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DIFFERENTIAL CONSTRUCT VALIDITY OF A PRESCHOOL BATTERY FOR BLACKS, WHITES, MALES, AND FEMALES

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Summary: Seven major preschool tests were administered to a group of 322 kindergarten children. Scaled scores from the instruments were submitted to principal factoring, with iterations for the total sample and separately by race/sex groupings. The average intercorrelation of the pretests was similar across race and sex. A two-factor solution of the battery was derived for the total group and for each of the four subgroups (WF, WM, BF, BM). The two-factor solution was highly similar across race and sex, as indicated by the large coefficients of congruence obtained between factors derived within each group, thus supporting the equivalence of internal psychometric properties of the battery across race and sex. No evidence was determined to support sexual or racial dimorphism in the early structure of cognitive abilities.

The last decade has seen a substantial upsurge of interest in several areas of psychology and education which are convergent in the field of preschool assessment: the early identification of children who may later experience learning problems, and the differential validity of psychological tests when used with individuals of varying cultural backgrounds. While "varying cultural backgrounds" has typically been defined by ethnic group membership, it is now clear that males and females are exposed to differing environments and sociocultural influences as children (Jean & Reynolds, Note 1). Recent legislation, most specifically P.L. 94-142, the Education for All Handicapped Children Act of 1975, mandates the early identification and assessment of young children through nonbiased assessment techniques. The problem of bias in psychological testing is multifaceted and complex in nature. While focusing on predictive validity, the APA committee on the use of educational and psychological tests with disadvantaged students (Cleary, Humphreys, Kendrick, & Wesman, 1975) also considered content and construct validity as important variables in the issue of bias.

Most research on test bias has focused on predictive validity (e.g., Bowers, 1970; Cleary, 1968; Reynolds & Hartlage, Note 2), though construct validity[1] of intelligence tests for school-age children has recently received attention (e.g., Gutkin & Reynolds, in press; Jensen, 1976; Reschly, 1978; Vance, Huelsman, & Wherry, 1976; Vance & Wallbrown, 1978). The majority of studies currently available generally support the absence of bias in prediction across race for the tests investigated with school-age children. The single available study of predictive validity across sex found no evidence of bias in prediction (Reynolds, Gutkin, Dappen, & Wright, 1979). The very few studies of construct validity for blacks and whites using preschool tests have turned up conflicting results. Construct validity across sex has not yet been studied.

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[1]The most widely accepted method of empirically evaluating construct validity is through the employment of factor analytic procedures (Anastasi, 1976; Cronbach, 1970), which has been the typical method of choice by previous researchers.

In a comparison of separate factor analyses of the McCarthy Scales of Children's Abilities for groups of black and white children, Kaufman and DiCuio (1975) concluded that the McCarthy Scales showed a high degree of factorial similarity across the two races. The conclusion was not clearcut, however. Four factors were found for blacks and three for whites. Kaufman and DiCuio (1975) based their conclusion of factorial similarity on the finding that each "white" factor had a coefficient of congruence of .85 to .93 with its "black" counterpart. The customary, though arbitrary, cutoff value for indicating factorial equivalence by the coefficient of congruence is .90 or higher (Harman, 1967; Reynolds, 1979). One "black" factor had no "white" counterpart with a coefficient of congruence beyond .74 (the Memory factor), and the black and white Motor factors showed a coefficient of congruence of only .85.

Investigating the factor structure of the Wechsler Preschool and Primary Scale of Intelligence (WPPSI), Kaufman and Hollenbeck (1974) found much "cleaner" factors for blacks and whites that were nearly identical across races. The two Kaufman and Hollenbeck factors (essentially Wechsler's *a priori* verbal and performance scales) are nearly identical to the hierarchical factor solution of WPPSI presented by Wallbrown, Blaha, and Wherry (1973). When comparing factor analyses of the Goodenough-Harris Drawing Test scoring items, Merz (1970) found highly similar factor structures between blacks, whites, Chicanos, and Indians.

Other investigators have found differences in the factor structure for blacks and whites of several tests designed for preschool and primary grade children. Goolsby and Frary (1970) factor analyzed the Metropolitan Readiness Test and the Metropolitan Achievement Test separately for blacks and whites, finding differences in the factor structure across race. When evaluating the experimental edition of the Illinois Test of Psycholinguistic Abilities (ITPA), Leventhal and Stedman (1970) noted differences in the factor structure across the two races. The construct validity of preschool scales across race is by no means a settled issue.

