ of 121 to 130)
7 - very superior (IQ of 131 and above)

Table 10. Number of subjects in the Monongalia County sample, by ability level and grade

Grade	70 or below	71-80	81-90	91-110	111-120	121-130	131 or above
				Number of subjects			
Total	21	43	125	577	236	63	15
Grade 3	2	3	12	57	30	7	1
Grade 4	1	2	14	65	24	9	6
Grade 5	3	5	6	65	19	7	-
Grade 6	-	3	9	59	35	10	3
Grade 7	3	8	19	60	14	7	-
Grade 8	1	8	15	54	20	3	-
Grade 9	2	4	16	74	18	3	1
Grade 10	2	4	12	47	25	4	3
Grade 11	4	4	11	48	27	9	-
Grade 12	3	2	11	48	24	4	1

Table 11. Number of subjects in the control samples, by ability level, location of sample, and grade

Location and grade	Ability level (IQ)						
	70 or below	71-80	81-90	91-110	111-120	121-130	131 or above
	Number of subjects						
Total--	1	25	71	582	318	172	44
California-------------------------------------	-	2	48	245	75	26	8
Colorado---------------------------------------	1	19	8	164	103	79	24
Wisconsin--------------------------------------	-	4	15	173	140	67	12
Grade 1--	-	-	1	44	41	16	1
Grade 2--	-	3	6	65	20	7	3
Grade 3--	-	1	1	62	31	9	-
Grade 4--	-	1	6	38	30	15	10
Grade 5--	-	5	13	56	24	9	3
Grade 6--	1	2	3	35	23	32	10
Grade 7--	-	1	3	44	33	22	1
Grade 8--	-	5	12	67	18	5	2
Grade 9--	-	1	3	44	33	23	10
Grade 10---------------------------------------	-	-	5	47	36	14	-
Grade 11---------------------------------------	-	6	17	57	13	5	-
Grade 12---------------------------------------	-	-	1	23	16	15	4

The distribution of general intellectual ability for the Monongalia County samples is reported in table 10 separately for each grade and for all grades combined. However, no ability scores were available for the Morgantown samples in grades 1 and 2. Similar data for the control samples are given in table 11. A basically symmetric distribution extending to both extremes was obtained for the Monongalia County samples, although there was some upward skewing due to greater inclusion of children from higher socioeconomic levels than had originally been anticipated. This skewing was even more pronounced for the control samples in whose school districts policy decision leads to assignment of children of low ability to special classes both earlier and more systematically than is the case in Monongalia County. The skewing was most pronounced for the Colorado samples and least pronounced in the Wisconsin samples. The distribution of children in the California samples was fairly similar to that found in

Monongalia County. Patterns across grades were fairly uniform within each geographical area.

While these samples are certainly not exact replication of the distribution of talent within the population, they would seem to be broadly representative of typical school populations; thus they meet the sampling requirements set forth in the introduction to this report.

TEST INSTRUMENTS

Wide Range Achievement Test

The principal instrument used for this study was, of course, the 1963 revision of the Wide Range Achievement Test, for which validity data were to be obtained. Because of the purpose of this study, the parts of the WRAT administered were confined to the ones included in the Health Examination Survey, i.e., the Reading and Arithmetic sections. Two levels are available for each

of these sections in the 1963 revision of the WRAT. One is designed for primary school children and the other for secondary school children. In this study one or the other form was used, depending on the appropriate grade level.

The *Arithmetic section* of the Wide Range Achievement Test consists of a series of written arithmetic problems ranging from simple addition and subtraction through algebraic problems. Although defined as a timed test, it is a power test in the sense that the outside time limit of 10 minutes amply permits the students to work up to the maximum level of their arithmetic skills.

The *Reading section* of the test consists of a list of words ranking from very simple ones such as "cat," "go," and "in" to complicated ones such as "belligerent" and "occurrence." It is assumed that the student who fails to recognize a given word is likely to mispronounce it also. The test, nevertheless, is not one of pronunciation or diction, and speech defects or colloquial usages are not penalized. For students at the very low level of ability the Arithmetic section contains an oral part and the Reading section contains a preword part involving letter recognition.

The criterion measures used were the group achievement tests. These tests were the Stanford Achievement Tests in the appropriate form, depending on the grade level, for grades 1 through 9 and the Metropolitan Achievement Test for grades 10 through 12. Each of these group achievement test batteries contains subtests which are directly pertinent as validating criteria for the WRAT. In addition, they contain other subtests covering school performance, which is less directly related to reading or arithmetic. In designing this study it was required that certain tests of immediate relevance as criterion variables be routinely administered, while the other subtests could be administered at the discretion of the participating schools. As a result the minimal amount of required data is reported at all grade levels while additional, or complete, data on the criterion batteries vary from one grade to the next, depending upon the discretion of the schools.

Stanford Achievement Test

The specific forms of the Stanford Achievement Test (SAT) which were used are as follows: Primary I, Form W, for grade 1; Primary II,

Form W, for grades 2 and 3; Intermediate I, Form W, for grade 4; Intermediate, Form J, for grades 5 and 6; and Advanced, Form Km, for grades 7, 8, and 9. Not all SAT forms have the same number of subtests. Thus, six subjects are covered at the first grade level, eight at the second and the third grade levels, ten at the fourth grade level, and nine at the fifth to ninth grade levels. The tabulations for data relating to SAT have been arranged to give maximum comparability from one grade level to the next. Missing data indicate subjects for which no SAT subtest was available at a given grade level because the particular school did not elect to administer the optional tests. The following paragraphs describe the subtests of the criterion batteries and their contents.

Two SAT subtests are *directly relevant* criterion variables for the Reading part of the WRAT:

Word Meaning or Vocabulary (grades 1-9).— The Word Meaning, or Vocabulary, test employs a multiple choice type of item in which the pupil is required to select the proper answer for a given stimulus word from a series of three or four alternatives. This is essentially a word recognition test.

*Paragraph Meaning (grades 1-9).—*The Paragraph Meaning test consists of a series of paragraphs, graduated in difficulty, from each of which two or more words have been omitted. The pupil's task is to demonstrate his comprehension of the paragraph by selecting the proper word for each omission from the choices that are given.

Four other subtests are useful as criteria for the Reading part of the WRAT because, theoretically, they are *related to* reading. These are the following:

*Spelling (grades 1-9).—*The Spelling test consists of multiple choice questions in which the pupil chooses the correct spelling from among three possible spellings or marks "ng" if the correct spelling is not given.

*Word Study Skills (grades 1-4).—*The Word Study Skills subtest contains various combinations of auditory perception of beginning and ending sounds, phonics, and phono-

grams. For the beginning and ending sounds the pupil must match a word from a multiple choice selection matching the beginning or ending sound read by the teacher. The phonics involve selecting a written word which is the same as one he hears read by the teacher, and the phonogram requires matching a word he hears with a rhyming one which he reads.

Language (grades 2-5; 7-9).—This is an exercise in capitalization, punctuation, sentence sense, and language usage, with a few additional items of grammar. In all items a correct and an incorrect, or much less acceptable, usage are presented as options.

Word Reading (grade 1).—Pupils are required to look at a picture and then select the appropriate word from a multiple choice set. This subtest is designed to measure skills to analyze and identify words out of context.

The following three tests are used as the principal criterion variables *related to* the Arithmetic portion of the WRAT:

Arithmetic Concepts and Reasoning (grades 1-9).—The Arithmetic Concepts and Reasoning tests measure reasoning with problems taken from life experience, with the reading vocabulary being kept much below the problem-solving level being measured. Also tested here is the informational background of pupils and their understanding of the numbers system.

Arithmetic Computation (grades 2-9).—The Arithmetic Computation test measures proficiency in computational skills. The tests are multiple choice forms; the response "not given" is included as one of the choices in each question in order to discourage guessing.

Arithmetic Application.—This test occurs only at the fourth grade level and is designed to measure application of number concepts to practical situations.

Three additional criterion methods of school performance were included which are *not directly*

related to the predictive variables. These are the following:

Social Studies (grades 4-9).—The items in this test primarily measure social studies content or information with approximately equal distribution among history, geography, civics, and social problems.

Science (grades 4-9).—This subtest contains about equal proportions of items from the areas of life science, health and safety, elementary physics, and chemistry, with a smaller representation for the earth sciences and conservation.

The form used for the second and third grade levels combines the above two topics into a Science and Social Studies Concepts test.

Study Skills (grades 5-9).—This subtest measures study tools including reading charts, graphs, and tables; map reading; and using the dictionary.

Metropolitan Achievement Test

This test contains a total of 11 subtests. Because of the time factors involved, only 7 of the 11 subtests were given routinely, while 1 or more of the remaining tests were given in some of the grade samples. The five criterion variables thought to be most relevant (Reading, Spelling, Language, Mathematical Computation and Concepts, and Mathematical Analysis and Problem Solving) were administered in all instances.

One of the Metropolitan subtests, Reading, is a *direct* criterion for the WRAT Reading test:

Reading.—This test consists of four reading selections. The student's reading comprehension is assessed by presenting him with multiple choice questions on content and word meaning.

Three other subtests are *indirectly relevant* as criteria for the WRAT Reading test:

Spelling.—This test consists of a number of sentences, each containing one underlined term. The student has to decide whether the term is spelled correctly.

Language.—This test covers punctuation and capitalization, recognizing correct word uses, and understanding correct word usage, as well as sentence structure.

Language Study Skills.—This is a test of the student's ability to use a dictionary and to identify appropriate sources of information.

The following two tests serve as *criteria* for the WRAT Arithmetic Test:

Mathematical Computation and Concepts.—This is a series of arithmetic problems comparable with those on the WRAT. However, answers are provided in multiple choice form and the procedure of solution may introduce a recognition element.

Mathematical Analysis and Problem Solving.—This is a set of somewhat more complex problems expressed in language form. They require the student to identify the problem as well as to select the correct solution from the set of multiple choice answers.

The remaining five Metropolitan Achievement subtests are *not directly related to* the WRAT:

Social Studies Information.—These are multiple choice questions covering history, civics, and geography.

Social Studies Study Skills.—This subtest measures ability to read and interpret maps, tables, graphs, and charts and also assesses the student's ability to draw inferences from such data.

Social Studies Vocabulary.—This is a multiple choice test of the student's knowledge of terms (taken from newspapers, magazines, and school publications) relating to social science studies material encountered in and out of the classroom.

Scientific Concepts and Understanding.—This is a measure of the student's science vocabulary and of his comprehension of printed scientific material of the kind covered in high school science courses.

Science Information.—This consists of multiple choice questions covering a broad area of the physical and biological sciences.

EXAMINATION PROCEDURE

The criterion achievement battery was administered by classroom teachers in the conventional manner in order to replicate the normal school use of achievement tests. To gain further assurance of normal administration, the services of the public school testing director were obtained to direct the group achievement test administration. In some instances the achievement tests were administered in a single day, but at other times 2 days were required.

In order to replicate the examination procedure used on the Health Examination Survey, the WRAT was administered individually. Examiners were classroom teachers from the participating schools who had been specially trained in WRAT administration. Although, for convenience and economy, children were examined by classroom teachers from their own schools, in no case was a child examined by his own teacher.

Each sample child was given the WRAT during one of two programed times (1) during the hour before the start of the day's classes or (2) during the hour immediately after the end of the day's classes. Children were randomly distributed between these two testing times. A systematic surveillance of the Reading test was effected by tape recording selected testing sessions.

Table 12 gives the number of examiners used in each grade for the Monongalia County samples and the control samples. Almost all examiners gave WRAT's to children in all grade levels of the school in which they served as examiners. Differences in numbers of examiners at the secondary school level between the Monongalia County and control samples occurred because only teachers were used as examiners in the Monongalia County sample while graduate students in psychology were hired to supplement the examining staff in the control samples.

The teachers and other examiners were provided with a copy of the administration instructions lifted verbatim from the WRAT manual (see Appendixes I and II). In addition a training

Table 12. Number of examiners administering the WRAT subtests in the Monongalia County samples and in the control samples, by grade

Grade	Monongalia County samples	Control samples
	Number of examiners	
Grade 1-----------	6	4
Grade 2-----------	8	3
Grade 3-----------	8	9
Grade 4-----------	5	4
Grade 5-----------	5	3
Grade 6-----------	6	8
Grade 7-----------	25	3
Grade 8-----------	20	3
Grade 9-----------	24	8
Grade 10----------	23	2
Grade 11----------	23	3
Grade 12----------	23	3

session was conducted for each group of examiners to insure uniform testing procedures. The examiners were instructed to serve primarily as recorders of the pupils' responses. They were not expected to do any test scoring.

To insure uniformity in scoring and reporting of results, all tests were scored by research personnel. Achievement tests were machine scored directly from the students' answer sheets

and then punched on IBM cards for analysis. All WRAT's were scored according to instructions in the manual, and Jastak's norms were used to obtain grade level scores. Reliability of scoring was spot checked and is reported in the following section.

RELIABILITY OF SCORING PROCEDURE

The reliability of scores on the Reading section of the WRAT may have been seriously affected by three sources of technical error. The first of these was the failure of the examiner to record accurately whether the child correctly or incorrectly pronounced a given word. The second source of error was the scorers' variability in interpreting the marks used by the examiners to record the children's performances. A third possible source of error arose from the failure of the scorer to follow instructions to disregard correct responses made after 12 consecutive failures.

The first type of error was investigated by checking tape recordings of the Reading examination. Disagreements with the examiners appeared to be largely a matter of accepting localisms in pronunciation. The seriousness of this problem is underscored by the fact that for a sample of 30 records, a reviewer who was unfamiliar with local speech patterns obtained a

Table 13. Number of scoring errors made in processing WRAT Arithmetic and Reading tests, by sample

Number of errors	Arithmetic		Reading	
	Monongalia sample (N=72)	Control sample (N=72)	Monongalia sample (N=72)	Control sample (N=72)
No error--------------------------------	71	68	62	70
One error-------------------------------	1	4	7	2
Two errors------------------------------	-	-	2	-
Three errors----------------------------	-	-	1	-

NOTES: Average scoring error per record: Arithmetic=0.035 points; Reading=0.111 points.

N—number.

Table 14. Means and standard deviations on selected background data, by grade for the Monongalia County elementary school samples

Grade	Occupational level of parent		Ability level		Days between individual and group tests		Age at time of group test		Grade level at time of group test	
	Mean	S.D.	Mean	S.D.	Mean	S.D.	Mean	S.D.	Mean	S.D.
Grade 1 (N=114) --------	4.69	2.84	---	---	5.00	9.26	6.98	0.36	1.80	0.01
Grade 2 (N=111) --------	4.70	2.45	---	---	1.67	8.61	8.08	0.47	2.80	0.00
Grade 3 (N=113) --------	4.95	2.55	4.23	1.00	44.80	4.14	9.05	0.45	3.80	0.00
Grade 4 (N=121) --------	4.65	2.53	4.32	1.05	3.45	6.08	10.17	0.56	4.80	0.00
Grade 5 (N=105) --------	4.72	2.29	4.08	0.97	8.32	5.19	11.13	0.67	5.80	0.01
Grade 6 (N=119) --------	5.18	2.32	4.41	0.93	34.77	5.15	12.00	0.65	6.80	0.00
Combined grades 2 and 3 (N=224) ------	4.83	2.50	---	---	23.42	22.59	8.57	0.67	3.30	0.50
Combined grades 5 and 6 (N=224) ------	4.97	2.32	4.25	0.96	27.69	18.91	11.59	0.79	6.33	0.50

NOTE: S.D.—standard deviation; N—number.

rho of .60 with local examiner decisions. Practically all disagreements, however, were resolved in favor of the examiners' scoring when allowance was made for localisms.

The other two error sources were investigated by drawing a random sample of the records of three boys and three girls from each grade level and rescoring these records. Table 13 gives the frequency distribution of discrepancies and suggests that scoring errors have little effect on data analysis.

Table 15. Means and standard deviations on selected background data, by grade for the elementary school control samples

Grade	Occupational level of parent		Ability level		Days between individual and group tests		Age at time of group test		Grade level at time of group test	
	Mean	S.D.	Mean	S.D.	Mean	S.D.	Mean	S.D.	Mean	S.D.
Grade 1 (N=103) ------	4.18	2.82	4.73	0.77	-1.63	8.70	6.95	0.26	1.87	0.05
Grade 2 (N=104) ------	4.06	2.20	4.30	0.90	9.78	13.98	8.03	0.37	2.86	0.05
Grade 3 (N=104) ------	4.39	2.85	4.44	0.70	0.99	3.45	9.27	0.55	3.80	0.00
Grade 4 (N=100) ------	4.01	2.88	4.82	1.11	-12.77	6.30	9.97	0.32	4.88	0.04
Grade 5 (N=110) ------	4.54	2.50	4.25	1.01	9.95	8.75	11.03	0.40	5.90	0.00
Grade 6 (N=106) ------	5.12	2.84	5.01	1.20	-4.27	8.17	12.25	0.65	6.80	0.00
Combined grades 2 and 3 (N=208) -----	4.23	2.55	4.37	0.81	4.39	11.51	8.65	0.78	3.33	0.47
Combined grades 5 and 6 (N=216) -----	4.82	2.69	4.63	1.17	2.97	11.06	11.63	0.82	6.34	0.45

NOTE: S.D.—standard deviation; N—number.

