THE RELATIONSHIP BETWEEN RAVEN'S COLOURED PROGRESSIVE MATRICES AND THE WECHSLER INTELLIGENCE SCALE FOR CHILDREN FOR A GROUP OF MILDLY MENTALLY RETARDED MEXICAN-AMERICAN CHILDREN

A Thesis

Presented to

the Faculty of the Department of Psychology

University of Houston

In Partial Fulfillment

of the Requirements for the Degree

Master of Arts

---

by

Ralph E. Carlson

August, 1967

THE RELATIONSHIP BETWEEN RAVEN'S COLOURED PROGRESSIVE MATRICES AND THE WECHSLER INTELLIGENCE SCALE FOR CHILDREN FOR A GROUP OF MILDLY MENTALLY RETARDED MEXICAN-AMERICAN CHILDREN

An Abstract of a Thesis

Presented to

the Faculty of the Department of Psychology

University of Houston

In Partial Fulfillment

of the Requirements for the Degree

Master of Arts

---

by

Ralph E. Carlson

August, 1967

ABSTRACT

The purpose of this study was to investigate the degree of relationship between the Wechsler Intelligence Scale for Children (WISC) and the Raven's Coloured Progressive Matrices (CPM) (1956) for a group of mildly mentally retarded children of Mexican-American descent.

The subjects were thirty-two male and female children of Mexican-American descent in two special education classes for the mildly mentally retarded in the Houston Independent School District. The subjects consisted of fifteen males and seventeen females ranging in chronological age from 120 months to 156 months with a mean of 139.97 months and a standard deviation of 10.78 months. Their WISC Full Scale IQs ranged from 51 to 85 with a mean of 68.28 and a standard deviation of 7.39. The subjects were screened, by the school nurse and physician, for any physical defects, such as sensory or neurological impairments. They were from homogeneous lower socio-economic backgrounds, and they were bilingual.

The WISC and CPM were individually administered and scored by the examiner. The thirty-two subjects were randomly placed in two groups of sixteen; for one group the WISC was administered first and for the other group the CPM

was administered first. Each test was given in different sessions with twenty-four hours between the first and second session for each subject. All WISC subtests, six Verbal and six Performance, were given and prorated.

Mean male and female CPM raw scores were tested (null hypothesis) for any significant sex difference and no significant difference was found. A t-ratio of 1.77 was obtained.

Spearman rank-order correlation coefficients were computed between raw scores for the CPM and WISC subtests. Partial correlation coefficients were computed between the CPM raw scores and the WISC IQs: Verbal, Performance, and Full Scale. Partial correlation coefficients were used to hold the chronological age factor constant.

Spearman rank-order correlation coefficients between raw scores for the CPM and WISC subtests yielded correlations significant at the .01 level of confidence for the following: Information, .46; Comprehension, .48; Similarities, .45; Vocabulary, .68; Picture Arrangement, .44; and Block Design, .62; correlations were significant at the .05 level of confidence for the following: Arithmetic, .32; Digit Span, .42; Object Assembly, .38; and Mazes, .36; correlations with Picture Completion and Coding were -.02 and -.05, respectively. Except for Block Design .62, the CPM correlated more highly with WISC verbal and language subtests than with the WISC nonverbal and nonlanguage subtests.

Partial correlation coefficients between CPM raw scores and WISC IQs Verbal, Performance, and Full Scale were .45, significant at the .01 level of confidence; .39, significant at the .05 level of confidence; .46, significant at the .01 level of confidence, respectively.

Although the correlations in this study were moderate, further research with the CPM might prove heuristic when small groups of homogeneous subjects, explicitly defined and carefully selected, are used. Future research might go in the direction of the CPM as a predictor of language potential and indicator of visual perceptual disorders. Possible groups with language and communication disorders, such as the deaf and aphasic, might be investigated.

ACKNOWLEDGEMENTS

I wish to express my appreciation to Dr. Franklin Stovall for his encouraging interest and his patience and assistance during this study.

TABLE OF CONTENTS

LIST OF TABLES

CHAPTER I

THE PROBLEM

Statement of the Problem

The purpose of this study was to investigate the degree of relationship, if any, between the Wechsler Intelligence Scale for Children (WISC) and Raven's Coloured Progressive Matrices (CPM) (1956) for a group of mildly mentally retarded children of Mexican-American descent.