Another potentially important variable in the comparison of factor structures, which has been largely ignored, is sex. This lack of attention is apparently due to the common practice of counterbalancing item bias by sex during the developmental phase of test construction, thus preventing mean differences in total test scores for males and females. While mean differences in group scores in no way indicate the presence or absence of bias (Cleary, 1968; Thorndike, 1971), they have tended to make tests showing such differences suspect. Particularly in preschool tests, the differential maturation rates of males and females could conceivably affect the underlying constructs being measured by the instruments. Recent neuropsychological data also suggest sexual dimorphism in the neural substratus underlying cognitive function (e.g., Buffery, 1976; Witelson, 1976, 1977). Each of these hypotheses suggests that the construct validity of preschool tests may differ for males and females. For example, factor analysis of the McCarthy Scales (Kaufman, 1975) at several age levels has shown no numerical factor until age 5 in addition to movement of specific subtests (Draw-A-Design and Draw-A-Child) from a motor factor at young ages to a cognitive factor at upper ages. Since girls mature at an accelerated rate, as compared to boys, during this period, the factor structure for females could become stable at an earlier age. Such a finding could have considerable theoretical and diagnostic significance. Findings by Jensen (1976) concerning differential rates of cognitive development for blacks and whites and the results of Bogen, DeZure, Tenhouten, and Marsh (1972) and Reynolds, McBride, and Gibson (Note 3) concerning race and hemisphericity suggest similar hypothesis for the two races.

The present study attempted to determine whether the theoretical or underlying constructs being measured by a battery of preschool tests chosen to be representative of the core areas of preschool assessment were equivalent across race and sex. Previous studies have confounded race with the sex variable. To avoid the confounding of race and sex in the present study, four groups were employed: white females, white males, black females, and black males. The representative areas of assessment from which tests were selected included visual-motor integration, nonverbal intelligence, conceptual thinking, general readiness, achievement, and language.

METHOD

Subjects. The sample consisted of 322 kindergarten children from a small metropolitan area of the southeastern United States ranging in age from 4 years 6 months to 6 years 6 months, with a mean age of 5 years 10½ months, SD = 3.74 months. The group consisted of 90 white females (WF), 86 white males (WM), 73 black females (BF), and 73 black males (BM). None of the groups differed in mean age from any other group. All of the children attended either public or private kindergarten during the year of their May testing.

Socioeconomic status (SES) data were collected from teachers and school records and classification was based on the occupational status of the parent with the higher-ranking job. This method was used in contrast to traditional use of the father's occupation in order to gain a more accurate description of the family's true SES. This method is desirable due to recent changes in the employment roles of women. SES was determined through classification into one of five occupational groups, condensed from the ten U.S. Census categories which have been used in sample stratification of the WISC-R (Wechsler, 1974) and the McCarthy Scales (McCarthy, 1972). Table 1 presents the SES classifications for each race/sex grouping. As can be seen, all SES classifications were represented within each race/sex category, though whites revealed a significantly higher SES rating than the blacks, $\chi 2(12) = 93.07$, $p < .001$.

Test Instruments.

1. *The McCarthy Drawing Tests: Draw-A-Design (DAD) and Draw-A-Child (DAC)* (McCarthy, 1972). *DAD* and *DAC* are subtests 12 and 13 of the *McCarthy*

Table 1
Socioeconomic Classifications for All Race/Sex Groupings[a]

Race/Sex Group	SES Classification				
	Upper Class	Upper Middle	Middle Class	Lower Middle	Lower Class
White Females N = 90	20	29	18	22	1
White Males N = 86	20	22	19	24	1
Black Females N = 73	4	5	12	45	7
Black Males N = 73	4	2	7	51	9
Total	48	58	56	142	18

[a] χ^2 (12) = 93.07, $p < .001$

Scales of Children's Abilities. The two tests measure primarily visual-motor integration and nonverbal concept formation. Although designed to be individually administered, Reynolds (1978) found that the two tests can be validly administered in a group setting with the obtained scores showing significant correlation with measures of achievement (typically around .50). Reynolds (1978) also obtained test-retest reliabilities from group to individual administration for *DAD* and *DAC* of .86 and .82, respectively. In addition, Kaufman and Kaufman (1973) failed to find race differences in scores on *DAD* and *DAC* in the 4½ to 6½ year old range. In the present study, the two tests were administered in groups of 8 to 10 by a kindergarten teacher and an aide trained by the investigator in the administration of the tests. Scoring was done by a doctoral level school psychologist with no knowledge of the child's race or age.