II. THE ELEMENTARY SCHOOL STUDY

BACKGROUND DATA

The subjects for the Monongalia County sample for the elementary school study were obtained by the exhaustive testing of pupils in all six grades of three primary grade schools. These included one school in the central residential area, another in a predominantly middle-class area, and a third in a lower-class, semi-rural area. These schools were chosen in order to maximize the likelihood of obtaining a reasonably representative selection of pupils from the population being studied. Table 14 shows that the desired results were approximated; that is, on ability and socioeconomic indices the population was close to, or slightly above, average.

Table 14 also includes data on the mean number of days that elapsed between the individual and group tests, the mean age of the students at the time the group test was administered, and the grade level at the time of the group testing. Intervals between individual and group tests for grades 3 and 6 are considerably longer than for the other grades. This may be accounted for by the fact that group test data for these children were obtained from a school-system wide testing program which was conducted approximately a month prior to the data collection for the present study.

Table 15 contains similar data on the control samples used in the elementary study. Comparison of tables 14 and 15 shows that the children in the control sample had parents of slightly lower socioeconomic status but that they averaged slightly higher on group tests of general ability. Mean age at the time of testing for the control samples was within a maximum of 3 months of the Monongalia County samples. The grade levels at the time the group tests were given were very close for the two samples, with a maximum discrepancy of a tenth of a grade level (or 1 month of class time). The matching for the control samples is probably as good as can be hoped for without census-type sampling procedures. Differences in general ability level need, however, be kept in mind when considering discrepancies between the principal and control samples.

ADEQUACY OF GRADE LEVEL PLACEMENT

Tables 16 and 17 give the means and standard deviations for the entire population of WRAT raw scores and tables 18 and 19 give similar data for the grade level scores. Tables 18 and 19 show that except for the Arithmetic scores of the second and the fifth graders in the control sample, all subjects obtained WRAT scores somewhat above the actual grade levels of the class at the time the test was administered.

WRAT score means for the control and Monongalia samples for the elementary school study differed up to one grade level for the Reading section and up to approximately one-half grade level for the Arithmetic section and for the grade level estimate obtained by combining scores on Reading and Arithmetic. All differences are significant at the 1-percent level of confidence, except for the Reading section in grades 4 and 5 and for the combined Reading and Arithmetic score in grade 3.

The lower performance of the Monongalia first grade sample may have been due to the absence of kindergarten classes. For the other grades, these data imply that the Colorado and Wisconsin samples demonstrated significantly higher skills in Reading than did the Monongalia sample. The Monongalia sample, in turn, significantly exceeded the California sample on both Reading and Arithmetic and the Colorado sample on Arithmetic alone.

Before suggesting that the above results yield positive evidence of overestimation of actual grade placement, attention must again be called to Jastak's contention that the Reading and Arithmetic grade levels, similar to age-scale-derived intelligence quotients, cannot be expected to show systematic increment with grade wise promotion of pupils. To do justice to the test author, it is necessary, therefore, to determine the magnitude of the discrepancies of the findings of this study from the values given in the manual. Unfortunately, Jastak does not provide means and standard deviations for the samples on which his tables of norms

Table 16. Means and standard deviations on the WRAT, by subtest and grade for the Monongalia County elementary school samples (raw scores)

Grade	Arithmetic		Reading		Arithmetic + Reading	
	Mean	S.D.	Mean	S.D.	Mean	S.D.
Grade 1---	21.31	3.51	38.57	9.13	59.87	11.79
Grade 2---	26.60	2.96	50.37	8.61	76.97	10.30
Grade 3---	32.32	3.05	61.77	9.38	94.08	11.11
Grade 4---	34.10	3.43	66.20	12.09	100.31	14.60
Grade 5---	37.31	4.57	70.16	9.28	107.48	11.81
Grade 6---	44.00	5.88	78.03	9.10	122.04	13.25
Combined grades 2 and 3--------------------	29.49	4.15	56.12	10.66	85.60	13.71
Combined grades 5 and 6--------------------	40.87	6.27	74.34	9.99	115.21	14.54

NOTE: S.D.—standard deviation.

are based. While a test of significance of discrepancies is thereby precluded, it is nevertheless possible to make a direct assessment of the magnitude of discrepancies by obtaining from Jastak's manual the grade level equivalent to the 50th percentile at the mean age of this study's samples.

Tables 20 and 21 give the magnitudes of discrepancies from actual grade placement and from Jastak's norms. These tables also contain the t-ratios for the test of significance of mean differences between obtained WRAT grade level scores and actual grade placement. Actual grade

Table 17. Means and standard deviations on the WRAT, by subtest and grade for the elementary school control samples (raw scores)

Grade	Arithmetic		Reading		Arithmetic + Reading	
	Mean	S.D.	Mean	S.D.	Mean	S.D.
Grade 1---	24.68	2.09	44.50	8.54	69.17	9.95
Grade 2---	24.70	2.30	47.69	9.87	72.30	11.17
Grade 3---	30.81	2.15	63.55	10.27	94.07	12.03
Grade 4---	34.11	3.44	71.86	10.40	105.97	12.60
Grade 5---	36.94	4.36	68.31	11.21	105.15	13.94
Grade 6---	45.07	5.73	79.09	11.77	124.16	16.38
Combined grades 2 and 3--------------------	27.75	3.78	55.62	12.82	83.18	15.91
Combined grades 5 and 6--------------------	40.93	6.-50	73.60	12.69	114.48	17.91

NOTE: S.D.—standard deviation.

Table 18. Means and standard deviations on the WRAT, by subtest and grade for the Monongalia County elementary school samples (grade level scores)

Grade	Arithmetic		Reading		Arithmetic + Reading	
	Mean	S.D.	Mean	S.D.	Mean	S.D.
Grade 1	1.97	0.59	2.06	0.76	2.02	0.60
Grade 2	3.02	0.69	3.08	1.03	3.05	0.72
Grade 3	4.49	0.72	4.74	1.63	4.62	1.02
Grade 4	4.91	0.77	5.70	2.31	5.30	1.43
Grade 5	5.62	1.04	6.33	2.00	5.97	1.29
Grade 6	7.60	2.01	8.24	2.44	7.92	1.93
Combined grades 2 and 3	3.76	1.02	3.92	1.60	3.84	1.18
Combined grades 5 and 6	6.67	1.91	7.34	2.44	7.01	1.92

NOTE: S.D.—standard deviation.

placement at the time the WRAT was administered is obtained by adjusting the grade level at the time the group test was taken by the average time elapsed between the individual and group tests.

Results of these comparisons suggest that the WRAT tends to overestimate grade level even when Jastak's norms are used to adjust the actual grade level estimate. The adjusted method also yields WRAT overestimates of grade level except for the second grade control sample and for the fourth and fifth grade arithmetic scores on both the principal and the control samples.

Since all but the second and fourth grade control samples are slightly above average in

Table 19. Means and standard deviations on the WRAT, by subtest and grade for the elementary school control samples (grade level scores)

Grade	Arithmetic		Reading		Arithmetic + Reading	
	Mean	S.D.	Mean	S.D.	Mean	S.D.
Grade 1	2.56	0.38	2.53	0.81	2.54	0.53
Grade 2	2.59	0.48	2.87	1.05	2.73	0.66
Grade 3	4.13	0.59	5.10	1.87	4.61	1.12
Grade 4	4.92	0.77	6.76	2.27	5.84	1.40
Grade 5	5.53	0.98	6.09	2.25	5.81	1.46
Grade 6	7.87	1.89	8.69	2.60	8.28	2.02
Combined grades 2 and 3	3.36	0.94	3.99	1.88	3.67	1.32
Combined grades 5 and 6	6.68	1.90	7.36	2.76	7.02	2.15

NOTE: S.D.—standard deviation.

Table 20. Discrepancies between observed WRAT grade level scores, actual grade level, and Jastak's age norms, by subtest and grade for the Monongalia County elementary school samples

Grade	Discrepancy from actual grade level						Discrepancy from Jastak's age norms		
	Arithmetic		Reading		Arithmetic + Reading		Arithmetic	Reading	Arithmetic + Reading
	D	t	D	t	D	t			
Grade 1	+0.15	[1]2.68	+0.24	[1]3.38	+0.20	[1]3.51	-0.05	-0.16	-0.20
Grade 2	+0.21	[1]3.18	+0.27	[1]2.75	+0.24	[1]3.48	-0.29	-0.23	-0.26
Grade 3	+0.54	[1]7.94	+0.79	[1]5.16	+0.57	[1]5.94	+0.44	+0.69	+0.57
Grade 4	+0.10	1.43	+0.79	[1]3.76	+0.49	[1]3.77	-0.10	+0.69	+0.29
Grade 5	-0.21	[1]2.08	+0.50	2.56	÷0.14	1.11	-0.11	+0.10	-0.26
Grade 6	+0.68	[1]3.70	+1.32	[1]6.14	+1.00	[1]5.65	+0.33	+0.97	+0.65
Combined grades 2 and 3	+0.38	[1]7.60	+0.54	[1]5.74	+0.46	[1]8.21	+0.08	+0.24	+0.16
Combined grades 5 and 6	+0.13	1.14	+0.92	[1]6.01	+0.59	[1]5.09	-0.17	+0.50	+0.17

[1]Significant at the 1-percent level of confidence.

NOTE: D—algebraic difference; t—t-test of the significance of the difference between means.

Table 21. Discrepancies between observed WRAT grade level scores, actual grade level, and Jastak's age norms, by subtest and grade, for the elementary school control samples

Grade	Discrepancy from actual grade level						Discrepancy from Jastak's age norms		
	Arithmetic		Reading		Arithmetic + Reading		Arithmetic	Reading	Arithmetic + Reading
	D	t	D	t	D	t			
Grade 1	+0.69	[1]18.65	+0.66	[1]8.25	+0.67	[1]12.89	+0.74	+0.71	+0.72
Grade 2	-0.30	[1]6.52	-0.02	0.20	-0.16	2.54	-0.51	-0.23	-0.37
Grade 3	+0.33	[1]5.69	+1.30	[1]7.10	+0.81	[1]7.36	+0.08	+1.05	+0.76
Grade 4	+0.01	0.13	+1.85	[1]8.15	+0.93	[1]4.10	+0.07	+1.91	+0.99
Grade 5	-0.40	[1]4.30	+0.13	0.61	+0.12	0.86	-0.37	+0.16	+0.15
Grade 6	+1.08	[1]5.87	+1.90	[1]7.51	+1.49	[1]7.60	+0.67	+1.49	+1.08
Combined grades 2 and 3	+0.03	0.71	+0.65	[1]5.70	+0.33	[1]4.58	-0.08	+0.54	+0.22
Combined grades 5 and 6	+0.34	[1]3.01	+1.02	[1]5.83	+0.68	[1]5.67	+0.30	+0.98	+0.64

[1]Significant at the 1-percent level of confidence.

NOTE: D—algebraic difference; t—t-test of the significance of the difference between means.

Table 22. Means, standard deviations, and discrepancies from actual grade level on the Stanford Achievement Test, Form Primary I, by sample and subtest for grade 1

Subtest	Mean	S.D.	D	t
	Monongalia County sample (N=114)			
Word Reading--	1.80	0.58	0.00	0.00
Paragraph Meaning------	1.91	0.57	+0.11	[1]2.04
Vocabulary----	2.28	1.03	+0.48	[1]5.00
Spelling------	1.95	0.54	+0.15	[1]3.00
Word Study Skills-------	2.16	0.95	+0.36	[1]4.04
Arithmetic----	2.08	0.61	+0.21	[1]3.68
	Wisconsin control sample (N=103)			
Word Reading--	2.17	0.52	+0.30	[1]5.88
Paragraph Meaning------	2.15	0.59	+0.28	[1]4.83
Vocabulary----	2.24	0.68	+0.37	[1]5.44
Spelling------	2.29	0.66	+0.42	[1]6.56
Word Study Skills-------	2.60	1.00	+0.73	[1]7.37
Arithmetic----	2.12	0.48	+0.25	[1]5.21

[1]Significant at the 1-percent level of confidence.

NOTE: N—number; S.D.—standard deviation; D—algebraic difference; t—t-test of the significance of the difference between means.

general ability, it is conceivable that the latter variable may account for the overestimation that occurred in the present study. Comparison of grade level estimates from the WRAT and the criterion measures will further bear on the issue of adequate grade placement and will be examined in one of the following sections.

PERFORMANCE ON THE SAT

Means and standard deviations for the grade scores on the Stanford Achievement Test are reported in tables 22 through 27. Data have been tabulated separately for Primary Form I, used in the first grade; Primary Form II, used in the second and third grades; Intermediate Form I, used in the fourth grade; and Intermediate Form J, administered to the fifth and sixth grade children. In every case, differences from actual grade level at time of test administration have been computed, and these, along with the significance and magnitude of the differences, are given in the above-mentioned tables. Our data suggest that the samples used for the elementary school study perform at, or slightly above, the normed averages on the group achievement measures. There are some minor discrepancies between the Monongalia County and control samples, with the former generally scoring slightly higher in all but the first grade samples.

Significantly higher than average performance was shown by all of the first graders on Vocabulary, Spelling, Word Study Skills, and Arithmetic; the Wisconsin control sample also scored higher on Word Reading and Paragraph Meaning. The second and third graders in the Monongalia County sample scored significantly above average on Science and Social Studies Concepts, and the third graders were also above average on Arithmetic Concepts. But the California second grade control sample was below average on all SAT variables, while the third grade (Colorado) control sample exceeded the norms for Word Meaning, Science and Social Studies Concepts, Spelling, Word Study Skills, and Language.

Performance of the fourth grade samples was at the normative level except for above average performance on Social Studies by the principal Monongalia sample and significant below average performance on Arithmetic Computation by the Wisconsin Control sample.

In grades 5 and 6 the Monongalia County samples attained above grade level means for Spelling, Social Studies, Science, and Study Skills, while the fifth grade sample had below average performance on Arithmetic Computation. The California fifth grade sample scored below average on all SAT subtests, while the Colorado sixth grade sample was significantly above normative levels on Paragraph Meaning, Spelling, Language, and Study Skills.

Most of the significant discrepancies of the SAT from actual grade level ranged from one-

Table 23. Means, standard deviations, and discrepancies from actual grade level on the Stanford Achievement Test, Primary Form II, by subtest for the Monongalia County samples, grades 2 and 3

Subtest	Grade 2 (N=111)				Grade 3 (N=113)				Combined grades 2 and 3 (N=224)			
	Mean	S.D.	D	t	Mean	S.D.	D	t	Mean	S.D.	D	t
Word Meaning------	2.73	0.75	-0.07	0.99	3.85	1.12	+0.05	0.47	3.30	1.11	0.00	0.00
Paragraph Meaning-	2.87	0.80	+0.07	0.92	3.95	1.11	+0.25	2.45	3.42	1.11	+0.12	1.82
Science and Social Studies Concepts-	3.11	1.15	+0.31	[1]2.84	4.32	1.21	+0.52	[1]4.56	3.72	1.32	+0.42	[1]5.32
Spelling----------	2.73	0.79	-0.07	0.93	3.97	1.14	+0.17	1.57	3.36	1.16	+0.06	0.91
Word Study Skills-	3.02	1.46	+0.22	1.58	4.07	1.60	+0.27	1.80	3.55	1.62	+0.25	2.45
Language----------	2.83	1.04	+0.03	0.30	4.00	1.16	+0.20	1.83	3.42	1.25	+0.12	1.64
Arithmetic Computation------	2.72	0.61	-0.08	1.38	3.72	0.65	-0.08	1.31	3.22	0.81	-0.08	1.90
Arithmetic Concepts---------	2.75	0.92	-0.05	0.57	4.20	1.20	+0.40	[1]3.51	3.48	1.29	+0.18	2.47

[1]Significant at the 1-percent level of confidence.

NOTE: N—number; S.D.—standard deviation; D—algebraic difference; t—t-test of the significance of the difference between means.

fourth to three-fourths of a grade level. The discrepancies from actual grade level in the criterion must, of course, be considered in evaluating the seriousness of the deviations of the WRAT from actual grade level. Appropriate analyses of this complicating problem are reported following the discussion of the WRAT's relation to the criterion measures.

RELATION OF THE WRAT TO THE SAT

Validity coefficients describing the relation of the WRAT and the Stanford Achievement Test have been grouped together for all grades to permit easier comparison. The reader must be reminded again that, due to the age level of

Table 24. Means, standard deviations, and discrepancies from actual grade level on the Stanford Achievement Test, Primary Form II, by subtest for the California and Colorado control samples, grades 2 and 3

Subtest	Grade 2 (N=104)				Grade 3 (N=104)				Combined grades 2 and 3 (N=208)			
	Mean	S.D.	D	t	Mean	S.D.	D	t	Mean	S.D.	D	t
Word Meaning------	2.36	0.60	-0.50	[1]8.62	4.15	1.31	+0.35	[1]2.74	3.26	1.35	-0.07	0.92
Paragraph Meaning-	2.40	0.66	-0.46	[1]7.19	4.10	1.34	+0.25	1.91	3.25	1.36	-0.08	1.03
Science and Social Studies Concepts-	2.62	0.73	-0.44	[1]6.11	4.31	1.47	+0.51	[1]3.54	3.46	1.44	+0.13	1.53
Spelling----------	2.58	0.87	-0.28	[1]3.33	4.22	1.18	+0.42	[1]3.62	3.40	1.32	+0.07	0.93
Word Study Skills-	2.40	0.95	-0.46	[1]4.95	4.61	1.85	+0.81	[1]4.48	3.50	1.84	+0.17	1.53
Language----------	2.54	0.64	-0.42	[1]6.77	4.26	1.54	+0.46	[1]3.05	3.40	1.46	+0.07	0.81
Arithmetic Computation------	2.30	0.50	-0.56	[1]11.67	3.94	0.77	+0.14	1.87	3.12	1.04	-0.21	[1]4.20
Arithmetic Concepts---------	2.30	0.69	-0.56	[1]8.36	3.97	1.32	+0.17	1.32	3.13	1.34	-0.20	[1]2.60

[1]Significant at the 1-percent level of confidence.

