THE COMPARATIVE EFFECT ON INTELLIGENCE TEST SCORES OF NEGRO AND CAUCASIAN CHILDREN WHEN CERTAIN VERBAL AND TIME FACTORS ARE VARIED BY USE OF THE WISC, PPVT AND CMMS

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Introduction

The problems of differences in intellectual functioning levels of individuals and of groups has been of concern to educators and psychologists for many years. Nowhere, it seems, has this problem been more acute or puzzling than in the area of racial differences. In the American culture, many pages have been written concerning the comparisons of the native intelligence of Negroes and Caucasians. A major area of difficulty has been that of the accurate assessment of intelligence in order that valid comparisons could be made. Perhaps the most widely used assessment instruments have been the standardized intelligence tests. Since different intelligence tests have yielded differences in scores between Caucasians and Negroes, many authorities have attempted to explore the causes for these differences.

Purpose of This Study

Among the various factors that may contribute to intelligence test score differences are the verbal-response load and speededness of the test. In order to examine the possible effect on test scores of varying these verbal and time factors, three standardized, individually administered intelligence tests were chosen: the Wechsler Intelligence Scale for Children (WISC); the Peabody Picture Vocabulary Test (PPVT), Form "B"; and the Columbia Mental Maturity Scale (CMMS), 1959 Revision. A review of previous research and recent writings indicated that the three instruments did vary, in emphasis, in regard to relative dependence of intelligence test scores on both verbalization and speed. The WISC was found to be heavily dependent upon acceptable verbal response in the Verbal Scales and also heavily dependent upon speed in the Performance Scales. The PPVT both changes the verbal conceptualization involved for a correct response and is untimed, while the CMMS could be considered as a "performance test", or relatively "non-verbal", requiring no verbal response, and is also untimed. Having chosen the instruments to vary the verbal and time factors in test score results, this study was designed to answer the following questions:

1. When three different individual intelligence tests which vary in verbal and time factors are administered to

selected samples of Caucasian and Negro children of both sexes, ages nine years six months to ten years six months, how do their performances compare?

2. Are there differences in performance related to sex or race?

3. Do these differences change with verbal and ti... variations from test to test?

4. What are the correlations among subtests and total scores?

5. Do these correlations vary by race or by sex?

Design and Procedure

Subjects

A group of third and fourth grade Negro children (twelve boys and thirteen girls) between the ages of nine years six months and ten years six months, whose formal education had taken place entirely in the Negro elementary schools of Alachua County, Florida, was chosen from a single Negro elementary school in Gainesville, Florida. A comparative white group was chosen by age, sex, and grade placement from among those children whose entire formal education had taken place in the Alachua County Schools and also who were in attendance at a single segregated elementary school in the community of Gainesville, Florida. The grade level and sex were individually matched for the Negro and white samples and the writer was able to match the mean chronological age of the sexes within racial groups.

Procedure

All Negro children were tested between the dates of March 16 and April 14, 1964. The Negro sample was tested first in order to avoid any difficulty in matching should a Negro child for any reason (sickness, withdrawal, etc.) not be included in the sample. All testing was done in the school during school hours and in the afternoon to avoid disruption of classes and activities for any greater length of time than absolutely necessary and to make available testing areas for other personnel during the morning hours. The order of administering the three instruments (WISC, PPVT, and CMMS) was also varied. The WISC was administered at an initial session to six boys and seven girls, while the PPVT and CMMS were administered at a second session. The PPVT and CMMS were administered at the first test session to six girls and six boys, and the WISC was given at the second

session. The reason for alternate testing was to determine if the order of administration would affect the test scores. Using the t-test technique for determining differences between means of small groups, it was found that no differences existed between the means of the two tested groups at the .05 level of significance.

The comparative Caucasian group was tested between April 15 and May 15, 1964. All procedures used with the Negro sample were followed with the white sample as to time of administration and alternate testing. The same results were obtained in examining the differences between the means of the alternately tested groups as are reported above for the Negro sample.

