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THE VALIDITY AND USE OF THE WECHSLER PRE-SCHOOL AND
PRIMARY SCALE OF INTELLIGENCE IN PREDICTING
SCHOOL ACHIEVEMENT

by

Sam Campanella

A thesis submitted in partial fulfillment
of the requirements for the degree

of

MASTER OF SCIENCE

in

Psychology

Approved:

UTAH STATE UNIVERSITY
Logan, Utah

1968

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Sam Campanella

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ABSTRACT

The Validity and Use of the Wechsler Pre-School and
Primary Scale of Intelligence in Predicting
School Achievement

by

Sam Campanella

Utah State University, 1968

Major Professor: Dr. Glendon W. Casto
Department: Psychology

The purpose of this study was to evaluate the Wechsler Pre-School and Primary Scale of Intelligence for use in predicting school achievement. The Wechsler Pre-School and Primary Scale of Intelligence was administered to 22 children enrolled in the Operation Head Start Program in Logan, Utah. The Wide Range Achievement Test was administered five months later to the same 22 children. The scores on the Wechsler Pre-School and Primary Scale of Intelligence were correlated to the scores on the Wide Range Achievement Test.

On the basis of the .53 correlation between the Wechsler Pre-School and Primary Scale of Intelligence Full Scale IQ and the Wide Range Achievement Test Average Standard Score, the Wechsler Pre-School and Primary Scale of Intelligence was judged to be a useful instrument in predicting school achievement.

(26 pages)

CHAPTER I

INTRODUCTION

Teachers and parents should be equipped with specific information about each child's psychological readiness if they are to evaluate the child's ability to succeed at subsequent grade levels. Thut and Gerberich (1949, p. 380) state that "a teacher should possess extensive knowledge and understanding of each pupil if he is to contribute most effectively to the pupil's development. . ."

Don C. Dinkmeyer (1965, p. 355) views the role of the teacher as an assessor of general classroom skills.

It is basic to effective learning that the teacher understand the general range of capacities in the classroom and the range of learning experiences that are necessary if children of the same age are to achieve effectively in a specific field.

In order to aid the teacher in her assessment of each child's abilities and liabilities, psychological tests have been developed. The use of intelligence tests as a screening device for general abstract learning and problem solving abilities, has shown the greatest advancement in the area of psychological testing.

Stake (1960) investigated the criterion of tests used as screening devices for pre-school children. He concluded that measuring devices such as tests are useful for screening purposes.

John E. Anderson's (1939, p. 351) main precautions in the use and interpretation of early tests is "the earlier in the developmental course measurements are made, the less reliance can be placed on a single measurement or observation, if that measurement is used for predicting subsequent development."

The two most popular tests used to evaluate a child's intellectual development are the Stanford-Binet and the Wechsler Intelligence Scale for Children. Robinson and Robinson (1965) state that the Stanford-Binet is probably the best single test of mental ability while the Wechsler Intelligence Scale for Children is its chief rival.

Although the Stanford-Binet has been the most preferred test because of its low basal limits of two years it has its drawback in that it is essentially a test of verbal abilities. The WISC being a test of both verbal and performance abilities has its drawback in that its age limitations of five through fifteen render it useless as a test for pre-school children.

The Wechsler Pre-School and Primary Scale of Intelligence is a recent development in the area of intelligence testing. It was developed for the purpose of measuring the mental abilities of pre-school children. Its most outstanding feature when compared to the Stanford-Binet and the WISC is that it assesses both verbal and performance abilities and has a low enough basal limitation to be used with pre-school children.

The purpose of this study was to evaluate the Predictive Validity of the Wechsler Pre-School and Primary Scale of Intelligence to school achievement using as a criterion the Wide Range Achievement Test.

CHAPTER II

REVIEW OF LITERATURE

This review of literature will be limited to three general areas: (1) The concept of readiness and factors that influence school achievement. (2) Prediction of Achievement. (3) Organization Reliability and Validity of Wechsler's Pre-School and Primary Scale of Intelligence.