Children from the Mexican-American subculture manifest an extremely high proportion of mental retardation relative to the culture at large. The WISC, a general intelligence test of verbal and nonverbal ability, is the most frequently used test for identifying the mentally retarded child of Mexican-American descent. The nonverbal part of the WISC has been purported to be more "culturally free" than the verbal part; thus, it may be assumed that the nonverbal part of the WISC could be used more satisfactorily than the verbal part of the WISC with subcultures, such as the Mexican-American. Another test of nonverbal ability that has been purported as a test with "reduced cultural contamination" is the Coloured Progressive Matrices (CPM) (1956). Clearly cultural factors, which as yet exert unknown qualitative and quantitative

differences to the development of mental abilities, cannot be completely separated from any measure of mental ability. Nevertheless, it should be possible to construct measuring instruments which might limit the cultural effect, or, stated in other words, the results of which might not be unduly affected by differences in cultural backgrounds. There have been many investigations involving correlations between the WISC and CPM for groups of normal and mentally retarded children in the culture at large, but there seems to be at this writing no correlation research specifically on a group of mentally retarded Mexican-American children.

Importance of the Problem

When two variables correlate significantly, it is assumed they are tapping, extracting, or measuring the same phenomenon. Thus, if the mental factors measured by the WISC are also measured by the CPM, there should be a correlation between the two tests. The purpose of this study was to investigate if any significant correlation exists between the WISC and CPM for a group of mildly mentally retarded children of Mexican-American descent.

The study sought to answer the following questions relative to a group of mildly mentally retarded children of Mexican-American descent:

1. Is there any significant difference between male and female scores obtained on the CPM?

2. To what extent are CPM raw scores correlated with WISC subtests and WISC IQs Verbal, Performance, and Full Scale?
3. If correlations are found, would they be significant enough to warrant using the CPM as a screening or supplementary test when attempting to identify the mentally retarded Mexican-American child for placement in a special education class?

CHAPTER II

REVIEW OF THE LITERATURE

WISC and CPM Construction

Wechsler (1949) describes the Wechsler Intelligence Scale for Children (WISC) as a measure of global intelligence. Split-half reliability coefficients are reported for each subtest of the WISC, as well as for Verbal, Performance, and Full Scale scores. These reliabilities were computed separately within the 7½, 10½, and 13½ year samples, each age group consisting of two hundred cases. The Full Scale reliability coefficients for the three age levels were .92, .95, and .94, respectively. The corresponding reliabilities for the Verbal Scale were .88, .96, and .96; for the Performance Scale they were .86, .89, and .90. A different picture is presented by the subtest reliabilities. A few of these coefficients are in the .50's; most are distributed in the .60's, .70's, and .80's. Only one subtest, Vocabulary, yielded a coefficient in the .90's.

Robinson and Robinson (1965) stated the following about the validity of the WISC: "There seems good reason to believe that the Verbal Scale of the WISC measures about the same functions as does the Stanford-Binet." They found

correlations between the WISC Verbal Scale and Stanford-Binet ranged from .58 to .92, with a median of about .80. Correlations between the WISC Performance Scale and the Stanford-Binet ranged from .46 to .83, with a median of .66.

Raven (1956) states that the Coloured Progressive Matrices (CPM) (1956), as a whole, can be described as "a test of observation and clear thinking."

Anastasi (1961) states that on the whole, the CPM show considerable promise for a variety of testing purposes, but more systematic data are needed on norms, reliability at different levels, and validity. Maher (1960) states that the CPM does not yield qualitative information about the child's intellective processes.

Raven (1956) reports CPM test-retest reliability coefficients of .65 for children under seven; by age nine, a test-retest reliability of at least .80, and over the whole range for which the test was constructed a test-retest reliability of .90; for children nine years of age, a correlation of .66 with the Stanford-Binet, Form L.

Use with Normal Children

Martin and Wiechers (1954) used the CPM (1947), administered individually, with 100 normal Indiana school children between their ninth and tenth birthdays, WISC Full Scale IQs 74 to 141, mean 107, SD 16.1. The following correlations were found with CPM (1947): WISC Full Scale IQs, .91; WISC

Verbal Scale IQs, .84; WISC Performance IQs, .83. Correlations with WISC weighted subtest scores were Block Design, .74; Object Assembly, .73; Vocabulary, .73; Comprehension, .70; Arithmetic, .66; Picture Completion, .62; Similarities, .62; Coding, .60; Picture Arrangement, .58; Information, .47.

Martin and Wiechers suggest that in view of these high correlations and the ease and speed of administration, it would seem the Coloured Progressive Matrices will find more extensive use in the clinical testing of children.