All testing was carefully controlled so that no child in either group passed from one chronological age to another between testing sessions. All instruments were administered and scored by the writer to avoid any possible variance that might occur with two or more examiners.

Permanent school records of all children were thoroughly examined for such information as confirmation of birth-date, familial information, sibling position in family and teacher's assessment of socio-economic class. Test scores on the Stanford Achievement Test, Elementary Battery, were obtained from the permanent school record for each child. The Negro third and fourth grade classes had been administered the Stanford Achievement Test during the month of October, 1963. The white sample had been tested with the Stanford in September, 1963. These test scores were recorded for each child and means were computed for sex, race, and grade to provide comparison of achievement level of both groups on a standardized achievement test.

Test scores were recorded for every child on each of the three intelligence tests used. Means and medians were computed for racial groups and for each sex within racial groups. Analysis of variance was used to test for significant differences between racial groups, between sexes, and within racial groups. Test results were also compared by intercorrelating fifteen different test scores by use of the Pearson product-moment correlation. For all statistical tests, a five per cent level of significance was used.

Findings

Group averages are presented in Table 1 for all variables.

A comparison of the mean IQ scores for the two racial groups indicates the generally reported difference between Negro and white groups; however it should again be noted that CMMS scores brought the means of the two groups into

Table 1

Mean Performance of All Groups on All Tests

Test	Caucasians			Negroes		
	Male	Female	Total	Male	Female	Total
WISC						
Verbal	115.5	101.4	108.2	91.4	86.3	88.7
Performance	109.3	97.9	103.4	86.1	87.3	86.7
Full Scale	113.7	99.9	106.5	87.8	85.3	86.5
PPVT	112.4	99.2	105.5	82.9	71.8	77.2
CMMS	89.7	84.6	87.0	75.1	74.9	75.0

closer proximity (12 IQ points) even though these means represent a lower score for both groups in comparison to the WISC and PPVT IQ score means.

An examination of the median scores for the total groups and the four race-sex groups demonstrated the same differences as those found in the comparative mean scores without exception.

Tables 2 through 6 present the analyses of variance for each measure. It was noted that for the WISC Verbal IQ (Table 2), significant differences do exist between males and females of both races and between the racial groups, but that no significant interaction exists. The analysis of variance data for the WISC Performance IQ (Table 3) indicated the racial difference remains consistent, the difference between boys and girls (both races combined) is not significant, but that a significant difference of an interrelated sort exists between Negro boys and Negro girls and between white boys and white girls in the Performance scales. Table 4, the analysis of variance for the WISC Full Scale IQ, indicates that while significant sex and racial group differences are demonstrated, the differences reported on WISC Performance IQ (Table 3) were eliminated when the Verbal IQ factors were introduced to provide a Full Scale IQ score.

The PPVT IQ analysis of variance (Table 5) indicates much the same differentiation exists as was demonstrated on the WISC Verbal IQ analysis and the WISC Full Scale IQ data. The PPVT data indicate significant differences exist for racial and sexual groups but that no significant differences exist for the interaction of race and sex.

Table 6 presents the data for analysis of variance on the CMMS IQ. The CMMS does not discriminate by sex or by interaction, but does discriminate between racial groups.

In order to further examine intelligence test score differences between Negro and white children and between the sexes, a third method of statistical analysis was used. While an examination of differences of mean and median IQ's established that differences in score existed between the races and between the sexes, and an analysis of variance established the level of confidence of these differences, neither technique indicated what the instruments measure or what differences might be found in comparing the race-sex groups on the basis of other test results available from the study. The third method used to examine these differences was to intercorrelate ten WISC Subtest raw scores (Information, Comprehension, Arithmetic, Similarities, Vocabulary,

Table 2

Analysis of Variance Data
For WISC Verbal IQ

Source	df	Mean Square	F-ratio	p
Sex	1	1,162	6.75	$<.05$
Race	1	4,724	27.43	$<.01$
Interaction	1	247	1.43	$>.05$
Within	46	172.2		

