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Subtest Estimates of the WISC Full Scale IQ's for Children

A research study of the use of Scaled Scores on the Vocabulary and Block Design subtests of the Wechsler Intelligence Scale for Children (WISC) for predicting Full Scale IQ's by socioeconomic, sex, and ethnic (Anglo, Negro, and Mexican-American) factors. The relative predictive power of these two subtests is compared with other subtest dyads among 11 of the 12 subtests of the WISC. Regression equations are provided for these two subtests with optimal prediction of Full Scale IQ by ethnic group and for the total sample of 1,310 children studied.

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FOREWORD

The Health Examination Survey (HES) is one of the major continuing programs of the National Center for Health Statistics, an agency authorized by Congress to provide statistical information on the amount, distribution, and effects of illness and disability in the United States. The collection, analysis, and publication of data obtainable *only* through direct examination of people is the particular task of the HES. Examination programs for national samples of segments of our population began in November 1959 with a survey of adults between the ages of 18 and 79 (designated Cycle I). Mobile examination centers with their teams of specialists began traveling throughout the United States, setting up in diverse locations to examine individuals selected in the national probability sample. The basic pattern of operation has continued through successive surveys and has included examinations of a sample of children 6-11 years of age (Cycle II) and of adolescents 12-17 years of age (Cycle III).

While the initial effort in the adult examination program was devoted primarily to obtaining information on several prevalent chronic diseases, when attention was directed toward younger age groups, the concern logically shifted to factors related to growth and development. At this point it became obvious that social and personal adjustment in the context of school and home is an integral part of healthy growth. Health problems of the developmental years are primarily those of retarded and disrupted growth, and the nature of personality development, as evidenced in acquisition of communication skills, general mental abilities, and interpersonal relationships, must be considered in assessment procedures.

Because time and physical limitations must inevitably be imposed on a comprehensive health survey, no one health factor—whether dental, physiological, physical, or psychological—can be evaluated as thoroughly as it would be in a typical clinical or research setting. As a case in point, sound, widely accepted, brief tests of the psychological factors found to be important to the goals of the survey did not exist. To cover the necessarily broad area, it was decided that the battery should be composed of either the briefest tests available or abbreviated and specially administered versions of widely used psychological instruments. The resulting battery, used in the children's survey and continued into the adolescent's survey, reflects the more frequent decision to use parts of longer tests and special administration procedures. Incumbent on the user of abbreviated tests is the need to conduct methodological studies to determine relationships between the new form and the original established instrument or other criterion measures or both. In the case of psychological data, the National Center for Health Statistics has attempted to fulfill this obligation primarily through contracts with several scientists. The study reported here is the result of one such contract.

This report was written under contract with the National Center for Health Statistics, Public Health Service Grant #PH 43-67-756. The report does not deal with the issue of the validity of the WISC in measuring the intelligence of children from various socioeconomic levels and ethnic groups.

The results from this study provide a means of estimating the Full Scale IQ level of children aged 6-11 years examined in the Cycle II Health Examination Survey for the Wechsler Intelligence Scale for Children (WISC) based on the Vocabulary and Block Design subtests of the WISC which were used in Cycle II of the Health Examination Survey.

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SYMBOLS

Data not available	---
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SUBTEST ESTIMATES OF THE WISC FULL SCALE IQ'S FOR CHILDREN

Jane R. Mercer, Ph. D., and Joyce M. Smith[a]

INTRODUCTION

In Cycle II of the Health Examination Survey of noninstitutionalized children of the United States aged 6-11, the Vocabulary and Block Design subtests of the Wechsler Intelligence Scale for Children (WISC) were administered. The purpose of this report, written under contract with the National Center for Health Statistics, is to evaluate the use of these two subtests as the basis for estimating the Full Scale IQ's of children aged 6-11 from various socioeconomic levels and ethnic groups and to determine the amount and direction of error likely to occur if these tests are used to estimate the rate of subnormal intelligence in these populations. The report does not deal with the validity of the WISC IQ's as a measure for children from socioculturally nonmodal backgrounds.

There are various methods for estimating Full Scale IQ's from subtests: prorating the sum of the scaled scores, simple regression, and multiple regression. Silverstein (1967a) used all three methods to predict Full Scale IQ's from a short form consisting of Vocabulary and Block Design. He found that while the error associated with proration always exceeded that of either simple or multiple regression, the improvement in prediction was relatively small (Silverstein, 1967d). Simple and multiple regression were the methods used in the present study.

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STUDY DESIGN

Sample

The sample consisted of 1,310 children aged 6-11 attending public elementary schools in Riverside, California, during the school year 1967-68.

These children were from three different ethnic groups: 505 were English-speaking Caucasians (hereafter called "Anglo"); 487 were of Mexican-American heritage; and 318 were Negro.

The Mexican-American and Negro children included all the children aged 6-11 who attended three de facto segregated elementary schools prior to September 1966. The Anglo children were randomly selected from the student populations of 11 elementary schools which were predominantly Anglo prior to comprehensive school desegregation which began in September 1966. Of the total sample, 1,270 were enrolled in regular classes and 40 were enrolled in classes for the educable mentally retarded.

Table 1 presents the age, sex, and socioeconomic status of the children. Socioeconomic status is based on the occupation of the head of the household in which the child was living. Occupations were categorized into three levels, using the Duncan Socioeconomic Index (Reiss, 1961). Low-status occupations are those rated 0-29 on the Index; middle-status occupations are those rated 30-69; and high-status occupations are those rated 70 or higher.

Although the children in the sample were not

Table 1. Distribution of the 1,310 sample schoolchildren, by sex, age, socioeconomic status, and ethnic group

Sex and age	Socioeconomic status[1]											
	Total	Low (0-29)	Middle (30-69)	High (70+)	Total	Low (0-29)	Middle (30-69)	High (70+)	Total	Low (0-29)	Middle (30-69)	High (70+)
Both sexes	Anglo				Mexican-American				Negro			
Total	505	95	278	132	487	413	74	0	318	240	62	16
Percent each social status	100	18.8	55.0	26.1	100	84.8	15.1	0	100	75.5	19.5	5.0
Boys												
Total	264	56	144	64	241	205	36	0	156	125	24	7
6 years	28	9	14	5	29	24	5	0	20	15	4	1
7 years	62	13	36	13	53	43	10	0	31	20	8	3
8 years	53	13	24	16	41	32	9	0	30	26	4	0
9 years	37	7	19	11	44	39	5	0	26	24	0	2
10 years	42	7	27	8	39	35	4	0	25	20	4	1
11 years	42	7	24	11	35	32	3	0	24	20	4	0
Girls												
Total	241	39	134	68	246	208	38	0	162	115	38	9
6 years	32	9	17	6	31	27	4	0	21	15	4	2
7 years	38	1	22	15	43	34	9	0	33	22	10	1
8 years	47	5	27	15	34	31	3	0	28	24	3	1
9 years	45	5	23	17	55	44	11	0	38	24	12	2
10 years	48	10	30	8	49	42	7	0	23	19	3	1
11 years	31	9	15	7	34	30	4	0	19	11	6	2

[1] Socioeconomic status was classified using the Duncan Socioeconomic Index. Occupation of the head of the household score: 0-29, low status; 30-69, middle status; and 70+, high status.

a random selection from the general population of the city, the distribution of socioeconomic statuses within each ethnic group for the sample approximates the socioeconomic distribution for each ethnic group in the city of Riverside. A household survey of a stratified area probability sample of 2,661 housing units conducted 3 years prior to the testing found that 25 percent of the Anglos lived in low-status families, 54 percent in middle-status families, and 22 percent in high-status families when the same classification categories on the Duncan Socioeconomic Index were used as those presented in table 1. Thus, there were relatively more Anglo children in the sample from high-status families and fewer from low-status families than there were in the Riverside population. In the same survey, 78 percent of the Mexican-Americans in the city were low status, 20 percent were middle status, and 2 percent were high status, while 74 percent of the Negroes were low status, 17 percent were middle status, and 5 percent were high status. Thus, the sample percentages also approximate the percentages of children from these ethnic groups in the three status levels in Riverside. Relatively few Mexican-American and Negro families in Riverside had a head of the household with an occupation rated 70 or higher on the Index, and there were no Mexican-American children and only 16 Negro children in the sample from such families. Therefore, no separate analyses of the performance of high-status Mexican-American and Negro children were made.

Testing Procedures

Each child was tested during the regular school day. Because some school buildings did not have testing rooms available that were quiet and undisturbed, trailers were rented and moved from campus to campus. Some trailers contained four testing rooms and others contained a single room, depending upon the number of children to be tested at a particular school. Field testing took place from February 15 to June 15, 1967.

Psychometrists were recruited through professional organizations, the University of California personnel office, and contacts with college campuses in the vicinity of Riverside. The 11 psychometrists who conducted the testing had all been trained to administer the WISC in regular college courses in psychometric testing. They were supervised by a school psychologist certified by the State of California. An intensive 3-day psychometric training session was conducted to assure that the Vocabulary and Block Design subtests would be administered and scored in a fashion identical to that used in Cycle II of the Health Examination Survey. Psychometrists were trained to use standard pronunciations of the words in the Vocabulary test following the "Pronunciation Guide" used in Cycle II, and test administration and scoring were monitored by the certified school psychologist throughout the fieldwork in accordance with the guidelines developed for Cycle II.

Information on the age, grade, and ethnic group of each child was secured from school records. Each child's age was verified in an interview with his parents. Information about the occupation of the head of the household in which each child was living was also obtained during the parent interview.[b] All data were keypunched, checked for internal consistency, and stored on magnetic tape.

[b]The parent interview was conducted as part of the Riverside Desegregation Study supported by the California State Department of Education, McAteer M6-14.

Relationships of Age, Sex, Socioeconomic Status, and Ethnic Group to IQ

In order to determine which of the four characteristics being investigated was most highly correlated with IQ, three stepwise multiple regressions were run using Full Scale IQ, Verbal IQ, and Performance IQ as the dependent variables and age, sex, socioeconomic status, and ethnic group as independent variables. Ethnic group was dichotomized, Anglo vs. Mexican-American and Negro; socioeconomic status index scores were dichotomized, 0-29 vs. 30+; and age was dichotomized, 6-8 vs. 9-11. Table 2 presents the results of these analyses.

Ethnic group was the single best predictor of IQ. It correlated .428, .407, and .328 with Full Scale, Verbal, and Performance IQ, respectively. Individual correlations between socioeconomic status and IQ were almost as high: .377, .344, and .290. Together, ethnic group and socioeconomic status correlated .457 with Full Scale IQ, .428 with Verbal IQ, and .350 with Performance IQ. All multiple correlations were statistically significant beyond the .01 level of probability. Knowledge of sex and age added very little to the accuracy of prediction of IQ after the effect of ethnic group and socioeconomic status were taken into account. The primary relationship of age with intellectual development was taken into account by the conversion of raw test scores to age-specific scaled scores at 4-month age intervals. It was concluded that the three ethnic groups should be analyzed separately, looking at socioeconomic levels within an ethnic group.

ANGLO CHILDREN

Age

Although the sample of Anglo children was a random selection from the elementary school population of 11 elementary schools, the older children had a higher mean Full Scale and Verbal IQ than the younger children. This was not true for the Performance IQ. Table 3 presents the mean scores, standard deviations, and F ratios.

There were 34 children in the Anglo sample with a Full Scale IQ of 84 and below; 39 with a

Table 2. Stepwise multiple regressions with WISC IQ's as the dependent variables and age, sex, ethnic group, and socioeconomic status as independent variables, 1,310 sample schoolchildren

Independent variables	Full Scale IQ		Verbal IQ		Performance IQ	
	r[1]	R[2]	r[1]	R[2]	r[1]	R[2]
Ethnic group	[3].428	[3].428	[3].407	[3].407	[3].328	[3].328
Socioeconomic status	[3].377	[3].457	[3].344	[3].428	[3].290	[3].350
Sex	[4].067	[3].461	[3].081	[3].435	.034	[3].351
Age	.002	[3].462	.029	[3].437	.005	[3].352

[1] r: Zero order product moment correlation coefficients.
[2] R: Multiple correlation coefficients.
[3] Significant at .01 level.
[4] Significant at .05 level.

Table 3. Mean IQ's, standard deviations, and F ratios for Anglo children, by age

Mean IQ and standard deviation	Age in years						F ratio
	6 (N=60)	7 (N=100)	8 (N=100)	9 (N=82)	10 (N=90)	11 (N=73)	
Full Scale IQ							
Mean	101.9	104.3	105.1	104.9	109.8	107.5	2.57
SD	10.4	15.2	16.0	15.3	15.2	15.5	$p < .02$
Verbal IQ							
Mean	98.4	102.4	103.5	102.5	108.3	105.2	3.71
SD	11.3	14.8	15.8	15.6	14.1	14.9	$p < .01$
Performance IQ							
Mean	104.7	106.1	106.3	106.7	110.7	108.7	1.56
SD	10.5	15.7	16.3	15.1	16.3	16.1	NS

Verbal IQ of 84 and below; and 31 with a Performance IQ of 84 and below. The children with low IQ's were evenly distributed throughout the six age groups. However, there were more children aged 10 and 11 with IQ's above 125 than there were at other ages. This accounts for the higher average IQ of the older children in the sample. Because of these age differences, subsequent analyses will study children's performance by age group.

Sex Within Socioeconomic Status

The IQ's and subtest scores of Anglo girls were compared with those of Anglo boys within the three socioeconomic levels. Table 4 presents the mean scores for each sex, and the values of t when the means were compared.

Four of the 42 sex comparisons were significant at the .05 level and four were significant at the .01 level, slightly more than would be expected by chance. Four of the significant differences were for low-status children, and in each case, boys scored significantly higher than girls. There was no pattern to the other differences except that middle- and high-status girls were significantly higher on Coding ($p < .01$).

Differences across socioeconomic levels, however, were large and consistent. The mean Full Scale, Verbal, and Performance IQ's for each sex

Table 4. Mean IQ's and subtest scores for Anglo children, by socioeconomic status and sex and mean IQ's across socioeconomic status

Mean IQ and subtest	Low status			Middle status			High status			Comparison across socioeconomic status	
	Boys (N=56)	Girls (N=39)	*t*	Boys (N=144)	Girls (N=134)	*t*	Boys (N=64)	Girls (N=68)	*t*	Boys (N=264) *F*	Girls (N=241) *F*
Mean IQ											
Full Scale IQ	100.0	95.2	1.5	105.6	105.3	.1	109.7	110.0	.2	[1]6.55	[1]13.36
Verbal IQ	98.1	92.0	[2]2.0	103.7	102.6	.6	108.8	107.2	.8	[1]7.74	[1]15.35
Performance IQ	102.1	99.5	.8	106.6	107.2	.3	108.7	111.4	1.2	[2]3.12	[1]7.75
Verbal subtests											
Information	9.3	8.3	1.7	10.8	10.2	1.4	11.7	11.3	.7	[1]8.35	[1]12.57
Comprehension	9.5	7.5	[1]3.4	9.8	9.4	1.1	10.6	9.6	1.8	1.80	[1]6.53
Arithmetic	10.0	9.8	.3	10.9	10.7	.5	11.9	11.6	.8	[1]5.68	[1]5.12
Similarities	10.1	9.7	.6	11.2	11.7	1.2	11.7	11.7	.1	[2]3.76	[1]6.39
Vocabulary	10.5	8.8	[2]2.4	11.2	10.8	1.1	12.8	11.7	[2]2.2	[1]7.26	[1]10.37
Digit span	8.8	8.4	.6	9.4	9.7	.7	9.5	10.8	[2]2.5	1.05	[1]8.42
Performance subtests											
Picture Completion	10.7	8.6	[1]3.3	10.8	10.2	1.5	10.4	10.3	.2	.32	[2]4.43
Picture Arrangement	10.6	9.6	1.5	11.0	11.2	.6	11.0	11.9	1.7	.40	[1]6.74
Block Design	10.4	9.7	.9	11.5	11.0	1.3	12.4	11.6	1.6	[1]6.25	[1]4.72
Object Assembly	10.2	10.9	1.2	11.1	11.0	.3	11.9	11.7	.5	[1]5.49	1.40
Coding	9.6	10.7	1.5	10.3	11.6	[1]3.5	10.5	12.5	[1]4.4	1.56	[2]4.06

[1] Significant at .01 level.
[2] Significant at .05 level.

rose consistently from low status to high status, and all increases were statistically significant. Four of the means of the verbal subtests increased significantly with socioeconomic level for boys and all six verbal subtests increased significantly for girls. The performance subtests were not as influenced by socioeconomic status as the verbal subtests. Only two of the increases were significant for boys, although four of the increases were significant for girls.

It is clear that socioeconomic level and IQ are related. In general, scores on the WISC were positively correlated with socioeconomic level. This was especially true for verbal abilities. Therefore, we conclude that socioeconomic differences as well as ethnic and age differences should be held constant when analyzing the efficiency of using various combinations of subtests as short forms of the WISC for Anglo children.