Green and Ewert (1955) used the CPM (1947) in group testing with colored slides, with 1,214 normal Minnesota children, ages 6 to 12.5. CPM (1947) correlations were obtained as follows: with Otis IQs for Children ages 6.6 to 12.5 (N 192), .78; with California Mental Maturity Test IQs and Kuhlman-Anderson IQs, for small groups (N 22 to 51), at different age levels, correlations ranged from .28 to .56. The authors stated that the Raven norms appeared too low. They concluded that the test should not be thought of as a test of nonverbal reasoning ability but as a test of fairly complex intellectual reasoning processes.

Use with Mentally Subnormal Adults

Stacey and Gill (1955) used the CPM (1947) with 172 mentally subnormal adult subjects between the ages of 16 years and 57 years 6 months with a mean of 23-10 and SD 7.1 years. Stanford-Binet (L) IQs ranged from 40 to 80 with a

mean of 63.8 and SD 10.4; W-B Full Scale IQs ranged from 46 to 102 with a mean of 69.7 and SD 9.7. The following correlations with CPM (1947) were obtained: S-B (L) IQ, .86; W-B Full Scale IQ, .68; W-B Performance IQ, .51; W-B Verbal IQ, .56. The correlations between CPM scores and the eleven subtest weighted scores were: Block Design, .60; Picture Arrangement, .52; Picture Completion, .52; Similarities, .50; Vocabulary, .48; Comprehension, .43; Information, .41; Digit Symbol, .39; Object Assembly, .38; Digit Span, .33; Arithmetic, .29.

Orme (1961) used the Coloured Progressive Matrices (CPM) (1956) and Wechsler Adult Intelligence Scale (WAIS) with 202 mentally subnormal adults with a chronological age range of 16 to 65, and within a 40 to 80 IQ range. The sample was split into five age groups and the results calculated separately. The following CPM and WAIS correlations were found in each age group: 16 - 25, .98; 26 - 35, .86; 36 - 45, .74; 46-55, .97; 56 - 65, .72. The combined correlation of .93, using Z scores, indicates the Matrices test has over 86 per cent of the variance in common with the WAIS Full Scale IQ. There appears to be a decreasing correlation with increasing age. Orme states that the correlation between the two measures indicates the CPM is an efficient measure of intellectual subnormality.

Use with Mentally Retarded Children

Stacey and Carleton (1955) used the CPM (1947) with 150 children in a State School, with an age range of 7 -5 to 15 -9 with a mean of 12 - 50 and SD 1.87; Stanford-Binet (L) IQs ranged from 39 to 89 with a mean of 67.02 and SD 8.60; WISC Full Scale IQs ranged from 36 to 91 with a mean of 68.35 and SD 11.86. They reported the following correlations with CPM (1947): Stanford-Binet (L) MA, .69; IQ, .71; WISC Full Scale IQ, .55; WISC Performance IQ, .52; WISC Verbal IQ, .54. Correlations with WISC subtest weighted scores were: Picture Completion, .48; Digit Span, .44; Arithmetic, .43; Block Design, .41; Information, .41; Similarities, .40; Picture Arrangement, .40; Vocabulary, .36; Object Assembly, .35; Comprehension, .30; Coding, .28; Mazes, .28.

Malpass, Brown and Hake (1960) used the CPM (1956) with 104 retarded children (56 institutionalized and 48 enrolled in educable mentally retarded classes). The age range was 8 to 13 years with mean CAs for all retardates being 11 - 8. The mean WISC Full Scale IQ for all retardates was 65.29 and SD 8.64, with the institutionalized group having slightly lower IQs than the children enrolled in educable mentally retarded classes, their mean IQs being 62.71 and 68.06, respectively, with SDs of 7.60 and 8.80, respectively. Correlational analysis between the WISC and CPM (1956) scores revealed a partial correlation of .506 for all retarded subjects. There were no significant differences between the

correlations of the institutionalized and noninstitutionalized retardates. A slight sex difference in favor of the girls' scores was observed, correlations of .551, and .484 for the girls and the boys, respectively. The authors concluded that the significant relationships between the CPM (1956) and IQ scores and the CPM's economy in administering and scoring, offers possibilities as a screening device for United States' retarded children.

Raven (1956) indicates that "passive perception" and active repetition or patterning are characteristic of very young or very dull children, and of very old people and of "primitive peoples." This might partly explain the distribution of scores on the CPM relative to intelligence. However, the CPM and intelligence tests relationship might be due to a third variable, for example: motivation, perceptual experiences, and cultural factors.

Levinson (1960) purports the hypothesis that different subcultures produce different constellations of intelligence test responses. Furthermore, he believes that the more closely subcultures resemble each other, the more similar will be their psychometric patterns.