NOTE: N—number; S.D.—standard deviation; D—algebraic difference; t—t-test of the significance of the difference between means.

Table 25. Means, standard deviations, and discrepancies from actual grade level on the Stanford Achievement Test, Intermediate Form I, by sample and subtest for grade 4

Subtest	Monongalia County sample (N=121)				Wisconsin control sample (N=100)			
	Mean	S.D.	D	t	Mean	S.D.	D	t
Word Meaning---------------------	4.99	1.47	+0.19	1.42	5.02	1.52	+0.14	0.92
Paragraph Meaning---------------	5.16	1.89	+0.36	2.09	5.14	1.83	+0.26	1.43
Spelling-------------------------	5.00	1.69	+0.20	1.30	4.98	1.54	+0.10	0.65
Word Study Skills----------------	4.61	1.87	-0.19	1.12	5.25	1.88	+0.37	1.97
Language-------------------------	4.91	1.92	+0.11	0.63	4.61	1.74	-0.27	1.55
Arithmetic Computation----------	4.86	0.93	+0.06	0.71	4.16	0.69	-0.62	[1]8.98
Arithmetic Concepts-------------	5.03	1.49	+0.23	1.70	5.14	1.54	+0.26	1.69
Arithmetic Applications----------	4.84	1.54	+0.04	0.29	4.83	1.35	-0.05	0.37
Social Studies-------------------	5.34	1.46	+0.54	[1]4.06	5.15	1.59	+0.27	1.71
Science--------------------------	5.14	1.69	+0.34	2.21	5.21	1.72	+0.33	1.93

[1]Significant at the 1-percent level of confidence.

NOTE: N—number; S.D.—standard deviation; D—algebraic difference; t—t-test of the significance of the difference between means.

the children involved, not all criterion measures are available at all ages. Dashes in the columns of tables indicate such missing data. Validity coefficients are given separately for each grade and for the combined second and third grades and combined fourth and fifth grades. Table 28 lists the appropriate validity measures relating the SAT grade scores to the grade level scores on the WRAT Arithmetic section. Values for the relationships with the most pertinent criteria have been boxed. Coefficients for the individual grade samples (for Arithmetic Concepts and

Table 26. Means, standard deviations, and discrepancies from actual grade level on the Stanford Achievement Test, Intermediate Form J, by subtest for the Monongalia County samples, grades 5 and 6

Subtest	Grade 5 (N=105)				Grade 6 (N=119)				Combined grades 5 and 6 (N=224)			
	Mean	S.D.	D	t	Mean	S.D.	D	t	Mean	S.D.	D	t
Paragraph Meaning-	6.13	1.71	+0.33	1.98	7.23	2.00	+0.43	2.35	6.71	1.95	+0.38	[1]3.04
Word Meaning------	5.96	1.53	+0.16	1.07	7.19	1.65	+0.39	2.58	6.61	1.71	+0.29	[1]2.71
Spelling----------	6.23	1.46	+0.43	[1]3.03	7.45	1.77	+0.65	[1]4.01	6.88	1.74	+0.55	[1]5.05
Language----------	5.85	2.08	+0.05	0.25	7.17	2.23	+0.37	1.81	6.55	2.26	+0.22	1.52
Arithmetic Reasoning--------	5.56	1.20	-0.24	2.05	7.04	1.48	+0.24	1.76	6.35	1.55	+0.02	0.22
Arithmetic Computation------	5.37	0.97	-0.43	[1]4.53	6.81	1.16	+0.01	0.09	6.14	1.30	-0.19	[1]2.60
Social Studies----	6.35	1.54	+0.55	[1]3.67	7.51	1.75	+0.71	[1]4.44	6.97	1.75	+0.64	[1]5.82
Science----------	6.57	1.99	+0.77	[1]3.97	7.40	2.04	+0.60	[1]3.21	7.01	2.06	+0.68	[1]5.04
Study Skills------	6.48	1.95	+0.68	[1]3.58	7.90	2.13	+1.10	[1]5.64	7.23	2.17	+0.90	[1]6.52

[1]Significant at the 1-percent level of confidence.

NOTE: N—number; S.D.—standard deviation; D—algebraic difference; t—t-test of the significance of the difference between means.

Table 27. Means, standard deviations, and discrepancies from actual grade level on the Stanford Achievement Test, Intermediate Form J, by subtest for the California and Colorado control samples, grades 5 and 6

Subtest	Grade 5 (N=110)				Grade 6 (N=106)				Combined grades 5 and 6 (N=216)			
	Mean	S.D.	D	t	Mean	S.D.	D	t	Mean	S.D.	D	t
Paragraph Meaning-	5.42	1.69	-0.48	[1]2.98	7.23	2.07	+0.53	[1]2.69	6.31	2.09	-0.03	0.22
Word Meaning------	5.77	1.33	-0.13	1.03	6.76	1.81	-0.04	0.23	6.25	1.66	-0.08	0.74
Spelling----------	5.68	1.59	-0.22	1.45	7.75	1.74	+0.95	[1]5.72	6.70	1.96	+0.36	[1]3.00
Language----------	5.19	2.20	-0.71	[1]3.38	7.37	2.16	+0.57	[1]2.77	6.26	2.44	-0.08	0.52
Arithmetic Reasoning--------	5.57	1.28	-0.33	[1]2.70	6.82	1.60	+0.02	0.13	6.18	1.57	-0.16	1.62
Arithmetic Computation------	5.41	1.10	-0.49	[1]4.67	6.65	1.15	-0.15	1.36	6.02	1.29	-0.32	[1]4.10
Social Studies----	5.84	1.38	-0.06	0.45	6.91	1.78	+0.11	0.65	6.37	1.68	-0.03	0.28
Science-----------	5.40	1.93	-0.50	[1]2.72	6.79	2.03	-0.01	0.05	6.08	2.10	-0.28	2.06
Study Skills------	5.58	1.72	-0.32	1.96	7.74	2.00	+0.94	[1]4.92	6.64	2.15	+0.30	2.24

[1]Significant at the 1-percent level of confidence.

NOTE: N—number; S.D.—standard deviation; D—algebraic difference; t—t-test of the significance of the difference between means.

Table 28. Validity coefficients describing the relation of the WRAT Arithmetic grade level scores with the grade level scores on the Stanford Achievement Test, by grade, sample, and subtest for the elementary school samples

Subtest	Grade 1		Grade 2		Grade 3		Grade 4		Grade 5		Grade 6		Combined grades 2 and 3		Combined grades 5 and 6	
	M	C	M	C	M	C	M	C	M	C	M	C	M	C	M	C
Word Meaning or Vocabulary--	.44	.25	.47	.35	.33	.59	.60	.61	.59	.56	.64	.48	.59	.76	.67	.59
Paragraph Meaning---------	.45	.55	.41	.50	.51	.61	.59	.61	.60	.54	.58	.44	.63	.77	.62	.56
Spelling--------	.55	.65	.46	.45	.36	.54	.56	.47	.46	.58	.59	.64	.62	.74	.61	.72
Word Study Skills---------	.34	.51	.21	.43	.39	.57	.56	.54	---	---	---	---	.44	.73	---	---
Language--------	---	---	.48	.30	.46	.59	.63	.59	.61	.42	.65	.67	.63	.71	.66	.66
Word Reading----	.51	.55	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Arithmetic Concepts and Reasoning-----	.61	.55	.59	.49	.64	.70	.75	.53	.78	.72	.78	.51	.76	.86	.82	.65
Arithmetic Computation----	---	---	.74	.59	.64	.61	.72	.68	.63	.69	.74	.50	.82	.79	.78	.67
Arithmetic Application----	---	---	---	---	---	---	.70	.63	---	---	---	---	---	---	---	---
Social Studies--	---	---	.63	.28	.39	.52	.70	.57	.45	.57	.59	.38	.64	.69	.60	.52
Science---------	---	---					.58	.55	.59	.59	.53	.38			.55	.53
Study Skills----	---	---	---	---	---	---	---	---	.64	.70	.71	.44	---	---	.71	.65

NOTES: Social Studies and Science were combined in a single subtest in the form used for grades 2 and 3.

M—Monongalia County samples; C—control samples.

Table 29. Validity coefficients describing the relation of the WRAT Reading grade level scores with the grade level scores on the Stanford Achievement Test, by grade, sample, and subtest for the elementary school samples

Subtest	Grade 1		Grade 2		Grade 3		Grade 4		Grade 5		Grade 6		Combined grades 2 and 3		Combined grades 5 and 6	
	M	C	M	C	M	C	M	C	M	C	M	C	M	C	M	C
Word Meaning or Vocabulary--	.68	.41	.79	.76	.79	.75	.83	.70	.68	.79	.66	.60	.84	.84	.72	.71
Paragraph Meaning--------	.87	.79	.79	.71	.79	.78	.74	.71	.59	.65	.63	.48	.84	.85	.65	.64
Spelling--------	.76	.80	.77	.84	.78	.81	.76	.63	.64	.76	.72	.80	.84	.88	.73	.84
Word Study Skills--------	.64	.77	.72	.72	.71	.78	.83	.78	---	---	---	---	.74	.85	---	---
Language--------	---	---	.67	.54	.72	.72	.77	.71	.67	.63	.62	.74	.77	.79	.68	.75
Word Reading----	.82	.81	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Arithmetic Concepts and Reasoning-----	.64	.45	.64	.53	.55	.71	.62	.46	.47	.60	.54	.45	.70	.79	.60	.60
Arithmetic Computation----	---	---	.37	.33	.55	.54	.57	.65	.21	.47	.41	.43	.64	.71	.47	.57
Arithmetic Application----	---	---	---	---	---	---	.54	.62	---	---	---	---	---	---	---	---
Social Studies--	---	---	.51	.21	.59	.51	.63	.68	.66	.72	.67	.53	.66	.64	.71	.66
Science---------	---	---					.68	.68	.64	.68	.54	.46			.60	.63
Study Skills----	---	---	---	---	---	---	---	---	.64	.63	.61	.48	---	---	.67	.65

NOTES: Social Studies and Science were combined in a single subtest in the form used in grades 2 and 3.

M—Monongalia County samples; C—control samples.

Reasoning, Arithmetic Computation, and Arithmetic Application) range from .59 to .78 for the Monongalia County samples and from .49 to .72 in the control samples. Similar coefficients for the combined grades range from .76 to .82 and from .65 to .86, respectively.

Substantial construct validity is supported, at least in the principal sample, by the fact that the most pertinent validity coefficients are higher than the associations with other criterion variables which are unrelated to the arithmetic tasks. There seems to be some progression in increased validity from the first three grades to the higher grades. Most likely this reflects the fact that the WRAT has, of necessity, fewer items to be administered to children in the lower grades, thus producing reduced variability.

The validity coefficients describing the relation between the *Reading* section of the WRAT and

the grade scores of the Stanford Achievement Test are reported in table 29. Validities for the most pertinent criteria (including Word Meaning or Vocabulary, Paragraph Meaning, Spelling, Word Study Skills, Language, and Word Reading) are again boxed in this table. Their values range for the individual grades from .59 to .87 in the Monongalia County samples and from .41 to .84 in the control samples. The combined grade samples yield validity coefficients ranging from .65 to .84 and from .64 to .88, respectively. It is again noted that evidence for construct validity may be inferred from the fact that the language-related subtests of the SAT have higher validities than the arithmetic-related ones when compared with the WRAT Reading section.

The validity coefficients describing the relationship between the combined Arithmetic and Reading grade level scores from the WRAT and

the grade scores from the Stanford Achievement Test are given in table 30. Use of the combined Arithmetic and Reading (A + R) score, as predicted, raises validities for the measures which are not specifically language or numerical ability related, but it does not markedly affect coefficients for the more specific measures.

DISCREPANCIES BETWEEN WRAT AND SAT GRADE LEVEL ESTIMATES

A set of validity coefficients does no more, of course, than indicate the extent to which the distribution of scores on a predictor variable conforms to, or can be linearly transformed into, a set of scores on a criterion variable. It does not in itself give information on the magnitude of discrepancies in estimating grade levels on the criterion from the predictor measure. In previous sections the discrepancies of the test scores from actual grade level at time of testing have been examined. These are necessarily related to the question, How closely do the samples conform to national averages? Quite independent thereof, and within this closed system, it is possible to examine the question, How well does the WRAT approximate the grade level estimates on the criterion instrument?

Discrepancies between the grade level means for the most pertinent criterion variables and the WRAT Arithmetic section are given in table 31 together with the t-ratios for the significance of these differences. It will be noted that the Arithmetic section of the WRAT significantly overestimates achievement on Arithmetic Concepts and Reasoning for the second and sixth grade samples as well as for the two combined samples. Arithmetic Computation, moreover, is overestimated by the WRAT at all levels except for the fourth grade sample. Overestimates of the

Table 30. Validity coefficients describing the relation of the WRAT combined Arithmetic and Reading grade level scores with the grade level scores on the Stanford Achievement Test, by grade, sample, and subtest for the elementary school samples

Subtest	Grade 1		Grade 2		Grade 3		Grade 4		Grade 5		Grade 6		Combined grades 2 and 3		Combined grades 5 and 6	
	M	C	M	C	M	C	M	C	M	C	M	C	M	C	M	C
Word Meaning or Vocabulary	.65	.40	.79	.73	.74	.77	.83	.70	.77	.79	.75	.61	.82	.87	.79	.70
Paragraph Meaning	.77	.79	.76	.75	.81	.81	.75	.71	.70	.68	.70	.51	.84	.88	.72	.67
Spelling	.75	.84	.77	.83	.75	.81	.77	.63	.68	.78	.76	.81	.83	.89	.77	.85
Word Study Skills	.57	.76	.62	.73	.70	.79	.82	.78	---	---	---	---	.69	.86	---	---
Language	---	---	.71	.54	.73	.75	.80	.71	.77	.63	.73	.79	.79	.82	.75	.78
Word Reading	.77	.81	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Arithmetic Concepts and Reasoning	.70	.54	.74	.60	.66	.77	.71	.46	.68	.70	.75	.52	.80	.84	.79	.67
Arithmetic Computation	---	---	.61	.47	.66	.61	.66	.65	.41	.59	.65	.51	.79	.81	.69	.66
Arithmetic Application	---	---	---	---	---	---	.62	.62	---	---	---	---	---	---	---	---
Social Studies	---	---					.70	.68	.70	.75	.73	.51	.72	.70	.75	.65
Science	---	---	.66	.26	.61	.56	.70	.68	.74	.72	.62	.48			.65	.63
Study Skills	---	---	---	---	---	---	---	---	.76	.71	.76	.51	---	---	.78	.71

NOTES: Social Studies and Science were combined in a single subtest in the form used for grades 2 and 3.

M—Monongalia County samples; C—control samples.

Table 31. Discrepancies between selected criterion measures from the Stanford Achievement Test and the Arithmetic section of the WRAT, by subtest, sample, and grade for the elementary school samples

Grade	Arithmetic Concepts and Reasoning				Arithmetic Computation			
	Monongalia County samples		Control samples		Monongalia County samples		Control samples	
	D	t	D	t	D	t	D	t
Grade 1--------------------	-0.13	2.60	+0.44	[1]10.73	...	[1]...	...	[1]...
Grade 2--------------------	+0.26	[1]3.61	+0.26	[1]4.33	+0.29	[1]6.30	+0.26	[1]5.91
Grade 3--------------------	+0.14	1.63	+0.16	1.63	+0.62	[1]11.27	+0.19	[1]3.11
Grade 4--------------------	-0.13	1.33	-0.25	1.91	+0.04	0.71	+0.73	[1]12.37
Grade 5--------------------	+0.05	0.68	-0.07	0.82	+0.24	[1]2.86	+0.09	1.14
Grade 6--------------------	+0.44	[1]3.46	+1.06	[1]6.23	+0.67	[1]5.28	+1.23	[1]7.69
Combined grades 2 and 3----	+0.20	[1]3.77	+0.22	[1]4.40	+0.44	[1]11.00	+0.23	[1]5.23
Combined grades 5 and 6----	+0.23	[1]3.15	+0.50	[1]4.95	+0.44	[1]5.50	+0.66	[1]6.54

[1]Significant at the 1-percent level of confidence.

NOTE: D—algebraic difference; t—t-test of the significance of the difference between means.

arithmetic criteria range up to a maximum of two-thirds of a grade level and are replicated by the control sample in all instances except Arithmetic Computation of grade 5.

Similar data for the Reading section of the WRAT are presented in table 32. Here it is obvious that the WRAT overestimates the criterion grade levels for all but the Monongalia County first grade sample. WRAT Reading scores exceed significantly the SAT Word Meaning scores for grades 2, 3, 4, and 6. The WRAT Reading score significantly exceeds the SAT scores for Paragraph Meaning and Language at all grade levels and the Spelling score at all but the first and fifth grade levels. It is also significantly higher than Word Study Skills at the third and fourth grade levels and at the second grade in the control sample. The magnitude by which the WRAT Reading section overestimates the criterion measures of verbal skills ranges up to a

full grade level and averages at approximately one-half grade levels. Again these findings are uniform for both samples except for Word Meaning at the first grade level.