Intercorrelation of Scores for Children Aged 7 and 10

The *WISC Manual* contains tables presenting the intercorrelations of subtest scores with each other and with Full Scale, Verbal, and Performance scaled scores for children aged 7½ and 10½ on whom the test was normed (Wechsler, 1949). Tables I and II in appendix I present the comparable intercorrelations for Anglo children aged 7 and 10 in the present study. When the z test of the significance of difference between r's (Guilford, 1965) was used to test the difference between each correlation and its counterpart in the WISC Manual, there were four correlations in the 89 comparisons for children aged 7 in which the correlation in the Anglo sample was significantly lower ($p < .05$) than the comparable correlation for the 200 children on whom the test was normed. There was one instance in which the correlation for the Anglo sample was significantly higher than that for the children in the standardization sample. There was no pattern to the differences.

When the correlations for children at age 10½ on whom the test was normed were compared with the correlations for the 10-year-old Anglo children in the present sample, there were many more significant differences than for the 7-year-old children. There were 26 correlations for the Anglo children in the present sample which were significantly lower ($p < .05$) than the comparable correlations in the standardization sample. Only two correlations were significantly higher in the Anglo sample than in the standardization sample. Wechsler did not publish the intercorrelations for children at ages 6, 8, 9, and 11; therefore, no comparisons were possible.

In general, it appears that the intercorrelations of subtests scores with each other and with Full Scale, Verbal and Performance IQ's are lower for the present Anglo sample than for the children on whom the test was originally normed.

Predicting Full Scale, Verbal, and Performance IQ's from Vocabulary and Block Design Scaled Scores

In Cycle II of the Health Examination Survey, only the Block Design and Vocabulary subtests of the WISC were administered. Stepwise multiple regressions were performed with Full Scale, Verbal, and Performance IQ's as the dependent variables.[c] The scaled scores for Block Design and Vocabulary were independent variables, within the three socioeconomic levels described earlier, yielding multiple correlations ranging from .642 to .883 (table 5). The multiple correlations with Full Scale IQ were highest at all status levels. The multiple correlations with Verbal IQ ranked second and those with Performance IQ ranked third. The multiple correlations for low-status and middle-status children were of similar magnitude, but those for high-status children tended to be lower. As would be expected, standard errors were smallest when predicting Full Scale IQ. They increased when predicting Verbal IQ, and were largest when predicting Performance IQ. If an investigator was primarily interested in the Verbal IQ and Performance IQ, he would use two verbal subtests and two performance subtests, respectively, as the basis for prediction.

Multiple correlations are also presented using Block Design and Vocabulary as independent variables and Full Scale, Verbal, and Performance IQ's as the dependent variables within three age groups: 6 and 7 years; 8 and 9 years; and 10 and 11 years. The multiple correlations were of approximately the same magnitude as those obtained within socioeconomic level.

As in the case of multiple correlations within socioeconomic levels, correlations within age groups were slightly higher for Full Scale IQ, followed by those for Verbal IQ, and then those for Performance IQ. Since R is inversely related to the standard error, standard errors were slightly smaller when predicting Full Scale IQ than when predicting Verbal IQ; they were highest when predicting Performance IQ.

When the entire group of Anglo children was analyzed without regard for age or socioeconomic status, the multiple correlation of the two subtests was .867 with Full Scale IQ, .839 with Verbal IQ, and .798 with Performance IQ. Standard errors were 7.50, 8.15, and 9.19 IQ points, respectively. Thus, prediction is not markedly improved by using subgroups of Anglo children based on social status or age.

When the beta coefficients and constant terms presented in table 5 were inserted in the multiple regression equation with an individual child's subtest scaled scores, the solution yielded the best prediction of IQ for that child. For example, to predict the Full Scale IQ of a low status child:

Predicted IQ = constant term, 49.82
+ (2.62 X Vocabulary Scaled Score)
+ (2.22 X Block Design Scaled Score)

Approximately two-thirds of the predicted IQ's will lie within one standard error, 7.50 IQ points, of the actual IQ. Table C in appendix I

[c]The convention in many short-form studies is to use the sum of scaled scores on the short form to predict the sum of scaled scores on the Full Scale rather than predicting the Full Scale IQ directly. Inasmuch as the sum of scaled scores on the Full Scale is perfectly correlated with the Full Scale IQ, correlations with the scaled scores of the short form are the same in either case.

Table 5. Full Scale, Verbal, and Performance IQ's from scaled scores for Anglo children, by socioeconomic status and age, and beta coefficients

Status, subtest, and age	Full Scale IQ			Verbal IQ			Performance IQ		
	r	*R*	Beta coefficient	*r*	*R*	Beta coefficient	*r*	*R*	Beta coefficient
STATUS									
Low (N=95)									
Vocabulary	.778	.778	2.62	.825	.825	3.21	.591	[1] (2).832	1.47
Block Design	.700	.883	2.22	.519	.849	1.03	.776	(1).776	3.15
Constant Term		49.82			53.64			54.76	
Standard error of *Y*		7.55			8.36			9.02	
Middle (N=278)									
Vocabulary	.787	.787	2.46	.834	.834	3.09	.614	[1] (2).819	1.29
Block Design	.732	.875	2.19	.580	.853	.98	.780	(1).780	3.11
Constant Term		53.72			58.04			57.72	
Standard error of *Y*		7.56			7.87			9.02	
High (N=132)									
Vocabulary	.594	.594	2.00	.707	.707	2.88	.231	[1] (2).642	.68
Block Design	.524	.749	1.76	.227	.721	.63	.622	(1).622	2.68
Constant Term		64.27			65.09			69.53	
Standard error of *Y*		7.12			8.39			9.56	
AGE									
6-11 years (N=505)									
Vocabulary	.765	.765	2.45	.819	.819	3.14	.558	[1] (2).798	1.23
Block Design	.701	.867	2.15	.523	.839	.97	.758	(1).758	3.06
Constant Term		53.77			57.22			58.56	
Standard error of *Y*		7.50			8.15			9.19	
6-7 years (N=160)									
Vocabulary	.734	.734	2.07	.790	.790	2.70	.522	[1] (2).808	.99
Block Design	.698	.857	2.27	.496	.814	1.02	.774	(1).774	3.23
Constant Term		56.77			60.97			60.06	
Standard error of *Y*		7.08			8.02			8.25	
8-9 years (N=182)									
Vocabulary	.778	.778	2.83	.830	.830	3.43	.580	[1] (2).801	1.61
Block Design	.640	.868	1.97	.461	.848	.88	.726	(1).726	2.81
Constant Term		50.42			53.98			55.84	
Standard error of *Y*		7.82			8.34			9.28	
10-11 years (N=163)									
Vocabulary	.776	.776	2.35	.833	.833	3.23	.561	[1] (2).796	.96
Block Design	.768	.880	2.30	.602	.852	.97	.779	(1).779	3.33
Constant Term		54.40			57.58			59.30	
Standard error of *Y*		7.25			7.80			9.76	

[1] The order of the subtests reverses for the Performance IQ because Block Design, being a performance test, always has a higher linear correlation with Performance IQ and independently accounts for more of the variance in Performance IQ than does Vocabulary.

presents predicted Full Scale IQ's for Anglo children with various combinations of Vocabulary and Block Design scaled scores.

These multiple regressions and others presented in the report were probably slightly inflated because correlations between scores on a short form and Full Scale IQ's obtained from the same administration of the test tended to be spuriously high. Such a correlation assumes that the subtests are perfectly reliable when, in fact, they are not. When Silverstein (1970a,b) used a corrected formula to calculate simple linear correlations between the sum of the scaled scores for Vocabulary and Block Design and Full Scale IQ, the standard error of estimate rose from 7.2 IQ points using the uncorrected estimate (Silverstein, 1967 a and c) to 7.8 IQ points using the corrected estimate (Silverstein, 1970 a). The correlation coefficient dropped from .879 to .856 (Silverstein, 1970 b).

Percentage of Error in Predicting Subnormal IQ Using Three Criteria

The appropriate beta coefficients for predicting Full Scale IQ from scaled scores on Vocabulary and Block Design were inserted in the multiple regression equations for each age and socioeconomic group and used to predict the Full Scale IQ of each Anglo child in the sample. Each child's actual Full Scale IQ was then compared with his predicted Full Scale IQ. The percentage of correct and incorrect classifications for subnormal IQ using three criteria (IQ below 85; below 80; and below 70) was calculated for children in each socioeconomic group. There were no IQ's below 85 in the high-status group; therefore, there are no estimates of the percentage of correct or incorrect predictions of low IQ for high-status children in table 6.

If children with IQ's below 85 are regarded as intellectually subnormal, there were 10.5 percent of the 95 low-status Anglo children who were correctly identified as intellectually subnormal. There were 5.3 percent who were identified as having low IQ's who actually had IQ's of 85 and above, and 3.2 percent who were identified as having IQ's of 85 and above who actually had IQ's below 85. Other percentages in table 6 indicate the percentage of children who were correctly or incorrectly classified using 79– and 69– as the criteria for subnormal IQ.

The percentage of "false low" predictions tended to balance the percentage of "false high" predictions. Therefore, the aggregate prediction for low IQ's was closer to the actual percentage in the population than the predictions for individuals. For example, 13.7 percent of the low-status children actually had IQ's below 85 and 15.8 percent were predicted to have IQ's that low. Thus, 2.1 percent more children were predicted to have low IQ's than actually had low IQ's. Some of the other differences were smaller. For middle-status children, the "false lows" equal the "false highs" at the 84– and 79– criteria.

Table 6 also presents the percentage of individuals in each age group correctly and incorrectly identified as having low Full Scale IQ's using the beta coefficients and constant terms appearing in table 5 as the basis for prediction. Most of the errors were underpredictions, ranging from −2.5 percent when predicting the percentage of children aged 6 and 7 with IQ's below 85 to +.6 percent when predicting the percentage of children aged 10 and 11 with IQ's below 85. Differences between age levels were negligible.

When IQ's were predicted for all the Anglo children without regard for socioeconomic status or age, the differences between the actual percentage of children with low IQ's and the estimated percentage of children with low IQ's was relatively low. The estimate was .2 percent high when the IQ 84– criteria was used and .4 percent and 1.8 percent low when the 79– and 69– criteria were used. However, errors in the placement of individual children were considerably higher—2.4 percent of the children were falsely predicted to have IQ's below 85, and 2.2 percent were falsely predicted to have IQ's of 85 and above for a total misplacement of 4.6 percent of the individual children. The total misplacement was 1.6 percent and 2.2 percent at the IQ 79– and 69– criteria, respectively.

Although multiple correlation coefficients ranging from .622 to .883 (table 5) were relatively high, there was still considerable error in predicting Full Scale IQ when only the Block Design and Vocabulary subtests were used. In predicting the aggregate percentage of children who will fall below the three criteria most commonly used by clinicians in diagnosis, the error in prediction ranged from −1.8 to +0.2

Table 6. Percent of correct and incorrect predictions of low Full Scale IQ's for Anglo children, by socioeconomic status[1] and age using three different criteria

Status, IQ, and age	Correctly identified low IQ's	False low IQ's[2]	False high IQ's[3]	Correctly identified high IQ's	Actual percent low IQ's	Predicted percent low IQ's	Difference
STATUS	Percent						
Low (N=95)							
IQ 84–	10.5	5.3	3.2	81.1	13.7	15.8	+2.1
IQ 79–	8.4	1.1	2.1	88.4	10.5	9.5	–1.0
IQ 69–	5.3	0.0	2.1	92.6	7.4	5.3	–2.1
Middle (N=278)							
IQ 84–	5.4	2.2	2.2	90.3	7.6	7.6	0.0
IQ 79–	3.6	1.1	1.1	94.2	4.7	4.7	0.0
IQ 69–	0.0	.4	1.8	97.8	1.8	.4	–1.4
AGE							
All ages, 6-11 years (N=505)							
IQ 84–	4.6	2.4	2.2	90.8	6.8	7.0	+ .2
IQ 79–	3.6	.6	1.0	94.8	4.6	4.2	– .4
IQ 69–	.4	.2	2.0	97.4	2.4	.6	–1.8
6-7 years (N=160)							
IQ 84–	3.8	1.3	3.8	91.3	7.6	5.1	–2.5
IQ 79–	2.5	1.3	1.3	95.0	3.8	3.8	0.0
IQ 69–	0.0	0.0	1.3	98.8	1.3	0.0	–1.3
8-9 years (N=182)							
IQ 84–	4.9	1.6	2.7	90.7	7.6	6.5	–1.1
IQ 79–	4.4	0.0	1.1	94.5	5.5	4.4	–1.1
IQ 69–	1.6	.5	2.2	95.6	3.8	2.1	–1.7
10-11 years (N=163)							
IQ 84–	4.3	1.2	.6	93.9	4.9	5.5	+ .6
IQ 79–	2.5	0.0	1.8	95.7	4.3	2.5	–1.8
IQ 69–	0.0	0.0	1.8	98.2	1.8	0.0	–1.8

[1] There were no IQ's below 85 in the high-status group; therefore there were no estimates of the percentage of correct and incorrect predictions.

[2] False low IQ's were for children who were predicted to have an IQ below the criteria but who actually had an IQ above the criteria.

[3] False high IQ's were for children who were predicted to have an IQ above the criteria but who actually had an IQ below the criteria.

percent for all children aged 6-11 in the sample with minimal error at the IQ 84- and IQ 79- cutoffs. Errors in the placement of individual children were even higher.

Optimal Prediction From Various Combinations of Subtests

Eleven subtests of the WISC were administered. The verbal subtests are Information, Comprehension, Arithmetic, Similarities, Vocabulary, and Digit Span. The performance subtests are Picture Completion, Picture Arrangement, Block Design, Object Assembly, and Coding. In order to determine the optimal test battery for each socioeconomic level and age group, stepwise multiple regressions were run using Full Scale, Verbal, and Performance IQ's as the dependent variables and all 11 subtests as independent variables.

Table 7 presents the multiple correlations between the subtests and the IQ's of Anglo children within socioeconomic levels and within age groups.

The four subtests appearing first in the solution for each socioeconomic group are listed for the Full Scale IQ. The three subtests appearing first are listed for the Verbal and Performance IQ's. For low- and high-status children, Vocabulary was the best single predictor of Full Scale IQ and Block Design appeared among the first four variables. Information replaced Vocabulary as the best single predictor for middle-status children, and Block Design did not appear for middle-status children when predicting Full Scale IQ.

Vocabulary was the best single predictor of Verbal IQ for low- and middle-status children, but it did not appear in the first three subtests for high-status children. Block Design ranked second in predicting Performance IQ for low-status children, but it did not appear for either middle- or high-status children. Standard errors ranged from 4.91 to 5.54 IQ points, but there was no pattern to the variation.

Multiple regressions within age groups and for the total group yielded correlations and standard errors similar to those found within socioeconomic levels. All multiple correlations were above .90 when three variables were used to predict Verbal and Performance IQ's and four variables were used to predict Full Scale IQ. Standard errors ranged between 4.56 and 5.58 IQ points. Vocabulary was the most important single variable predicting Full Scale IQ for children aged 10 and 11 and was among the top three variables in predicting Verbal IQ for all age groups. Block Design ranked second in predicting Full Scale IQ for children aged 6, 7, 10, and 11 and ranked as the most important single variable in predicting Performance IQ for the same two age groups.

The particular subtests which appeared in the multiple regressions shown in table 7 varied considerably from one age group and socioeconomic level to another. Certain subtests were conspicuous by their absence. Digit Span did not appear in any analysis nor did Picture Arrangement. The other subtests appeared with about equal frequency. One consistent pattern was that a verbal subtest was the most highly correlated with Full Scale IQ in each instance—Vocabulary and Information shared the top rank equally. The second ranking subtest in all multiple correlations with Full Scale IQ was consistently a performance subtest: Block Design appeared three times, Object Assembly twice, and Coding once.

When Anglo children were treated as a single group, regardless of social status or age, Vocabulary and Block Design were the best two subtests for predicting Full Scale IQ, Vocabulary was the best single predictor for Verbal IQ, and Block Design was the best single predictor for Performance IQ.

Optimal Predictions Compared With Predictions Based on Vocabulary and Block Design

Table 8 compares the multiple correlations obtained using the two optimal subtest predictors with the multiple correlations obtained using Vocabulary and Block Design. For Full Scale IQ, the optimal predictors were Vocabulary and Block Design for high-status children, for children aged 10-11, and for all Anglo children as a group. Differences were negligible for other groups.