2. *Lee-Clark Reading Readiness Test* (Lee & Clark, 1962). The *Lee-Clark* is a group administered reading readiness test which requires the matching and differentiation of letters, basic concept recognition, and letter and word identification. The *Manual* reports split-half reliabilities, corrected by Spearman-Brown, of .96 for two separate samples of kindergarten pupils (N = 94 and 80). Validity coefficients hovering about .50 with several first grade reading tests are also reported in the *Manual*. Administration and scoring were completed by the regular kindergarten teacher.

3. *Tests of Basic Experiences* (TOBE; Moss, 1970). The TOBE are a series of five standardized group tests for young children. For the present study, two of the tests were administered: mathematics and language. The TOBE mathematics subtest, according to the author, measures the child's mastery of basic math concepts and the terms associated with them (e.g., biggest, oldest, most, etc.). The TOBE language test primarily deals with vocabulary, sound-symbol relationships, listening skills, and letter recognition. The TOBE *Manual* reports KR_{20} reliability estimates of .80 for mathematics and .84 for language with a sample of 700 kindergarten children. Only evidence of content validity is given in the TOBE *Manual*, based on teacher judgments as to the correct classification of each item (i.e., math, language, science, etc.). A high percentage of agreement was obtained between teacher classifications of the items and the actual classification of the items. Administration and scoring were completed by the regular kindergarten teacher.

4. *Preschool Inventory-Revised Edition* (Educational Testing Service, 1970). The *Preschool Inventory* is divided into four subtests measuring personal-social responsiveness, associative vocabulary, concept activation-numerical, and concept activation-sensory. The *Inventory* is individually administered and consists of a series of general information questions and simple activities such as design copying. The *Inventory* was carefully normed according to U.S. Census data. KR_{20} reliability estimates ranging from .86 to .92 are reported for the standardization sample at various age ranges, with a total sample KR_{20} of .91. Correlations with the Stanford-Binet Intelligence Scale are reported in the *Manual* and range from .39 to .65, with a total sample correlation of .44. The sample consisted of 1,476 children divided into five age groups between 3—0 and 6—11 for norming and other statistical treatments. For the present study, the inventory was administered individually to each student and scored by a State of Georgia Department of Education certified school psychologist.

5. *Metropolitan Readiness Tests* (MRT; Hildreth, Griffiths, & McGauvran, 1969). The *MRT* were devised as a group test to measure the various skills in young children which contribute to readiness for first grade, and according to the authors, they provide a "quick, convenient, and dependable basis for the early classification of pupils. . . ." Six basic subtests and one alternative, an adaptation of the Goodenough-Harris Draw-

ing Test, are provided, measuring vocabulary, visual-motor integration, verbal comprehension, letter identification, and a variety of other subskills (e.g., visual perception and discrimination). Split-half reliabilities are reported in the *MRT Manual* and range from .90 to .95 for the total test with seven different samples. Subtest reliabilities are considerably lower, ranging from .33 to .89 across the seven samples. Alternate form reliabilities range from .89 to .93 for total test and .50 to .86 for individual subtests. Numerous validity studies are reported in the *Manual* and show correlations with later achievement measures consistently hovering about .50. Administration and scoring were completed by the regular classroom teacher.

Procedure. During the last two weeks of May, all children were administered all tests except the MRT. The following fall (due to restrictions imposed by the school system), during the first two weeks of school, all first grade children were administered the MRT.

Data Analysis. For all statistical analyses, raw scores from all tests, except MRT, were converted through direct linear transformation to standard scores with a mean of 100, SD = 15, from data provided in their respective manuals. For the MRT, raw scores were converted to percentiles due to a lack of data concerning the raw score distribution.

All pretest scores (the total test score was used for MRT, Reynolds, 1979b) were factor analyzed through the method of principal factors with iterations and R^2 as initial communality estimates and rotated to two-, three-, and four-factor Varimax solutions for the total sample. The solution best fitting the total sample (i.e., making the most psychological and statistical sense) was then applied to each group (WF, WM, BF, BM). Coefficients of congruence were then computed for each factor between each pair of groups. The coefficient of congruence is an index of factorial similarity with a value of .90 or higher taken to indicate equivalent factors (Harman, 1967; Mulaik, 1972). A measure of the average intercorrelation (Cureton, 1971; Kaiser, 1968) was also included for the total sample and each race/sex group to aid in accurately describing the interrelationships of the various tests.