CHAPTER III

SAMPLE GROUP, TEST MATERIALS AND PROCEDURES

Sample Group

Thirty-two male and female children of Mexican-American descent were used for this study. The subjects were in two special education classes during the school year, 1966-1967, for the mildly mentally retarded in the Houston Independent School District. The subjects consisted of fifteen males and seventeen females ranging in chronological age from 120 months to 156 months with a mean of 139.97 months and a standard deviation of 10.78 months, as shown in Table I. There was no significant difference in mean CA between the sexes. Their Wechsler Intelligence Scale for Children (WISC) Full Scale IQs ranged from 51 to 85 with a mean of 68.28 and a standard deviation of 7.39. There was no significant mean Full Scale IQ difference between the sexes. The above data are presented in Table II.

The subjects were screened, by the school nurse and physician, for any physical defects, such as sensory or neurological impairments. Among the subjects no physical defects were found.

TABLE I

CHRONOLOGICAL AGES IN MONTHS FOR MALES, FEMALES, AND TOTAL SAMPLE GROUP: RANGE, MEAN, STANDARD DEVIATION; MALE, FEMALE t-RATIO

		Range	Mean	S.D.
Males	N = 15	122-156	140.93	5.95
Females	N = 17	120-156	139.12	10.32
Total Sample Group	N = 32	120-156	139.97	10.78

t-ratio between Male and Female

CA = .62.

TABLE II

WISC FULL SCALE IQs FOR MALES, FEMALES, AND TOTAL SAMPLE GROUP: RANGE, MEAN, STANDARD DEVIATION; MALE, FEMALE t-RATIO

		Range	Mean	S.D.
Males	N = 15	60-85	69.20	6.86
Females	N = 17	51-84	67.41	7.95
Total Sample Group	N = 32	51-85	68.28	7.39

t-ratio between Male and Female WISC

Full Scale IQs = .68.

The subjects were from homogeneous socio-economic backgrounds. Their family incomes ranged from no income, other than incidental, to $3,000 a year, with the families of twelve of the subjects on social welfare. In eleven of the subjects' homes there was no father. The subjects were of Mexican-American cultural descent and were bilingual. Spanish was the language spoken in all of the homes of the subjects. Thus, Spanish was their primary language and English their secondary language. All subjects had attended only English speaking schools.

Test Materials

The two tests used in this study were the Wechsler Intelligence Scale for Children (WISC) and the Raven's Coloured Progressive Matrices (CPM) (1956).

The WISC, a general intelligence test of verbal and nonverbal ability, attempts to extract the construct of intelligence through the measurement of various heterogeneous abilities. These various abilities, arranged by content into subtests, are theoretically assumed to represent some part of intelligence. The WISC consists of twelve subtests that are grouped into Verbal and Performance Scales as follows: Verbal Scale: General Information, General Comprehension, Arithmetic, Similarities, Vocabulary, and an alternate, Digit Span; Performance Scale: Picture Completion, Picture Arrangement, Block Design, Object Assembly,

Coding, and an alternate, Mazes. The Full Scale score is obtained by combining the Verbal and Performance Scales together and prorating, if necessary.

Some subtests are timed and extra points are given for more rapid completion of an item, and no credit is given after a specific time limit has been reached. All items within a subtest are arranged in an ascending order of difficulty. The WISC construction and standardization are generally considered excellent.

The WISC, designed for use with young children and adolescents between the ages of five to sixteen years, is frequently used for identifying mentally retarded children for special education classes. It is individually administered according to the manual. Different subtests within the WISC appear to be influenced, in greater or lesser degrees, by the following variables: acculturation, sensory acuity, motor impairment, and language and communication factors.

The Raven's Coloured Progressive Matrices (CPM) (1956), a test of visual perception and cognition, appears to be a test of nonverbal ability. Many British psychologists regard it as the best measure of Charles Spearman's "g" factor now available. The CPM consists of a series of thirty-six colored abstract geometrical designs, divided into three sets of twelve A, Ab, B, and from each design a part has been removed. The subject is required to select the missing

part from a set of six given alternatives. The items are arranged in an ascending order of difficulty, the easier items requiring an accuracy of visual perception and discrimination; the more difficult items involving analogies, permutations and alterations of patterns, and other logical relationships, such as cognitive deductive-inductive synthesis.

The CPM is specifically designed for use with young children ages five to eleven years, old people, and for cross cultural studies; but it may also be used satisfactorily with people who have a language or communication problem, with people suffering from physical disabilities (aphasia, motor impairments, or deafness), as well as with people who are mentally retarded or mentally deteriorating. The CPM has no time limit and can be administered in pantomine, if necessary. The CPM can be administered individually or in a group. The CPM attempts measurement through the single sensory modality vision, and thus, may be influenced by visual acuity and visual perceptual disorders.