THE WRAT SECTIONS

Interrelationship

Since the WRAT is being used as a brief estimate of school achievement, one must further ask the question whether combining the scores from the Arithmetic and Reading sections would provide a more adequate predictor of grade placement or whether either of the two sections might prove to be a sufficient brief estimate of achievement level. The relevant data are presented in table 33, where the intercorrelations between the two sections of the WRAT are listed together with the correlation of each individual

Table 32. Discrepancies between selected criterion measures from the Stanford Achievement Test and the Reading section of the WRAT, by subtest, sample, and grade for the elementary school samples

Grade	Word Meaning or Vocabulary				Paragraph Meaning				Spelling			
	Monongalia County samples		Control samples		Monongalia County samples		Control samples		Monongalia County samples		Control samples	
	D	t	D	t	D	t	D	t	D	t	D	t
Grade 1---	-0.24	[1]3.38	+0.29	[1]3.62	+0.13	[1]3.61	+0.48	[1]9.80	+0.09	1.92	+0.24	[1]5.00
Grade 2---	+0.34	[1]5.67	+0.48	[1]5.05	+0.24	[1]3.94	+0.44	[1]6.03	+0.34	[1]5.23	+0.26	[1]4.64
Grade 3---	+0.74	[1]7.79	+0.95	[1]7.79	+0.64	[1]6.74	+1.00	[1]8.69	+0.62	[1]6.39	+0.88	[1]7.86
Grade 4---	+0.70	[1]5.60	+1.71	[1]10.56	+0.53	[1]3.68	+1.59	[1]9.88	+0.69	[1]5.07	+1.75	[1]9.89
Grade 5---	+0.34	2.36	+0.29	2.10	+0.17	1.02	+0.64	[1]3.90	+0.07	0.46	+0.38	[1]2.71
Grade 6---	+0.93	[1]5.57	+1.94	[1]9.56	+0.89	[1]4.97	+1.47	[1]6.26	+0.67	[1]4.32	+0.95	[1]6.13
Combined grades 2 and 3---	+0.54	[1]9.15	+0.72	[1]10.00	+0.42	[1]7.00	+0.73	[1]10.28	+0.48	[1]8.28	+0.58	[1]8.79
Combined grades 5 and 6---	+0.64	[1]5.61	+1.11	[1]8.28	+0.54	[1]4.29	+1.05	[1]7.24	+0.37	[1]3.33	+0.66	[1]6.23

Grade	Word Study Skills				Language			
	Monongalia County samples		Control samples		Monongalia County samples		Control samples	
	D	t	D	t	D	t	D	t
Grade 1-----------------------------------	-0.08	1.14	-0.07	[1]1.11	---	[1]---	---	[1]---
Grade 2-----------------------------------	+0.05	0.52	+0.44	[1]5.94	+0.24	[1]3.04	+0.30	[1]3.90
Grade 3-----------------------------------	+0.52	[1]4.48	+0.49	[1]4.08	+0.59	[1]5.51	+0.84	[1]6.51
Grade 4-----------------------------------	+1.08	[1]9.08	+1.47	[1]10.50	+0.78	[1]5.82	+2.12	[1]13.25
Grade 5-----------------------------------	---	---	---	---	+0.45	[1]2.78	+0.87	[1]4.75
Grade 6-----------------------------------	---	---	---	---	+0.95	[1]4.15	+1.33	[1]7.78
Combined grades 2 and 3---------------	+0.29	[1]3.72	+0.48	[1]6.76	+0.42	[1]6.05	+0.58	[1]7.25
Combined grades 5 and 6---------------	---	---	---	---	+0.70	[1]5.51	+1.10	[1]8.73

[1]Significant at the 1-percent level of confidence.

NOTE: D—algebraic difference; t—t-test of the significance of the difference between means.

section with the combined Arithmetic and Reading score. It is found here that from one-fourth to one-third of the variance of the two sections is common. The Reading section, moreover, is a superior estimate of the combined score and would therefore be chosen as the appropriate device if it were deemed necessary to reduce the time allocated by the Health Examination Survey to the achievement measures. This conclusion on the use of parts of the WRAT as a sufficient

Table 33. Correlation of the Arithmetic and Reading sections of the WRAT and correlation of each section with the Arithmetic and Reading (A + R) composite score, by sample and grade for the elementary school samples (raw scores and grade level scores)

Grade	Arithmetic with Reading		Arithmetic with A + R		Reading with A + R	
	M	C	M	C	M	C
Raw scores						
Grade 1	.67	.61	.82	.73	.98	.99
Grade 2	.46	.51	.67	.66	.97	.98
Grade 3	.45	.57	.66	.68	.97	.96
Grade 4	.66	.54	.78	.72	.98	.97
Grade 5	.38	.52	.69	.72	.93	.96
Grade 6	.55	.72	.83	.87	.94	.97
Combined grades 2 and 3	.65	.75	.81	.84	.97	.98
Combined grades 5 and 6	.58	.71	.83	.87	.94	.97
Grade level scores						
Grade 1	.58	.57	.86	.78	.92	.96
Grade 2	.39	.43	.75	.70	.90	.95
Grade 3	.43	.59	.70	.74	.95	.98
Grade 4	.63	.54	.78	.72	.98	.97
Grade 5	.38	.58	.69	.78	.93	.96
Grade 6	.50	.62	.84	.86	.89	.93
Combined grades 2 and 3	.62	.73	.85	.88	.94	.97
Combined grades 5 and 6	.56	.70	.85	.89	.91	.95

NOTE: M—Monongalia County samples; C—control samples.

estimator of school achievement is further supported by the data reported in tables 28 to 30 and is discussed in the preceding section.

Relation to General Ability and Socioeconomic Status

The relation of the WRAT to general ability and to the socioeconomic status of parents is of some concern in interpreting these results. Correlations with crude indices for the above variables are therefore given in table 34. Relation to parent's occupation ranges from quite low to moderate, and it may be concluded that the WRAT is probably equally suitable for children of different economic backgrounds. Moderate correlations with general ability were found, and they tend to increase with age. While there is relatively little correlation in the first two grades, the relationship increases to the point of accounting for one-fourth to one-half of the common variance.

Table 34. Correlation of the WRAT grade level scores with general ability level and with occupational level of parent, by subtest, sample, and grade for the elementary school samples

Grade	General ability level with:						Occupational level of parent with:					
	Arithmetic		Reading		Arithmetic + Reading		Arithmetic		Reading		Arithmetic + Reading	
	M	C	M	C	M	C	M	C	M	C	M	C
Grade 1----------	---	.37	---	.33	---	.36	.28	.10	.30	.24	.32	.23
Grade 2----------	---	.10	---	.08	---	.10	.21	.01	.28	.07	.29	.06
Grade 3---------	.34	.34	.59	.31	.59	.35	.21	.39	.31	.41	.32	.44
Grade 4---------	.54	.56	.52	.51	.56	.57	.14	.30	.16	.29	.17	.32
Grade 5--------	.47	.58	.35	.53	.45	.60	.30	.23	.21	.27	.28	.28
Grade 6---------	.65	.52	.62	.58	.71	.62	.26	.14	.25	.34	.28	.28
Combined grades 2 and 3--	---	.19	---	.21	---	.22	.19	.19	.28	.28	.27	.27
Combined grades 5 and 6--	.57	.59	.51	.62	.59	.66	.28	.20	.25	.32	.29	.29

NOTE: M—Monongalia County samples; C—control samples.

III. THE JUNIOR HIGH SCHOOL STUDY

BACKGROUND DATA

Subjects for the junior high school study in Monongalia County were obtained by the exhaustive testing of all students in the lower three grades of a semirural junior-senior high school and of all students in a suburban junior high school. A semirural suburban junior high school was also used in the three control samples. This particular selection of schools appeared to be the most feasible one for obtaining a broad socioeconomic representation. Tables 7 and 9 show distributions which suggest that this objective was generally reached. The summary given in table 35, however, suggests some noteworthy discrepancies in the junior high school samples between the Monongalia County samples and the control samples. The Monongalia samples showed an average socioeconomic level quite characteristic for that region but significantly lower than the level found for the control samples. Moreover, while the Monongalia samples were centered at about the national average for intellectual ability, it was found that both the Wisconsin and Colorado samples were above average on intellectual ability. These regional discrepancies must be noted and taken into account in the interpretation of findings for the junior high school samples. Table 35 also gives data on age at time of test and actual grade level. Here the Monongalia and control samples were close to each other.

Table 35. Means and standard deviations on selected background data, by grade and sample for the junior high school samples

Grade and sample	Occupational level of parent		Ability level		Days between individual and group tests		Age at time of group test		Grade level at time of group test	
	Mean	S.D.	Mean	S.D.	Mean	S.D.	Mean	S.D.	Mean	S.D.
Total junior high										
Monongalia County samples------------	3.50	2.57	3.92	0.95	1.21	12.73	14.06	1.09	8.82	0.83
Control samples------	4.95	2.40	4.58	1.01	-4.31	5.94	14.08	0.92	8.88	0.80
Grade 7										
Monongalia County samples------------	3.87	2.65	3.86	1.03	8.40	7.09	13.02	0.66	7.80	0.02
Control samples------	5.41	2.25	4.72	0.89	-6.04	3.82	13.05	0.42	7.85	0.05
Grade 8										
Monongalia County samples------------	3.12	2.63	3.92	0.93	10.73	5.42	14.08	0.78	8.80	0.01
Control samples------	4.54	2.24	4.11	0.89	-9.03	4.55	14.06	0.45	8.90	0.00
Grade 9										
Monongalia County samples------------	3.48	2.39	3.97	0.87	-13.69	5.68	15.03	0.66	9.79	0.02
Control samples------	4.92	2.59	4.91	1.06	1.78	2.63	15.05	0.43	9.80	0.00

NOTE: S.D.—standard deviation.

ADEQUACY OF GRADE LEVEL PLACEMENT

Means and standard deviations for the raw scores on the Wide Range Achievement Test are reported in table 36. Similar data on grade level scores appear in table 37. While the elementary grade study showed generally higher performance for the Monongalia County samples, the reverse is true for the samples under consideration here. Particularly noteworthy for the Reading section of the WRAT are regional differences, which range from one-half of a grade level to more than two grade levels.

Comparison of obtained grade level with actual grade level and discrepancies from Jastak's norms as obtained by referring to the values given at the 50th percentile are reported in table 38. The regional discrepancies present some difficulties in drawing adequate conclusions. However, it may be noted that both the West Virginia and the California eighth grade samples indicate significant underestimation of reading level. For the seventh and ninth grades, however, reading level is underestimated for the West Virginia samples and overestimated for the control samples. The WRAT Arithmetic section underestimates actual grade level throughout except for the ninth grade Colorado control sample.

Relating these findings to the evidence on general ability levels in the samples, it may be concluded that the WRAT estimates which are high simply reflect above average intellectual functioning in the respective samples. Thus, it must still be concluded that, in general, the WRAT underestimates actual grade level placement at the junior high school level.

PERFORMANCE ON THE SAT

Means and standard deviations for the grade scores on the Stanford Achievement Test are reported in table 39. Mean scores for the Monongalia County samples were slightly below the expected values, but discrepancies were by no means as extensive as those reported for the WRAT. Mean scores for the Wisconsin and Colorado control samples were also below the expected but were considerably closer to the national norms. The Colorado ninth grade sam-

ple, however, tended to equal or exceed the national norms. The Monongalia County samples did better on the Arithmetic subtest of the SAT than on the language-related tests. This appears to be a geographical peculiarity and is not replicated for the control samples.

RELATION OF THE WRAT TO THE SAT

Table 40 lists the validity coefficients describing the relation of the WRAT Arithmetic grade level scores with the grade scores of Advanced Form Km of the Stanford Achievement Test. Coefficients are given for the three grades and for the combined junior high school sample. Coefficients giving relationships to the most pertinent criteria have been boxed. The coefficients for Arithmetic Reasoning and Arithmetic Computation range from .74 to .80 for the Monon-

Table 36. Means and standard deviations on the WRAT, by subtest, grade, and sample for the junior high school samples (raw scores)

Grade and sample	Number	Arithmetic		Reading		Arithmetic + Reading	
		Mean	S.D.	Mean	S.D.	Mean	S.D.
Total junior high							
Monongalia County samples-----------	330	24.35	5.19	46.87	12.72	71.37	16.17
Control samples---------------------	327	26.20	6.27	54.59	11.21	80.81	15.77
Grade 7							
Monongalia County samples-----------	111	22.46	4.53	42.94	11.65	65.40	14.82
Control samples---------------------	104	22.47	4.16	55.03	10.01	77.50	12.43
Grade 8							
Monongalia County samples-----------	101	23.89	4.59	45.70	11.02	70.09	13.06
Control samples---------------------	109	24.80	5.46	48.68	11.84	73.48	15.95
Grade 9							
Monongalia County samples-----------	118	26.52	5.46	51.57	13.54	78.08	17.28
Control samples---------------------	114	30.96	5.60	59.84	8.59	90.85	12.92

NOTE: S.D.—standard deviation.

Table 37. Means and standard deviations on the WRAT, by subtest, grade, and sample for the junior high school samples (grade level scores)

Grade and sample	Number	Arithmetic		Reading		Arithmetic + Reading	
		Mean	S.D.	Mean	S.D.	Mean	S.D.
Total junior high							
Monongalia County samples----------------	330	7.79	2.03	8.36	2.90	8.07	2.20
Control samples-------------------------	327	8.62	2.61	10.11	2.73	9.36	2.38
Grade 7							
Monongalia County samples----------------	111	7.03	1.57	7.41	2.60	7.21	1.87
Control samples-------------------------	104	7.03	1.50	10.19	2.44	8.61	1.68
Grade 8							
Monongalia County samples----------------	101	7.60	1.81	8.12	2.34	7.86	1.77
Control samples-------------------------	109	7.98	2.13	8.68	2.79	8.33	2.22
Grade 9							
Monongalia County samples----------------	118	8.68	2.24	9.45	3.21	9.07	2.43
Control samples-------------------------	114	10.68	2.50	11.41	2.21	11.04	2.13

NOTE: S.D.—standard deviation.

galia County samples and from .66 to .84 for the control samples.

These values are substantial, and construct validity is again suggested since the most pertinent coefficients relating the Arithmetic section of the WRAT to the Arithmetic Content are higher than values relating the WRAT to other criterion tests.

Validity coefficients describing the relation between the Reading grade level scores from the WRAT and the grade scores on subtests of the Stanford Achievement Test are given in table 41. Coefficients for the most pertinent criteria (Paragraph Meaning and Word Meaning) range from .57 to .80 and from .47 to .73, respectively. In this instance validity coefficients are almost as high for most other criterion variables with the exception of Study Skills and the Arithmetic tests.

Table 42 gives the validity coefficients for the relationship between the combined Arithmetic

and Reading grade levels from the WRAT and the grade scores from the Stanford Achievement Test. Validity coefficients in this instance range from .51 to .84 for the Monongalia County samples and from .53 to .79 for the control samples. It may be noted that combined scores will improve prediction for the language-related criterion variables, but not for the number-related criterion variables.

DISCREPANCIES BETWEEN WRAT AND SAT GRADE LEVEL ESTIMATES

Attention must again be given to the question whether the reported underestimate of actual grade level placement noted for performance of the junior high school samples on the WRAT may not be a function of the samples' achievement levels being below their actual grade placement. Discrepancies have therefore been computed be-

Table 38. Discrepancies between observed WRAT grade level scores, actual grade level, and Jastak's age norms, by subtest, grade, and sample for the junior high school samples

Grade and sample	Discrepancy from actual grade level						Discrepancy from Jastak's age norms		
	Arithmetic		Reading		Arithmetic + Reading		Arithmetic	Reading	Arithmetic + Reading
	D	t	D	t	D	t			
Total junior high									
Monongalia County samples------------	-1.03	9.81[1]	-0.46	3.03[1]	-0.75	6.64[1]	-0.81	-0.24	-0.53
Control samples------	-0.27	2.18	+1.22	8.13[1]	+0.47	3.88[1]	+0.02	+1.51	+0.76
Grade 7									
Monongalia County samples------------	-0.75	5.03[1]	-0.37	1.50	-0.57	3.22[1]	-0.82	-0.44	-0.64
Control samples------	-0.84	5.71[1]	+2.32	9.67[1]	+0.74	4.48[1]	-0.82	+2.34	+0.76
Grade 8									
Monongalia County samples------------	-1.17	6.50[1]	-0.65	2.79[1]	-0.91	5.17[1]	-1.00	-0.48	-0.74
Control samples------	-0.94	4.63[1]	-0.24	0.90	-0.59	2.78[1]	-0.67	+0.03	-0.32
Grade 9									
Monongalia County samples------------	-1.15	5.58[1]	-0.38	1.29	-0.76	3.41[1]	-0.52	+0.25	-0.13
Control samples------	+0.88	3.76[1]	+1.61	7.78[1]	+1.24	6.23[1]	+1.48	+2.21	+1.84

[1] Significant at the 1-percent level of confidence.

NOTE: D—algebraic difference; t—t-test of the significance of the difference between means.

tween group means for the WRAT sections and the most appropriate criterion measures from the Stanford Achievement Test.