Table 3

Analysis of Variance Data
For WISC Performance IQ

Source	df	Mean Square	F-ratio	p
Sex	1	323	1.41	$>.05$
Race	1	12,427	54.27	$<.01$
Interaction	1	2,085	9.10	$<.01$
Within	46	229		

Table 4

Analysis of Variance Data
For WISC Full Scale IQ

Source	df	Mean Square	F-ratio	p
Sex	1	832	4.00	$<.05$
Race	1	4,978	23.91	$<.01$
Interaction	1	411	1.97	$>.05$
Within	46	208.2		

Table 5

Analysis of Variance Data
For PPVT IQ

Source	df	Mean Square	F-ratio	p
Sex	1	1,846	10. 5	$<.01$
Race	1	10,052	54.71	$<.01$
Interaction	1	17	.90	$>.05$
Within	46	183.7		

Table 6

Analysis of Variance Data
For CMMS IQ

Source	df	Mean Square	F-ratio	p
Sex	1	84	.45	>.05
Race	1	1,812	9.7	<.05
Interaction	1	74	.40	>.05
Within	46	187.2		

Picture Completion, Picture Arrangement, Block Design, Object Assembly and Coding) with mental age scores (MA) on the WISC Verbal Scales, WISC Performance Scales, WISC Full Scales, PPVT, and CMMS. Raw scores and MA's were used for correlations to eliminate the chronological age variable from this examination of test results.

Tables 7, 8, and 9 give the correlations. WISC Full Scale MA (Table 7) correlates well with all other test scores for all four groups, but some differences in significant correlations for the four race-sex groups were noted. The PPVT MA (Table 8) demonstrates some rather broad differences in correlations for the sexes (both white and Negro), while the CMMS (Table 9) was found to correlate rather spottily at a significant level with other test scores for all of the four race-sex groups.

Conclusions, Recommendations and Implications

By analyzing the data as described above, certain conclusions were reached with regard to the instruments used and the children included in the study. The WISC appeared to measure more consistently for all children than did the PPVT or CMMS. The PPVT was found to produce significant variances in sex, especially in the Negro sample, and should be questioned as to its use with Negro children in this age range (nine years six months to ten years six months). The CMMS, by comparison of mean and median scores, by analysis of variance data, and by inconsistent correlation coefficients found for the four race-sex groups raised questions as to what the test actually measures that may be common to the white and Negro culture.

The test score differences produced certain information concerning the children used as subjects. A significant difference was found between test scores for the racial groups on all three instruments used; however, significant differences were also found between the sexes (total girls and total boys) and between the sexes within racial groups. Some correlation coefficients found for the four race-sex groups indicated that both race and sex may play a part in the reliability and validity intelligence tests. It was also found that school group achievement test scores (obtained for both groups from school records) do not indicate the same differences as those found on intelligence test scores. Negro boys scored slightly higher throughout the intelligence testing (with the exception of WISC Performance IQ) than did the Negro girls; however, the Negro girls outscored the Negro boys on academic achievement test scores obtained from the Stanford Achievement Test, Elementary Battery. Also, the white

Table 7

Correlation Coefficients Between WISC Full Scale MA and Fourteen Other Test Scores for All Groups

Test	White Males	White Females	Negro Males	Negro Females
WISC Information	.65*	.40	.92*	.85**
WISC Comprehension	.75**	.38	.83**	.91**
WISC Arithmetic	.14	.81**	.85**	.86**
WISC Similarities	.54*	.86**	.82**	.67**
WISC Vocabulary	.61*	.86**	.86**	.87**
WISC Picture Completion	.92**	.56*	.80**	.61*
WISC Picture Arrangement	.56*	.74**	.63*	.55*
WISC Block Design	.62*	.68**	.85**	.71**
WISC Object Assembly	.87**	.90**	.85**	.93**
WISC Coding	.48	.72**	.62*	.81**
WISC Verbal MA	.78**	.96**	.96**	.96**
WISC Performance MA	.93**	.97**	.95**	.96**
PPVT MA	.81**	.28	.70**	.50*
CMMS MA	.37	.76**	.58*	.52*