Differences between the optimal predictors and Vocabulary and Block Design were greater for Verbal IQ and Performance IQ than for Full Scale IQ. Although using both Vocabulary and

Table 7. Optimal predictions of IQ's of Anglo children from various combinations of subtests, by socioeconomic status and age

Status, subtest, and age	Full Scale IQ r	Full Scale IQ R	Full Scale IQ Beta coefficient
STATUS			
Low (N=95)			
Vocabulary	.778	.778	1.61
Coding	.719	.899	1.59
Block Design	.700	.935	1.39
Information	.752	.953	1.31
Constant Term		40.48	
Standard error of Y		4.91	
Middle (N=278)			
Information	.800	.800	1.81
Object Assembly	.675	.886	1.75
Similarities	.736	.924	1.27
Arithmetic	.712	.942	1.20
Constant Term		39.50	
Standard error of Y		5.28	
High (N=132)			
Vocabulary	.593	.593	1.40
Block Design	.524	.749	1.45
Coding	.436	.819	1.24
Information	.572	.874	1.28
Constant Term		46.37	
Standard error of Y		5.26	
AGE			
6-11 years (N=505)			
Vocabulary	.761	.761	1.38
Block Design	.701	.867	1.60
Coding	.602	.907	1.21
Information	.762	.935	1.47
Constant Term		43.35	
Standard error of Y		5.34	
6-7 years (N=160)			
Information	.758	.758	1.57
Block Design	.698	.884	1.70
Similarities	.649	.918	1.33
Object Assembly	.611	.939	1.06
Constant Term		43.86	
Standard error of Y		4.76	
8-9 years (N=182)			
Information	.805	.805	1.97
Object Assembly	.695	.886	1.66
Similarities	.724	.925	1.44
Picture Completion	.631	.947	1.16
Constant Term		37.99	
Standard error of Y		5.08	
10-11 years (N=163)			
Vocabulary	.776	.776	1.80
Block Design	.768	.880	1.52
Coding	.629	.928	1.39
Picture Completion	.661	.950	.99
Constant Term		43.02	
Standard error of Y		4.80	

Status, subtest, and age	Verbal IQ r	Verbal IQ R	Verbal IQ Beta coefficient
STATUS			
Low (N=95)			
Vocabulary	.825	.825	1.84
Arithmetic	.778	.917	1.67
Similarities	.814	.951	1.64
Constant Term		44.66	
Standard error of Y		4.92	
Middle (N=278)			
Vocabulary	.834	.834	2.00
Arithmetic	.753	.912	1.90
Comprehension	.703	.946	1.32
Constant Term		47.86	
Standard error of Y		4.92	
High (N=132)			
Information	.722	.722	1.87
Similarities	.686	.841	1.59
Comprehension	.633	.900	1.32
Constant Term		54.43	
Standard error of Y		5.31	
AGE			
6-11 years (N=505)			
Vocabulary	.819	.819	1.87
Arithmetic	.750	.903	1.74
Similarities	.777	.942	1.57
Constant Term		45.68	
Standard error of Y		5.04	
6-7 years (N=160)			
Information	.820	.820	1.65
Vocabulary	.790	.897	1.47
Arithmetic	.710	.944	1.65
Constant Term		51.19	
Standard error of Y		4.56	
8-9 years (N=182)			
Information	.847	.847	2.11
Similarities	.783	.917	1.57
Vocabulary	.830	.947	1.55
Constant Term		45.65	
Standard error of Y		5.08	
10-11 years (N=163)			
Vocabulary	.833	.833	1.95
Arithmetic	.757	.909	1.75
Comprehension	.750	.948	1.39
Constant Term		50.13	
Standard error of Y		4.79	

Status, subtest, and age	Performance IQ r	Performance IQ R	Performance IQ Beta coefficient
STATUS			
Low (N=95)			
Coding	.781	.781	2.21
Block Design	.776	.900	2.21
Picture Completion	.615	.949	1.61
Constant Term		40.40	
Standard error of Y		5.10	
Middle (N=278)			
Object Assembly	.781	.781	2.51
Picture Completion	.710	.882	1.97
Coding	.616	.937	1.59
Constant Term		40.96	
Standard error of Y		5.51	
High (N=132)			
Object Assembly	.652	.652	2.05
Picture Completion	.639	.815	1.72
Coding	.584	.897	1.71
Constant Term		48.37	
Standard error of Y		5.34	
AGE			
6-11 years (N=505)			
Block Design	.758	.758	2.26
Coding	.653	.861	1.82
Picture Completion	.671	.931	1.80
Constant Term		42.74	
Standard error of Y		5.58	
6-7 years (N=160)			
Block Design	.774	.774	2.40
Picture Completion	.569	.861	1.62
Object Assembly	.706	.921	1.77
Constant Term		42.88	
Standard error of Y		5.48	
8-9 years (N=182)			
Object Assembly	.788	.788	2.50
Picture Completion	.714	.894	2.01
Coding	.654	.941	1.64
Constant Term		40.73	
Standard error of Y		5.27	
10-11 years (N=163)			
Block Design	.779	.779	2.18
Coding	.686	.882	1.93
Picture Completion	.708	.943	1.68
Constant Term		43.14	
Standard error of Y		5.38	

Table 8. Comparison of Block Design and Vocabulary as predictors with the two optimal predictors for Full Scale, Verbal, and Performance IQ's for Anglo children, by socioeconomic status and age

Status and age	Full Scale IQ			Verbal IQ			Performance IQ		
	R Block Design and Vocabulary	R Two optimal predictors	Difference	R Block Design and Vocabulary	R Two optimal predictors	Difference	R Block Design and Vocabulary	R Two optimal predictors	Difference
Status									
Low (N=95)	.883	.899	.016	.849	.917	.069	.832	.900	.068
Middle (N=278)	.875	.886	.011	.853	.912	.059	.819	.882	.063
High (N=132)	.749	.749	.000	.721	.841	.120	.642	.815	.173
Age									
Total, 6-11 years (N=505) . . .	.867	.867	.000	.839	.903	.064	.798	.861	.063
6-7 years (N=160) . . .	.857	.884	.027	.814	.897	.083	.808	.861	.053
8-9 years (N=182) . . .	.868	.886	.018	.848	.917	.069	.801	.894	.093
10-11 years (N=163) . .	.880	.880	.000	.852	.909	.057	.796	.882	.086

Block Design to predict Verbal IQ and Performance IQ was better than using either of them individually, the prediction was best if another verbal subtest was used with Vocabulary to predict Verbal IQ and another performance subtest was used with Block Design to predict Performance IQ. Since the Verbal IQ was based on verbal subtest scores and the Performance IQ was based on performance subtests, this result was to be expected.

We conclude, therefore, that Vocabulary and Block Design were probably the two subtests which form the most efficient dyad for predicting the Full Scale IQ's of Anglo children of various ages and socioeconomic levels. The correlations of Vocabulary and Block Design with Full Scale IQ closely approximated the correlations for the optimal combinations of any two subtests for the Anglo children.

Discussion

In the 20 years since the publication of the WISC, a number of studies have investigated the possibility of deriving selected short forms. Unfortunately, many of these studies have been conducted using special populations of children suffering from emotional and/or learning problems; and most of them have studied various combinations of three, four, or five subtests as predictors (Clements, 1965; Enburg, Rowley, and Stone, 1961; McKerracher and Watson, 1968; Nickols, J., and Nickols, M., 1963; and Thompson and Finley, 1963).

Most correlations in these studies, expect for that of Yalowitz and Armstrong, were comparable in magnitude to those obtained in the present study when three or four subtests were used to predict Full Scale IQ. As in the present study, Nickols and Nickols found no major differences between subpopulations dichotomized on the basis of age, and Clements found no difference by sex in the validity of the subtest combinations he used.

A short form composed of the two subtests (Vocabulary and Block Design) has been one of the most popular and widely used combinations. Simpson and Bridges (1959), using a sample of 120 children referred to the Division of Child Guidance of the Oklahoma City Public Schools, obtained a correlation of .874 between the Vocabulary-Block Design sum and the Full Scale IQ—a correlation comparable with that secured for the Anglo children (.867, table 7) in the Riverside sample. The chronological age of their subjects ranged from 65-192 months, with a mean of 124.23 months; Full Scale IQ ranged from 54-142, with a mean of 95.10.

Silverstein (1967c), using the WISC standardization sample, correlated the sum of scaled scores on Vocabulary and Block Design and the Full Scale IQ. The regressions were tested and found homogeneous for both tests. Consequently, the pooled within-groups regressions were used in the subsequent analysis. For the WISC, the pooled within-groups correlation of .878 corresponded to a standard error of estimate of about 7.2 IQ points. In a later study, Silverstein (1967b) investigated the possibility of using Vocabulary and Block Design as a short form of the Wechsler Preschool and Primary Scale of Intelligence (WPPSI), as well as of Wechsler's other scales. Using the published tables of subtest intercorrelations, the correlation between the sum of scaled scores on Vocabulary and Block Design (V-BD) and the Full Scale (FS) score was determined for each of the six age agroups which comprised the WPPSI standardization sample. The regressions were tested and found homogeneous, and the method of deriving scaled scores made it possible to use a single regression equation for all groups:

$$(FS = 3.57\ V\text{-}BD + 28.53).$$

The pooled within-groups correlation of .851 corresponded to a standard error of estimate of about 7.9 IQ points. These correlations and standard errors are very similar to those found in the present study (see table 8). Silverstein concluded that errors of this magnitude were not prohibitive for screening purposes, but no one would seriously advocate the use of a short form for a comprehensive assessment of intellectual functioning for individual case classification.

In another study, Silverstein (1967d) used Doppelt's formula to determine the correlation with the WISC Full Scale of all possible short forms of two, three, four, and five subtests. The range of correlations with the Full Scale of the 10 best short forms of each length at each age level were presented in table form. The range of correlations over age for the 10 best dyads was .807 to .906. In the present study, the range of correlations for the best dyads was .749 to .899 (table 7), very similar to those obtained by Silverstein. For obvious reasons, Silverstein's correlations increased as the length of the short form increased. Although we found little variation in correlations by age, Silverstein found a tendency for the correlations at age 10½ to be higher than those at 13½, which in turn tended to be higher than those at 7½. Information-Picture Arrangement, Information-Block Design, and Vocabulary-Block Design were among the best dyads at all age levels. At ages 10½ and 13½, the standard errors of estimate were approximately 7.0 IQ points for the best dyads. At age 7½, the standard errors were about 1.5 points higher for the best dyads. Silverstein also applied the Wherry-Doolittle method to the WISC standardization data. This method selects the best short form of each length but entails the differential weighting of subtest scores rather than their simple summation. Comparison of simple and multiple correlations revealed that the use of differential weighting did not result in appreciably higher validities.

Silverstein agrees with Mumpower (1964) that a correlational measure of validity is not as meaningful as the agreement between Short Form IQ and Full Scale IQ in classifying individuals. Using Wechsler's seven-category classification system from Very Superior to Defective, he estimated the agreement between the best short forms and the Full Scale IQ. The best dyads misclassified more than one individual out of every three, and even for the best pentads the corresponding figure was one out of every five. Thus, Silverstein concluded that data on agreement should be used to supplement correlational data in evaluating the validity of short forms.

Mumpower (1964) noted that even with an r as high as .90, only 81 percent of the variance in short-form IQ is attributable to the Full Scale IQ, leaving 19 percent, or nearly one-fifth, of the variance unaccounted for. His random sample of 50 children referred for evaluation to the Special Education Department at the University of Southwestern Louisiana ranged in age from 7 years 2 months to 15 years 10 months, and included a variety of exceptional characteristics: slow learner, retarded educable, exceptionally able, emotionally disturbed, speech problem, vision problem, hearing problem, neurologically impaired, educationally retarded, and physically handicapped. The sum of Vocabulary and Block Design scaled scores was converted to a Short Form IQ. The Full Scale and Short Form IQ distributions were then correlated and yielded a

Pearson r or .95. The respective means were 85.64 and 83.52, and standard deviations were 19.93 and 18.33. Each Full Scale IQ and Short Form IQ was classified into 10 categories: exceptionally able, superior, above average, high average, average, low average, slow learner, retarded educable, retarded trainable, or retarded custodial. Both IQ's placed the child in the same category in 39 cases of the 50 comparisons made. The average difference between Full Scale IQ and Short Form IQ for the remaining 11 cases was 9.5 IQ points. Thus, Mumpower concluded that 22 percent of the cases would have been misclassified on the basis of Short Form IQ and resulting recommendations would in all probability have been inaccurate. The extent of classification errors using the multiple regression equations based on the Anglo children to identify children with subnormal intelligence in the present sample is presented in table 6.

Both Wechsler (1949) and Seashore et al. (1950) warned the user to take the fairly low reliabilities of some of the subtests into account in interpreting either the absolute subtest scores or relations between them. Littell (1960) in his review of a decade of research on the WISC noted that at the age level of 7½ years only Vocabulary, Picture Arrangement, Block Design, and Mazes had coefficients of internal consistency above .70, while Comprehension and Picture Completion fell as low as .59. He reminded the reader that the reliability of the test tends to increase with age, so that at age level 13½, all subtests except Digit Span (.50) and Picture Completion (.68) were above .70. He suggested that age of subjects be studied as a variable in the construction of WISC short forms. However, age differences were negligible for the Anglo children in Riverside.

Conclusions

1. Vocabulary and Block Design were the optimal dyad for predicting the Full Scale IQ for Anglo children in the Riverside sample.

2. Although there were socioeconomic status and age differences in the Full Scale, Verbal, and Performance IQ's of children in the Riverside sample, differences in multiple correlations between Vocabulary and Block Design scaled scores and Full Scale IQ's by socioeconomic status and age were negligible. Therefore, we conclude that the regression equation based on all Anglo children was as efficient as the regression equation based on subgroups categorized by age or socioeconomic level.

3. When Vocabulary and Block Design were used to predict Full Scale IQ ($R = .867$) of Anglo children, the regression equation was

$$\text{Predicted Full Scale IQ} = 53.77 + (2.45 \times \text{Vocabulary Scaled Score}) + (2.15 \times \text{Block Design Scaled Score})$$

The standard error of estimate was 7.50 IQ points.

4. When individual Anglo children were classified as subnormal or normal using this equation, 2.4 percent were falsely classified as having IQ's below 85; .6 percent were falsely classified as having IQ's below 80; and .2 percent were falsely classified as having IQ's below 70. On the other hand, 2.2 percent were falsely classified as having IQ's of 85 and above; 1.0 percent were falsely classified as having IQ's of 80 and above; and 2.0 percent were falsely classified as having IQ's of 70 and above. The total error in classifying individuals as subnormal was, thus, 4.6 percent, 1.6 percent, and 2.2 percent for the three criteria.

5. When estimates were concerned with the percentage of Anglo children falling below the three criteria rather than the placement of individual children, the error was greatly reduced. The predicted percentage of children with IQ's below 85 was .2 percent higher than the actual percentage; the predicted percentage with IQ's below 80 was .4 percent less than the actual percentage; and the predicted percentage with IQ's below 70 was 1.8 percent less than the actual percentage.

NEGRO CHILDREN

Age

Table 9 presents the mean IQ's and standard deviations for Negro children by age. F ratios comparing mean scores over age indicate a significant age variation ($p < .05$) for Verbal IQ but not for Full Scale or Performance IQ's. By

Table 9. Mean IQ's, standard deviations, and *F* ratios for Negro children, by age

Mean IQ and standard deviation	Age in years						*F* ratio
	6 (N=41)	7 (N=64)	8 (N=58)	9 (N=64)	10 (N=48)	11 (N=43)	
Full Scale IQ							
Mean	92.1	93.7	88.2	93.4	94.9	91.9	2.19
SD	11.8	11.3	12.4	11.5	10.9	12.3	NS
Verbal IQ							
Mean	92.6	93.0	87.8	93.4	95.8	93.1	2.40
SD	11.9	11.5	13.4	12.8	12.8	11.6	$p < .05$
Performance IQ							
Mean	92.6	96.5	90.3	94.1	94.4	92.3	1.68
SD	13.0	11.8	13.0	11.4	12.0	12.9	NS

chance, 8-year-old children scored significantly lower. As with the Anglo sample, subsequent analyses will study the performance of Negro children by age group.

There were 90 children in the sample with Full Scale IQ's of 84 and below; 83 with Verbal IQ's of 84 and below; and 81 with Performance IQ's of 84 and below.

Sex Within Socioeconomic Status

IQ's and subtest scores for Negro boys were compared with those of Negro girls within two socioeconomic levels—low status and middle status. There was not a sufficient number of Negro children from high-status homes for analysis. Table 10 presents the mean scores and the values of *t* when the means were compared.

Low-status Negro boys did significantly better on verbal subtests than low-status girls. The boys had a significantly higher Verbal IQ ($p < .05$) and did significantly better than the girls on four of the six verbal subtests: Information, Comprehension, Arithmetic, and Vocabulary. They also did better than the girls on Picture Completion, but the girls scored significantly higher on Coding. There were no significant sex differences for middle-status children. Thus, the pattern of sex differences was similar to that found for Anglo children, although it was somewhat more accentuated for Negro children. In both ethnic groups, low-status boys had a significantly higher Verbal IQ than low-status girls, and boys in both ethnic groups did better in Comprehension, Vocabulary, and Picture Completion than girls. Sex differences disappeared when middle-status boys were compared with middle-status girls.