Table 43 lists the discrepancies between means on the WRAT Arithmetic section and the Arithmetic Concepts and Reasoning and the Arithmetic Computation tests on the SAT. While there are systematic trends for all but the ninth grade control samples in the direction of under-estimation of the SAT by the WRAT, only a few of these discrepancies reach significance at the 1-percent level of confidence. The only individual grade sample reaching significant levels of under-estimation is the seventh grade Wisconsin control sample. However, when the total Monongalia County junior high school sample is combined, significant underestimation is found for both criterion measures. But the magnitude of the underestimation averages to two-tenths of a grade level, and it may therefore be concluded that the use of Jastak's arithmetic grade level norms at the junior high school level will result in under-estimation of actual grade placement but relatively accurate placement in terms of the students' achievement as measured on the Stanford Achievement Test.

A rather different story emerges for the Reading section of the WRAT. Relevant data on the discrepancies and their significance are reported in table 44. It will be noted that the WRAT Reading section systematically tends to over-estimate the SAT performance. The extent of

Table 39. Means and standard deviations on the Stanford Achievement Test, by grade, subtest, and sample for the junior high school samples (grade level scores)

Subtest and sample	Total junior high		Grade 7		Grade 8		Grade 9	
	Mean	S.D.	Mean	S.D.	Mean	S.D.	Mean	S.D.
Paragraph Meaning								
Monongalia County samples---------	7.93	2.31	7.25	2.23	7.84	2.34	8.65	2.14
Control samples-------------------	8.78	2.39	8.19	2.24	7.96	2.47	10.09	1.80
Word Meaning								
Monongalia County samples---------	8.06	2.36	7.11	2.16	8.01	2.13	9.00	2.34
Control samples-------------------	9.57	2.24	8.88	2.20	8.89	2.32	10.08	1.52
Spelling								
Monongalia County samples---------	---	---	---	---	7.90	1.99	8.90	2.34
Control samples-------------------	8.71	2.10	8.34	1.93	8.23	2.07	9.51	2.04
Language								
Monongalia County samples---------	7.57	2.99	7.14	3.04	6.57	2.61	8.83	2.81
Control samples-------------------	8.90	2.46	7.82	2.32	8.63	2.56	10.15	1.86
Arithmetic Reasoning								
Monongalia County samples---------	8.02	2.10	7.14	1.79	7.92	1.90	8.94	2.15
Control samples-------------------	8.74	2.05	7.74	1.60	8.11	1.91	10.27	1.62
Arithmetic Computation								
Monongalia County samples---------	7.98	1.84	7.23	1.54	7.75	1.56	8.89	1.94
Control samples-------------------	8.54	2.10	7.13	1.20	8.00	1.74	10.35	1.74
Social Studies								
Monongalia County samples---------	7.70	2.19	6.77	1.83	7.62	1.94	8.65	2.29
Control samples-------------------	8.71	2.28	8.14	1.98	8.04	2.30	9.88	2.07
Science								
Monongalia County samples---------	8.35	2.55	7.32	2.48	8.32	2.27	9.36	2.44
Control samples-------------------	9.16	2.55	8.99	2.30	8.11	2.69	10.31	2.12
Study Skills								
Monongalia County samples---------	7.48	2.39	6.75	2.20	7.29	2.34	8.33	2.34
Control samples-------------------	8.73	2.45	8.41	2.39	7.65	2.43	10.06	1.83

NOTE: S.D.—standard deviation.

Table 40. Validity coefficients describing the relation of the WRAT Arithmetic grade level scores with the grade level scores on Advanced Form Km of the Stanford Achievement Test, by grade, sample, and subtest for the junior high school samples

Subtest	Total junior high		Grade 7		Grade 8		Grade 9	
	M	C	M	C	M	C	M	C
Paragraph Meaning	.59	.66	.67	.53	.52	.67	.53	.63
Word Meaning	.58	.64	.65	.56	.44	.58	.51	.61
Spelling	---	.56	---	.49	.40	.58	.57	.50
Language	.58	.66	.68	.52	.46	.60	.54	.64
Arithmetic Reasoning	.80	.80	.78	.66	.79	.79	.75	.71
Arithmetic Computation	.79	.84	.74	.69	.78	.78	.76	.74
Social Studies	.57	.64	.61	.56	.42	.58	.51	.59
Science	.60	.57	.66	.47	.50	.62	.53	.52
Study Skills	.67	.63	.74	.51	.64	.68	.58	.58

NOTE: M—Monongalia County samples; C—control samples.

Table 41. Validity coefficients describing the relation of the WRAT Reading grade level scores with the grade level scores on Advanced Form Km of the Stanford Achievement Test, by grade, sample, and subtest for the junior high school samples

Subtest	Total junior high		Grade 7		Grade 8		Grade 9	
	M	C	M	C	M	C	M	C
Paragraph Meaning	.68	.64	.71	.47	.57	.70	.69	.56
Word Meaning	.78	.70	.80	.62	.72	.73	.75	.64
Spelling	---	.73	---	.66	.72	.81	.82	.67
Language	.70	.63	.73	.52	.62	.72	.71	.63
Arithmetic Reasoning	.64	.60	.62	.54	.51	.61	.64	.51
Arithmetic Computation	.64	.53	.65	.46	.40	.57	.65	.50
Social Studies	.64	.61	.70	.59	.44	.67	.63	.42
Science	.70	.64	.76	.55	.55	.66	.68	.48
Study Skills	.65	.58	.62	.43	.60	.63	.63	.38

NOTE: M—Monongalia County samples; C—control samples.

Table 42. Validity coefficients describing the relation of the WRAT combined Arithmetic and Reading grade level scores with the grade level scores on Advanced Form Km of the Stanford Achievement Test, by grade, sample, and subtest for the junior high school samples

Subtest	Total junior high		Grade 7		Grade 8		Grade 9	
	M	C	M	C	M	C	M	C
Paragraph Meaning	.72	.73	.78	.58	.65	.76	.70	.66
Word Meaning	.78	.75	.84	.70	.70	.74	.73	.69
Spelling	---	.72	---	.69	.68	.79	.80	.64
Language	.73	.72	.79	.61	.65	.74	.72	.70
Arithmetic Reasoning	.79	.79	.76	.69	.74	.76	.77	.68
Arithmetic Computation	.78	.77	.77	.64	.66	.73	.78	.69
Social Studies	.69	.70	.75	.68	.51	.70	.66	.56
Science	.74	.68	.81	.61	.62	.71	.69	.55
Study Skills	.74	.68	.75	.54	.73	.72	.68	.53

NOTE: M—Monongalia County samples; C—control samples.

the overestimate depends also on the criterion measure involved and shows decided regional differences. Thus, the WRAT Reading section significantly overestimates scores on all criterion measures for the Wisconsin and Colorado samples. Significant overestimates for the Monongalia County samples occur only for the eighth grade on Language, for the ninth grade on Paragraph Meaning, and for the combined junior high samples on both Language and Paragraph Meaning. Finally, the California (eighth grade) sample is overestimated on the Language subtest only.

In summary, it appears that there are substantial discrepancies between reading skill and actual grade placement in the junior high school level, although a definite relationship does exist. As a consequence, we find the apparent paradox that the WRAT Reading test in some instances will underestimate actual grade placement while overestimating language-related achievement as measured by the Stanford Achievement Test. In a situation such as this, the test author obviously faces the dilemma as to whether to key his measures to grade placement or to independent achievement indices. In the case of the norms for the WRAT for the pupils 13-15 years old, the test author apparently has achieved a compromise between these two alternatives.

THE WRAT SECTIONS

Interrelationship

The issue of the interrelation of the two parts of the WRAT used in the Health Examination Survey and the question of the advisability of combining these scores has also been investigated for the junior high school samples. Table 45 gives the correlations between the two sections and their relation to the combined score for each grade and the total junior high school samples. Again, substantial correlation between the two sections is noted, and as in the elementary school study, it appears that the Reading section correlates most highly with the combined score. Attention is again called to table 41, which showed that the Reading section of the WRAT predicted performance on the Arithmetic criterion variables reasonably well, although not quite as well as did

Table 43. Discrepancies between selected criterion measures from the Stanford Achievement Test and the Arithmetic section of the WRAT, by subtest, grade, and sample for the junior high school samples

Grade and sample	Arithmetic Concepts and Reasoning		Arithmetic Computation	
	D	t	D	t
Total junior high				
Monongalia County samples----------------------------------	-0.23	[1]3.19	-0.19	[1]2.75
Control samples----------------------------------	-0.13	1.51	-0.07	0.90
Grade 7				
Monongalia County samples----------------------------------	-0.09	0.83	-0.18	1.70
Control samples----------------------------------	-0.63	[1]4.74	-0.12	1.11
Grade 8				
Monongalia County samples----------------------------------	-0.29	2.42	-0.12	1.05
Control samples----------------------------------	-0.15	1.17	+0.04	0.31
Grade 9				
Monongalia County samples----------------------------------	-0.30	2.10	-0.25	1.84
Control samples----------------------------------	+0.41	2.48	+0.33	2.09

[1]Significant at the 1-percent level of confidence.

NOTE: D—algebraic difference; t—t-test of the significance of the difference between means.

the Arithmetic section. Here also, then, the Reading section might suffice as a brief estimate of school achievement.

Relation to General Ability and Socioeconomic Status

Table 46 gives the correlation of the WRAT with the measure of general ability and with the socioeconomic status of the students' parents. It is found again that for these samples one-third to one-fourth of the variance is common with the measure of general ability. Correlations with parents' occupational level, however, remain nonsignificant or quite low and in no instance account for more than 15 percent of the common variance. As for the elementary school sample, it can be concluded, therefore, that the WRAT is reasonably applicable to subjects of varying socioeconomic backgrounds. A similar conclusion with respect to levels of intelligence, however, must await further investigation.

Table 44. Grade level discrepancies between selected criterion measures from the Stanford Achievement Test and the Reading section of the WRAT, by subtest, grade, and sample for the junior high school samples

Grade and sample	Word Meaning or Vocabulary		Paragraph Meaning		Spelling		Language	
	D	t	D	t	D	t	D	t
Total junior high								
Monongalia County samples-	+0.30	2.22	+0.43	[1]3.23	---	---	+0.89	[1]5.97
Control samples-----------	+0.53	[1]4.82	+1.32	[1]10.91	+1.39	[1]13.37	+1.20	[1]9.68
Grade 7								
Monongalia County samples-	+0.32	1.66	+0.18	0.95	---	---	+0.29	1.34
Control samples-----------	+1.29	[1]6.45	+1.98	[1]8.40	+1.83	[1]10.00	+2.35	[1]10.22
Grade 8								
Monongalia County samples-	+0.14	0.59	+0.31	1.36	+0.25	1.05	+1.48	[1]5.76
Control samples-----------	-0.21	1.14	+0.70	[1]3.55	+0.43	[1]2.74	+0.03	0.16
Grade 9								
Monongalia County samples-	+0.41	1.57	+0.76	[1]2.99	+0.51	2.06	+0.58	2.16
Control samples-----------	+1.33	[1]8.36	+1.32	[1]7.37	+1.90	[1]12.10	+1.26	[1]7.54

[1]Significant at the 1-percent level of confidence.

NOTE: D—algebraic difference; t—t-test of the significance of the difference between means.

IV. THE SENIOR HIGH SCHOOL STUDY

BACKGROUND DATA

The subjects for the senior high school study were obtained in Monongalia County by the exhaustive testing of students in the upper three grades of a semirural high school, and quotas were completed by random sampling from the University High School. Similar quota sampling was used in one high school in each of the three control areas. Because of the demographic distributions in the sampling areas, the average occupational level of the parents was somewhat low in West Virginia and California. The remaining two samples (Colorado and Wisconsin) were closer to, or slightly above, the national average. With respect to intellectual ability, rather close matching to national averages was obtained for the West Virginia and California samples, while the Wisconsin and Colorado samples showed above average ability levels, probably reflecting different patterns of high school dropout than was true for the principal sample. Table 47 gives the relevant data on parent's occupation, pupil ability level, days between individual and group tests, age at time of test, and grade level at time of test. It should be noted that for the Monongalia

and control samples both grade and age levels have been matched to within less than one-tenth of a grade level.

ADEQUACY OF GRADE LEVEL PLACEMENT

Table 48 gives means and standard deviations for the WRAT raw scores, and similar data for the WRAT grade level scores are provided in table 49. All grade level estimates (with the exception of the Wisconsin tenth grade sample) were below actual grade level placement. Regional discrepancies were again the most noteworthy. The West Virginia and California samples showed actual grade level placement underestimates ranging from two to three grade levels, while the remaining samples came very close to actual grade level. Magnitude of discrepancy from actual grade level and associated significance test results are reported in table 50. Considering the above-average intellectual level for the Wisconsin and Colorado samples, it must again be concluded

that the WRAT, in general, seriously underestimates actual grade level for senior high school students.

A fair consideration of the test author's position once again must include reanalysis of the data with respect to the notion that grade levels are not expected to show systematic increment because of different (and often automatic) promotion policies. The grade level equivalent at the 50th percentile corresponding to the average age of our grade sample was obtained from Jastak's manual, and discrepancies were recomputed using these new levels as reference points. No significance tests are available for the revised discrepancies also reported in table 50. By inspection, however, it may now be seen that use of Jastak's conversion tables results in discrepancies which seem to reflect the intellectual levels of the several samples. Thus use of the conversion tables leads to obvious overestimates of grade level for the Wisconsin and Colorado samples. However, grade level estimates for the

Table 45. Correlation of the Arithmetic and Reading sections of the WRAT and correlation of each section with the Arithmetic and Reading (A + R) composite score, by sample and grade for the junior high school samples (raw scores and grade level scores)

Grade	Arithmetic with Reading		Arithmetic with A + R		Reading with A + R	
	M	C	M	C	M	C
Raw scores						
Total junior high-----------------------------	.58	.71	.78	.86	.94	.97
Grade 7--	.60	.44	.78	.69	.97	.95
Grade 8--	.38	.65	.70	.83	.84	.97
Grade 9--	.58	.63	.77	.86	.97	.94
Grade level scores						
Total junior high-----------------------------	.59	.70	.85	.89	.93	.95
Grade 7--	.57	.42	.82	.75	.94	.91
Grade 8--	.45	.63	.81	.88	.89	.93
Grade 9--	.58	.64	.84	.92	.93	.89

NOTE: M—Monongalia County samples; C—control samples.

Table 46. Correlation of WRAT grade level scores with general ability level and with occupational level of parent, by subtest, sample, and grade for the junior high school samples

Grade	General ability level with:					
	Arithmetic		Reading		Arithmetic + Reading	
	M	C	M	C	M	C
Total junior high------------------------------------	.49	.59	.56	.62	.59	.66
Grade 7--	.54	.51	.56	.63	.62	.68
Grade 8--	.51	.60	.52	.60	.61	.66
Grade 9--	.50	.35	.63	.38	.65	.40

Grade	Occupational level of parent with:					
	Arithmetic		Reading		Arithmetic + Reading	
	M	C	M	C	M	C
Total junior high------------------------------------	.14	.20	.17	.32	.18	.29
Grade 7--	.29	.01	.26	.12	.31	.09
Grade 8--	.18	.35	.30	.35	.28	.39
Grade 9--	.08	.20	.08	.13	.09	.19

NOTE: M—Monongalia County samples; C—control samples.

West Virginia and California samples now more closely approach their actual grade average.

Perhaps some closure can be achieved by considering the discrepancies for the combined senior high school samples. Inspection of the totals in table 50 suggests that use of grade level estimates for senior high school students underestimates actual level while use of Jastak's conversion table results in a slight overestimate.

PERFORMANCE ON THE MAT

Data on the student's performances on the Metropolitan Achievement Test (MAT), the criterion variables for the senior high school sample, were analyzed in two different ways. Standard scores are available which indicate the student's performance as compared with the total high school sample, on which the test was standardized.

Table 47. Means and standard deviations on selected background data, by grade and sample for the senior high school samples

Grade and sample	Occupational level of parent		Ability level		Days between individual and group tests		Age at time of group test		Grade level at time of group test	
	Mean	S.D.	Mean	S.D.	Mean	S.D.	Mean	S.D.	Mean	S.D.
Total senior high										
Monongalia County samples-------	3.70	2.36	4.14	1.05	6.63	10.51	17.08	1.06	11.85	0.81
Control samples-----------------	4.83	2.57	4.41	0.94	-4.74	3.22	16.92	0.85	11.78	0.51
Grade 10										
Monongalia County samples-------	3.69	2.30	4.17	1.08	6.79	11.05	16.09	0.62	10.83	0.05
Control samples-----------------	5.11	2.64	4.58	0.79	-7.18	1.02	16.11	0.44	10.90	0.00
Grade 11										
Monongalia County samples-------	3.71	2.28	4.14	1.10	7.02	10.32	17.03	0.80	11.82	0.04
Control samples-----------------	4.02	2.34	3.94	0.87	-5.88	0.81	17.00	0.45	11.90	0.00
Grade 12										
Monongalia County samples-------	3.70	2.40	4.11	0.95	6.11	10.17	18.04	0.67	12.82	0.04
Control samples-----------------	5.55	2.46	4.83	0.98	0.46	0.53	17.99	0.39	12.90	0.00

NOTE: S.D.—standard deviation.

These scores are in the typical T-score form with a mean of 50 and a standard deviation of 10. On scores such as these, one would expect the eleventh grader to fall at about the average while the tenth grader should be below and the twelfth grader above the mean given for the total normative population. A second type of score, the within grade stanine, permits comparison of the study's subsamples with national norms. Means and standard deviations in T-score form are reported in table 51 and their grade stanine equivalents are given in table 52.