Procedures

The Wechsler Intelligence Scale for Children (WISC) and Raven's Coloured Progressive Matrices (CPM) (1956) were individually administered and scored by the examiner. The group of thirty-two subjects was randomly placed in two groups of sixteen; for one group the WISC was administered first and for the other group the CPM was administered first.

Each test was given in different sessions with twenty-four hours between the first and second session for each subject. All WISC subtests, six Verbal and six Performance, were given and prorated.

Mean male and female CPM raw scores were tested (null hypothesis) for any significant sex difference. N - 1 was used to correct for bias in the computation of standard deviations (Hays 1963).

Spearman rank-order correlation coefficients (ρ) were computed by the following formula (Downie and Heath, 1959), between raw scores for the CPM and all WISC subtests, six Verbal and six Performance.

$$\rho = 1 - \frac{6\Sigma D^2}{N(N^2 - 1)}$$

Scores of the same magnitude were averaged and assigned the same mean rank. The Spearman rank-order correlation coefficients (ρ) level of significance was tested by the following formula adapted from Hays (1963). A t-ratio at the .05 or .01 level of confidence was considered significant (one-tailed test).

$$t = \frac{\rho\sqrt{N - 2}}{\sqrt{1 - \rho^2}}$$

Pearson product-moment correlation coefficients (r) were computed by the following formula (Guilford, 1954), between the following: CPM raw scores with WISC IQs Verbal, Performance, Full Scale and CA; CA with WISC IQs Verbal, Performance and Full Scale.

$$r = \frac{N\Sigma XY - (\Sigma X)(\Sigma Y)}{\sqrt{[N\Sigma X^2 - (\Sigma X)^2][N\Sigma Y^2 - (\Sigma Y)^2]}}$$

Partial correlation coefficients ($r_{xy.z}$) were obtained by extending the seven above Pearson product-moment correlation coefficients (r) into partial correlation coefficients for the purpose of holding the chronological age factor constant.

These partial correlation coefficients ($r_{xy.z}$) were computed, by the following formula (Siegel, 1956), between the CPM raw scores and WISC IQs Verbal, Performance, and Full Scale.

$$r_{xy.z} = \frac{r_{xy} - (r_{zy})(r_{zx})}{\sqrt{(1 - r_{zy}^2)(1 - r_{zx}^2)}}$$

The partial correlation coefficients ($r_{xy.z}$) level of significance was tested by the following formula adapted from Hays (1963). A t-ratio at the .05 or .01 level of confidence was considered significant (one-tailed test).

$$t = \frac{r_{xy.z}\sqrt{N - 3}}{\sqrt{1 - r_{xy.z}^2}}$$

CHAPTER IV

PRESENTATION AND ANALYSIS OF DATA

Basic Data

The basic data for this study of the relationship between the Coloured Progressive Matrices (CPM) (1956) and Wechsler Intelligence Scale for Children (WISC) are given in Table III.

Where, as shown in Table IV, mean male and female CPM raw scores were tested (null hypothesis) for any significant sex difference and no significant difference was found, a t-ratio of 1.77 was obtained. The males had a slightly higher mean CPM raw score (23.26) than did the females (20.70); also, the males' mean CA of 140.93 months and mean WISC Full Scale IQ of 69.20 were higher than the females' mean CA of 139.12 months and mean WISC Full Scale IQ of 67.41 as shown in Tables I and II. This may partly account for the males having a slightly higher mean CPM raw score.

WISC Subtests and CPM Correlations

The Spearman rank-order correlation coefficients between raw scores for the CPM and WISC subtests were generally moderate, Table V. Raw scores for the CPM and WISC subtests

TABLE III

THE BASIC DATA FOR THIS STUDY OF THE RELATIONSHIP BETWEEN THE COLOURED PROGRESSIVE MATRICES (CPM) AND WISC FOR A GROUP (N = 32) OF MILDLY MENTALLY RETARDED MEXICAN-AMERICAN CHILDREN: SEX, CA IN MONTHS, CPM RAW SCORES, WISC SUBTESTS VERBAL AND PERFORMANCE AND WISC IQs VERBAL, PERFORMANCE, AND FULL SCALE