When Full Scale, Performance, and Verbal IQ's of low-status and middle-status children were compared, there was no difference in Verbal IQ for the boys, but all other comparisons were statistically significant for both sexes. In every comparison, the middle-status children had higher IQ's than low-status children.

Socioeconomic differences on specific subtests were not as marked as they were for Anglo children. Among the verbal subtests, only Digit Span differentiated low-status boys from middle-status boys, while only Information and Vocabulary differentiated the girls. Both middle-status boys and girls did significantly better than low-status children on Object Assembly, and the middle-status boys did significantly better on Picture Arrangement. Although only six of the subtest comparisons were statistically significant, the mean scaled score of middle-status children was higher than that of low-status children on all subtests.

Table 10. Mean IQ's and subtest scores for Negro children, by socioeconomic status and sex and mean IQ's across socioeconomic status

Mean IQ and subtest	Low status			Middle status			Comparison across socioeconomic status	
	Boys (N=125)	Girls (N=115)	*t*	Boys (N=31)	Girls (N=47)	*t*	Boys (N=156) *t*	Girls (N=162) *t*
Mean IQ								
Full Scale IQ	91.6	89.4	1.4	97.4	94.9	.9	[1]2.6	[1]2.6
Verbal IQ	92.7	89.1	[2]2.2	97.2	93.8	1.1	1.8	[2]2.0
Performance IQ	92.0	91.7	.2	98.0	97.0	.4	[1]2.9	[2]2.4
Verbal subtests								
Information	8.8	7.9	[1]2.6	9.7	8.8	1.4	1.8	[2]2.1
Comprehension	8.8	8.0	[2]2.5	9.7	8.8	1.4	1.7	1.5
Arithmetic	9.3	8.4	[2]2.5	9.4	8.5	1.3	.2	.2
Similarities	8.9	9.1	–.5	9.3	9.4	–.1	.7	.6
Vocabulary	9.0	7.7	[1]3.4	9.6	9.6	.1	1.3	[1]3.9
Digit Span	8.2	8.6	–1.1	9.6	8.9	.9	[2]2.0	.5
Performance subtests								
Picture Completion	8.8	8.2	[2]2.1	9.8	8.8	1.5	1.6	1.7
Picture Arrangement	9.2	9.1	.2	10.4	9.5	1.4	[2]2.5	.6
Block Design	8.6	8.3	.9	8.8	8.9	–.2	.3	1.4
Object Assembly	8.6	8.3	1.0	9.9	9.7	.4	[1]3.1	[1]2.9
Coding	8.9	10.2	[1]–3.5	9.7	10.9	–1.9	1.3	1.6

[1] Significant at .01 level.
[2] Significant at .05 level.

Intercorrelation of Scores for Children Aged 7 and 10

Tables IV and V in appendix II present the intercorrelations between subtest scores and the correlations between subtest scores and IQ's for Negro children 7 and 10 years of age. These tables were compared with those published by Wechsler for the standardization sample (Wechsler, 1949). There were three intercorrelations between subtest scores for 7-year-olds that were significantly smaller in the Negro sample than in the standardization sample and two correlations with Full Scale IQ that were significantly smaller. None of the calculations were larger in the Negro sample than in Wechsler's sample.

There were more differences which were significant for Negro children at age 10 than at age 7, just as there were for Anglo children. Only one of the intercorrelations between Verbal subtests was significantly lower than in the standardization sample, but 14 of the 30 intercorrelations between Verbal subtests and Performance subtests were lower for Negro children at age 10 in the Riverside sample than for the children in Wechsler's sample. Correlations were especially low between Comprehension and Arithmetic scores and Performance subtest scores—four out of five comparisons were significantly different. Three out of five correlations with Information were also significantly lower. This, in turn, produced significantly lower correlations for Negro children between three Performance subtests (Picture Completion, Picture Arrangement, and Block Design) and Verbal IQ, and very low correlations between Performance IQ and scores in Comprehension and Arithmetic. Correlations with Full Scale IQ were, consequently, depressed for these five subtests. Thus, we conclude that correlations between Verbal and Performance scores were relatively low for Negro children at age 10.

The number of children aged 10 in the Negro sample was small (only 48 children), and these relatively low intercorrelations must be interpreted with caution. However, it does appear that Verbal and Performance tasks were less highly correlated in the Negro sample than in the Anglo sample on which the tests were originally normed. These differences tend to justify our decision to treat the ethnic groups separately in analyzing the efficacy of various combinations of subtests as short forms of the WISC.

Predicting Full Scale, Verbal, and Performance IQ's From Vocabulary and Block Design Scaled Scores

Table 11 presents multiple regression coefficients predicting Full Scale, Verbal, and Performance IQ's from Vocabulary and Block Design scaled scores for Negro children by socioeconomic status and age. As with Anglo children, the multiple correlations were highest between the two subtests and Full Scale IQ, dropped slightly for the Verbal IQ, and dropped more markedly for Performance IQ. Correlations were slightly higher for low-status than for middle-status Negro children. Standard errors varied accordingly.

The multiple correlations and standard errors of Verbal and Block Design scaled scores with Full Scale, Verbal, and Performance IQ's for Negro children by age group were of approximately the same magnitude as those found by socioeconomic level. In general, standard errors were lowest when predicting Full Scale IQ, increased slightly when predicting Verbal IQ, and were largest when predicting Performance IQ.

The multiple correlations and their related standard errors for all Negro children combined were about the same as those for the various subgroups by socioeconomic status and age, indicating that there was no appreciable improvement in prediction when subgroup classifications were used. Table VI (appendix II) shows the predicted Full Scale IQ's of Negro children with various combinations of Vocabulary and Block Design scaled scores based on the formula

$$\text{Estimated IQ} = (2.55 \times \text{Vocabulary Scaled Score}) + (1.71 \times \text{Block Design Scaled Score}) + 55.0$$

Percentage of Error in Predicting Subnormal IQ Using Three Criteria

The appropriate multiple regression equations were used to predict the Full Scale IQ of each Negro child by socioeconomic status and age. The percentages of children classified correctly and incorrectly as having subnormal IQ's are shown in table 12, which also presents the nature and magnitude of the discrepancies.

There was a relatively large percentage of individual children at the lower end of the IQ distribution who were misclassified, especially when IQ 84– was used as the criterion. Among low-status Negro children, 6.3 percent of the children who were classified as having IQ's below 85 in fact had IQ's of 85 and above, and 9.6 percent of those who were classified as having IQ's of 85 and above in fact had IQ's below 85. This means that 15.9 percent of the individual low-status Negro children would be misclassified predicting IQ from Vocabulary and Block Design scaled scores using this criterion. The total misclassification at this level for middle-status children was even higher. Of the middle-status children, 7.7 percent were falsely classified as having IQ's below 85, and 14.1 percent were falsely classified as having IQ's of 85 and above, for a total of 21.8 percent misclassifications. The magnitude of error in classifying individuals is much less using criteria of IQ 79– and IQ 69–. Within the age levels, the percentage of "false lows" ranged from 0 to 11.5 percent, and the percentage of "false highs" ranged from 2.2 percent to 13.1 percent.

To some extent, the "false lows" balanced the "false highs." Thus, the overall error in predicting the percentage of subnormal IQ's for the aggregate was lower than that for predicting individual IQ's. In the sample of Negro children, all differences between the actual and predicted percentages of children having low IQ's were underestimates. These ranged from 1.3 percent for middle-status children at the 69– criterion to 6.4 percent for middle-status children using the 84– and 79– criteria. Underestimates for low-

Table 11. Full Scale, Verbal, and Performance IQ's from scaled scores for Negro children, by socioeconomic status and age, and beta coefficients

Status, subtest, and age	Full Scale IQ			Verbal IQ			Performance IQ		
	r	*R*	Beta coefficient	*r*	*R*	Beta coefficient	*r*	*R*	Beta coefficient
STATUS									
Low (N=240)									
Vocabulary	.745	.745	2.49	.816	.816	3.32	.457	[1] (2).748	1.11
Block Design	.583	.835	1.64	.339	.822	.46	.703	(1).703	2.68
Constant Term		55.78			59.36			59.79	
Standard error of *Y*		6.46			7.12			8.08	
Middle (N=78)									
Vocabulary	.668	.668	2.58	.732	.732	3.54	.404	[1] (2).729	1.08
Block Design	.578	.785	1.94	.351	.748	.82	.694	(1).694	2.81
Constant Term		53.87			53.82			62.04	
Standard error of *Y*		7.64			9.01			8.32	
AGE									
6-11 years (N=318)									
Vocabulary	.736	.736	2.55	.798	.798	3.35	.464	[1] (2).747	1.19
Block Design	.581	.827	1.71	.346	.806	.54	.698	(1).698	2.71
Constant Term		55.07			58.30			59.61	
Standard error of *Y*		6.78			7.60			8.21	
6-7 years (N=105)									
Vocabulary	.746	.746	2.68	.777	.777	3.12	.547	[1] (2).730	1.75
Block Design	.571	.830	1.69	.399	.796	.82	.626	(1).626	2.36
Constant Term		55.33			58.82			59.05	
Standard error of *Y*		6.56			7.25			8.41	
8-9 years (N=122)									
Vocabulary	.704	.704	2.30	.805	.805	3.28	.384	[1] (2).756	.74
Block Design	.607	.821	1.91	.374	.819	.73	.735	(1).735	2.90
Constant Term		54.78			56.61			61.15	
Standard error of *Y*		7.16			7.82			8.08	
10-11 years (N=91)									
Vocabulary	.786	.786	2.93	.808	.808	3.83	.516	[1] (2).779	1.40
Block Design	.567	.846	1.37	.266	.809	-.08	.727	(1).727	2.72
Constant Term		54.04			58.76			57.25	
Standard error of *Y*		6.34			7.52			7.96	

[1] The order of the subtests reverses for the Performance IQ because Block Design, being a performance test, always has a higher linear correlation with Performance IQ and independently accounts for more of the variance in Performance IQ than does Vocabulary.

Table 12. Percent of correct and incorrect predictions of low Full Scale IQ's for Negro children, by socioeconomic status and age using three different criteria

Status, IQ, and age	Correctly identified low IQ's	False low IQ's[1]	False high IQ's[2]	Correctly identified high IQ's	Actual percent low IQ's	Predicted percent low IQ's	Difference
STATUS							
Low (N=240)				Percent			
IQ 84–	21.7	6.3	9.6	62.5	31.3	28.0	-3.3
IQ 79–	7.5	4.6	7.9	80.0	15.4	12.1	-3.3
IQ 69–	.4	.4	2.9	96.3	3.3	.8	-2.5
Middle (N=78)							
IQ 84–	5.1	7.7	14.1	73.1	19.2	12.8	-6.4
IQ 79–	3.8	0.0	6.4	89.7	10.2	3.8	-6.4
IQ 69–	0.0	0.0	1.3	98.7	1.3	0.0	-1.3
AGE							
All ages, 6-11 years (N=318)							
IQ 84–	17.6	6.6	10.7	65.1	28.3	24.2	-4.1
IQ 79–	6.6	3.5	7.5	82.4	14.1	10.1	-4.0
IQ 69–	.3	.3	2.5	96.9	2.8	.6	-2.2
6-7 years (N=105)							
IQ 84–	16.2	4.8	10.5	68.6	26.7	21.0	-5.7
IQ 79–	5.7	3.8	6.7	83.8	12.4	9.5	-2.9
IQ 69–	0.0	0.0	2.9	97.1	2.9	0.0	-2.9
8-9 years (N=122)							
IQ 84–	20.5	11.5	13.1	54.9	33.6	32.0	-1.6
IQ 79–	6.6	3.3	9.8	80.3	16.4	9.9	-6.5
IQ 69–	.8	.8	2.5	95.9	3.3	1.6	-1.7
10-11 years (N=91)							
IQ 84–	15.4	5.5	7.7	71.4	23.1	20.9	-2.2
IQ 79–	7.7	3.3	5.5	83.5	13.2	11.0	-2.2
IQ 69–	0.0	0.0	2.2	97.8	2.2	0.0	-2.2

[1] False low IQ's were for children who were predicted to have an IQ below the criteria but who actually had an IQ above the criteria.

[2] False high IQ's were for children who were predicted to have an IQ above the criteria but who actually had an IQ below the criteria.

status children ranged from 2.5 percent to 3.3 percent. These discrepancies were much higher than the comparable discrepancies for Anglo children (table 6).

When predicting by age group, errors in predicting rates for aggregates were again lower than errors in placing individuals, and all differences were in the direction of underestimates. These ranged from a low of 1.6 percent when predicting the percentage of children at ages 8 and 9 with IQ's below 85 to a high of 5.7 percent when predicting the percentage of children at ages 6 and 7 with IQ's below 85. These underestimates are of approximately the same magnitude as those found by socioeconomic status.

When predictions were made for all Negro children without regard for age or socioeconomic status, 4.1 percent fewer IQ's of 84 and below were predicted than were actually found, 4.0 percent fewer IQ's of 79 and below were predicted than found, and 2.2 percent fewer IQ's of 69 and below were predicted than were found. These discrepancies were larger than those found for Anglo children, indicating more error may be expected in assessing individual subnormality for Negro than for Anglo children using Vocabulary and Block Design scores as the predictors.

Optimal Prediction From Various Combinations of Subtests

Table 13 presents the results of a stepwise multiple regression analysis and shows the subtests that best predicted Full Scale, Verbal, and Performance IQ's for Negro children of various socioeconomic and age levels. The four tests predicting the most variance in Full Scale IQ and the three tests predicting the most variance in Verbal and Performance IQ are reported.

Multiple correlations with Full Scale IQ as the dependent variable ranged from .920 to .935, and standard errors ranged from 4.32 to 4.75 IQ points. These correlations were very similar to those found for Anglo children. Vocabulary was the best single predictor of Full Scale IQ for low-status children and for age groups 6-7 and 10-11. It appeared among the top three tests in predicting Verbal IQ's for children of both social statuses and in one age group. Block Design did not appear as a high-ranking subtest in any of the analyses by socioeconomic status or for the group as a whole. Digit Span, which did not appear at all for Anglo children, appeared as one of the three best predictors of Full Scale IQ for low-status children and of Performance IQ for children at both socioeconomic levels and at all age levels.

The size of the multiple correlations was similar for all subgroups of Negro children. Digit Span and Picture Arrangement, which did not appear in any of the solutions for Anglo children, were highly correlated with Verbal IQ and Performance IQ of Negro children.

The pattern of subtests which was the best predictor of Full Scale IQ for Negro children fluctuated. However, Vocabulary appeared most frequently as the Verbal subtest that was most highly correlated with Full Scale and Verbal IQ. Object Assembly appeared most frequently as the Performance subtest having the highest correlation with Full Scale IQ and also was the best predictor in four of the six predictions of Performance IQ. Picture Arrangement appeared among the top three variables in every prediction of Performance IQ. Block Design did not have the same consistent correlation with IQ as either of these subtests. A short form consisting of the Vocabulary and Object Assembly subtests would have given slightly better predictions for the group as a whole than the combination of Vocabulary and Block Design used in Cycle II of the Health Examination Survey. However, the difference in the multiple R is trivial ($R = .835$ vs. .827 or .008 difference).

Optimal Predictions Compared With Predictions Based on Vocabulary and Block Design

Table 14 compares the multiple correlations obtained using the two optimal subtest predictors with the multiple correlations obtained using Vocabulary and Block Design. Differences between optimal predictions and predictions of Full Scale IQ based on Vocabulary and Block Design were generally slightly larger for Negro than for Anglo children but were not as large as might be expected, considering that Object Assembly was a better predictor than Block Design for Negro children (table 8). For the entire Negro group, the difference between the two multiple correlations was only .008.

Discrepancies in predicting Verbal and Performance IQ were slightly higher than those found for Anglo children. Again, this may have been because Block Design was not as good a predictor for Negro children as for Anglo children.