RESULTS AND DISCUSSION

The mean performance for each subgroup is presented in Table 2 along with a summary tabulation of *t*-tests comparing mean performance for WF vs. WM, WF vs. BF, WM vs. BM, and BF vs. BM. As a general rule, performance on the various measures rank ordered WF>WM>BF>BM, with the notable exception of DAC, which ordered WF>BF>WM>BM. While sex differences appear on several measures, cross-race comparisons produce significant differences for all but one comparison.

All measures showed significant intercorrelation ($p \leq .01$) for the total sample of 322. Table 3 presents the correlation matrix for all measures, which was subsequently factor analyzed to determine what solution would be applied to each race/sex grouping. The average intercorrelation of the pretests for the total sample was .57. The two-factor Varimax solution appeared to best fit the matrix, being psychometrically quite reasonable and psychologically sound. The two-factor Varimax solution produced the factor matrix presented in Table 4 (Eigenvalues and communalities are based on the unrotated principal factor matrix).

Factor 1 appears to be a *General Readiness* factor dominated by language and reasoning skills. Factor 2, with dominant loadings by DAD and DAC, appears to be a

Table 2
Means and SDs for Each Race/Sex Grouping with Summary Tabulation of t-tests[a] for Equivalence of Means for Logical Group Comparisons

	White Females		White Males		Black Females		Black Males		WF vs WM[b]		WF vs BF[c]		WM vs BM[d]		BF vs BM[e]	
Variable Name	$\bar{X}$	SD	$\bar{X}$	SD	$\bar{X}$	SD	$\bar{X}$	SD	*t*	*p*	*t*	*p*	*t*	*p*	*t*	*p*
TOBE-Language	111.21	11.23	106.67	12.72	89.97	14.48	90.58	12.54	2.51	*	11.04	**	8.00	**	−.72	NS
TOBE-Math	106.84	10.48	105.10	11.22	88.19	12.61	88.81	16.99	1.06	NS	10.31	**	7.23	**	−.25	NS
Preschool Inventory	119.43	6.88	117.43	11.28	105.48	11.65	104.19	12.14	1.29	NS	9.56	**	7.12	**	.66	NS
Lee-Clark	114.21	8.83	106.28	18.40	93.22	21.40	92.48	22.30	3.32	**	8.46	**	4.28	**	.20	NS
Draw-A-Design	93.61	15.31	91.22	14.73	88.08	13.84	78.84	13.08	1.06	NS	2.39	*	5.56	**	4.15	**
Draw-A-Child	103.89	18.28	96.40	15.84	98.90	17.82	85.41	16.26	2.90	**	1.75	NS	4.31	**	4.78	**
Metro-politan Readiness Test	67.59	14.16	57.28	57.28	50.23	14.89	44.95	14.20	2.06	*	7.61	**	6.82	**	2.20	*

[a] All *t*-tests are two-tailed
[b] df = 174
[c] df = 161
[d] df = 157
[e] df = 144
* = $p \leq .05$
** = $p \leq .01$
NS = $p > .05$

Table 3
Correlation Matrix for All Preschool Measures

	TOBE-Language	TOBE-Math	Preschool Inventory	Lee-Clark	Draw-A-Design	Draw-A-Child
TOBE-Math	.79					
Preschool Inventory	.76	.72				
Lee-Clark	.64	.58	.65			
Draw-A-Design	.42	.41	.41	.30		
Draw-A-Child	.47	.45	.47	.39	.53	
MRT-Total Test	.75	.68	.68	.59	.52	.56

N = 322
Average intercorrelation = .57

Visual-Motor factor. The large loadings of the MRT on both factors is easily explained since it contains several measures from both areas. The 3-factor solution failed to provide a more adequate explanation of the correlational pattern of the variables.