The Monongalia County sample fell at or above average on the subtests of Reading, Language, Language Study Skills, Social Studies Information, and Science Information, while it fell somewhat below the national average on Spelling, Mathematical Computation, and Mathematical Analyses. Underestimates of achievement of grade level for the Arithmetic part of the Wide Range

Achievement Test for these samples may therefore be attributable to their generally lower level in mathematics achievement.

As on the WRAT, the control samples from Colorado and Wisconsin exceeded the West Virginia samples on practically all of the Metropolitan subtests, while the California sample performed slightly below the West Virginia sample. Care must be taken, however, to remember the higher average on the general ability index for the two control samples before interpreting these results.

Comparison of the control samples to national averages requires consideration of the within grade stanines reported in table 52. The average stanine has a value of five. Hence, it follows that the Wisconsin sample was at about the national average on most subjects except Language, on which it was low, and Science and Social Studies, on which it was high. The California sample appeared to be at or near average on Reading, Social Studies, and Science and low on all other subjects, while the Colorado sample was at or about average on Spelling and Language and above average on all other items. The Monongalia County samples, finally, were all below average on Mathematics and Spelling, and the twelfth grade sample appeared low on all subjects except Science and Social Studies.

RELATION OF THE WRAT TO THE MAT

Table 53 gives the validity coefficients describing the relation of the WRAT Arithmetic section grade level scores with the standard scores on the Metropolitan Achievement Test. Results for individual grade levels and combined high school samples are given separately for the Monongalia County and control groups. The boxed group of coefficients in this table represents the

Table 48. Means and standard deviations on the WRAT, by subtest, grade, and sample for the senior high school samples (raw scores)

Grade and sample	Number	Arithmetic		Reading		Arithmetic + Reading	
		Mean	S.D.	Mean	S.D.	Mean	S.D.
Total senior high							
Monongalia County samples	301	28.30	6.34	55.21	13.04	83.52	17.38
Control samples	269	30.11	6.75	59.54	10.74	89.62	15.50
Grade 10							
Monongalia County samples	95	27.07	5.93	51.52	12.75	78.59	16.24
Control samples	102	31.11	5.92	60.03	9.38	91.14	13.21
Grade 11							
Monongalia County samples	103	28.85	6.22	57.43	13.40	86.31	17.98
Control samples	98	26.36	6.30	55.98	11.67	82.34	16.06
Grade 12							
Monongalia County samples	103	28.87	6.66	56.40	12.18	85.27	16.81
Control samples	69	33.96	5.74	63.87	9.45	97.71	12.95

NOTE: S.D.—standard deviation.

Table 49. Means and standard deviations on the WRAT, by subtest, grade, and sample for the senior high school samples (grade level scores)

Grade and sample	Number	Arithmetic		Reading		Arithmetic + Reading	
		Mean	S.D.	Mean	S.D.	Mean	S.D.
Total senior high							
Monongalia County samples------------	301	9.48	2.78	10.29	3.16	9.88	2.61
Control samples----------------------	269	10.32	2.99	11.36	2.66	10.84	2.48
Grade 10							
Monongalia County samples------------	95	8.90	2.55	9.40	3.02	9.13	2.38
Control samples----------------------	102	10.72	2.71	11.46	2.39	11.09	2.19
Grade 11							
Monongalia County samples------------	103	9.72	2.74	10.87	3.24	10.30	2.67
Control samples----------------------	98	8.68	2.65	10.48	2.81	9.58	2.42
Grade 12							
Monongalia County samples------------	103	9.77	2.93	10.53	3.02	10.15	2.61
Control samples----------------------	69	12.05	2.65	12.45	2.37	12.25	2.08

NOTE: S.D.—standard deviation.

correlations with the most pertinent criterion variables, the subtests involving subject knowledge of Mathematical Computation and Concepts and of Mathematical Analysis and Problem Solving. The validity coefficients for these specific criteria for the individual grade samples range from .62 to .82 for the Monongalia County and from .66 to .77 for the control samples. Values for the combined high school sample are .68 and .77 and .73 and .78, respectively. These values are above correlations with the nonmathematics criteria and thus demonstrate construct validity for the WRAT Achievement section also in the high school sample.

Validity coefficients describing the relation of the WRAT Reading grade level scores with the standard scores from the Metropolitan Achievement Test are given in table 54. Here the most pertinent criterion variables would seem to be the subjects Reading, Spelling, and Language, although the topics Language Studies Skills and Social Studies Vocabulary are also clearly relevant. Correlations with the three most pertinent criteria range from .61 to .82 for the Monongalia County samples and from .49 to .82 for the control samples. Again, construct validity seems present for the Reading section of the WRAT since correlations are generally higher for the language-related than for the nonlanguage-oriented subject matter criteria.

Relationships were also evaluated between scores for the combined Wide Range Achievement Test and the standard scores on the MAT. Coefficients describing these relationships are listed in table 55. As in the studies using the Stanford Achievement Test as the criterion, it is again found that use of the combined WRAT score improves prediction for the language-related criterion measures while it does not significantly affect the magnitude of prediction of the arithmetic measures.

Table 50. Discrepancies between observed WRAT grade level scores, actual grade level, and Jastak's age norms, by subtest, grade, and sample for the senior high school samples

Grade and sample	Discrepancy from actual grade level						Discrepancy from Jastak's age norms		
	Arithmetic		Reading		Arithmetic + Reading		Arithmetic	Reading	Arithmetic + Reading
	D	t	D	t	D	t			
Total senior high									
Monongalia County samples----------	-2.37	[1]14.81	-1.56	[1]8.62	-1.97	[1]13.13	-0.29	+0.52	+0.11
Control samples----	-1.47	[1]8.12	-0.43	[1]2.65	-0.95	[1]6.33	+0.57	+1.61	+1.09
Grade 10									
Monongalia County samples----------	-1.91	[1]7.38	-1.41	[1]4.56	-1.68	[1]6.94	-0.65	-0.15	-0.42
Control samples----	-0.20	0.75	+0.56	2.36	+0.19	0.88	+1.12	+1.88	+1.51
Grade 11									
Monongalia County samples----------	-2.08	[1]7.76	-0.93	[1]2.92	-1.50	[1]5.72	-0.03	+1.12	+0.55
Control samples----	-3.24	[1]12.09	-1.44	[1]4.91	-2.34	[1]9.59	-1.07	+0.73	-0.17
Grade 12									
Monongalia County samples----------	-3.03	[1]10.52	-2.27	[1]7.64	-2.65	[1]10.27	-0.18	+0.58	+0.20
Control samples----	-0.85	[1]2.66	-0.45	1.58	-0.65	2.60	+2.10	+2.50	+2.30

[1]Significant at or beyond the 1-percent level of confidence.

NOTE: D—algebraic difference; t—t-test of the significance of the difference between means.

DISCREPANCIES BETWEEN WRAT AND MAT ESTIMATES

While the correctness of grade level estimation may not be as crucial at the high school level as it is for children at the earlier ages, it is nevertheless important to assess to what extent, if any, the WRAT tends to overestimate or underestimate school achievement as measured by an independent assessment procedure.

No grade level estimates were available for the MAT, but it was possible to use Jastak's tables to convert grade levels into standard score form. Jastak's standard scores were converted into the conventional T-score form, and discrepancies were computed, even though the absence of appropriate statistics in the manuals precluded formal significance tests.

Tables 56 and 57 give the WRAT Arithmetic and Reading score means in T-score form and list the discrepancies in T-score points from the corresponding means on the Metropolitan Achievement Test. There is considerable variability among grade levels and samples. The clearest picture merges when we consider the combined means for the total high school samples. Here it appears that the Arithmetic section on the WRAT slightly overestimated achievement in mathematics for the Monongalia County samples but was approximately close, on the average, for the control samples. The WRAT Reading section closely predicted average level for the Metro-

politan Reading Test (except for marked under-estimate of the Colorado twelfth grade sample) but seemed to overestimate the Spelling and Language subtests of the Metropolitan by an average of one-half of a standard deviation.

THE WRAT SECTIONS

Interrelationship

Table 58 gives the intercorrelations between the Arithmetic and Reading sections of the WRAT for the high school samples. Substantial correlation exists between these sections for all samples, and the finding for the elementary and junior high samples regarding the higher correlation of the Reading section with the combined Arithmetic and Reading score is replicated. Inspection of tables 55 through 57, however, suggests somewhat better definition in criterion prediction for the two forms of the test. Thus,

while the Reading section presents a better choice if the battery has to be shortened, there appears to be greater justification for retaining both subtests of the WRAT at the high school level than at the lower grades.

Relation to General Ability and Socioeconomic Status

The correlation of the WRAT parts and combined score with the measure of intellectual ability and occupation of parent is given in table 59. For the high school samples, correlations of the WRAT with occupational level, as the estimate of socioeconomic status, are nonsignificant, or trivial, and present evidence of the utility of the test for children from varying socioeconomic backgrounds. Correlation with intellectual ability is again quite substantial, although some decrement in the relationship occurs at the twelfth grade level.

V. VALIDITY OF THE WRAT AT EXTREME ABILITY LEVELS

WRAT PERFORMANCE AT EXTREME LEVELS

In the previous section substantial correlations were reported between the WRAT scores and the measure of general ability. These findings raised serious questions as to the suitability of the WRAT at extreme levels of intellectual ability. In order to handle this problem, special studies were conducted on samples of subjects at both the lowest and highest levels of the ability range. For this study subjects were pooled from the Monongalia County and the control samples and subsamples were pooled wherever comparable forms of the criterion tests were available. As a result, data are presented on four samples. Two of these represent students from the fifth through the ninth grades, all of whom took the Stanford Achievement Test. The other two samples represent students from grades 10-12, on whom we had comparable data on the Metropolitan

Achievement Test. In each set, one sample represents students with IQ's of 80 or below, while the other sample represents students with IQ's of 121 or above.

Table 60 shows the mean age and grade level placement for each of these samples, as well as the WRAT grade level scores. As would be expected, mean ages are higher for the low-ability groups and the average grade level scores on the WRAT are much below actual grade level for the low-ability groups. The two high-ability groups are substantially above their expected grade level, but of course, the discrepancy here is not as great as for the low-ability group.

In the analysis of the validity of the WRAT for the extreme groups, the matter of the relation of the WRAT to the most pertinent criteria from the Stanford and Metropolitan Achievement Tests will again be attended to and, in the case of the SAT, the discrepancy between grade levels will be considered.

Table 51. Means and standard deviations on the Metropolitan Achievement Test, by grade, subtest, and sample for the senior high school samples (standard scores)

Subtest and sample	Total senior high		Grade 10		Grade 11		Grade 12	
	Mean	S.D.	Mean	S.D.	Mean	S.D.	Mean	S.D.
Reading								
Monongalia County samples---	52.70	13.76	50.54	13.18	54.83	13.69	52.56	14.02
Control samples------------	56.41	13.86	52.39	12.80	52.61	12.60	67.74	10.41
Spelling								
Monongalia County samples---	47.76	16.16	43.96	14.79	48.59	16.17	50.45	16.71
Control samples------------	50.96	15.84	49.72	14.57	47.49	16.71	57.71	14.24
Language								
Monongalia County samples---	51.06	16.21	48.63	15.63	51.87	15.67	52.49	16.99
Control samples------------	52.15	14.12	46.76	12.52	50.24	12.95	62.83	12.08
Language Study Skills								
Monongalia County samples---	---	---	---	---	51.18	18.27	51.30	18.98
Control samples------------	56.84	15.56	53.16	14.23	52.15	14.45	68.93	12.30
Social Studies Skills								
Monongalia County samples---	---	---	---	---	---	---	---	---
Control samples------------	---	---	53.16	14.23	---	---	67.68	13.77
Social Studies Vocabulary								
Monongalia County samples---	---	---	---	---	---	---	---	---
Control samples------------	58.48	17.00	54.34	15.37	54.07	15.56	70.87	15.07
Social Studies Information								
Monongalia County samples---	52.66	15.09	49.66	13.67	53.61	13.94	54.47	16.91
Control samples------------	---	---	54.12	12.33	56.08	13.64	---	---
Mathematical Computation and Concepts								
Monongalia County samples---	46.54	15.54	43.39	13.62	48.87	14.58	47.12	17.52
Control samples------------	52.83	16.47	51.24	13.47	46.41	15.77	64.29	15.55
Mathematical Analysis and Problem Solving								
Monongalia County samples---	46.19	17.51	44.40	16.94	46.37	16.60	47.66	18.72
Control samples------------	53.59	17.55	51.15	14.65	46.99	16.26	66.59	16.38
Science Information								
Monongalia County samples---	51.62	14.82	52.74	14.85	51.94	12.38	50.26	16.79
Control samples------------	---	---	56.77	13.62	51.77	15.97	---	---
Science Concepts								
Monongalia County samples---	---	---	---	---	---	---	---	---
Control samples------------	---	---	57.87	14.33	---	---	67.29	15.34

NOTE: S.D.—standard deviation.

Table 52. Means and standard deviations on the Metropolitan Achievement Test, by grade, subtest, and sample for the senior high school samples (within grade stanines)

Subtest	Total senior high		Grade 10		Grade 11		Grade 12	
	Mean	S.D.	Mean	S.D.	Mean	S.D.	Mean	S.D.
Reading								
Monongalia County samples----------	4.73	1.87	4.92	1.77	4.98	1.94	4.31	1.82
Control samples--------------------	5.33	1.80	5.15	1.70	4.73	1.76	6.43	1.47
Spelling								
Monongalia County samples----------	4.21	2.07	4.12	2.02	4.32	2.12	4.17	2.05
Control samples--------------------	4.65	2.08	4.87	2.03	4.14	2.13	5.04	1.94
Language								
Monongalia County samples----------	4.47	2.03	4.65	1.99	4.58	2.02	4.19	2.04
Control samples--------------------	4.58	1.75	4.25	1.64	4.30	1.76	5.48	1.59
Language Study Skills								
Monongalia County samples----------	---	---	---	---	4.48	2.31	4.15	2.31
Control samples--------------------	5.23	1.96	5.15	1.85	4.57	1.94	6.30	1.68
Social Studies Skills								
Monongalia County samples----------	---	---	---	---	---	---	---	---
Control samples--------------------	---	---	5.30	1.72	---	---	6.42	1.73
Social Studies Vocabulary								
Monongalia County samples----------	---	---	---	---	---	---	---	---
Control samples--------------------	5.80	2.15	6.01	2.07	4.93	2.04	6.71	1.94
Social Studies Information								
Monongalia County samples----------	4.76	1.92	5.17	1.77	4.73	1.72	4.41	2.15
Control samples--------------------	---	---	5.76	1.57	5.12	1.83	---	---
Mathematical Computation and Concepts								
Monongalia County samples----------	4.23	1.88	4.07	1.77	4.45	1.77	4.16	2.06
Control samples--------------------	5.01	2.06	5.12	1.90	4.13	1.93	6.09	1.90
Mathematical Analysis and Problem Solving								
Monongalia County samples----------	4.24	1.99	4.27	1.97	4.13	1.91	4.33	2.07
Control samples--------------------	5.13	2.02	5.18	1.80	4.27	1.90	6.29	1.87
Science Information								
Monongalia County samples----------	4.84	1.91	5.34	1.94	4.70	1.68	4.53	2.01
Control samples--------------------	---	---	5.85	1.80	4.73	2.09	---	---
Science Concepts								
Monongalia County samples----------	---	---	---	---	---	---	---	---
Control samples--------------------	---	---	5.52	1.75	---	---	6.01	1.86

NOTE: S.D.—standard deviation.

Table 53. Validity coefficients describing the relation of the WRAT Arithmetic grade level scores with the standard scores on the Metropolitan Achievement Test, by grade, sample, and subtest for the senior high school samples

Subtest	Total senior high		Grade 10		Grade 11		Grade 12	
	M	C	M	C	M	C	M	C
Reading	.62	.57	.58	.50	.58	.55	.68	.50
Spelling	.58	.54	.51	.56	.50	.50	.66	.43
Language	.66	.58	.64	.46	.57	.69	.74	.61
Language Study Skills	---	.59	---	.45	.52	.57	.69	.62
Social Studies Skills	---	---	---	.46	---	---	---	.56
Social Studies Vocabulary	---	.59	---	.62	---	.60	---	.52
Social Studies Information	.59	---	.54	.43	.53	.56	.65	---
Mathematical Computation and Concepts	.77	.78	.70	.77	.76	.76	.82	.73
Mathematical Analysis and Problem Solving	.68	.73	.74	.66	.62	.69	.69	.74
Science Information	.52	---	.51	.52	.51	.49	.58	---
Science Concepts	---	---	---	.50	---	---	---	.57

NOTE: M—Monongalia County samples; C—control samples.

Table 54. Validity coefficients describing the relation of the WRAT Reading grade level scores with the standard scores on the Metropolitan Achievement Test, by grade, sample, and subtest for the senior high school samples

Subtest	Total senior high		Grade 10		Grade 11		Grade 12	
	M	C	M	C	M	C	M	C
Reading	.61	.61	.66	.57	.61	.65	.56	.49
Spelling	.73	.76	.69	.69	.82	.82	.66	.69
Language	.65	.65	.72	.67	.62	.74	.63	.49
Language Study Skills	---	.61	---	.55	.62	.67	.53	.48
Social Studies Skills	---	---	---	.40	---	---	---	.13
Social Studies Vocabulary	---	.62	---	.54	---	.67	---	.58
Social Studies Information	.56	---	.62	.43	.59	.52	.48	---
Mathematical Computation and Concepts	.53	.54	.56	.51	.57	.58	.46	.30
Mathematical Analysis and Problem Solving	.49	.53	.51	.46	.48	.44	.48	.31
Science Information	.56	---	.63	.56	.63	.44	.51	---
Science Concepts	---	---	---	.54	---	---	.48	---

NOTE: M—Monongalia County samples; C—control samples.