Discussion

The number of studies of the WISC which have been published during the last two decades

Table 13. Optimal predictions of IQ's of Negro children from various combinations of subtests, by socioeconomic status and age

Status, subtest, and age	Full Scale IQ			Status, subtest, and age	Verbal IQ			Status, subtest, and age	Performance IQ		
	r	R	Beta coef-ficient		r	R	Beta coef-ficient		r	R	Beta coef-ficient
STATUS				STATUS				STATUS			
Low (N=240)				Low (N=240)				Low (N=240)			
Vocabulary	.745	.745	1.63	Vocabulary	.816	.816	2.36	Object Assembly	.737	.737	2.35
Object Assembly	.605	.840	1.38	Digit Span	.637	.903	1.35	Picture Arrangement	.671	.849	1.77
Arithmetic	.653	.894	1.28	Arithmetic	.726	.942	1.46	Coding	.521	.916	1.51
Picture Arrangement	.625	.921	1.04	Constant Term		47.03		Constant Term		41.40	
Constant Term		44.44		Standard error of Y		4.21		Standard error of Y		4.89	
Standard error of Y		4.59									
Middle (N=78)				Middle (N=78)				Middle (N=78)			
Arithmetic	.744	.744	1.63	Arithmetic	.815	.815	1.93	Object Assembly	.712	.711	2.35
Picture Completion	.531	.855	1.62	Vocabulary	.732	.906	2.14	Picture Completion	.643	.872	2.07
Object Assembly	.603	.901	1.46	Digit Span	.704	.947	1.27	Picture Arrangement	.627	.922	1.27
Similarities	.655	.935	1.33	Constant Term		45.76		Constant Term		42.94	
Constant Term		39.76		Standard error of Y		4.39		Standard error of Y		4.74	
Standard error of Y		4.43									
AGE				AGE				AGE			
6-11 years (N=338)				6-11 years (N=338)				6-11 years (N=338)			
Vocabulary	.736	.736	1.68	Vocabulary	.798	.798	2.31	Object Assembly	.742	.742	2.30
Object Assembly	.620	.835	1.59	Arithmetic	.744	.901	1.35	Picture Arrangement	.663	.846	1.79
Arithmetic	.666	.894	1.15	Digit Span	.661	.944	1.58	Coding	.516	.913	1.52
Digit Span	.599	.920	.98	Constant Term		46.40		Constant Term		41.51	
Constant Term		44.81		Standard error of Y		4.26		Standard error of Y		5.05	
Standard error of Y		4.75									
6-7 years (N=105)				6-7 years (N=105)				6-7 years (N=105)			
Vocabulary	.746	.746	1.83	Vocabulary	.777	.777	2.22	Picture Arrangement	.697	.697	1.96
Digit Span	.672	.848	1.19	Digit Span	.729	.899	1.36	Coding	.631	.862	1.90
Object Assembly	.608	.895	1.25	Arithmetic	.655	.943	1.39	Block Design	.626	.932	1.77
Block Design	.571	.921	1.06	Constant Term		49.06		Constant Term		42.06	
Constant Term		46.26		Standard error of Y		4.01		Standard error of Y		4.47	
Standard error of Y		4.63									
8-9 years (N=122)				8-9 years (N=122)				8-9 years (N=122)			
Information	.775	.775	1.85	Information	.829	.829	2.12	Block Design	.735	.735	2.40
Object Assembly	.630	.870	1.52	Digit Span	.653	.901	1.67	Picture Arrangement	.660	.872	1.80
Arithmetic	.749	.912	1.52	Vocabulary	.805	.946	1.71	Coding	.456	.929	1.52
Picture Completion	.450	.933	1.02	Constant Term		44.48		Constant Term		40.31	
Constant Term		40.26		Standard error of Y		4.45		Standard error of Y		4.59	
Standard error of Y		4.56									
10-11 years (N=91)				10-11 years (N=91)				10-11 years (N=91)			
Vocabulary	.786	.786	1.47	Information	.817	.817	2.72	Object Assembly	.806	.806	2.58
Object Assembly	.618	.859	1.51	Digit Span	.594	.897	1.56	Coding	.406	.872	1.48
Digit Span	.499	.913	1.16	Comprehension	.670	.942	1.64	Picture Arrangement	.635	.930	1.72
Information	.759	.933	1.42	Constant Term		41.38		Constant Term		39.40	
Constant Term		42.76		Standard error of Y		4.33		Standard error of Y		4.70	
Standard error of Y		4.32									

Table 14. Comparison of Block Design and Vocabulary as predictors with the two optimal predictors for Full Scale, Verbal, and Performance IQ's for Negro children, by socioeconomic status and age

Status and age	Full Scale IQ			Verbal IQ			Performance IQ		
	R Block Design and Vocabulary	*R* Two optimal predictors	Difference	*R* Block Design and Vocabulary	*R* Two optimal predictors	Difference	*R* Block Design and Vocabulary	*R* Two optimal predictors	Difference
Status									
Low (N=240)	.835	.840	.005	.822	.903	.081	.748	.849	.101
Middle (N=78)	.785	.855	.070	.748	.906	.158	.729	.872	.143
Age									
Total, 6-11 years (N=318) . . .	.827	.835	.008	.806	.901	.095	.747	.846	.099
6-7 years (N=105) . . .	.830	.848	.018	.796	.899	.103	.730	.862	.132
8-9 years (N=122) . . .	.821	.870	.049	.819	.901	.082	.756	.872	.116
10-11 years (N=91) . . .	.846	.859	.013	.809	.897	.088	.779	.872	.093

using samples of Negro children is very limited. In general, such studies have concluded that the Wechsler norms are not applicable to samples of rural, Southern Negro children (Young and Bright, 1954; Young and Pitts, 1951); that Performance IQ's should not be used as an alternative measure when cultural deprivation is suspected in Negro children (Teahan, 1962); and that geographic region is a significant variable influencing performance (Caldwell and Smith, 1968; Carson and Rabin, 1960). A study of children aged 7, 8, and 9 found that the subtest intercorrelation matrix was similar for Negro and white children, except for lower intercorrelations involving the Arithmetic subtest for Negro children. However, a multivariate analysis of variance indicated that statistically dissimilar WISC structures existed for white and Negro children (Semler and Iscoe, 1966). A study of a selected sample of 84 Negro children aged 5 years 7 months to 12 years 6 months in five Southern States found Verbal IQ significantly higher than Performance IQ for both sexes, all ages, and in all but one geographic location. Differences between Verbal IQ and Performance IQ of groups from various geographic locations varied more than differences in Verbal and Performance IQ's by age or sex. The authors concluded that short forms of the WISC should not be used with Negro children, because every factor analysis performed on this sample found over half the total variance of the 12 subtests was not shared in common and because the subtests were not correlated highly enough for Negroes for any combination of them to be used as a short form of the test (Caldwell and Smith, 1968). Their conclusions are supported by a study of 177 children eligible for placement in classes for the educable mentally retarded (68 percent Negro and 32 percent white) conducted in Indianapolis. Only correlations based on pentads and hexads produced correlations of .90 or higher and thus qualified, according to the authors, for use as short forms (Schwartz and Levitt, 1960). However, another study of a mixed sample of 27 Negro and 56 white children found correlations comparable to those secured in the present study—e.g., a correlation of .91 between Full Scale IQ and a short form consisting of Vocabulary and Block Design (Wight and Sandry, 1962).

These studies were all conducted using relatively small samples, special subpopulations such as educable mental retardates, or mixed samples of Negro and white children. Therefore, it is difficult to interpret the meaning of conflicting results. The findings of the present study based on 318 Negro children, most of whom are in regular public school classes, showed that a short form consisting of Vocabulary and Block Design correlated only slightly less well with Full Scale, Verbal, and Performance IQ's of Negro children than it correlated with the IQ's of Anglo children. Comparable correlations were .827, .806, and .747 for Negro children (table 14) and .867, .839, and .798 for Anglo children (table 8). Correlations using the two subtests yielding the *optimal* predictions were also very similar: .835, .901, and .846 for Negro children and .867, .903, and .861 for Anglo children. For the Riverside sample of Negro children, we must conclude that short forms of the WISC are just as feasible as they are for Anglos. In either case, however, a short form consisting of only two subtests produced predictions with relatively large standard errors. Using a short form consisting of Block Design and Vocabulary, the standard errors were 6.78, 7.60, and 8.21 IQ points for Negro children when predicting Full Scale, Verbal, and Performance IQ, respectively, and 7.50, 8.15, 9.19 IQ points for Anglo children (see tables 5 and 11).

Conclusions

1. Vocabulary and Object Assembly were the two subtests providing the best prediction of Full Scale IQ for Negro children in the Riverside sample. However, the prediction using this optimal combination, $R = .835$ with a standard error of 6.63 IQ points, was only slightly better than that using Vocabulary and Block Design, $R = .827$ with a standard error of 6.78 IQ points.

2. Differences in multiple correlations between Vocabulary and Block Design scaled scores and Full Scale IQ's by socioeconomic status and age were negligible, in spite of the fact that there were sex differences in IQ for low-status children; age differences in Verbal IQ; and socioeconomic differences. The regression equation based on all Negro children was as good a predictor as the regression equations based on subgroups categorized by age or socioeconomic status.

3. When Vocabulary and Block Design were used to predict Full Scale IQ ($R = .827$) of Negro children the regression equation was

$$\text{Predicted Full Scale IQ} = 55.07 + (2.55 \times \text{Vocabulary Scaled Score}) + (1.71 \times \text{Block Design Scaled Score})$$

The standard error of estimate was 6.78 IQ points. Table VI in appendix II presents the predicted Full Scale IQ for Negro children who had various combinations of Vocabulary and Block Design scaled scores.

4. When Negro children were classified as subnormal or normal using this equation, 6.6 percent were falsely classified as having IQ's below 85; 3.5 percent were falsely classified as having IQ's below 80; and .3 percent were falsely classified as having IQ's below 70. On the other hand, 10.7 percent were falsely classified as having IQ's of 85 and above; 7.5 percent were falsely classified as having IQ's of 80 and above; and 2.5 percent were falsely classified as having IQ's of 70 and above. The total error in classifying individuals as subnormal was 17.3 percent, 11.0 percent, and 2.8 percent for the three criteria.

5. Error was reduced when estimates were concerned with the percentage of children falling below the three criteria rather than the placement of individual children, because "false lows" tended to balance "false highs." In every case, however, the error was in the direction of underestimation—e.g., 4.1 percent using the 84– criterion, 4.0 percent using the 79– criterion, and 2.2 percent using the 69– criterion.

MEXICAN-AMERICAN CHILDREN

Age

There were no differences in mean IQ's by age for Mexican-American children. However, table 15 does reveal a pattern which did not appear for either Anglo or Negro children. The Performance IQ for Mexican-American children was significantly higher at every age level than the Verbal IQ. Mean Performance IQ's ranged between 95.7 and 99.4, while mean Verbal IQ's ranged between 84.6 and 90.0, approximately 10 points lower.

There were 137 Mexican-American children with a Full Scale IQ of 84 and below; 204 with a Verbal IQ of 84 and below; and 66 with a Performance IQ of 84 and below. The number of Mexican-American children with low Verbal IQ's was 2.4 times greater than the number of children with low Performance IQ's.

Table 15. Mean IQ's, standard deviations, and *F* ratios for Mexican-American children, by age

Mean IQ and standard deviation	Age in years: 6 (N=60)	7 (N=96)	8 (N=75)	9 (N=99)	10 (N=88)	11 (N=69)	*F* ratio
Full Scale IQ							
Mean	93.9	92.7	91.3	91.3	91.6	88.9	1.23
SD	12.8	12.3	13.3	12.2	11.1	13.3	NS
Verbal IQ							
Mean	90.0	88.6	87.8	88.1	88.2	84.6	1.38
SD	12.9	12.9	13.8	12.4	10.9	11.9	NS
Performance IQ							
Mean	99.4	99.0	97.0	96.8	97.6	95.7	.83
SD	12.8	12.5	12.9	12.8	12.3	15.1	NS

Sex Within Socioeconomic Status

Table 16 presents sex differences by socioeconomic level. The most conspicuous pattern in this table was the consistent differences found for low-status children. Low-status Mexican-American girls had significantly lower Full Scale, Verbal, and Performance IQ's than boys. They scored lower on every subtest but Coding and were significantly lower on Information, Comprehension, and Vocabulary among the Verbal subtests; and they scored lower on Picture Completion, Picture Arrangement, Block Design, and Object Assembly among the Performance subtests.

The general pattern was the same for middle-status children—i.e., girls tended to score lower on most subtests. However, the differences were not statistically significant except for Picture Completion.

This same pattern appeared for low-status Anglo and Negro children but was less pronounced. Low-status Anglo girls tended to score lower than low-status Anglo boys with four significant differences in 14 comparisons (table 4). Low-status Negro girls scored lower than low-status Negro boys with seven of 14 comparisons being statistically significant (table 10). Differences tended to disappear or to become insignificant at higher status levels for Anglo and Negro children, just as they did for Mexican-American children. We concluded that the lower performance on the WISC of low-status girls was a pervasive tendency in all three ethnic groups but was most marked among Mexican-American children.

Socioeconomic differences were negligible for the boys but were significant for the girls. Middle-status girls had significantly higher Full Scale, Verbal, and Performance IQ's and scored significantly higher on five of the six Verbal subtests and one of the Performance subtests. For this sample, it appeared that a middle-status background did not materially improve the intellectual performance of boys, but that it did improve the intellectual performance of girls. A significant sex difference was found at the lower socioeconomic level, but it disappeared at the middle socioeconomic level. The girls' performance improved so that it matched that of the boys while the latter changed little with social status.

For Anglos, high socioeconomic status also had slightly more impact on the girls' scores than on the boys' scores—13 of 14 socioeconomic comparisons for Anglo girls were significant as opposed to nine of 14 for the boys (see table 4). Among Negro children, there was a comparable improvement of scores with higher socioeconomic status.

Table 16. Mean IQ's and subtest scores for Mexican-American children, by socioeconomic status and sex and mean IQ's across socioeconomic status

Mean IQ and subtest	Low status			Middle status			Comparison across socioeconomic status	
	Boys (N=205)	Girls (N=208)	*t*	Boys (N=36)	Girls (N=31)	*t*	Boys (N=241) *t*	Girls (N=239) *t*
Mean IQ								
Full Scale IQ	89.2	83.8	[1]3.3	96.7	95.1	.5	1.9	[1]3.3
Verbal IQ	87.8	84.7	[1]2.6	92.3	92.5	–.1	1.8	[1]3.3
Performance IQ	98.5	94.3	[1]3.3	102.1	99.0	1.1	1.5	[2]2.4
Verbal subtests								
Information	7.9	7.2	[2]2.5	8.6	8.8	–.2	1.4	[1]3.1
Comprehension	8.2	7.4	[1]3.4	8.7	7.9	1.0	.8	1.1
Arithmetic	9.0	8.5	1.9	10.0	9.8	.2	1.7	[1]2.8
Similarities	8.1	7.8	.9	8.3	9.3	–1.4	.4	[1]3.0
Vocabulary	7.4	6.8	[2]2.2	8.3	8.4	–.1	1.7	[1]2.9
Digit Span	7.7	7.7	.1	8.7	8.6	.1	[2]2.3	[2]2.0
Performance subtests								
Picture Completion	9.4	8.4	[1]3.8	10.5	8.6	[1]2.8	1.8	.6
Picture Arrangement	9.6	9.0	[2]2.0	10.3	9.9	.6	1.6	[2]2.0
Block Design	9.6	8.7	[1]3.5	10.5	9.5	1.4	1.5	1.5
Object Assembly	10.3	9.1	[1]4.8	10.1	9.9	.4	.4	1.9
Coding	10.0	10.8	[1]–2.7	10.1	11.3	–1.9	.2	1.2

[1] Differences are significant at .01 level.
[2] Differences are significant at .05 level.

Intercorrelations of Scores for Children Aged 7 and 10

Tables VII and VIII in appendix III present the intercorrelations of the subtests of the WISC for Mexican-American children at ages 7 and 10. The correlations in these tables were compared with those published by Wechsler for children aged 7½ and 10½ on whom the test was normed. The *z* test of the significance of difference between two *r*'s was used. There were no Mexican-American children in the Wechsler sample.

There was a pattern of lower correlations between Coding and other subtests for 7-year-old children. There were no other significant differences in the correlations when 7-year-old Mexican-Americans were compared with children of similar age in Wechsler's sample.

For 10-year-old children, however, there were 34 correlations in the matrix which were significantly lower for Mexican-American children than for those in Wechsler's sample. Correlations between individual subtests and Full Scale IQ were significantly lower for every subtest except Object Assembly and Coding, both Performance tests. Comprehension and Picture Arrangement also had low correlations with the other subtests and with Full Scale, Verbal, and Performance IQ's. Ten of the 13 correlations for Comprehension and nine of the 13 correlations for Picture Arrangement were significantly lower than for the sample on which the test was normed. Only the correlations of Comprehension with Arithmetic, Similarities and Picture Completion approximated those of Wechsler's sample. Correlations with Vocabulary were significantly lower on seven of 13 comparisons, including Full

Scale, Verbal, and Performance IQ's. The correlations of Block Design with the other subtests and with the IQ's were significantly lower on four of 13 comparisons. With such generally low intercorrelations, it was not surprising that the correlation between Verbal IQ and Performance IQ was also significantly lower than that for the population on which the test was normed.

These lower intercorrelations of the subtest scores with each other and with Full Scale, Verbal, and Performance IQ's further justified the decision to treat ethnic groups separately in the evaluation of various short forms of the WISC.