A two-factor Varimax solution was subsequently derived for each race/sex group. The correlation matrix for whites is presented in Table 5 and for blacks in Table 6. In each table, correlations above the diagonal are for males and correlations below the diagonal are for females. The average intercorrelation between the various tests is similar for each group. Upon visual inspection, the two-factor solutions appear similar across race and sex. Table 7 presents the two-factor solution for each group. The

Table 4
Two-factor Varimax Solution for the Total Sample

Variable	Factor 1	Factor 2	Communality
TOBE-Language	.85*	.32	.75
TOBE-Math	.78*	.32	.67
Preschool Inventory	.79*	.33	.66
Lee-Clark	.68*	.24	.49
Draw-A-Design	.22	.71*	.36
Draw-A Child	.32	.64*	.40
MRT-Total Test	.67*	.53	.66
Eigenvalue	4.42	.91	
% Variance	89.5	10.5	

*denotes highest loading
N = 322

Table 5
Correlation Matrix for All Preschool Measures:
White Females and White Males[a]

	TOBE-Language	TOBE-Math	Preschool Inventory	Lee-Clark	Draw-A-Design	Draw-A-Child	MRT-Total Test
TOBE-Language		.76	.65	.52	.42	.56	.71
TOBE-Math	.78		.71	.45	.38	.54	.68
Preschool Inventory	.65	.60		.47	.40	.55	.56
Lee-Clark	.63	.56	.60		.20	.32	.48
Draw-A-Design	.46	.46	.40	.37		.61	.50
Draw-A-Child	.35	.36	.34	.37	.43		.61
MRT-Total Test	.72	.73	.54	.54	.46	.39	

[a]Coefficients above the diagonal are for white males and those below the diagonal are for white females.
White Males N = 86, Average Intercorrelation = .53
White Females N = 90, Average Intercorrelation = .52

Table 6
Correlation Matrix for All Preschool Measures:
Black Females and Black Males[a]

	TOBE-Language	TOBE-Math	Preschool Inventory	Lee-Clark	Draw-A-Design	Draw-A-Child	MRT-Total Test
TOBE-Language		.66	.62	.57	.21	.49	.58
TOBE-Math	.64		.58	.41	.22	.42	.43
Preschool Inventory	.69	.52		.66	.23	.42	.53
Lee-Clark	.49	.51	.49		.18	.45	.49
Draw-A-Design	.23	.28	.24	.14		.30	.31
Draw-A-Child	.43	.41	.42	.28	.52		.46
MRT-Total Test	.63	.56	.63	.51	.46	.60	

[a]Coefficients above the diagonal are for black males and those below the diagonal are for black females.
Black Males N = 73, Average Intercorrelation = .46
Black Females N = 73, Average Intercorrelation = .47

Table 7
Two-Factor Varimax Solution for Each Race/Sex Grouping[a]

	White Females			White Males			Black Females			Black Males		
Variable	Factor 1	Factor 2	H^2	Factor 1	Factor 2	H^2	Factor 1	Factor 2	H^2	Factor 1	Factor 2	H^2
TOBE-Language	.88	.25	.71	.80	.35	.68	.82	.21	.61	.78	.29	.60
TOBE-Math	.81	.28	.68	.80	.32	.68	.68	.27	.49	.64	.26	.50
Preschool Inventory	.66	.31	.50	.70	.35	.58	.74	.25	.55	.78	.23	.58
Lee-Clark	.62	.33	.48	.58	.13	.33	.63	.13	.37	.68	.24	.51
Draw-A-Design	.38	.50	.32	.19	.74	.40	.10	.70	.32	.12	.51	.14
Draw-A-Child	.20	.70	.26	.39	.72	.54	.34	.69	.45	.44	.49	.35
MRT-Total Test	.72	.35	.61	.65	.49	.62	.64	.56	.63	.54	.48	.44
Eigenvalue	4.13	0.86		4.23	0.93		3.83	1.10		3.73	0.93	
% Variance	90.5	9.5		88.3	11.7		84.2	15.8		91.9	8.1	

[a]Eigenvalues and communality estimates are based on the unrotated principal factor matrix

coefficients of congruence between each factor for each logical comparison presented in Table 8 all exceeded the established cutoff value of .90. According to Harman (1967), Mulaik (1972) and others, these results indicate that the two factors are essentially invariant across the several experimental populations. The substantial magnitude of the coefficients of congruence obtained here are also similar to values obtained by Reschly (1978) with the WISC-R comparing Chicanos, blacks, whites, and Papagos. Coefficients of congruence for the off-group comparisons (e.g., WM to BF) in the present study all exceeded .96, adding credence to the similarity of the underlying constructs measured by the battery regardless of the race and sex of the group membership.