				WISC Verbal Subtests Raw Scores						WISC Performance Subtests Raw Scores								
Subject	Sex	CA in Months	CPM Raw Scores	Information	Comprehension	Arithmetic	Similarities	Vocabulary	Digit Span	Picture Completion	Picture Arrangement	Block Design	Object Assembly	Coding	Mazes	Verbal Scale IQ	Performance Scale IQ	Full Scale IQ
1	M	152	31	10	10	7	10	25	9	14	30	10	22	30	13	79	86	80
2	M	154	31	10	10	7	5	17	9	6	8	22	22	21	12	72	69	68
3	M	152	30	8	10	6	9	24	9	13	24	27	29	24	16	77	96	85
4	F	139	29	8	8	7	9	21	8	7	24	35	22	22	17	76	87	80
5	M	140	29	8	9	4	9	28	8	7	8	10	20	24	14	75	71	70
6	M	156	28	10	12	9	8	22	8	7	8	14	16	24	15	72	58	62
7	M	127	28	5	4	5	1	12	6	7	6	19	22	15	13	58	78	64
8	F	154	27	9	8	8	10	31	10	11	12	23	21	52	17	81	90	84
9	F	137	26	6	8	5	5	19	5	8	22	6	20	18	9	63	69	63
10	F	120	25	8	8	4	4	18	6	8	4	5	19	16	7	72	74	70
11	F	146	25	8	9	6	7	14	8	7	12	18	22	34	13	67	76	69
12	M	148	25	8	11	3	6	16	8	8	6	10	22	25	9	66	67	63
13	F	151	24	8	5	7	9	13	8	6	6	10	13	31	12	67	64	62
14	M	156	23	9	11	7	5	15	7	13	23	11	22	35	15	63	84	70
15	M	142	22	10	13	6	10	25	5	10	20	10	22	20	13	76	80	76
16	F	154	22	7	4	6	2	15	8	9	22	18	25	31	9	60	79	66
17	F	153	22	8	10	5	11	16	8	10	22	12	12	38	19	74	83	76
18	F	156	22	7	9	5	6	15	5	8	12	10	23	21	15	60	75	64
19	F	123	21	5	9	5	4	14	7	11	8	6	11	27	16	66	83	72
20	M	122	20	5	7	5	4	11	7	9	12	6	4	26	9	65	69	64
21	M	122	18	6	2	4	4	16	8	9	17	6	19	21	2	65	76	67
22	M	139	17	9	9	7	6	16	8	8	18	5	11	27	13	72	68	67
23	M	139	17	12	10	8	4	15	7	9	8	6	23	38	11	72	76	72
24	F	137	17	5	10	6	9	14	9	8	18	10	11	26	11	72	69	68
25	F	132	17	9	8	6	6	14	7	8	6	6	21	38	6	67	71	66
26	F	127	16	8	7	6	2	11	6	7	4	10	14	45	2	65	75	67
27	F	129	16	5	4	6	3	8	7	8	6	6	21	30	14	65	79	69
28	M	140	16	7	8	5	1	14	8	10	6	6	14	17	11	62	65	60
29	F	146	15	6	8	4	6	17	6	6	6	6	23	29	10	60	62	57
30	F	137	15	6	5	5	3	9	10	9	6	14	18	13	14	61	69	62
31	M	125	14	7	7	5	9	13	7	8	5	6	20	23	9	72	72	70
32	F	124	13	4	0	4	0	5	4	8	8	5	10	17	13	46	65	51

TABLE IV

CPM RAW SCORES FOR MALES, FEMALES, AND TOTAL SAMPLE GROUP: RANGE, MEAN, STANDARD DEVIATION; MALE, FEMALE t-RATIO

		Range	Mean	S.D.
Males	N = 15	14 - 31	23.26	5.99
Females	N = 17	13 - 29	20.70	4.91
Total Sample Group	N = 32	13 - 31	21.91	5.51

t-ratio between Male and Female

CPM Raw Scores = 1.77.

TABLE V

SPEARMAN RANK-ORDER CORRELATION COEFFICIENTS (ρ) BETWEEN RAW SCORES ON THE CPM AND WISC SUBTESTS FOR A GROUP (N = 32) OF MILDLY MENTALLY RETARDED MEXICAN-AMERICAN CHILDREN

WISC Subtests	ρ
Verbal	
Information	.46**
Comprehension	.48**
Arithmetic	.32*
Similarities	.45**
Vocabulary	.68**
Digit Span	.42*
Performance	
Picture Completion	-.02
Picture Arrangement	.44**
Block Design	.62**
Object Assembly	.38*
Coding	-.05
Mazes	.36*

*Significant at the .05 level (one-tailed test).