Predicting Full Scale, Verbal, and Performance IQ's From Vocabulary and Block Design Scaled Scores

Table 17 presents the multiple correlation coefficients and standard errors obtained when Vocabulary and Block Design were used to predict the IQ's of Mexican-American children of various socioeconomic levels and ages. As with Anglo and Negro children, controlling for socioeconomic status and age did not appreciably improve the predictions. The multiple correlation for all the Mexican-American children for Full Scale IQ was .846 with a standard error of 6.74 IQ points. The coefficients for various socioeconomic and age categories ranged from .832 to .873, and the standard errors ranged from 6.29 to 6.91. Predictions were most accurate for Full Scale IQ and least accurate for Performance IQ. While the multiple correlation coefficients were of similar magnitude, all the standard errors were consistently lower for Mexican-American children than Anglo children. They were about the same as those for Negro children. Table IX in appendix III presents data on the estimated Full Scale IQ of Mexican-American children, which was obtained based on various combinations of Vocabulary and Block Design scaled scores using the following formula:

$$\text{Estimated IQ} = (2.64 \times \text{Vocabulary Scaled Score}) + (1.98 \times \text{Block Design Scaled Score}) + 53.49$$

The Percentage of Error in Predicting Subnormal IQ Using Three Criteria

The Full Scale IQ for each Mexican-American child in the sample was estimated using the appropriate beta coefficients. The percentages of children classified correctly and incorrectly as having subnormal IQ's is shown in table 18.

There were 30 percent of the low-status Mexican-American children and 17.6 percent of the middle-status Mexican-American children who had IQ's below 85, and 7.5 percent and 6.8 percent of these children, respectively, were falsely predicted to have IQ's of 85 and above. Altogether, 14.8 percent and 8.2 percent of the individual children were misclassified using this criterion. Errors were somewhat reduced using the two lower criteria. However, "false highs" tended to be balanced by "false lows"; the predicted percentage of children with low IQ's was from .2 percent to 5.4 percent less than the actual percentage of children with low IQ's, a much smaller percentage of error than found with predictions for individual children.

As with Negro children, differences between the actual and predicted percentage of low IQ's were all negative—i.e., in the direction of underestimating the percentage of persons with subnormal IQ's using the three different criteria. The magnitude of the errors was generally less than that found for Negro children but greater than that found for Anglo children (tables 6 and 12).

When the predicted Full Scale IQ's using the entire sample of Mexican-American children were compared with the actual IQ's, 6.6 percent of the individual children were misclassified as having IQ's below 85 and 7.4 percent were falsely classified as having IQ's of 85 and above—a 14-percent error. The total error using the 79– criterion was 10.5 percent and 3.2 percent using the 69– criterion. Errors of this magnitude would seem to preclude using a short form consisting of two subtests for screening individual children. If the consistent bias toward underestimation is taken into account, however, such a short form could be used to obtain a rough estimate of the percentage of children in a given population having low IQ's using each of the three criteria. This bias paralleled that found for Negro children (table 12).

Table 17. Full Scale, Verbal, and Performance IQ's from scaled scores for Mexican-American children, by socioeconomic status and age, and beta coefficients

Status, subtest, and age	Full Scale IQ			Verbal IQ			Performance IQ		
	r	*R*	Beta coefficient	*r*	*R*	Beta coefficient	*r*	*R*	Beta coefficient
STATUS									
Low (N=413)									
Vocabulary	.736	.736	2.68	.806	.806	3.26	.511	[1] (2).761	1.54
Block Design	.612	.841	1.98	.413	.825	.84	.692	(1).692	2.87
Constant Term		55.03			55.44			59.14	
Standard error of *Y*		6.72			6.91			8.46	
Middle (N=74)									
Vocabulary	.721	.721	2.36	.834	.834	3.37	.415	[1] (2).792	.81
Block Design	.634	.844	1.93	.400	.850	.75	.768	(1).768	2.87
Constant Term		56.92			56.73			65.11	
Standard error of *Y*		6.89			7.21			7.62	
AGE									
All ages, 6-11 years (N=487)									
Vocabulary	.740	.740	2.64	.816	.816	3.30	.504	[1] (2).766	1.41
Block Design	.620	.846	1.98	.420	.834	.83	.706	(1).706	2.87
Constant Term		53.49			55.40			60.06	
Standard error of *Y*		6.74			6.95			8.36	
6-7 years (N=156)									
Vocabulary	.730	.730	2.44	.802	.802	3.21	.485	[1] (2).758	1.11
Block Design	.634	.837	2.02	.456	.825	.99	.713	(1).713	2.79
Constant Term		55.79			56.13			63.70	
Standard error of *Y*		6.91			7.46			8.01	
8-9 years (N=174)									
Vocabulary	.779	.779	2.84	.858	.858	3.56	.533	[1] (2).783	1.53
Block Design	.612	.873	2.07	.410	.872	.83	.708	(1).708	3.05
Constant Term		50.27			52.73			56.87	
Standard error of *Y*		6.29			6.38			8.08	
10-11 years (N=157)									
Vocabulary	.729	.729	2.69	.800	.800	3.17	.518	[1] (2).761	1.66
Block Design	.611	.832	1.76	.389	.813	.59	.693	(1).693	2.71
Constant Term		54.63			57.82			59.63	
Standard error of *Y*		6.89			6.75			8.95	

[1] The order of the subtests reverses for the Performance IQ because Block Design, being a performance test, always has a higher linear correlation with Performance IQ and independently accounts for more of the variance in Performance IQ than does Vocabulary.

Table 18. Percent of correct and incorrect predictions for low Full Scale IQ's for Mexican-American children, by socioeconomic status and age using three different criteria

Status, IQ, and age	Correctly identified low IQ's	False low IQ's[1]	False high IQ's[2]	Correctly identified high IQ's	Actual percent low IQ's	Predicted percent low IQ's	Difference
STATUS	Percent						
Low (N=413)							
IQ 84-	22.5	7.3	7.5	62.7	30.0	29.8	- .2
IQ 79-	11.1	3.4	8.2	77.2	19.3	14.5	-4.8
IQ 69-	1.2	.7	2.7	95.4	3.9	1.9	-2.0
Middle (N=74)							
IQ 84-	10.8	1.4	6.8	81.1	17.6	12.2	-5.4
IQ 79-	2.7	1.4	2.7	93.2	5.4	4.1	-1.3
IQ 69-	0.0	0.0	1.4	98.6	1.4	0.0	-1.4
AGE							
All ages, 6-11 years (N=487)							
IQ 84-	20.5	6.6	7.4	65.5	27.9	27.1	- .8
IQ 79-	10.1	3.3	7.2	79.4	17.3	13.4	-3.9
IQ 69-	1.0	.8	2.4	95.8	3.4	1.8	-1.6
6-7 years (N=156)							
IQ 84-	16.0	4.5	8.3	71.2	24.3	20.5	-3.8
IQ 79-	6.4	1.9	7.7	84.0	14.1	8.3	-5.8
IQ 69-	.6	0.0	1.9	97.4	2.5	.6	-1.9
8-9 years (N=174)							
IQ 84-	19.5	7.5	9.2	63.8	28.7	27.0	-1.7
IQ 79-	12.1	2.3	6.9	78.7	19.0	14.4	-4.6
IQ 69-	1.1	2.3	2.9	93.7	4.0	3.4	- .6
10-11 years (N=157)							
IQ 84-	23.6	6.4	7.6	62.4	31.2	30.0	-1.2
IQ 79-	11.5	5.1	7.0	76.4	18.5	16.6	-1.9
IQ 69-	1.9	0.0	1.9	96.2	3.8	1.9	-1.9

[1] False low IQ's were for children who were predicted to have an IQ below the criterion but who actually had an IQ above the criterion.

[2] False high IQ's were for children who were predicted to have an IQ above the criterion but who actually had an IQ below the criterion.

Optimal Prediction From Various Combinations of Subtests

Table 19 presents the results of a stepwise multiple regression analysis in which each of the scaled scores of the 11 subtests was used as an independent variable to predict Full Scale, Verbal, and Performance IQ's. Only the four best predictors of Full Scale IQ and the three best predictors of Verbal and Performance IQ are shown. There was little difference in the size of the correlation coefficients or standard errors across socioeconomic status or age. For the entire Mexican-American sample, $R = .926$ for Full Scale IQ using four subtests and ranged from .925 to .938 for various subgroups. The

Table 19. Optimal predictions of IQ's of Mexican-American children from various combinations of subtests, by socioeconomic status and age

Status, subtest, and age	Full Scale IQ r	Full Scale IQ R	Full Scale IQ Beta coefficient	Status, subtest, and age	Verbal IQ r	Verbal IQ R	Verbal IQ Beta coefficient	Status, subtest, and age	Performance IQ r	Performance IQ R	Performance IQ Beta coefficient
STATUS				STATUS				STATUS			
Low (N=413)				Low (N=413)				Low (N=413)			
Vocabulary	.736	.736	1.73	Vocabulary	.806	.806	1.90	Object Assembly	.709	.709	2.28
Block Design	.612	.841	1.32	Arithmetic	.725	.900	1.76	Picture Arrangement	.701	.850	2.03
Picture Arrangement	.693	.897	1.28	Similarities	.753	.939	1.35	Coding	.566	.914	1.52
Arithmetic	.688	.925	1.30	Constant Term		46.66		Constant Term		39.73	
Constant Term		42.56		Standard error of Y		4.19		Standard error of Y		5.30	
Standard error of Y		4.72									
Middle (N=74)				Middle (N=74)				Middle (N=74)			
Information	.753	.753	1.51	Vocabulary	.834	.834	1.81	Block Design	.768	.768	2.34
Block Design	.634	.869	1.66	Information	.829	.909	2.15	Picture Completion	.612	.852	1.56
Similarities	.680	.904	1.22	Digit Span	.536	.945	1.46	Coding	.483	.923	1.48
Picture Completion	.582	.927	.97	Constant Term		45.90		Constant Term		46.44	
Constant Term		46.27		Standard error of Y		4.50		Standard error of Y		4.84	
Standard error of Y		4.88									
AGE				AGE				AGE			
6-11 years (N=487)				6-11 years (N=487)				6-11 years (N=487)			
Vocabulary	.740	.740	1.77	Vocabulary	.816	.816	1.92	Block Design	.706	.706	2.21
Block Design	.620	.846	1.32	Arithmetic	.725	.903	1.71	Picture Arrangement	.693	.845	2.01
Picture Arrangement	.676	.898	1.26	Similarities	.761	.952	1.39	Coding	.555	.913	1.54
Arithmetic	.691	.926	1.26	Constant Term		46.67		Constant Term		41.49	
Constant Term		42.85		Standard error of Y		4.22		Standard error of Y		5.32	
Standard error of Y		4.78									
6-7 years (N=156)				6-7 years (N=156)				6-7 years (N=156)			
Information	.745	.745	1.46	Vocabulary	.802	.802	1.88	Picture Arrangement	.728	.728	2.10
Picture Arrangement	.722	.853	1.34	Information	.789	.895	2.03	Coding	.540	.858	1.48
Vocabulary	.730	.902	1.35	Digit Span	.647	.940	1.60	Block Design	.713	.925	1.78
Block Design	.634	.934	1.29	Constant Term		46.40		Constant Term		49.93	
Constant Term		46.30		Standard error of Y		4.51		Standard error of Y		4.68	
Standard error of Y		4.53									
8-9 years (N=174)				8-9 years (N=174)				8-9 years (N=174)			
Vocabulary	.779	.779	2.13	Vocabulary	.858	.858	2.09	Block Design	.708	.708	2.36
Block Design	.612	.873	1.53	Arithmetic	.731	.919	1.65	Picture Arrangement	.706	.845	1.92
Coding	.553	.913	1.02	Similarities	.783	.951	1.36	Coding	.587	.909	1.47
Picture Arrangement	.681	.938	1.20	Constant Term		45.53		Constant Term		41.95	
Constant Term		39.11		Standard error of Y		4.06		Standard error of Y		5.43	
Standard error of Y		4.50									
10-11 years (N=157)				10-11 years (N=157)				10-11 years (N=157)			
Vocabulary	.729	.729	1.66	Vocabulary	.800	.800	2.33	Object Assembly	.808	.808	2.42
Object Assembly	.713	.852	1.76	Arithmetic	.737	.906	1.71	Picture Completion	.686	.884	1.64
Arithmetic	.647	.908	1.40	Digit Span	.540	.950	1.49	Picture Arrangement	.650	.934	1.61
Digit Span	.503	.931	1.17	Constant Term		42.60		Constant Term		43.88	
Constant Term		40.09		Standard error of Y		3.46		Standard error of Y		4.93	
Standard error of Y		4.57									

standard error for the total sample was 4.78 IQ points and ranged from 4.50 to 4.88 for various subgroups. Differences between multiple correlation coefficients for the total sample and those for subgroups were negligible for Verbal IQ and Performance IQ.

Vocabulary and Block Design were the two subtests which, together, accounted for the most variance in Full Scale IQ for the total sample of Mexican-Americans. Vocabulary consistently appeared as one of the better predictors for the entire sample and for different subgroups based on socioeconomic status and age. The pattern for Block Design was less clear in the subgroups, but it emerged as the best performance test when all children were treated as a single group.

Optimal Predictions Compared With Predictions Based on Vocabulary and Block Design

Table 20 compares the multiple correlation coefficients based on Vocabulary and Block Design with the coefficients based on the two subtests yielding the highest correlation. In three comparisons, the optimal combination of two subtests was Block Design and Vocabulary, and in the three other comparisons differences ranged from .016 to .025. As in the case of Anglo children, we concluded that the two optimal tests for a short form of the WISC for Mexican-American children are Vocabulary and Block Design, the tests used in Cycle II.

Discussion

A view of the literature revealed no studies specifically investigating the use of short forms of the WISC in evaluating a sample of Mexican-American children, although there are investigators who have studied the possibility of using the Performance IQ as a more valid indicator of intelligence in Mexican-American children than Full Scale IQ. Other investigators have found differences between Verbal and Performance IQ similar to those found in the present study. For example, Altus compared the WISC scores of a group of bilingual children of Mexican descent with unilingual children of non-Mexican descent. All these children were being screened for special education classes. She found significant differences in favor of the unilingual children on Verbal IQ but no difference in Performance IQ (Altus, 1953). Thompson found discrepancies in verbal performance to be significantly higher for a bilingual group of 60 children than for a control group of English-speaking children equated for age and Performance IQ (Thompson, 1951).

Table 20. Comparison of Block Design and Vocabulary as predictors with the two optimal predictors for Full Scale, Verbal, and Performance IQ's for Mexican-American children, by socioeconomic status and age

Status and age	Full Scale IQ			Verbal IQ			Performance IQ		
	R Block Design and Vocabulary	*R* Two optimal predictors	Difference	*R* Block Design and Vocabulary	*R* Two optimal predictors	Difference	*R* Block Design and Vocabulary	*R* Two optimal predictors	Difference
Status									
Low (N=413)	.841	.841	.000	.825	.900	.075	.761	.850	.089
Middle (N=74)	.844	.869	.025	.850	.909	.059	.792	.852	.060
Age									
Total, 6-11 years (N=487) . . .	.846	.846	.000	.834	.903	.069	.766	.845	.079
6-7 years (N=156) . . .	.837	.853	.016	.825	.895	.070	.758	.858	.100
8-9 years (N=174	.873	.873	.000	.872	.919	.047	.783	.845	.062
10-11 years (N=157) . .	.832	.852	.020	.813	.906	.093	.761	.884	.123

Holland conducted a study in which he administered the WISC bilingually to 36 Spanish-speaking children in first through fifth grades. This testing yielded an English Verbal IQ and a Bilingual Verbal IQ. He interpreted the difference in the two IQ's as a measure of the language barrier. The mean English Verbal IQ was 80.6, with a range of 45 to 118, while the mean Bilingual Verbal IQ was 85.2, with a range of 48 to 118, an average language barrier of 4.6 IQ points. In the same study, Holland found the mean Performance IQ was 10.2 points higher than the mean English Verbal IQ ($p < .01$) and 5.6 points higher than the mean Bilingual Verbal IQ ($p < .01$) (Holland, 1960). The difference between Verbal and Performance IQ's is almost identical to that found in the Riverside sample. The difference between the mean Verbal IQ and mean Performance IQ was 9.4 for 6-year-old Mexican-American children, 10.4 for 7-year-olds, 9.2 for 8-year-olds, 8.7 for 9-year-olds, 9.4 for 10-year-olds, and 11.1 for 11-year-olds (table 20).

The feasibility of using the Performance IQ as a short form was further explored by Cate, who administered the Performance subtests of the WISC and WAIS, depending upon the child's age, to a sample of students enrolled in classes teaching English as a second language. He compared these Performance IQ's with IQ's derived from Tests of General Ability administered to grades 6 through 9; Raven's Progressive Matrices; the Cattell Culture Fair Intelligence Test, Scale 2; and a verbal test in Spanish, the *Test Rapido Barranguilla.* There were no marked differences in the mean IQ's obtained nor any significant difference between the mean scaled scores for Picture Completion, Picture Arrangement, Block Design, and Object Assembly. There was a considerable difference between the mean for Coding and all other performance tests. Intercorrelations between subtests and the Performance scaled score ran a little higher than intercorrelations shown in the *WISC Manual* (Wechsler, 1949) for children age 13½, and the ranking of correlations for each subtest were similar (Cate, 1967).