This factor analytic investigation provides no evidence to support an hypothesis of sexual dimorphism in the organization of cognitive abilities as has been suggested by other researchers (e.g., Buffery, 1976; Witelson, 1976, 1977). Neither was evidence obtained to indicate racial dimorphism in the organization of the abilities underlying cognition and learning.

These results are in general agreement with the findings of Gutkin and Reynolds (in press), Jensen (1976), Kaufman and Hollenbeck (1974), Merz (1970), Reschly (1978), Vance and Wallbrown (1978), and with conclusions reached by Maccoby and Jacklin (1974) in their exhaustive review of literature. Only a study by Goolsby and Frary (1970) is blatantly incongruent with the results of the present study.

Discrepancies between the Goolsby and Frary results and those of the present study may be due to differences between the size of the samples employed, differing methods of factoring and initial rotation, or to the substantial restriction of range occurring for Goolsby and Frary's blacks. Nevertheless, even when considering the limitations of small samples in factor analytic research, the heavy weight of evidence now available indicates that, when common measurement instruments are employed, the apparent organization of the abilities underlying performance is constant across race and sex. The finding of factorial similarity here adds support to the use of general screening measures with kindergarten children of both races and sexes in the very necessary early identification (Reynolds, 1979c) of potential learning and behavior problems. While these data allow the psychologist to have confidence in certain interpretations regarding the general developmental pattern of scores obtained by blacks, whites, males, and females, it should now be apparent that studies of the construct validity of educational and psychological tests should also be conducted routinely as a part of the development of new tests. Test authors and publishers need to demonstrate factorial invariance across all groups for whom the instrument is de-

Table 8
Coefficients of Congruence for Factor 1 and Factor 2 for Each Logical Race/Sex Grouping Comparison

	Coefficients of Congruence	
Comparison	Factor 1	Factor 2
WF to WM	.99	.97
WF to BF	.98	.95
BF to BM	.99	.98
WM to BM	.99	.99

signed in order to make the instrument more readily interpretable. This is true in the affective as well as cognitive domain. The reasons for this are well stated by Reschly: "Comparability of factor analysis results for different groups, and the degree to which the results of the factor analysis are consistent with the major scores and common interpretations of the test are necessary conditions for fairness in use of the test with culturally diverse persons" (1978, p. 417). Only when this comparability has been documented can the meaning of test scores be generalized across groups.

Following replication of the present results with other preschool populations, including the handicapped, studies linking the findings of neuropsychological researchers with the factor analytic approach should be undertaken. Neuropsychological researchers typically employ experimental methods and tests with considerable specificity. With few exceptions (e.g., Guilford, 1967), educational/psychological investigators employ tests measuring multiple abilities (or having a large "g" component). Only when the neuropsychologist, developmentalist, and measurement specialist coordinate their findings into a comprehensive theory of learning, cognition, and development can we devise efficacious programs to foster early growth and serve as primary prevention programs with a high probability of success. School and other educational psychologists appear to be in a unique position to promote coordination of research in these areas and most certainly, in the consultant role, are the choice for translating future findings into educational practice in the schools.

REFERENCE NOTES

1. Jean, P. J., & Reynolds, C. R. *The Bias in Attitudes Survey: A male/female roles questionnaire.* Paper presented to the annual meeting of the Nebraska Academy of Sciences, Lincoln, April 1979.
2. Reynolds, C. R., & Hartlage, L. C. *Comparison of WISC and WISC-R racial regression lines.* Paper presented to the 24th annual meeting of the Southeastern Psychological Association, Atlanta, March 1978.
3. Reynolds, C. R., McBride, R. D., & Gibson, L. J. *Black-White IQ discrepancies may reflect differences in hemisphericity.* Paper presented to the annual meeting of the National Association of School Psychologists, San Diego, March 1979.

REFERENCES

Anastasi, A. *Psychological testing* (4th ed.). New York: Macmillan, 1976.

Bogen, J. E., DeZure, R., Tenhouten, W. D., & Marsh, J. F. The other side of the brain IV: The A/P ratio. *Bulletin of the Los Angeles Neurological Society,* 1972, *37,* 49-61.

Bowers, J. The comparison of GPA regression equations for regularly admitted and disadvantaged freshmen at the University of Illinois. *Journal of Educational Measurement,* 1970, *7,* 219-225.