**Significant at the .01 level (one-tailed test).

yielded Spearman rank-order correlation coefficients significant at the .01 level of confidence for the following: Information, .46; Comprehension, .48; Similarities, .45; Vocabulary, .68; Picture Arrangement, .44; and Block Design, .62; correlations were significant at the .05 level of confidence for the following: Arithmetic, .32; Digit Span, .42; Object Assembly, .38; and Mazes .36; correlations with Picture Completion and Coding were -.02 and -.05, respectively. The reason for the slight negative correlation found with Picture Completion and Coding is unknown to the author. These slight negative correlations might be partly due to the small variance in raw scores or to the timing and cultural factors involved. Except for Block Design .62, the CPM correlated more highly with WISC verbal and language subtests than with the WISC nonverbal and nonlanguage subtests. This is consistent with the findings and conclusions of Green and Ewert (1955) in their study with normal children. Also, in general, the CPM and WISC subtests correlations were consistent with the findings of Stacey and Carleton (1955) for a group of mentally retarded children.

WISC IQs and CPM Correlations

Correlational analysis between the CPM raw scores and WISC IQs Verbal, Performance, and Full Scale revealed partial correlation coefficients of .45, significant at the .01 level of confidence; .39, significant at the .05 level of confidence;

.46, significant at the .01 level of confidence, respectively, as shown in Table VI. These partial correlation coefficients were extended from Pearson product-moment correlation coefficients and thus their level of significance can be interpreted the same as a Pearson product-moment correlation coefficient. These partial correlations are moderate but, considering the small restricted ranges of age and intelligence for the sample group, they are meaningful.

The partial correlation coefficients found in this study are consistent with correlations found with mentally retarded children by Malpass, Brown, and Hake (1960), and by Stacey and Carleton (1955). However, the partial correlation coefficients found in this study are considerably lower than the correlations found by Martin and Wiechers (1954) with normal children. This may be accounted for by the wide range of intelligence of the subjects used by Martin and Wiechers, and by their not controlling the CA factor when IQs were correlated with raw scores.

TABLE VI

PARTIAL CORRELATION COEFFICIENTS ($r_{xy.z}$) BETWEEN CPM RAW SCORES AND WISC IQs VERBAL, PERFORMANCE, AND FULL SCALE FOR A GROUP (N = 32) OF MILDLY MENTALLY RETARDED MEXICAN-AMERICAN CHILDREN WERE OBTAINED BY EXTENDING SEVEN PEARSON PRODUCT-MOMENT CORRELATION COEFFICIENTS (r) INTO PARTIAL CORRELATION COEFFICIENTS FOR THE PURPOSE OF HOLDING CA CONSTANT

Pearson Product-Moment Correlations were computed between the following:	r
CPM Raw Scores with WISC Verbal IQ	.50
CPM Raw Scores with WISC Performance IQ	.42
CPM Raw Scores with WISC Full Scale IQ	.50
CPM Raw Scores with CA	.29
CA with WISC Verbal IQ	.30
CA with WISC Performance IQ	.18
CA with WISC Full Scale IQ	.25

Partial Correlation Coefficients were obtained by extending the above Pearson Product-Moment Correlations into Partial Correlations with CA held constant for the following:	$r_{xy.z}$
CPM Raw Scores with WISC Verbal IQ	.45**
CPM Raw Scores with WISC Performance IQ	.39*
CPM Raw Scores with WISC Full Scale IQ	.46**

*Significant at the .05 level (one-tailed test).

**Significant at the .01 level (one-tailed test).

CHAPTER V

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

Summary

The purpose of this study was to investigate the degree of relationship between the Wechsler Intelligence Scale for Children (WISC) and Raven's Coloured Progressive Matrices (CPM) (1956) for a group of mildly mentally retarded children of Mexican-American descent.

The subjects were thirty-two male and female children of Mexican-American descent in two special education classes for the mildly mentally retarded in the Houston Independent School District. The subjects consisted of fifteen males and seventeen females ranging in CA from 120 months to 156 months with a mean of 139.97 months and a standard deviation of 10.78 months. Their WISC Full Scale IQs ranged from 51 to 85 with a mean of 68.28 and a standard deviation of 7.39. The subjects were screened by the school nurse and physician for any physical defects, such as sensory or neurological impairments. They were from homogeneous lower socio-economic backgrounds. They were bilingual: Spanish was their primary language and English their secondary language. All subjects

had attended only English speaking schools.

The WISC and CPM were individually administered and scored by the examiner. The thirty-two subjects were randomly placed in two groups of sixteen; for one group the WISC was administered first and for the other group the CPM was administered first. Each test was given in different sessions with twenty-four hours between the first and second session for each subject. All WISC subtests, six Verbal and six Performance, were given and prorated.