Readiness as It Relates to School Achievement

Readiness

The term readiness is a product of the concept of maturational growth. Binet used the maturational level as an indice for intelligence. Arnold Gesell and Jean Piaget exploited the idea of maturational growth by developing theories of child development around this concept.

The child's readiness as described by Gesell (1943, p. 4) is a function of his psychological processes being in harmony with his cultural milieu.

The child, as an organism and his environment, are inseparable. Each reacts upon the other. The reactions of the child are primary: He must do his own growing. The culture helps him to achieve: His developmental potentialities help him learn, but the processes of acculturation is always limited by the child's natural growth processes. Child and culture come into conflict when the two processes are not balanced and accommodated to each other.

Flavell (1963) indicates that every child is subject to critical periods which must be made use of if the child is to reach his optimal growth potential.

The prediction of school achievement hinges on our ability to determine the child's readiness. The detection of special learning problems is directly related to the areas of growth in which the child has not developed or matured.

Reading Readiness

Readiness for first grade seems to be heavily dependent upon the individual's reading readiness. Breckenridge and Vincent (1960) indicate in their book on Child Development that the primary function of the elementary grades is the teaching of reading. The first grader's achievement would therefore be contingent upon his reading readiness.

The concept of reading readiness as described by Anderson and Dearborn (1952, p. 50) ". . . appears to have been introduced in the 1925 Report of the National Committee on Reading."

Gessell (1943, p. 45) estimated 11 factors needed for reading readiness:

1. Normal vision
2. Normal hearing
3. General mental level of 6 to 6-1/2 years
4. Good motor coordination
5. Relatively even development in the various fields of behavior
6. Normal use and comprehension of language
7. Relatively mature personality
8. Articulation not more than slightly immature
9. Interest in and ability to follow stories of moderate length.

10. Ability to control attention on set tasks
11. Ability to adjust to the requirements of school-room routine

Factors Relating to Reading Difficulty

Anderson and Dearborn (1952, p. 501) describe the child lacking in reading readiness as ". . . small and frail, socially and emotionally immature, slow in language development and poor in motor control. . . ."

Frandsen (1957) indicates that the four primary factors for determining readiness are: (1) Age and mental age, (2) present stage of developmental sequence, (3) tests of readiness aptitude, and (4) interests.

Age and mental age. Terman (1916) used the mental age as an indice for mental growth. The child's MA is his present level of mental abilities as compared to his chronological growth. Morphett and Washburn (1931) found a correlation of .50 to .65 between mental age and ability to read.

Baer (1958, p. 19) found that comparison of early age school starters with late school starters reveals the following:

1. Older students tend to receive higher marks but that this differentiation becomes progressively smaller as the students advance through school.
2. Girls received better grades than boys in both age groups.
3. Children in the older age group received significantly higher marks on certain achievement tests than the younger group.

Developmental sequence. Flavel (1963) states that every

child is subject to specific developmental patterns and that in order for the child to perform certain tasks, he must first reach the developmental level necessary to complete the task. The four developmental levels first identified by Piaget are: (1) Sensory motor, (2) pre-operational thought, (3) concrete operations, and (4) formal operations.

Tests of readiness aptitude. These tests are essentially to determine if the child has had the necessary pre-school training that is needed to begin first grade work.

Interests. It is this particular factor that enables teachers not only to determine readiness but also a means of remediation of special learning problems.

Blair (1964, p. 11) has identified what he feels to be the 10 most likely factors which underlie reading difficulty.

1. Poor visual perception
2. Immature eye-movement habits
3. Poor auditory acuity
4. Low academic aptitude
5. Left handedness
6. Mixed hand eye dominance
7. Emotional factors
8. Lack of interest
9. Meager experiential background
10. Lack of reading experience

Gates (1936) found that there is a definite relationship between reading disabilities and emotional maladjustment. Out of 100 disabled readers Gates (1936, p. 206) found the following emotional problems:

1. 10 cases of nervous tension
2. 16 cases of defense behavior

3. 18 cases of aggressive reactions
4. 26 cases of recessive behavior
5. 14 cases of avoidance behavior
6. 33 cases of submissive reactions
7. 35 cases of extreme self consciousness

Factors for Determining Readiness

McCarthy (1955) studied 80 underage school children in order to determine variables which lead to school success. He concluded that standards for first grade entrance should involve more than consideration for intelligence.