Table 55. Validity coefficients describing the relation of the combined WRAT Arithmetic and Reading grade level scores with the standard scores on the Metropolitan Achievement Test, by grade, sample, and subtest for the senior high school samples

Subtest	Total senior high		Grade 10		Grade 11		Grade 12	
	M	C	M	C	M	C	M	C
Reading	.70	.67	.73	.63	.67	.68	.70	.60
Spelling	.75	.73	.72	.72	.75	.75	.75	.67
Language	.75	.70	.80	.65	.67	.80	.78	.67
Language Study Skills	---	.68	---	.58	.65	.70	.69	.67
Social Studies Skills	---	---	---	.50	---	---	---	.44
Social Studies Vocabulary	---	.69	---	.61	---	.72	---	.66
Social Studies Information	.66	---	.68	.50	.63	.60	.64	---
Mathematical Computation and Concepts	.73	.75	.72	.75	.74	.75	.73	.64
Mathematical Analysis and Problem Solving	.66	.69	.72	.66	.60	.63	.67	.65
Science Information	.62	---	.68	.63	.65	.52	.62	---
Science Concepts	---	---	---	.60	---	---	---	.64

NOTE: M—Monongalia County samples; C—control samples.

Table 56. T-score discrepancies between selected criterion measures on the Metropolitan Achievement Test and the Arithmetic section of the WRAT, by subtest, grade, and sample for the senior high school samples

Grade and sample	WRAT Arithmetic score in T-score form	Mathematical Computation and Concepts	Mathematical Analysis and Problem Solving
		D	D
Total senior high			
Monongalia County samples	49.3	+2.8	+3.1
Control samples	53.0	+0.2	-0.6
Grade 10			
Monongalia County samples	47.3	+3.9	+2.9
Control samples	53.3	+2.1	+1.1
Grade 11			
Monongalia County samples	50.0	+1.1	+3.6
Control samples	46.0	-0.4	-1.0
Grade 12			
Monongalia County samples	49.3	+2.2	+1.6
Control samples	57.0	-7.3	-7.6

NOTE: D—algebraic difference.

Table 57. T-score discrepancies between selected criterion measures on the Metropolitan Achievement Test and the Reading section of the WRAT, by subtest, grade, and sample for the senior high school samples

Grade and sample	WRAT Arithmetic score in T-score form	Reading D	Spelling D	Language D
Total senior high				
Monongalia County samples--------------------	52.0	-0.7	+4.2	+0.9
Control samples-----------------------------	56.0	-0.4	+6.0	+3.8
Grade 10				
Monongalia County samples--------------------	48.7	-1.8	+4.7	+0.1
Control samples-----------------------------	56.0	+3.6	+6.3	+9.2
Grade 11				
Monongalia County samples--------------------	52.0	-2.8	+3.4	+0.1
Control samples-----------------------------	52.7	+0.1	+5.2	+1.5
Grade 12				
Monongalia County samples--------------------	52.0	-0.6	-1.5	-0.5
Control samples-----------------------------	58.3	-9.4	-1.6	-4.5

NOTE: D—algebraic difference.

Table 58. Correlation of the Arithmetic and Reading sections of the WRAT and correlation of each section with the Arithmetic and Reading (A + R) composite score, by sample and grade for the senior high school samples (raw scores and grade level scores)

Grade	Arithmetic with Reading		Arithmetic with A + R		Reading with A + R	
	M	C	M	C	M	C
	Raw scores					
Total senior high-----------------------------	.55	.54	.78	.81	.95	.93
Grade 10---	.44	.46	.71	.78	.94	.92
Grade 11---	.61	.56	.81	.80	.96	.95
Grade 12---	.55	.38	.80	.73	.94	.90
	Grade level scores					
Total senior high-----------------------------	.54	.54	.86	.89	.89	.86
Grade 10---	.45	.47	.82	.88	.88	.84
Grade 11---	.59	.57	.87	.88	.91	.89
Grade 12---	.54	.36	.87	.85	.88	.80

NOTE: M—Monongalia County samples; C—control samples.

Table 59. Correlation of WRAT grade level scores with general ability level and with occupational level of parent, by subtest, sample, and grade for the senior high school samples

| Grade | General ability level with: | | | | | |
| | Arithmetic | | Reading | | Arithmetic + Reading | |
	M	C	M	C	M	C
Total senior high------------------------------	.58	.61	.64	.61	.70	.70
Grade 10-------------------------------------	.63	.56	.70	.66	.78	.71
Grade 11-------------------------------------	.60	.58	.73	.66	.75	.70
Grade 12-------------------------------------	.56	.45	.54	.35	.62	.49

| Grade | Occupational level of parent with: | | | | | |
| | Arithmetic | | Reading | | Arithmetic + Reading | |
	M	C	M	C	M	C
Total senior high------------------------------	.13	.23	.09	.11	.12	.20
Grade 10-------------------------------------	.05	.14	.10	.18	.10	.18
Grade 11-------------------------------------	.10	.04	.09	.07	.10	.02
Grade 12-------------------------------------	.21	.28	.09	.02	.17	.19

NOTE: M—Monongalia County samples; C—control samples.

RELATION BETWEEN THE WRAT AND THE CRITERION VARIABLES

Table 61 gives validity coefficients for the group of extreme intellectual ability. It may be seen that at these levels the WRAT works reasonably well in predicting performance on the Stanford Achievement Test at both high and low ability levels and that further evidence of construct validity is presented by the fact that the pertinent criterion variables correlate higher with the appropriate section of the WRAT.

Less favorable results occur in the relationship of the WRAT to the Metropolitan Achievement Test for the groups drawn from the senior high school samples. While there is significant prediction in the expected direction for the high-ability samples, validities are not as high as one would hope for. Of more concern is the fact that the Reading section of the WRAT completely fails to predict relevant criterion variables for the low-ability group. It is true that this group is represented only by a small sample (N=25). However, modest correlations are yielded by this

Table 60. Means and standard deviations on the WRAT, age at time of test, and grade level at time of test for groups of extreme ability

Ability group	Number	Age at time of test		Grade level at test		Arithmetic grade level		WRAT Reading grade level		A + R grade level	
		Mean	S.D.	Mean	S.D.	Mean	S.D.	Mean	S.D.	Mean	S.D.
Low ability, grades 5-9-----------	52	13.76	1.62	7.74	1.38	5.25	1.36	5.04	1.82	5.14	1.35
High ability, grades 5-9-----------	51	12.17	1.16	7.26	1.19	9.07	1.88	10.74	2.57	9.90	2.00
Low ability, grades 10-12---------	25	18.04	1.46	11.78	0.67	5.92	1.46	5.36	1.79	5.64	1.26
High ability, grades 10-12---------	59	16.87	1.02	11.93	0.87	12.92	0.64	13.67	1.96	13.30	1.79

NOTE: S.D.—standard deviation; A + R—Arithmetic and Reading.

Table 61. Correlation between the WRAT and selected criterion measures, by subtest for groups of extreme ability

Subtests of the Stanford and Metropolitan Achievement Tests	Arithmetic		Reading		Arithmetic + Reading	
	Low	High	Low	High	Low	High
Stanford Achievement Test						
Paragraph Meaning------------------------------------	.34	.38	.61	.50	.59	.50
Word Meaning------------------------------------	.10	.45	.60	.64	.45	.62
Language------------------------------------	.16	.57	.50	.74	.42	.74
Arithmetic Reasoning and Concepts-----------------	.58	.61	.38	.57	.55	.65
Arithmetic Computation-------------------------	.60	.62	.24	.60	.46	.68
Metropolitan Achievement Test						
Reading------------------------------------	.17	.23	-.17	.41	-.02	.40
Spelling------------------------------------	.23	.22	.00	.64	.13	.52
Language------------------------------------	.27	.41	.14	.43	.26	.54
Mathematical Computation-------------------------	.45	.72	.06	.26	.30	.67
Mathematical Analysis and Problem Solving--------	.35	.64	.06	.28	.25	.63

sample between the Arithmetic section of the WRAT and appropriate criterion variables. The use of the Reading section of the WRAT at the high school level for students of low ability must therefore be viewed with great caution.

DISCREPANCIES BETWEEN WRAT AND SAT GRADE LEVEL SCORES

A final analysis of the performance of the extreme ability groups concerns the discrepancy of grade levels as estimated by the WRAT from the grade level estimates provided by the group achievement test battery. Table 62 presents data on the most pertinent criterion measures. There seems to be a tendency for the Arithmetic section to underestimate the mathematics criteria. However, the magnitude of the underestimation is more serious for Arithmetic Computation than Arithmetic Reasoning and is probably significant only for the high-ability group.

The WRAT Reading section for the high-ability group tends to overestimate the language-related skills by more than one grade level. For the low-ability group, however, WRAT estimates are quite close to the criteria for Paragraph and Word Meaning, but again the WRAT overestimates performance on the SAT language subtest. These

Table 62. Discrepancies between the WRAT grade level scores and the Stanford Achievement Test grade level scores, by subtest for groups of extreme ability

SAT subtest	Low ability group		High ability group	
	Mean	D	Mean	D
WRAT Arithmetic test				
Arithmetic Reasoning and Concepts---	5.33	-0.08	8.68	-0.39
Arithmetic Computation-	5.52	-0.27	8.23	-0.74
WRAT Reading test				
Paragraph Meaning-----	4.70	+0.34	9.34	+1.40
Word Meaning-	5.19	-0.15	8.84	+1.90
Language-----	3.74	+1.16	9.32	+1.42

NOTE: D—algebraic difference.

findings are, of course, quite similar to those reported for the total sample, and they suggest that the WRAT can be considered applicable to extreme ability levels for the elementary and junior high school children.

VI. CONCLUSIONS

The basic questions raised in this study involved the validity of the WRAT as a brief measure of school achievement and its adequacy for accurately predicting actual school performance as measured by conventional, comprehensive achievement measures.

On the first issue it seems fair to conclude that the Arithmetic and Reading sections for both Levels I and II of the 1963 Revised Wide Range Achievement Test have reasonably good construct validity as judged by their relation to conventional group school achievement tests. While there is a considerable range in the magnitude of validity coefficients depending on the level and geographical region involved, there is sufficient evidence of substantial correlation with criterion measures at every age level investi-

gated to consider the WRAT a satisfactory brief estimate of school achievement.

Adequacy of the WRAT has also been investigated at extreme levels of ability, and it is concluded that the WRAT is quite satisfactory with high-ability students. With respect to students of low ability, the WRAT still seems satisfactory except for the use of the Reading section with high school students, where validity seems in doubt. Since the correlation of the WRAT with level of parental occupation is quite low, it may further be concluded that the test is applicable for children with widely differing socioeconomic backgrounds.

The question of grade level placement is rather complex. Here the WRAT must be rated as varying from being satisfactory to being in

considerable error, depending on the criterion used and the level at which the test is applied. Level I of both the Reading and Arithmetic sections of the WRAT overestimates both actual grade level and achievement on criterion measures from the Stanford Achievement Test. The tendency for the WRAT to overestimate is particularly serious for the Reading section, and since it is found in various area samples it cannot be dismissed as being due to geographic peculiarities.

Level II of the WRAT, on the other hand, tends to underestimate actual grade level but is quite close in predicting achievement levels on the Stanford Achievement and Metropolitan mathematics-related subtests. The WRAT Level II Reading test overestimated actual grade level for the junior high students but underestimated it for the senior high students. Likewise, performance on the SAT was underestimated, while performance on the Metropolitan criterion variables was overestimated.

Consideration of Jastak's age norms helps in some instances, such as providing more accurate grade level assignment at the junior high school level, but in other instances use of his tables increases the reported discrepancies.

Analysis of the interrelation between the WRAT Arithmetic and Reading sections and their relation to criterion variables suggests that it would be possible to rely upon the Reading section as the sole achievement estimate at the elementary and junior high levels. However, such reduction of the achievement estimate would seriously reduce the accuracy of the estimate for mathematics-related skills, particularly for the senior high school levels.

Replication of our analyses for the Monongalia County samples with the geographically dispersed control samples produced additional evidence of test validity but confirmed further that the grade level placement provided in the test manual must be used with caution, and may be subject to considerable geographical variation due to different educational policies and ability distributions.

In summary, it may be suggested that the Arithmetic and Reading sections of the WRAT provide useful estimates of school achievement but that restandardization of raw scores and their grade placement equivalents on the basis of the Health Examination Survey data would be desirable. Such restandardization ought to provide separate norms for broad geographic areas and, to be most useful, should provide separate norms for various age levels.

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APPENDIX I

LEVEL I OF THE WIDE RANGE ACHIEVEMENT TEST
FORM USED IN THE ELEMENTARY SCHOOL STUDY

Personal Data

The four lines at the top of the title page should be carefully filled out before the test is begun. This section provides necessary statistical information. The following uniform procedures should be observed in completing the blanks.

Name: Print last name first, then first name and initials. Never assume that you know how to spell a name (not even Smith). Have S spell or write it for you on the line provided on the test form. A correct name may save much time in filing and finding records when needed.

Birthdate: Example: 10-18-1955 for October 18,1955.

M. F.: Encircle M for male; F for female.

Chronological Age: List completed years and months up to age 15 years, 11 months. For example, a child born on 7-21-1957 was 6 yrs., 3 mos. old on 11-15-1963. At 16 yrs. and above, list age in years only, using the year completed on the last birthday. A person born on 10-18-1943 was 19 yrs. old on 6-5-1963.

School: Write down name of school attended at the time of the test.

Grade: Enter the grade he is attending at the time of the examination in the case of school children.

Date: Always record the date on the test. Example: 10-15-1960 for October 15, 1960.

Examiner: Print name of person administering test.

DO NOT COMPLETE ANY OTHER ITEMS.

Now have the child write his name on the line below the little boxes on the first page.

Test Instructions, Level I Reading

E should acquaint himself with the pronunciation of the words in the list. The pronunciation guide is provided for the examiner on page 6. The transcription symbols are those found in Webster's New Collegiate Dictionary. The E may use other standard dictionaries or the symbols of the International Phonetic Association in learning to pronounce the words.

Since this is primarily a reading test and not a test of speech or diction, unusual pronunciations due to colloquialism, foreign accent, and defective articulation are accepted as correct. An incorrect answer is any misreading due to improper sequence of letter sounds, confusion of phonetic values, and misplaced accent.

Always begin the administration with the word pronunciation test (75 words). Two copies of the test form may be used, one for S to read from, and one (with personal data filled out) for E to record on. Point to the first word "cat" and say: *Look at each word carefully and say it aloud. Begin here* (point) *and read the words across the page so I can hear you. When you finish the first line, go to the next line and then the next.* In the case of young children (5 to 7 yrs.), each word should be pointed to with a pencil while S attempts to read.

Time: 10 seconds per word.

The reading part should be administered with as few interruptions as possible. Any clearcut response should be accepted and scored as either right or wrong. The first time an error is made, S is asked to say the word again. His response is scored right, if he corrects himself on the second trial. From then on, the first response is scored as either right or wrong, unless S spontaneously corrects the error he has made.

If the response is not clear, E may ask S to repeat the word. The E should not intimate, by either motion or emotion, that he is dissatisfied with the answers. Spontaneous corrections are credited, but teaching, coaching, or questioning should be avoided.

The reading speed may be controlled by E. Saying "next" at the end of the time limit of 10 sec. is one way of controlling the rate of performance. Refusals to read within time limits should not always be accepted as evidence of failure. If S hesitates or says "I don't know this word", E should encourage S to try the word anyway or "take a guess" at it.

Testing Limits: 12 consecutive failures.

Recording:

    a. Underline the first letter if the word is correctly pronounced. Example: c̲at, b̲lock.

    b. Cross out the first letter of the mispronounced word. Example: ¢at, ฿lock.

    c. If S first mispronounces the word, then corrects his error, cross out the first letter and underline the second letter of the word. Example: ¢a̲t, ฿l̲ock. Score right.

    d. If S first pronounces the word correctly, then mispronounces it, underline the first letter and cross out the second letter of the word. Example: c̲át, b̲łock. Score wrong.

On the reading test, some Ss tend to skim over the words or produce a response that sounds superficially correct. The E should be alert to these near successes and score them wrong, or ask S to repeat if no clear-cut decision can be made.

Examples of such near successes are:

blăk for blŏk, ĕkskāp for ĕskăp, hūmíditi for hūmíd̆itĭ, kŏntémpori for kŏntĕmporari, akōv́ for ăľkŏv, kŏntĕmpūus for kŏntĕmptūus, benī for benĭń, prōtūb̆erăns for prōtūberăns, sĕntrí figăl for sĕntrĭfūgal, abĭsmăl for ăbĭzmal, sŭsĭngkt for sŭksĭngkt́, etc.

Pre-Reading Section

Whenever failures occur in the first line of the reading test, the three pre-reading parts of the subtest are administered as follows:

    1. Naming 13 letters: Say, *Read these letters aloud. What is this* or *What do you call this?* (Point to the first letter in the second row of capital letters printed above the word list: A B O, etc.) Point to each letter consecutively as S reads them.

    Time: 10 seconds per letter

    2. Recognizing 10 letters: Cover the word list with a sheet of paper, point to the first letter (A) in the top row on page 4 of the test form and say: *Find one just like this down here* (pointing to the row of letters underneath). The instructions may be repeated if necessary. Each letter should be pointed to.