Mean male and female CPM raw scores were tested (null hypothesis) for any significant sex difference and no significant difference was found. A t-ratio of 1.77 was obtained.

Spearman rank-order correlation coefficients were computed between raw scores for the CPM and WISC subtests. Partial correlation coefficients were computed between the CPM raw scores and the WISC IQs Verbal, Performance, and Full Scale. Partial correlation coefficients were used to hold the CA factor constant.

Spearman rank-order correlation coefficients between raw scores for the CPM and WISC subtests yielded correlations significant at the .01 level of confidence for the following: Information, .46; Comprehension, .48; Similarities, .45; Vocabulary, .68; Picture Arrangement, .44; and Block Design, .62; correlations were significant at the .05 level of confidence for the following: Arithmetic, .32; Digit Span, .42;

Object Assembly, .38; and Mazes, .36; correlations with Picture Completion and Coding were -.02 and -.05, respectively. It is interesting to note that, with the exception of Block Design .62, the CPM correlated more highly with the WISC subtests that are loaded with verbal and language factors than with WISC subtests that are largely nonverbal and nonlanguage. This might indicate that the CPM is not as much a nonverbal or nonlanguage measure as often purported.

Partial correlation coefficients between CPM raw scores and WISC IQs Verbal, Performance, and Full Scale were .45, significant at the .01 level of confidence; .39, significant at the .05 level of confidence; .46, significant at the .01 level of confidence, respectively.

Conclusions and Recommendations

On the basis of this study several conclusions could be drawn:

1. There was no significant sex difference in the obtained CPM raw scores.
2. Except for Block Design, the CPM correlated more highly with WISC verbal and language subtests than with the WISC nonverbal and nonlanguage subtests.
3. The moderate correlations from this study indicate that the CPM and WISC are not completely measuring or extracting the same phenomena. However, these

correlations are of a magnitude that indicates the CPM would contribute, either as a supplementary or screening test, to the measurement of mental retardation. It appears that the CPM would have particular value with special groups, such as those with language and communication problems.

4. Although the correlations in this study were moderate, future research with the CPM might prove heuristic when small groups of homogeneous subjects explicitly defined and carefully selected are used.
5. Future research might go in the direction of the CPM as a predictor of language potential and indicator of visual perceptual disorders. Possible groups with language and communication disorders, such as the deaf and aphasic, might be investigated.

BIBLIOGRAPHY

Anastasia, Anne. Psychological testing. New York: Macmillan, 1961.

Downie, N. M. and R. W. Heath. Basic statistical methods. New York: Harper and Row, 1959.

Green, M. W. and J. C. Ewert. Normative data on Progressive Matrices. J. Consult. Psych., 1955, 19, 139-142.

Guilford, J. P. Psychometric methods. New York: McGraw-Hill, 1954.

Hays, W. L. Statistics for psychologists. New York: Holt, Rinehart and Winston, 1963.

Levinson, B. M. A comparative study of the verbal and performance abilities of monolingual and bi-lingual native born Jewish pre-school children of traditional parentage. J. Genet. Psychol., 1960, 96-97, 151.

Malpass, L., R. Brown and D. Hake. The utility of the Progressive Matrices (1956 edition) with normal and retarded children. J. Clin. Psychol., 1960, 16, 350.

Maher, B. A. Position errors and primitive thinking in the Progressive Matrices test. American J. Ment. Defic., 1960, 64, 1016-1020.

Martin, A. W. and J. E. Wiechers. Raven's Colored Progressive Matrices and the Wechsler Intelligence Scale for Children. J. Consult. Psychol., 1954, 18, 143-144.

Orme, J. E. The Coloured Progressive Matrices as a measure of intellectual subnormality. Brit. J. Med. Psychol., 1961, 34, 291-292.

Raven, J. C. Guide to using the Coloured Progressive Matrices (1956). London: H. K. Lewis, 1956.

Robinson, H. B. and N. M. Robinson. The mentally retarded child. New York: McGraw-Hill, 1965.

Siegel, S. Nonparametric statistics. New York: McGraw-Hill, 1956.

Stacey, C. L. and F. O. Carleton. The relationship between Raven's Colored Progressive Matrices and two tests of general intelligence. J. Clin. Psych., 1955, 11, 84-85.

Stacey, C. L. and M. R. Gill. The relationship between Raven's Colored Progressive Matrices and two tests of general intelligence for 172 subnormal adult subjects. J. Clin. Psych., 1955, 11, 86-87.

Wechsler, David. Manual for the Wechsler Intelligence Scale for Children. New York: Psychological Corp., 1949.