Anderson and Dearborn (1952, p. 12) indicate that low mental age alone is a poor indicator of possible reading difficulty. Their alternative approach for identifying children with reading problems ". . . is in terms of a discrepancy between reading age and a composite of all the rest of the child's growth ages."

In summary the prediction of school achievement is contingent upon determining the mental maturity of the child while at the same time taking into account his social, emotional and physical development.

Prediction of Achievement

Prediction of Achievement

The usual procedure for prediction of success in subsequent grade levels is to administer an achievement test at the end of each school year. Obviously this would be inadequate for pre-school children because they have not had any formal training

which can be measured by an achievement test. In order to adequately predict first grade achievement we must use tools other than achievement tests.

Jastak and Jastak (1965, p. 15) argue that in order to successfully predict achievement in one area we must use a measuring device which measures more than just one specific area.

The most convenient method of measuring achievement is one that depends on criteria of internal consistency established by a factor analysis of a large number of entirely different abilities. The unimpaired abilities serve then as a useful reference point for the estimation of the degree of observed defect in the subject under study. The more reference points deviate in a diagnostically meaningful direction, the more objective and the more clearcut the inferences concerning the nature and degree of the impairment are likely to be.

Jastak and Jastak (1965) state that the standardized intelligence test is the best indice for prediction of school success and the detection of special learning disabilities.

Gates and Jersild (1949) state that tests of readiness are not only useful in prediction of school success but are also valuable tools in the detection of special learning problems.

The usefulness of psychological tests for screening has been a question concerning many investigators. Koppitz (1957) used the Bender Gestalt as a screening device for reading readiness and found it to be as useful as the Lee-Clark Readiness Test and the Metropolitan Readiness Test.

Koppitz, Sullivan, Blyth and Shelton (1959) reported on a study of predicting first grade achievement by use of the Bender Gestalt and the Human Figure Drawings. Their subjects were taken from the Greater Columbus Area. The tests were administered after the first six weeks of school, then correlated at the end of a seven month period to the Metropolitan Achievement tests. The multiple correlation of the Bender and the Human Figure Drawings to the Achievement Test was .65.

Arden K. Ruddell (1963) reported on a study of an "Evaluation of an In-Service Arithmetic Program." The subjects were 16 heterogeneously grouped first grade classes. Each S was administered an arithmetic concept inventory during the first three weeks of school. There were two groups of S's. Group A received arithmetic instruction from a teacher involved in an arithmetic in-service training program. Group B received arithmetic instruction from a teacher not involved in an arithmetic in-service training program.

The results of Ruddell's (1963, p. 233) study indicate:

1. Significant differences between the two groups supported an in-service training program.
2. A positive relationship between readiness and arithmetic achievement.
3. No significant differences in arithmetic achievement between boys or girls.

Ruddell's study would lend support to the notion that it may be possible to predict first grade achievement if we have an indication of the child's readiness.

Prediction of achievement is not necessarily limited to objective devices. Cline, Richards and Abe (1964) successfully predicted high school achievement through the use of a biographical information blank. Goldsmith (1922) initiated this procedure when he predicted the performance of salesmen with a biographical information blank.

Williams (1963) predicted school achievement through the use of ability scores and teacher ratings of likeability of the student.

In summary, prediction of school achievement can be accomplished through the use of psychological tests whether objective or subjective.

Organization, Reliability, and Validity
of the Wechsler Pre-School and Primary
Scale of Intelligence

The Wechsler Pre-School and Primary Scale of Intelligence was designed to evaluate the general abstract thinking and problem solving abilities of children between the ages of four to six and one-half years.