*Significant at .05 level of confidence
**Significant at .01 level of confidence

Table 8

Correlation Coefficients Between PPVT MA and Fourteen Other Test Scores For All Groups

Test	White Males	White Females	Negro Males	Negro Females
WISC Information	.72**	.12	.78**	.46
WISC Comprehension	.74**	.33	.59*	.36
WISC Arithmetic	.37	.31	.48	.42
WISC Similarities	.43	.24	.58	.43
WISC Vocabulary	.43	.09	.87**	.34
WISC Picture Completion	.75**	.14	.76**	.29
WISC Picture Arrangement	.53*	.38	.18	.53*
WISC Block Design	.33	.53*	.48	.21
WISC Object Assembly	.60*	.12	.30	.44
WISC Coding	.22	.17	.41	.23
WISC Verbal	.66**	.28	.73**	.49*
WISC Performance MA	.70**	.24	.57*	.45
WISC Full Scale MA	.81**	.28	.70**	.50*
CMMS MA	.09	.04	.53*	-.07

*Significant at .05 level of confidence
**Significant at .01 level of conficence

Table 9

Correlation Coefficients Between CMMS MA and Fourteen Other Test Scores for All Groups

Test	White Males	White Females	Negro Males	Negro Females
WISC Information	.27	.13	.54*	.45
WISC Comprehension	-.08	.34	.70**	.62*
WISC Arithmetic	-.07	.56*	.48	.58*
WISC Similarities	-.04	.68**	.72**	.13
WISC Vocabulary	.35	.71**	.57*	.68**
WISC Picture Completion	.35	.61*	.54*	.00
WISC Picture Arrangement	.06	.54*	.14	.45
WISC Block Design	.30	.67*	.47	.48
WISC Object Assembly	.45	.80**	.27	.38
WISC Coding	.56*	.50*	.72**	.54*
WISC Verbal MA	.16	.69*	.65*	.55*
WISC Performance MA	.39	.78**	.47	.46
WISC Full Scale MA	.37	.76**	.58*	.52*
PPVT MA	.09	.04	.53*	-.07

*Significant at .05 level of confidence
**Significant at .01 level of confidence

males scored considerably higher on all intelligence test scores than did white females; however, in achievement test scores the difference was reduced considerably between the white girls and white boys. Comparison of achievement test score means for the two racial groups indicated the total white sample (boys and girls) were functioning at grade level while the Negro sample (boys and girls) were operating approximately one school year below grade level. Unless predictions are made separately by sex, the usefulness of intelligence test scores as criteria of success in school is limited for children of both races at this age level. It was further concluded that the data from this study supports the hypothesis that intelligence test scores may be explained in terms of both biological or cultural terms or in terms of interaction of the two.

Further, this study indicates that school psychologists and psychometrists, as well as teachers and administrators, should recognize that a Negro child scoring at IQ 110 and above may well represent the higher IQ level of his subcultural group; and, conversely, that an IQ of 75 on the WISC might not necessarily indicate that a Negro child is a candidate for an educable mentally retarded school class. Mean and median IQ's found for Negro children in this study would indicate that such an approach to mental retardation is unrealistic in terms of classifying Negro mental retardation on the basis of educational standards for Caucasian children.

Needed Research

Additional research is indicated in the area of test score differences. Both longitudinal studies of the same nature as herein reported and research directed toward determining the causes of differences are needed. Item analysis of the WISC data obtained on a large Negro sample, covering the total elementary school range, might well provide significant information as to causation of lowered test scores. Studies directed to comparisons of equated Negro groups in segregated and desegregated school settings would contribute to the understanding of demonstrated differences. Larger numbers and more thorough statistical analyses are needed in studies of this nature to develop more adequate justification of the conclusions drawn and recommendations made in this study.