We found that the multiple correlation coefficients predicting Full Scale IQ from the scaled scores on Vocabulary and Block Design were .846 for Mexican-American children (with a standard error of 6.74 IQ points) as compared with $R = .827$ (with a standard error of 6.78 IQ points) for Negro children and $R = .867$ (with a standard error of 7.50 IQ points) for Anglo children (see tables 5, 11, and 17). Differences between the groups were inconsequential.

Conclusions

1. Vocabulary and Block Design were the two subtests which provided the best prediction of Full Scale IQ for Mexican-American children in the Riverside sample.

2. Differences in multiple correlations between Vocabulary and Block Design scaled scores and Full Scale IQ by age and socioeconomic status were minimal although there were sex differences in mean IQ for low-status Mexican-American children, there were socioeconomic differences in mean IQ, and the mean Performance IQ was consistently higher than the mean Verbal IQ for each age group. The regression equation based on all Mexican-American children was as efficient for predicting Full Scale IQ as the regression equations for subgroups categorized by age or socioeconomic level.

3. When Vocabulary and Block Design were used to predict Full Scale IQ of Mexican-American children, the regression equation was

$$\text{Predicted Full Scale IQ} = 53.49 + (2.64 \times \text{Vocabulary Scaled Score}) + (1.98 \times \text{Block Design Scaled Score})$$

with $R = .846$.

Table IX in appendix III can be used to facilitate the calculation of estimated IQ's for individual children using scaled scores on Vocabulary and Block Design.

4. When Mexican-American children were classified as intellectually "normal" or "subnormal" using IQ's estimated from their scaled scores on Vocabulary and Block Design, 14 percent of the individual children were misclassified when 84– was the criterion, 10.5 percent were misclassified when 79– was the criterion, and 3.2 percent were misclassified when 69– was the criterion. Errors of this magnitude seem to indicate that two subtests were not sufficiently correlated with Full Scale IQ for identifying individual subnormals.

5. When estimates were concerned with the percentage of children falling below each of the three criteria, the error was reduced. As with Negro children, the error was always in the direction of underestimation—e.g., .8 percent at the 84– criterion; 3.9 percent at the 79– criterion; and 1.6 percent at the 69– criterion.

GENERAL SUMMARY AND CONCLUSIONS

The purpose of this report was to evaluate the use of two subtests of the WISC, Vocabulary and Block Design, as a short form for estimating the Full Scale IQ's of children 6-11 years of age, with specific attention to their efficiency in differentiating children with subnormal IQ's.

Because of significant correlations of Full Scale, Verbal, and Performance IQ's with ethnic group and socioeconomic status, it was decided to conduct the analysis separately for Anglo, Negro, and Mexican-American children and to examine relationships by socioeconomic status and age for each group.

The first finding was that girls from homes of lower socioeconomic status in all three ethnic groups did less well than low-status boys. Low-status boys had significantly higher Verbal IQ's in all ethnic groups. Differences were especially marked for Negro and Mexican-American children. Low-status Negro boys were significantly higher than low-status Negro girls on six of the 11 subtests, and Mexican-American boys were significantly higher than Mexican-American girls on seven of the 11 subtests. Sex differences tended to disappear for middle-status children (tables 4, 10, and 16).

All scores tended to increase with social status for both Anglo boys and girls. The same pattern held for Negro and Mexican-American children, except that relatively few of the increases for boys were statistically significant whereas many of the increases for girls were significant. It appears that the disappearance of sex differences for middle-status Negro and Mexican-American children resulted primarily from the relatively greater improvement in the scores of girls with the increase in status.

The intercorrelations of subtest scaled scores with each other and with Full Scale, Verbal, and Performance IQ's for the three ethnic groups were compared with comparable intercorrelation matrices reported by Wechsler for children at ages 7½ and 10½ on whom the test was normed. The intercorrelations for 7-year-olds in the Riverside sample approximated the matrix presented by Wechsler, but many of the intercorrelations for the 10-year-olds in the sample were significantly lower—e.g., 26 of 89 for Anglo 10-year-olds; 27 of 89 for Negro 10-year-olds; and 33 of 89 for Mexican-American 10-year-olds. This indicates that the intercorrelations for the Riverside sample, in general, may not have been as high as for Wechsler's sample, which would influence the amount of error in predicting IQ from Vocabulary and Block Design in the Riverside sample.

When Vocabulary and Block Design were used to predict Full Scale, Verbal, and Performance IQ's, it was found that estimates were not materially improved when each ethnic group was categorized by socioeconomic status or by age. Multiple correlation coefficients were approximately the same for all three ethnic groups. Therefore, we concluded that Vocabulary and Block Design provide an essentially equivalent short form for predicting the IQ's for all three groups.

However, when we focused specifically on the lower end of the distribution to determine the number of children correctly and incorrectly categorized as "subnormal" using three different criteria (IQ 84–, 79–, and 69–), more errors were made in categorizing individual Negro and Mexican-American children than in classifying individual Anglo children. Proportionately, about three times as many Negro and Mexican-American children were incorrectly classified using the 84– criterion than Anglo children; six times as many using the 79– criterion; but less than twice as many using the 69– criterion. These differences were undoubtedly related to the fact that more Mexican-American and Negro children than Anglo children had IQ's below 85. It is doubtful that a short form of the WISC consisting of Vocabulary and Block Design should be used for anything but a crude initial individual screening, and then only at the traditional level for defining mental retardation (i.e., IQ 69–). While it might be used for Anglo children at the 79– criterion, the error is large for Negro and Mexican-American children, and the short form should probably not be used at that criterion for these groups. The 84– criterion had a relatively large percentage of classification errors for all three groups (tables 6, 12, and 18). However, false high IQ's tended to balance false low IQ's, so that predictions of rates are feasible for groups but not for individuals. Predictions for groups tended to underestimate rates of low IQ's for both Negro and Mexican-American children.

Multiple correlations were used to identify the optimal subtests for predicting Full Scale, Verbal, and Performance IQ's for each ethnic group and for subclasses within ethnic groups based on socioeconomic status and age. Vocabulary and Block Design proved to be the two optimal subtests for Anglo and Mexican-American children. Vocabulary and Object Assembly were the optimal dyad for Negro children; however, the difference in predictability when compared with Vocabulary and Block Design was minimal (tables 7, 13, and 19).

When the correlation between Full Scale IQ and the optimal dyad was compared with the correlation between Full Scale IQ and the dyad consisting of Vocabulary and Block Design, Vocabulary and Block Design were the optimal dyad in three of seven categories, and differences in multiple correlation coefficients ranged from .011 to .027 in the other four comparisons for Anglos (table 8). Vocabulary and Block Design were not the optimal dyad for predicting Full Scale IQ for any of the groups of Negro children, but differences in the multiple correlation coefficients between the optimal dyad and Vocabulary and Block Design were relatively small, ranging from .005 to .070 (table 14). For Mexican-American children Vocabulary and Block Design were the optimal dyad in three of the six categories of children, and differences ranged from .016 to .025 in the other three groups (table 20). When the empirical and theoretical distributions for IQ were compared, the two matched exactly at the mean for Anglo and Mexican-American children—i.e., predicted IQ for scaled scores of 10 on Vocabulary and Block Design = 100, but predicted IQ for Negro children was one point lower, 99.

We concluded that the choice of Vocabulary and Block Design as the two subtests to use in Cycle II of the Health Examination Survey was justified. No other dyad would have produced better overall predictions for all three ethnic groups in the Riverside sample. However, the multiple correlation coefficients when this dyad was correlated with Full Scale IQ were only .867, .827, and .846, with standard errors of 7.50, 6.78, and 6.74 IQ points for the three ethnic groups. This means that only approximately 72 percent of the variance in Full Scale IQ was accounted for by these two subtests, leaving 28 percent of the variance unaccounted for. Prediction of group rates based on this dyad is feasible, but classification of individuals based on this or any other dyad of subtests should be done with discretion.

Table X in appendix IV provides estimated full scale IQ's predicted from the scaled scores of the Vocabulary and Block Design subtests using the multiple regression equation based on the entire sample of 1,310 children without regard for ethnic group. The multiple correlation coefficient of .880 was higher than for any individual ethnic group. The regression equation for the estimated Full Scale IQ was (2.57 X Vocabulary Scaled Score) + (2.05 X Block Design Scaled Score) + 53.15. The standard error of *Y* was 7.09.

Table XI in appendix IV presents estimated full scale IQ's predicted from the sum of the scaled scores on Block Design and Vocabulary for the entire 1,310 children. A correlation coefficient of .880 was obtained and the regression equation was:

Estimated Full Scale IQ = 52.51
+ (2.3 X Sum Scaled Score on Block Design and Vocabulary)

and the standard error of *Y* was 7.14. Thus, the Full Scale IQ for the entire sample can be predicted with about the same accuracy from the unweighted sum of the scaled scores as from the weighted scaled scores. Table XI also presents separate predictions for males and females. The correlation for females of .889 is slightly higher than that of .871 for males. The female distribution exactly matched the theoretical distribution at the mean—i.e., predicted IQ for a sum of the scaled scores of Block Design and Vocabulary of 20 was 100.

Table XII in appendix IV presents the percentage of correct and incorrect predictions of Low Full Scale IQ's comparing the two methods of predicting from Block Design and Vocabulary scaled scores. Using the IQ 69- criterion, the sum of scaled scores produced slightly less error than the weighted scaled scores (1.2 percent vs. 1.7 percent). When the IQ 79- and IQ 84- criteria are used, there was slightly less error in the weighted scaled scores based on the multiple regression equation.

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APPENDIX I ANGLO CHILDREN

Table I. Intercorrelations of tests in the WISC for Anglo children[1] aged 7: 62 boys and 38 girls

Test	Information	Comprehension	Arithmetic	Similarities	Vocabulary	Digit Span	Picture Completion	Picture Arrangement	Block Design	Object Assembly	Coding	Verbal IQ	Performance IQ	Full Scale IQ
Comprehension	.50													
Arithmetic	.59	.37												
Similarities	.54	.34	.51											
Vocabulary	.61	.51	.45	.50										
Digit Span	.29	.10	.47	.35	[2].14									
Picture Completion	.42	[2].09	.29	.29	.42	[2].05								
Picture Arrangement	.35	.18	.32	.42	.27	.26	.24							
Block Design	.42	.33	.48	.39	.43	.38	.28	.49						
Object Assembly	.44	.17	.46	.33	.41	.36	.35	.45	.56					
Coding	.41	.15	.42	.24	.36	.34	.17	.19	.47	.34				
Verbal IQ	.74	.52	.67	.62	.64	.35	.38	.41	.56	.50	.45			
Performance IQ	.59	.27	.57	.49	.55	.40	.41	.54	[3].71	.66	.47	.66		
Full Scale IQ	.66	[2].33	.62	.55	.70	.34	.35	.43	.62	.56	.42	-	-	-
Mean IQ												102.5	106.1	104.3
Standard deviation												14.8	15.7	15.2

[1] All *r*'s were corrected for spuriousness whenever a single test was correlated with a composite of which it is a contributing member. The same correction was used as that used by Wechsler (1949, p. 9), i.e., the correction suggested by McNemar (1949).

[2] The correlation in the Anglo sample is significantly lower ($p < .05$) than that in the standardization sample.

[3] The correlation in the Anglo sample is significantly higher ($p < .05$) than that in the standardization sample.

Table II. Intercorrelations of tests in the WISC for Anglo children[1] aged 10: 42 boys and 48 girls

Test	Information	Comprehension	Arithmetic	Similarities	Vocabulary	Digit Span	Picture Completion	Picture Arrangement	Block Design	Object Assembly	Coding	Verbal IQ	Performance IQ	Full Scale IQ
Comprehension	[2].45													
Arithmetic	[2].45	.27												
Similarities	[2].51	.47	[2].43											
Vocabulary	.67	[2].60	.49	.64										
Digit Span	.16	.21	[2].19	.20	[2].22									
Picture Completion	.49	.28	.28	.39	.42	.31								
Picture Arrangement	[2].28	[2].00	[2].22	[2].06	[2].27	[2].05	.29							
Block Design	.50	.32	.50	[3].62	.61	.21	.51	[2].29						
Object Assembly	.32	[2].06	.18	.26	.28	.14	.39	.42	.49					
Coding	.37	.27	.26	.40	.38	.39	.37	.31	.39	.43				
Verbal IQ	[2].66	.58	[2].52	.66	.78	[2].27	.50	[2].21	.66	.29	.48			
Performance IQ	.56	[2].28	.41	.50	.56	.32	.60	.48	.64	.64	[3].56	.61		
Full Scale IQ	[2].62	[2].36	[2].44	.56	[2].68	[2].25	.53	[2].28	.68	.44	.50			
Mean IQ												108.28	110.67	109.83
Standard deviation												14.13	16.29	15.20

[1] All *r*'s were corrected for spuriousness whenever a single test was correlated with a composite of which it is a contributing member. The same correction was used as that used by Wechsler (1949, p. 9), i.e., the correction suggested by McNemar (1949).

[2] The correlation in the Anglo sample is significantly lower ($p < .05$) than that in the standardization sample.

[3] The correlation in the Anglo sample is significantly higher ($p < .05$) than that in the standardization sample.

Table III. Estimated Full Scale IQ from Block Design and Vocabulary scaled scores for Anglo children aged 6-11

Block Design	Vocabulary																				
	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
0	54	56	59	61	64	66	68	71	73	76	78	81	83	86	88	91	93	95	98	100	103
1	56	58	61	63	66	68	71	73	76	78	80	83	85	88	90	93	95	98	100	103	105
2	58	61	63	65	68	70	73	75	78	80	83	85	87	90	92	95	97	100	102	105	107
3	60	63	65	68	70	72	75	77	80	82	85	87	90	92	95	97	99	102	104	107	109
4	62	65	67	70	72	75	77	80	82	84	87	89	92	94	97	99	102	104	107	109	111
5	65	67	69	72	74	77	79	82	84	87	89	92	94	96	99	101	104	106	109	111	114
6	67	69	72	74	77	79	81	84	86	89	91	94	96	99	101	103	106	108	111	113	116
7	69	71	74	76	79	81	84	86	88	91	93	96	98	101	103	106	108	111	113	115	118
8	71	73	76	78	81	83	86	88	91	93	96	98	100	103	105	108	110	113	115	118	120
9	73	76	78	81	83	85	88	90	93	95	98	100	103	105	107	110	112	115	117	120	122
10	75	78	80	83	85	88	90	92	95	97	100	102	105	107	110	112	115	117	119	122	124
11	77	80	82	85	87	90	92	95	97	100	102	104	107	109	112	114	117	119	122	124	127
12	80	82	85	87	89	92	94	97	99	102	104	107	109	111	114	116	119	121	124	126	129
13	82	84	87	89	92	94	96	99	101	104	106	109	111	114	116	119	121	123	126	128	131
14	84	86	89	91	94	96	99	101	104	106	108	111	113	116	118	121	123	126	128	131	133
15	86	89	91	93	96	98	101	103	106	108	111	113	116	118	120	123	125	128	130	133	135
16	88	91	93	96	98	101	103	105	108	110	113	115	118	120	123	125	127	130	132	135	137
17	90	93	95	98	100	103	105	108	110	112	115	117	120	122	125	127	130	132	135	137	139
18	93	95	97	100	102	105	107	110	112	115	117	120	122	124	127	129	132	134	137	139	142
19	95	97	100	102	105	107	109	112	114	117	119	122	124	127	129	131	134	136	139	141	144
20	97	99	102	104	107	109	112	114	116	119	121	124	126	129	131	134	136	139	141	143	146

NOTE: Estimated IQ = (2.45 X Vocabulary scaled score) + (2.15 X Block Design scaled score) + 53.77. Standard error = 7.50.

APPENDIX II NEGRO CHILDREN

Table IV. Intercorrelations of tests in the WISC for Negro children[1] aged 7: 31 boys and 33 girls

Test	Information	Comprehension	Arithmetic	Similarities	Vocabulary	Digit Span	Picture Completion	Picture Arrangement	Block Design	Object Assembly	Coding	Verbal IQ	Performance IQ	Full Scale IQ
Comprehension	.27													
Arithmetic	.38	.18												
Similarities	.28	.31	.27											
Vocabulary	.57	.49	.30	.55										
Digit Span	.39	.32	.38	.39	.43									
Picture Completion	.14	.30	[2]-.06	.18	.30	.18								
Picture Arrangement	.25	.34	.39	.34	.51	.34	.24							
Block Design	.23	[2]-.02	.27	.19	.14	.23	.24	.29						
Object Assembly	.28	.16	.16	.27	.35	.23	.23	.35	[2].12					
Coding	.17	.14	.05	.27	.38	.23	.35	.10	.12	.38				
Verbal IQ	.55	.43	.43	.51	.70	.54	.25	.52	.25	.34	.30			
Performance IQ	.34	.30	.28	.41	.55	.40	.48	.47	.37	.49	.43	.54		
Full Scale IQ	.42	.33	[2].31	.45	.65	.43	.31	.47	[2].24	.38	.30	-	-	
Mean IQ												93.05	96.48	93.75
Standard deviation												11.47	11.84	11.28

[1] All *r*'s were corrected for spuriousness whenever a single test was correlated with a composite of which it is a contributing member. The same correction was used as that used by Wechsler, (1949, p. 9), i.e., the correction suggested by McNemar (1949).
[2] The correlation in the Negro sample is significantly lower ($p < .05$) than that in the standardization sample.