Organization

The WPPSI is quite similar to the WISC in form and content. It is composed of a verbal and a performance section, each of which has five subtests and one alternate test. According to Wechsler (1965) each test is a measure of different abilities which contribute to the total effect of general intelligence.

Standardization. The population sample of the WPPSI was stratified according to: (1) age and sex, (2) geographic region, (3) urban-rural residence, (4) color (white and non-white), and (5) father's occupation. This strata was established in order to maintain a representative sampling of the United States population as described by the 1960 U.S. Census Report.

Scaled scores and IQ. Each subtest of the WPPSI at each age level has a mean score of 10 and a standard deviation of three. The sum total of the verbal tests yield a verbal scaled score and the sum total of the performance tests yield a performance scaled score.

The IQ score has a mean of 100 and a standard deviation of 15. Table 1 is an interpretation of IQ's into percentiles as described in the WPPSI manual (Wechsler [1967, p. 15].)

Table 1. The relation of the WPPSI IQ's to percentile rank

IQ	Percentage	IQ	Percentage
135	99	96	40
128	97	92	30
125	95	90	25
119	90	87	20
113	80	81	10
110	75	75	5
108	70	72	3
104	60	65	1
100	50		

Table 2 is Wechsler's (1967, p. 16) classification of IQ's as described in the WPPSI manual.

Table 2. WPPSI intelligence classification

IQ	Classification
130 and above	Very Superior
120 - 129	Superior
110 - 119	Bright Normal
90 - 109	Average
80 - 89	Dull Normal
70 - 79	Borderline
69 and below	Mental Defective

Reliability

Table 3 shows the reliability coefficients and the standard error of measurement of the Verbal, Performance, and Full Scale IQ's of the WPPSI (Wechsler [1967, p. 13]) according to age levels. (See p. 14.)

Validity

A special study reviewed in the WPPSI manual, correlated the WPPSI to the Stanford-Binet Form L-M, the Peabody Picture Vocabulary Test, Form A, and the Pictorial Test of Intelligence. The subjects used in the study were from the Alum Rock Union Elementary School District, San Jose, California. Table 4 (see p. 14) shows the validity coefficients of the WPPSI to these tests of intelligence. (Wechsler [1967, p. 32].)

Table 3. Reliability and standard error of measurement of the WPPSI IQ's

Age	<u>Verbal Scale IQ</u>		<u>Performance Scale IQ</u>		<u>Full Scale IQ</u>	
	r	sem	r	sem	r	sem
4	.89	5.06	.84	5.09	.92	4.32
4-1/2	.89	4.99	.85	5.46	.92	4.14
5	.87	4.95	.89	5.20	.93	3.99
5-1/2	.90	4.68	.91	4.82	.94	3.34
6	.90	4.69	.91	4.76	.94	3.72
6-1/2	.89	5.07	.86	5.43	.92	4.14

Table 4. WPPSI correlations to the Stanford-Binet, Peabody Picture Vocabulary and Pictorial Test of Intelligence

	<u>S-B</u>	<u>PPVT</u>	<u>PTI</u>
<u>WPPCI</u>	.75	.58	.64

The above study would seem to indicate a relatively high correlation between the WPPSI and other tests of intelligence. In order to assess the predictive validity of the WPPSI to school achievement, it would require a study correlating the WPPSI to an achievement test.

Summary

In summary predictive tools need to be thoroughly investigated before we use them to assess possible future achievement. To summarize the review of literature it would seem that the prediction of school achievement is dependent upon: (1) the child's readiness, (2) the type of tool used to predict, and (3) the tested validity of the predictive tool.

In this study, the WPPSI, which has both a verbal and performance subtests, and the WRAT and achievement test of reading, spelling and arithmetic were administered to children enrolled in the Operation Head Start Program in Logan, Utah.

The study attempted to answer the following question:
Can the Wechsler Pre-School and Primary Scale of Intelligence predict pre-school children's future level of achievement in reading, spelling and arithmetic, as measured by the Wide Range Achievement Test?