    Time: 10 seconds per letter

    3. Two letters in name: Point to the first letter in the name which S has written on page one of the test form and say: *What do you call this*

letter? or *What is this letter? And this one?* (pointing to the next letter). The E may stop after the second correctly named letter.

    Time: 10 seconds per letter

Recording: Underline letter correctly named or recognized, cross out letter incorrectly identified or named within time limits.

Level I—Pronunciation Guide for Reading Test

1. cat..................... kăt
2. to .... tōō
3. see .... sē
4. book.................. bŏŏk
5. big..................... bĭg
6. eat..................... ēt
7. was.................... wŏz
8. red .... rĕd
9. him................... hĭm
10. letter.................. lĕt́ĕr
11. open................... ṓpĕn
12. how.................... hou
13. then .... thĕn
14. deep................... dēp
15. work .... wûrk
16. jar .... jär
17. awake................. ȧ wāḱ
18. size .... sīz
19. spell .... spĕl
20. lip...................... lĭp
21. block.................. blŏk
22. weather .... wĕth́ĕr
23. even................... ḗvĕn
24. finger.................. fĭnǵĕr
25. should .... shŏŏd
26. cliff.................... klĭf
27. felt..................... fĕlt
28. stalk .... stôk
29. tray .... trā
30. huge................... hūj
31. approve .... ȧ prōōv́
32. lame................... lām
33. plot.................... plŏt
34. struck .... strŭk
35. quality................ kwŏĺĭ tĭ
36. sour.................... sour
37. urge................... ûrj
38. abuse.................. ȧ būź *or* ȧ būś
39. collapse............... kŏ lăpś
40. exhaust............... ĕg zôst́
41. bulk .... bŭlk
42. residence............. rĕźĭ dĕns
43. clarify................. klăŕĭ fī
44. humidity.............. hū mĭd́ĭ tĭ
45. imply .... ĭm plī́
46. quarantine........... kwŏŕăn tēn
47. threshold .... thrĕsh́ōld *or* thrĕsh́hōld

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48. glutton.................. glŭt'' n
49. recession............. rē sĕsh'ŭn
50. participate .... pär tĭs'ĭ pāt
51. horizon................. hō rī'z'n
52. emphasis .... ĕm'fȧ sĭs
53. aeronautic............ ā'ĕr ō nô'tik *or* âr ō nô'tik
54. intrigue................. ĭn trēg'
55. luxurious .... lŭks ū'rĭ ŭs *or* lŭgz-
56. endeavor.............. ĕn dĕv'ĕr
57. persevere .... pûr'sĕ vēr'
58. rescinded............. rē sĭnd'ĕd
59. discretionary........ dĭs krĕsh'ŭn ĕr ĭ
60. mitosis .... mī tō'sĭs *or* mĭ-
61. repugnant............. rē pŭg'nȧnt
62. putative............... pū'tȧ tĭv
63. rudimentary .... rōō dĭ mĕn'tȧ rĭ
64. heresy................. hĕr'ĕ sĭ
65. usurp.................. ū zûrp' *or* ū sûrp'
66. novice .... nŏv'ĭs
67. audacious............. ô dā'shŭs
68. anomaly .... ȧ nŏm'ȧ lĭ
69. seismograph.......... sīz'mō grȧf
70. idiosyncrasy.......... ĭd'ĭ ō sĭng'krȧ sĭ
71. itinerary.............. ī tĭn'ĕr ĕr'ĭ *or* ī tĭn'ĕr ĕr ĭ
72. spurious .... spū'rĭ ŭs
73. miscreant............. mĭs'krē ȧnt
74. aborigines............. ăb ō rĭj'ĭ nēz
75. pseudonym .... sū'dō nĭm *or* psū'dō nĭm

Level I—Arithmetic

This test is composed of an oral and a written part. The oral part of the subtest consists of:

1. Counting 15 dots...................................... 8 points
2. Reading 5 digits .... 5 "
3. Showing 3 and 8 fingers............................. 2 "
4. Telling which number is more: 9 or 6; 42 or 28 .... 2 "
5. Three oral addition and subtraction problems .... 3 "

20 points

The written part consists of 43 computation problems.

Test Instructions:

Begin the testing with the written computations. In examining young children (5 to 7 yrs.) point to the first problem (1 + 1 =) and say: *Read this.* If the problem, including the signs, is read correctly, ask: *"What is the answer?"* When the answer is given, say: *Write it down on this line.* Then say: *Now read this* (pointing to 4 - 1 =) *and put the answer on the line* (point). *Next read this* (pointing to 6 + 2) *and put the answer under the line. Then read all the other problems in this row* (pointing) *and write your answers on or under the lines.*

If the child is unable to read the first problem (1 + 1 =), discontinue the written part and administer the oral parts according to the instructions outlined below.

Children of ages 5 to 7 yrs. and persons who obtain a score of less than 7 points on the written part, are given the oral parts of the subtest.

1. Counting 15 dots: Point to the dots printed at the top of page 2 of the test form and say: *Point with your finger and count these dots one by one beginning here* (S's left) *and going this way* (moving to the right, motion). *Count them aloud so I can hear you and tell me how many dots there are.*

2. Reading Numbers 3, 5, 6, 17, 41: Point to the numbers (printed upside down on the form) and say: *Read these numbers. What is this?* (pointing to the 3). *And this.* Etc.

3. Showing Fingers: Say: *Show me 3 fingers. Show me 8 fingers.*

4. Telling Which Number is More: Say: *Which is more, 9 or 6? Which is more, 42 or 28?*

5. Add and Subtract: Ask: (a) *If you have 3 pennies and spend 1 of them, how many have you left?* (b) *How many are 3 apples and 4 apples?* (c) *Jack had 9 marbles. He lost 3 of them. How many were left?*

Time Limits: 10 minutes for page of written computations.
1 minute for counting 15 dots.
1 minute for reading *all* five numbers.
1 minute for showing fingers (both problems).
1 · minute for telling which is more (both problems).
1 minute for each of the three oral problems.

Recording Oral Part:

Counting dots—underline the last number correctly counted and pointed to. Reading numbers, Showing fingers, Which is more, and Solving problems—underline numbers on form if correct; cross them out if incorrect.

DO NOT SCORE WRITTEN PART.

Answer Key - Arithmetic, Level I	Cumul. Points
Oral Part: Counts 15 dots, 1 point for each of the following:	
1, 2-3, 4-5, 6-7, 8-9, 10-11, 12-13, 14-15.............	8
Reads 5 numbers. . 5 pts. Fingers. . 2 pts.........	15
Which is more. . 2 pts. Answers to problems:2 7 6...	20

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APPENDIX II

LEVEL II OF THE WIDE RANGE ACHIEVEMENT TEST
FORM USED IN THE JUNIOR AND SENIOR HIGH SCHOOL STUDIES

Personal Data

The four lines at the top of the title page should be carefully filled out before the test is begun. This section provides necessary statistical information. The following uniform procedures should be observed in completing the blanks.

Name: Print last name first, then first name and initials. Never assume that you know how to spell a name (not even Smith). Have S spell or write it for you on the line provided on the test form. A correct name may save much time in filing and finding records when needed.

Birthdate: Example: 10-18-1955 for October 18, 1955.

M. F.: Encircle M for male; F for female.

Chronological Age: List completed years and months up to age 15 yrs., 11 mos. For example, a child born on 7-21-1957 was 6 yrs., 3 mos. old on 11-15-1963. At 16 yrs. and above, list age in years only, using the year completed on the last birthday. A person born on 10-18-1943 was 19 yrs. old on 6-5-1963.

School: Write down name of school attended at the time of the test.

Grade: Enter the grade he is attending at the time of the examination in the case of school children.

Date: Always record the date of the test. Example: 10-15-1960 for October 15, 1960.

Examiner: Print name of person administering test.

DO NOT COMPLETE ANY OTHER ITEMS.

Now have the child write his name on the line below the little boxes on the first page.

Reading Instructions

Before administering this test, study the pronunciation guide on page 5. The transcription symbols are those found in Webster's New Collegiate Dictionary. The E may use other standard dictionaries or the symbols of the International Phonetic Association in learning to pronounce the words.

Since this is primarily a reading test and not a test of speech or diction, unusual pronunciations due to colloquialism, foreign accent, and defective articulation are accepted as correct. An incorrect answer is any misreading due to improper sequence of letter sounds, confusion of phonetic values, and misplaced accent.

Always begin the administration with the word pronunciation test (74 words). Two copies of the test form may be used, one for S to read from, and one (with personal data filled out) for E to record on. Point to the first word "in" and say: *Look at each word carefully and say it aloud. Begin here* (point) *and read the words across the page so I can hear you. When you finish the first line, go on to the next line and then the next.* In the case of young children (5 to 7 yrs.), each word should be pointed to with a pencil while S attempts to read.

Time: 10 seconds per word.

The reading part should be administered with as few interruptions as possible. Any clearcut response should be accepted and scored as either right or wrong. The first time an error is made, S is asked to say the word again. His response is scored right, if he corrects himself on the second trial. From then on, the first response is scored as either right or wrong, unless S spontaneously corrects the error he has made.

If the response is not clear, E may ask S to repeat the word. The E should not intimate, by either motion or emotion, that he is dissatisfied with the answers. Spontaneous corrections are credited, but teaching, coaching, or questioning should be avoided.

The reading speed may be controlled by E. Saying "next" at the end of the time limit of 10 sec. is one way of controlling the rate of performance. Refusals to read within the time limits should not always be accepted as evidence of failure. If S hesitates or says "I don't know this word," E should encourage S to try the word anyway or "take a guess" at it.

Testing Limits: 12 consecutive failures.

Recording:

    a. Underline the first letter if the word is correctly pronounced. Example: c̲at, b̲lock.

    b. Cross out the first letter of the mispronounced word. Example: ȼat, ȼlock.

    c. If S first mispronounces the word, then corrects his error, cross out the first letter and underline the second letter of the word. Example: ȼa̲t, ȼl̲ock. Score right.

    d. If S first pronounces the word correctly, then mispronounces it, underline the first letter and cross out the second letter of the word. Example: c̲át, b̲ȼock. Score wrong.

On the reading test, some Ss tend to skim over the words or produce a response that sounds superficially correct. The E should be alert to these near successes and score them wrong, or ask S to repeat if no clear-cut decision can be made.

Examples of such near successes are:

blăk for blŏk, ĕkskāp for ĕskāp, hŭmĭdĭti for hŭmĭdĭti, kŏntempori for kŏntĕmporari, akōv′ for ăl′kōv, kŏntĕmpūus for kŏntĕmptūus, benī for bĕnīn′, prōtuberans for prōtuberans, sĕntri′figal for sĕntrifugal, abismál for äbizmál, sŭsingkt for sŭksingkt′, etc.

Pre-Word Level:

If S obtains a score of 10 points or less in the regular reading part, he should be asked to name the 13 capital letters printed above the word list and to name at least 2 letters in his name which he has written or printed on the line provided on the first page of the test form. One point is assigned for each of the 2 letters in his name and the 13 letters to be identified.

Level II—Pronunciation Guide for Reading Test

1. in.................... ĭn
2. milk................. mĭlk
3. tree................. trē
4. city................. sĭt′ĭ
5. animal.............. ăn′ĭ măl
6. himself............. hĭm sĕlf′
7. between............. bē twēn′
8. chin................. chĭn
9. split................ splĭt
10. grunt............... grŭnt
11. form................. fôrm
12. stretch............. strĕch
13. aboard............. ā bôrd′
14. theory............. thē′ō rĭ
15. escape............. ĕs kāp′ or ĭs kāp′
16. grieve............. grēv

17. contemporary..... kŏn tĕm′pō rĕr′ĭ
18. toughen............ tŭf′ĕn
19. contagious........ kŏn tā′jŭs
20. ethics............... ĕth′ĭks
21. image.............. ĭm′ĭj
22. triumph........... trī′ŭmf
23. conspiracy........ kŏn spĭr′ā sĭ
24. eliminate.......... ē lĭm′ĭ nāt
25. rancid.............. răn′sĭd
26. tranquillity....... trăn kwĭl′ĭ tĭ or trăng kwĭl′ĭ tĭ
27. deny............... dē nī′
28. humiliate.......... hū mĭl′ĭ āt
29. alcove............. ăl′kōv
30. scald.............. skôld
31. municipal......... mū nĭs′ĭ păl
32. desolate.......... dĕs′ō lĭt
33. mosaic............. mō zā′ĭk
34. bibliography...... bĭb′lĭ ŏg′rā fĭ
35. unanimous........ ū năn′ĭ mŭs
36. decisive.......... dē sī′sĭv
37. contemptuous..... kŏn tĕmp′tŭ ŭs
38. predatory......... prĕd′ā tō rĭ
39. benign............. bē nīn′
40. deteriorate....... dē tēr′ĭ ō rāt
41. protuberance..... prō tū′bĕr ăns
42. stratagem........ străt′ā jĕm
43. regime............ rā zhēm′
44. predilection...... prĕ′dĭ lĕk′shŭn
45. prevalence........ prĕv′ā lĕns
46. irascible.......... ī răs′ĭ b′l or ĭ-
47. peculiarity........ pē kū′lĭ ăr′ĭ tĭ
48. abysmal.......... ā bĭz′măl
49. pugilist........... pū′jĭ lĭst
50. soliloquize........ sō lĭl′ō kwīz
51. enigmatic......... ē′nĭg măt′ĭk or ĕn ĭg măt′ĭk
52. centrifugal........ sĕn trĭf′ŭ găl
53. emaciated........ ē mā′shĭ āt ĕd
54. oligarchy......... ŏl′ĭ gär kĭ
55. covetousness..... kŭv′ē tŭs nĕs
56. ingratiating....... ĭn grā′shĭ āt ĭng
57. coercion.......... kō ûr′shŭn
58. vehemence........ vē′ē mĕns
59. sepulcher......... sĕp′ŭl kēr
60. longevity......... lŏn jĕv′ĭ tĭ
61. evanescence...... ĕv′ā nĕs ĕns
62. beneficent........ bē nĕf′ĭ sĕnt
63. subtlety.......... sŭt′′l tĭ
64. succinct.......... sŭk singkt′
65. beatify........... bē ăt′ĭ fĭ
66. regicidal.......... rĕj ĭ sīd′ăl
67. schism........... sĭz′m
68. heinous.......... hā′nŭs
69. desuetude........ dĕs′wē tūd
70. egregious........ ē grē′jŭs or ē grē′jĭ ŭs
71. misogyny......... mĭ sŏj′ĭ nĭ or mī sŏj′ĭ nĭ
72. internecine....... ĭn′tĕr nē′sĭn
73. synecdoche....... sĭ nĕk′dō kē
74. ebullience........ ē bŭl′ĭ ĕns

Instructions: Say: *This is an arithmetic test. Turn to page 3 where it says Arithmetic, Level II and look at the problems printed below the heavy line* (hold test form up and point). *I'a like to know how many of the problems on this page you can figure out. Look at each problem carefully to see what you are supposed to do - add, subtract, multiply, or divide - and then put down your answer in the space on or under the lines. Should you wish to figure on the paper, you may use the empty spaces or the margins to write on. First do the top row, then the second row, then the third row, etc. The problems get more difficult as you go down the page. Don't spend too much time on any one problem. You can skip a problem if it is too difficult for you, but do as many as you can one by one. You will have 10 minutes. Now, go ahead and do as many as you can.*

Time: 10 minutes for page of computations.

DO NOT SCORE RESULTS.

Any person obtaining less than five points in the written part must be given the oral part as follows:

1. Counting 15 dots: Point to the dots printed at the top of page 2 of the test form and say: *Point with your finger and count these dots one by one beginning here* (S's left) *and going this way* (moving to the right). *Count them aloud so I can hear you and tell me how many dots there are.*

   (On top of page check once for correct count from 1 to 6 and again for correct count from 6 to 15.)

2. Reading numbers 3, 5, 6, 17, 41: Point to the numbers (printed upside down on page 2 of the test form) and say: *Read these numbers. What is this?* (Pointing to 3) *And this?* Etc.

3. Solving three problems: Ask: (a) *If you have three pennies and spend one of them, how many have you left?* (b) *How many are three apples and four apples?* (c) *Jack had nine marbles. He lost three of them. How many were left?*

   (Record answers to questions a, b, and c at the top of the test form page.)

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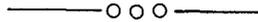
APPENDIX III

PERSONNEL PARTICIPATING IN THE DATA COLLECTION AND ANALYSIS

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Project Secretary

Margaret D. Auberle

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Naomi A. Patterson, Ph.D. (Fort Collins, Colo.)

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Anne Barr
Robert Beach
Linda Bosley
Virginia Bunner
Carillon Copeland
Margie Fox
Patricia Lowry
Felix Lunghi
Fred Miller
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Kent Staggers
William Sterling
Bonnie Tennant
Gladys White
Huey Wilson

Central Group
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Margaret Brand
Eleanor Collins
Maxine Glover
Eleanor Henry
Katherine Reed

Cheat Lake Group
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Mary McGregor
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Ethel Bagshaw
Marguerite Franklin
Julia Frum
Daun Johnson
Virginia Long
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Dorotha Morris
Ruth Morton
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Mildred Williams

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Mrs. William Fournier
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Mrs. Claude Kemper
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Sara E. Logan
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Dianne Perone
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Dennis Schrank
S. B. Schultz
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—————o o o—————

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