Table V. Intercorrelations of tests in the WISC for Negro children[1] aged 10: 25 boys and 23 girls

Test	Information	Comprehension	Arithmetic	Similarities	Vocabulary	Digit Span	Picture Completion	Picture Arrangement	Block Design	Object Assembly	Coding	Verbal IQ	Performance IQ	Full Scale IQ
Comprehension	.59													
Arithmetic	[2].47	.53												
Similarities	.53	.54	.50											
Vocabulary	.81	.62	.51	.49										
Digit Span	.39	.30	.47	.48	.34									
Picture Completion	[2].00	[2]-.14	[2]-.19	[2]-.08	[2].02	-.03								
Picture Arrangement	[2].23	[2].10	[2]-.03	.17	.36	.14	.26							
Block Design	[2].12	[2]-.14	[2]-.11	.15	[2].26	.02	[2].10	.27						
Object Assembly	.19	[2].02	[2].01	.14	.30	.14	.44	.40	.58					
Coding	.48	.38	.55	.24	.51	.34	-.08	[2]-.06	.08	.07				
Verbal IQ	.71	.65	.62	.64	.70	.47	[2]-.10	[2].20	[2].05	.17	.54			
Performance IQ	.35	[2].08	[2].09	.21	.50	.21	.35	.41	.50	.70	.08	[2].30		
Full Scale IQ	.61	[2].37	[2].35	.46	.72	.35	[2].01	[2].25	[2].18	.36	.33	-	-	
Mean IQ												95.83	94.38	94.90
Standard deviation												12.77	12.02	10.95

[1] All *r*'s were corrected for spuriousness whenever a single test was correlated with a composite of which it is a contributing member. The same correction was used as that used by Wechsler, (1949, p. 9), i.e., the correction suggested by McNemar (1949).
[2] The correlation in the Negro sample is significantly lower ($p < .05$) than that in the standardization sample.

Table VI. Estimated Full Scale IQ from Block Design and Vocabulary scaled scores for Negro children aged 6-11

Block Design	Vocabulary																				
	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
0	55	58	60	63	65	68	70	73	75	78	81	83	86	88	91	93	96	98	101	104	106
1	57	59	62	64	67	70	72	75	77	80	82	85	87	90	92	95	98	100	103	105	108
2	58	61	64	66	69	71	74	76	79	81	84	87	89	92	94	97	99	102	104	107	110
3	60	63	65	68	70	73	76	78	81	83	86	88	91	93	96	98	101	104	106	109	111
4	62	64	67	70	72	75	77	80	82	85	87	90	93	95	98	100	103	105	108	110	113
5	64	66	69	71	74	76	79	81	84	87	89	92	94	97	99	102	104	107	110	112	115
6	65	68	70	73	76	78	81	83	86	88	91	93	96	98	101	104	106	109	111	114	116
7	67	70	72	75	77	80	82	85	87	90	93	95	98	100	103	105	108	110	113	116	118
8	69	71	74	76	79	82	84	87	89	92	94	97	99	102	104	107	110	112	115	117	120
9	70	73	76	78	81	83	86	88	91	93	96	99	101	104	106	109	111	114	116	119	121
10	72	75	77	80	82	85	87	90	93	95	98	100	103	105	108	110	113	116	118	121	123
11	74	76	79	82	84	87	89	92	94	97	99	102	105	107	110	112	115	117	120	122	125
12	76	78	81	83	86	88	91	93	96	99	101	104	106	109	111	114	116	119	122	124	127
13	77	80	82	85	88	90	93	95	98	100	103	105	108	110	113	116	118	121	123	126	128
14	79	82	84	87	89	92	94	97	99	102	105	107	110	112	115	117	120	122	125	127	130
15	81	83	86	88	91	93	96	99	101	104	106	109	111	114	116	119	122	124	127	129	132
16	82	85	88	90	93	95	98	100	103	105	108	111	113	116	118	121	123	126	128	131	133
17	84	87	89	92	94	97	99	102	105	107	110	112	115	117	120	122	125	128	130	133	135
18	86	88	91	94	96	99	101	104	106	109	111	114	116	119	122	124	127	129	132	134	137
19	88	90	93	95	98	100	103	105	108	111	113	116	118	121	123	126	128	131	133	136	139
20	89	92	94	97	99	102	105	107	110	112	115	117	120	122	125	128	130	133	135	138	140

NOTE: Estimated IQ = (2.55 X Vocabulary scaled score) + (1.71 X Block Design scaled score) + 55.07. Standard error = 6.78. R = .827.

APPENDIX III MEXICAN-AMERICAN CHILDREN

Table VII. Intercorrelations of tests in the WISC for Mexican-American children[1] aged 7: 53 boys and 43 girls

Test	Information	Comprehension	Arithmetic	Similarities	Vocabulary	Digit Span	Picture Completion	Picture Arrangement	Block Design	Object Assembly	Coding	Verbal IQ	Performance IQ	Full Scale IQ
Comprehension	.48													
Arithmetic	.51	.20												
Similarities	.59	.35	.34											
Vocabulary	.64	.53	.41	.54										
Digit Span	.37	.27	.52	.40	.37									
Picture Completion	[2].41	.28	.36	.29	.44	.16								
Picture Arrangement	.43	.35	.34	.50	.35	.43	.30							
Block Design	.33	.27	.40	.31	.35	.45	.23	.50						
Object Assembly	.35	.29	.38	.28	.38	[2].46	.22	.40	.50					
Coding	.16	[3]–.09	[3].08	–.01	.02	[3]–.01	.13	[3]–.04	.15	.09				
Verbal IQ	.73	.49	.50	.60	.70	.51	.44	.55	.48	.48	[3].03			
Performance IQ	.52	.34	.50	.43	.48	.48	.42	.52	.63	.55	.20	.62		
Full Scale IQ	.64	.37	.49	.48	.59	.49	.40	.52	.50	.50	[4]–.02	-	-	
Mean IQ												88.6	98.9	92.7
Standard deviation												12.9	12.5	12.3

[1] All *r*'s were corrected for spuriousness whenever a single test was correlated with a composite of which it is a contributing member. The same correction was used as that used by Wechsler, (1949, p. 9), i.e., the correction suggested by McNemar (1949).

[2] The correlation in the Mexican-American sample is significantly higher ($p < .05$) than that in the standardization sample.

[3] The correlation in the Mexican-American sample is significantly lower ($p < .05$) than that in the standardization sample.

[4] The correlation in the Mexican-American sample is significantly lower ($p < .01$) than that in the standardization sample.

Table VIII. Intercorrelation of tests in the WISC for Mexican-American children[1] aged 10: 39 boys and 49 girls

Test	Information	Comprehension	Arithmetic	Similarities	Vocabulary	Digit Span	Picture Completion	Picture Arrangement	Block Design	Object Assembly	Coding	Verbal IQ	Performance IQ	Full Scale IQ
Comprehension	[2].35													
Arithmetic	[3].53	.31												
Similarities	[3].50	.40	[3].39											
Vocabulary	.68	[2].41	.46	.62										
Digit Span	.41	[3].13	.23	[3].13	[3].15									
Picture Completion	.21	.17	.12	.16	.33	–.05								
Picture Arrangement	[3].22	[3].16	[3].24	[3].17	[3].34	.14	.27							
Block Design	.36	[3].11	.27	.20	[3].29	.28	.26	[3].28						
Object Assembly	.39	[3].10	.36	.24	.40	.18	.34	.40	.61					
Coding	.41	[3]–.05	.37	.14	.24	.11	.05	[3].10	.10	.25				
Verbal IQ	.73	[2].41	.55	.60	[3].71	.29	.24	[3].32	.37	.42	.30			
Performance IQ	.49	[2].16	.41	.29	[3].50	.20	.41	.46	.55	[4].70	.22	[3].51		
Full Scale IQ	[3].63	[2].22	[3].47	[3].39	[2].62	[3].20	[3].26	[3].34	[3].43	.55	.22	-	-	
Mean IQ												82.2	97.6	91.6
Standard deviation												10.9	12.4	11.1

[1] All *r*'s were corrected for spuriousness whenever a single test was correlated with a composite of which it is a contributing member. The same correction was used as that used by Wechsler (1949, p. 9), i.e., the correction suggested by McNemar (1949).

[2] The correlation in the Mexican-American sample is significantly lower ($p < .01$) than that in the standardization sample.

[3] The correlation in the Mexican-American sample is significantly lower ($p < .05$) than that in the standardization sample.

[4] The correlation in the Mexican-American sample is significantly higher ($p < .05$) than that in the standardization sample.

Table IX. Estimated Full Scale IQ from Block Design and Vocabulary scaled scores for Mexican-American children aged 6-11

Block Design	Vocabulary																				
	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
0	53	56	59	61	64	67	69	72	75	77	80	82	85	88	90	93	96	98	101	104	106
1	55	58	61	63	66	69	71	74	77	79	82	84	87	90	92	95	98	100	103	106	108
2	57	60	63	65	68	71	73	76	79	81	84	86	89	92	94	97	100	102	105	108	110
3	59	62	65	67	70	73	75	78	81	83	86	88	91	94	96	99	102	104	107	109	112
4	61	64	67	69	72	75	77	80	82	85	88	90	93	96	98	101	104	106	109	111	114
5	63	66	69	71	74	77	79	82	84	87	90	92	95	98	100	103	106	108	111	113	116
6	65	68	71	73	76	79	81	84	86	89	92	94	97	100	102	105	108	110	113	115	118
7	67	70	73	75	78	80	83	86	88	91	94	96	99	102	104	107	109	112	115	117	120
8	69	72	75	77	80	82	85	88	90	93	96	98	101	104	106	109	111	114	117	119	122
9	71	74	77	79	82	84	87	90	92	95	98	100	103	106	108	111	113	116	119	121	124
10	73	76	79	81	84	86	89	92	94	97	100	102	105	108	110	113	115	118	121	123	126
11	75	78	80	83	86	88	91	94	96	99	102	104	107	109	112	115	117	120	123	125	128
12	77	80	82	85	88	90	93	96	98	101	104	106	109	111	114	117	119	122	125	127	130
13	79	82	84	87	90	92	95	98	100	103	106	108	111	113	116	119	121	124	127	129	132
14	81	84	86	89	92	94	97	100	102	105	108	110	113	115	118	121	123	126	129	131	134
15	83	86	88	91	94	96	99	102	104	107	109	112	115	117	120	123	125	128	131	133	136
16	85	88	90	93	96	98	101	104	106	109	111	114	117	119	122	125	127	130	133	135	138
17	87	90	92	95	98	100	103	106	108	111	113	116	119	121	124	127	129	132	135	137	140
18	89	92	94	97	100	102	105	108	110	113	115	118	121	123	126	129	131	134	136	139	142
19	91	94	96	99	102	104	107	109	112	115	117	120	123	125	128	131	133	136	138	141	144
20	93	96	98	101	104	106	109	111	114	117	119	122	125	127	130	133	135	138	140	143	146

NOTE: Estimated IQ = (2.64 X Vocabulary scaled score) + (1.98 X Block Design scaled score) + 53.49. Standard error = 6.74. R = .846.

APPENDIX IV ALL SAMPLE CHILDREN

Table X. Estimated Full Scale IQ from Block Design and Vocabulary scaled scores for 1,310 children aged 6-11

Block Design	Vocabulary																				
	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
0	53	56	58	61	63	66	69	71	74	76	79	81	84	87	89	92	94	97	99	102	104
1	55	58	60	63	65	68	71	73	76	78	81	83	86	89	91	94	96	99	101	104	107
2	57	60	62	65	68	70	73	75	78	80	83	85	88	91	93	96	98	101	103	106	109
3	59	62	64	67	70	72	75	77	80	82	85	88	90	93	95	98	100	103	105	108	111
4	61	64	66	69	72	74	77	79	82	84	87	90	92	95	97	100	102	105	108	110	113
5	63	66	69	71	74	76	79	81	84	86	89	92	94	97	99	102	104	107	110	112	115
6	65	68	71	73	76	78	81	83	86	89	91	94	96	99	101	104	107	109	112	114	117
7	67	70	73	75	78	80	83	85	88	91	93	96	98	101	103	106	109	111	114	116	119
8	70	72	75	77	80	82	85	88	90	93	95	98	100	103	105	108	111	113	116	118	121
9	72	74	77	79	82	84	87	90	92	95	97	100	102	105	108	110	113	115	118	120	123
10	74	76	79	81	84	86	89	92	94	97	99	102	104	107	110	112	115	117	120	122	125
11	76	78	81	83	86	89	91	94	96	99	101	104	106	109	112	114	117	119	122	124	127
12	78	80	83	85	88	91	93	96	98	101	103	106	109	111	114	116	119	121	124	126	129
13	80	82	85	87	90	93	95	98	100	103	105	108	111	113	116	118	121	123	126	129	131
14	82	84	87	90	92	95	97	100	102	105	107	110	113	115	118	120	123	125	128	131	133
15	84	86	89	92	94	97	99	102	104	107	110	112	115	117	120	122	125	128	130	133	135
16	86	88	91	94	96	99	101	104	106	109	112	114	117	119	122	124	127	130	132	135	137
17	88	91	93	96	98	101	103	106	109	111	114	116	119	121	124	126	129	132	134	137	139
18	90	93	95	98	100	103	105	108	111	113	116	118	121	123	126	129	131	134	136	139	141
19	92	95	97	100	102	105	107	110	113	115	118	120	123	125	128	131	133	136	138	141	143
20	94	97	99	102	104	107	110	112	115	117	120	122	125	127	130	133	135	138	140	143	145

NOTE: Estimated IQ = (2.57 X Vocabulary scaled score) + (2.05 X Block Design scaled score) + 53.15. Standard error = 7.09. R = .880.

Table XI. Estimated Full Scale IQ using the sum of the scaled scores for Block Design and Vocabulary for all 1,310 children in the sample and for males and females separately

Sum of scaled scores—Block Design and Vocabulary	Estimated Full Scale IQ			Sum of scaled scores—Block Design and Vocabulary	Estimated Full Scale IQ		
	Total sample	Males	Females		Total sample	Males	Females
0	53	53	52	21	101	101	102
1	55	55	54	22	104	103	105
2	57	57	56	23	106	105	107
3	59	60	59	24	108	108	109
4	62	62	61	25	111	110	112
5	64	64	64	26	113	112	114
6	66	67	66	27	115	115	117
7	69	69	69	28	118	117	119
8	71	71	71	29	120	119	121
9	73	73	73	30	122	121	124
10	76	76	76	31	125	124	126
11	78	78	78	32	127	126	129
12	80	80	81	33	129	128	131
13	83	83	83	34	132	131	133
14	85	85	85	35	134	133	136
15	87	87	88	36	136	135	138
16	90	89	90	37	139	137	141
17	92	92	93	38	141	140	143
18	94	94	95	39	143	142	145
19	97	96	97	40	146	144	148
20	99	99	100				

NOTE: Estimated Full Scale IQ for all children = 52.51 + (2.33 X sum scaled scores in Block Design and Vocabulary); standard error of $Y = 7.14$; $r = .880$. Estimated Full Scale IQ for males = 52.92 + (2.28 X sum scaled scores on Block Design and Vocabulary); standard error of $Y = 7.34$; $r = .871$. Estimated Full Scale IQ for females = 51.68 + (2.40 X sum scaled scores in Block Design and Vocabulary); standard error of $Y = 6.90$; $r = .889$.

Table XII. Percent of correct and incorrect predictions of low Full Scale IQ's using two methods of predicting from Block Design and Vocabulary scaled scores for 1,310 children, aged 6-11 using three different criteria

Method and criteria	Correctly identified low IQ's	False low IQ's[1]	False high IQ's[2]	Correctly identified high IQ's	Actual percent low IQ's	Predicted percent low IQ's	Difference
Based on multiple regression equation	Percent						
IQ 84–	12.8	4.4	7.1	75.7	19.9	17.2	–2.7
IQ 79–	6.8	2.3	4.8	86.1	11.6	9.1	–2.5
IQ 69–	.7	.5	2.2	96.6	2.9	1.2	–1.7
Based on the regression on sum of scaled scores							
IQ 84–	12.9	4.0	7.0	76.1	19.9	16.9	–3.0
IQ 79–	6.3	2.2	5.3	86.2	11.6	8.5	–3.1
IQ 69–	1.0	.7	1.9	96.4	2.9	1.7	–1.2

[1] False low IQ's were for children who were predicted to have an IQ below the criteria but who actually had an IQ above the criteria.

[2] False high IQ's were for children who were predicted to have an IQ above the criteria but who actually had an IQ below the criteria.

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