CHAPTER III

METHODS AND PROCEDURES

Population

The subjects were chosen at random from the Operation Head Start Program located at the Wilson Elementary School in Logan, Utah. The children used in this study were generally from the middle socio-economic class.

Subjects

The 22 children used in this study were chosen from the Head Start classes at the Wilson Elementary School in Logan, Utah. Their ages ranged from four years, eight months, to six years.

Instruments

The tests used in this study were the Wechsler Pre-School and Primary Scale of Intelligence, and the Wide Range Achievement Test. The WPPSI is composed of a verbal and performance section, each of which has five subtests and one alternate test. The WRAT is composed of three achievement tests; reading, spelling, and arithmetic. Both the WPPSI and the WRAT have a population mean of 100 and a standard deviation of 15, therefore both tests are statistically compatible.

Procedures

The WPPSI was administered in the mornings, to each S, during the last two weeks of the Head Start Program. All the subjects were tested at the Wilson School during regular school hours. The testing of the WPPSI was done between June 15, 1967, and June 30, 1967.

Five months after the administration of the WPPSI, the subjects were tested with the Wide Range Achievement Test. Each S was tested in his respective school. All S's were not located in the same school during this time, therefore the WRAT was administered in five different elementary schools. The testing of the WRAT was done between November 15, 1967, and November 30, 1967.

Treatment of Data

The WPPSI Full Scaled Score, Full Scaled IQ, Performance IQ and Verbal IQ were correlated to the WRAT's mean Scaled Score, Spelling Scaled Score, Reading Scaled Score, and Arithmetic Scaled Score.

The group mean and standard deviation was computed for WPPSI Full Scaled Score, Full Scaled IQ, Performance IQ and Verbal IQ. The group mean and standard deviation was also computed for the WRAT Average Scaled Score, Spelling Scaled Score, Reading Scaled Score, and Arithmetic Scaled Score.

CHAPTER IV

RESULTS

This chapter will present the findings of this study as they pertain to the question of the WPPSI as a predictor of pre-school children's achievement on the WRAT.

The means and standard deviations for the WPPSI and the WRAT are presented in Table 5.

Table 5. Means and standard deviations of the WPPSI and WRAT

<u>WPPSI</u>	Mean	S.D.	<u>WRAT</u>	Mean	S.D.
Full Scale Score	99.81	18.65	Average SS	90.86	14.69
Full Scale IQ	99.81	14.68	Arithmetic SS	94.09	12.92
Verbal Scale IQ	98.59	12.96	Spelling SS	103.77	26.28
Performance Scale IQ	101.18	13.56	Reading SS	75.77	18.41

The mean WPPSI Full Scale Score and IQ were 8.9 points higher than the WRAT Average Standard Score. The WPPSI Full

Scale IQ range for the S's was 70 to 122. The WRAT Average Standard Score range for the S's was 62 to 116.

The correlations between the WPPSI Scale IQ's and the WRAT Average Standard Score are presented in Table 6.

Table 6. Correlations between the WPPSI Scale IQ's and the WRAT Average Standard Scores

<u>WPPSI</u>	<u>WRAT</u> Average Standard Score
Full Scale Score	.57
Full Scale IQ	.53
Verbal Scale IQ	.39
Performance Scale IQ	.59

The correlation of .53 (significant at the .01 level) between the WPPSI Full Scale IQ and the WRAT Average Standard Score supports the notion that the WPPSI can predict achievement on the WRAT.

According to the results presented in Table 6, the WPPSI Verbal Scale IQ does not predict achievement on the WRAT but the Performance Scale IQ predicts achievement on the WRAT above the .01 level.

The correlation between WPPSI Scale IQ's and the WRAT subtests standard scores are presented in Table 7.

Table 7. Correlations between WPPSI Scale IQ's and the WRAT Arithmetic, Spelling and Reading Standard Scores

<u>WPPSI</u>	<u>WRAT</u>		
	Arithmetic SS	Spelling SS	Reading SS
Full Scale Score	.42	.55	.36
Full Scale IQ	.43	.54	.35
Verbal Scale IQ	.40	.40	.20
Performance Scale IQ	.38	.62	.46

The WPPSI Full Scale IQ predicted WRAT Arithmetic achievement above the .05 level and WRAT Spelling achievement above the .01 level. The Verbal Scale of the WPPSI did not predict any WRAT achievement and had the lowest correlation, .20, with the WRAT Reading Standard Score. The WPPSI Performance Scale IQ was the best predictor of WRAT Spelling achievement and the only WPPSI IQ to predict WRAT Reading achievement.

The correlations reported significant at the .05 level and beyond are useful only in making group predictions.

CHAPTER V

DISCUSSION

The results indicate that there is a statistically significant correlation between the scores obtained on the WPPSI and the scores obtained on the WRAT.

The WPPSI Full Scale Score and IQ predicted WRAT achievement in both arithmetic and spelling. The WPPSI Performance IQ was the best measure to predict WRAT spelling achievement and the only measure to predict WRAT reading achievement. The WPPSI Verbal Scale did not predict WRAT achievement.

The high correlation between the WPPSI Performance Scale IQ and the WRAT Spelling Standard Score would seem to be almost expected when we note that the spelling section of WRAT, for children, is essentially a performance test requiring perceptual speed and memorization. This is very similar to the WPPSI Performance tests which require perceptual speed and memorization.

The WPPSI Performance Scale IQ was the only measure of intelligence to predict WRAT reading achievement. This would certainly suggest that reading achievement is composed of more than just verbal abilities. The results would also lend support to the statement of Jastak and Jastak (1965) that in order to successfully predict achievement in one area, we

must use a measuring device which measures more than just one specific area.

The inability of the WPPSI Verbal Scale IQ to predict achievement in any area of the WRAT would suggest that the Verbal test of the WPPSI may be measuring abilities very much different than those measured by the WRAT.

Although the WPPSI Verbal Scale IQ did not predict achievement on the WRAT it does not necessarily mean that it cannot predict school achievement. The validity of the WRAT as a measure of school achievement should be considered when we analyze the results of this study.

Prediction of first grade achievement is extremely difficult when we consider that the children at this age level are still in the process of intellectual and physical growth. It would be wise to keep in mind the statement by John E. Anderson (1939, p. 351) that "the earlier in the developmental course measurements are made, the less reliance can be placed on a single measurement. . . ."

A possible approach to the prediction of first grade achievement may be to take into consideration the present level of maturational growth in all areas of development. This would include his mental, social, emotional, and physical development.

On the basis of the correlation between the WPPSI Full Scale IQ and the WRAT Average Standard Score, it is concluded that the WPPSI is a useful instrument in predicting

pre-school children's achievement on the Wide Range Achievement Test.

SUMMARY

The purpose of this study was to evaluate the WPPSI for use in predicting school achievement. The WPPSI was administered to 22 Head Start children in Logan, Utah. The WRAT was administered five months later to the same 22 children. The scores on the WPPSI were correlated to the scores on the WRAT.

The correlation of .53 (significant at the .01 level) between the WPPSI Full Scale IQ and the WRAT Average Standard Score supports the notion that the WPPSI can predict achievement on the WRAT. The results of the study also indicated the WPPSI Performance IQ to be a better predictor of WRAT achievement between the WPPSI Full Scale IQ.

On the basis of the correlation between the WPPSI Full Scale IQ and the WRAT Average Standard Score, the WPPSI was judged to be a useful instrument in predicting achievement on the WRAT.

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VITA

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Biographical Information:

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Education: Attended elementary school in Newark, New Jersey; graduated from Irvington High School in 1961; received the Bachelor of Science degree from Utah State University, with a major in Psychology, in 1967; did graduate work in Psychology at Utah State University, 1967-1968.

Professional Experience: School Psychologist for the Pocatello School District, Pocatello, Idaho, 1967-1968.