Buffery, A. W. H. Sex differences in the neuropsychological development of verbal and spatial skills. In R. M. Knights & D. J. Bakker (Eds.), *The neuropsychology of learning disorders: Theoretical approaches.* Baltimore: University Park Press, 1976.

Cleary, T. A. Test bias: Prediction of grades of Negro and white students in integrated colleges. *Journal of Educational Measurement,* 1968, *5,* 115-124.

Cleary, T. A., Humphreys, L. G., Kendrick, S. A., & Wesman, A. Educational uses of tests with disadvantaged students. *American Psychologist,* 1975, *30,* 15-41.

Cronbach, L. J. *Essentials of psychological testing.* New York: Harper & Row, 1970.

Cureton, E. E. A measure of the average intercorrelation. *Educational and Psychological Measurement,* 1971, *31,* 627-628.

Educational Testing Service, *Preschool Inventory—Revised Edition.* Princeton: Author, 1970.

Goolsby, T. M., & Frary, R. B. Validity of the Metropolitan Readiness Test for White and Negro students in a southern city. *Educational and Psychological Measurement*, 1970, *30*, 443-450.

Guilford, J. P. *The nature of human intelligence*. New York: McGraw-Hill, 1967.

Gutkin, T. B., & Reynolds, C. R. Factorial similarity of the WISC-R for Anglos and Chicanos referred for psychological services. *Journal of School Psychology*, in press.

Harman, H. *Modern factor analysis*, (2nd edition). Chicago: University of Chicago Press, 1967.

Hildreth, G. H., Griffiths, N. L., & McGauvran, M. E. *Metropolitan Readiness Test*. New York: Harcourt, Brace, Jovanovich, 1969.

Jensen, A. R. Test bias and construct validity. *Phi Delta Kappan*, 1976, *58*, 340-346.

Kaiser, H. F. A measure of the average intercorrelation. *Educational and Psychological Measurement*, 1968, *28*, 245-247.

Kaufman, A. S. Factor structure of the McCarthy Scales at five age levels between 2½ and 8½. *Educational and Psychological Measurement*, 1975, *35*, 641-656.

Kaufman, A. S., & DiCuio, R. Separate factor analyses of the McCarthy Scales for groups of black and white children. *Journal of School Psychology*, 1975, *13*, 10-18.

Kaufman, A. S., & Hollenbeck, G. P. Comparative structure of the WPPSI for blacks and whites. *Journal of Clinical Psychology*, 1974, *30*, 316-319.

Lee, J. M., & Clark, W. W. *Lee-Clark Reading Readiness Test*. Monterey, CA: California Test Bureau, 1962.

Leventhal, D. S., & Stedman, D. J. A factor-analytic study of the Illinois Test of Psycholinguistic Abilities. *Journal of Clinical Psychology*, 1970, *26*, 473-477.

Maccoby, E. E., & Jacklin, C. N. *The psychology of sex differences*. Stanford, CA: Stanford University Press, 1974.

McCarthy, D. *McCarthy Scales of Children's Abilities*. New York: The Psychological Corporation, 1972.

Merz, W. R. *A factor analysis of the Goodenough-Harris Drawing Test across four ethnic groups* (Doctoral dissertation, University of New Mexico, 1970). *Dissertation Abstracts International*, 1970, (University Microfilms, No. 70-19, 714).

Moss, M. H. *Tests Of Basic Experiences*. Monterey, CA: CTB/McGraw-Hill, 1970.

Mulaik, S. A. *The foundation of factor analysis*. New York: McGraw-Hill, 1972.

Reschly, D. J. WISC-R factor structures among Anglos, Blacks, Chicanos, and Native American Papagos. *Journal of Consulting and Clinical Psychology*, 1978, *46*, 417-422.

Reynolds, C. R. The McCarthy Drawing Tests as a group instrument. *Contemporary Educational Psychology*, 1978, *3*, 169-1974.

Reynolds, C. R. Should we screen preschoolers? *Contemporary Educational Psychology*, 1979, *4*, 175-181.(c)

Reynolds, C. R., Gutkin, T. B., Dappen, L., & Wright, D. Differential validity of the WISC-R for boys and girls referred for psychological services. *Perceptual and Motor Skills*, 1979, *48*, 868-870.

Reynolds, C. R. Factor analysis of the Peabody Individual Achievement Test at five grade levels between grades one and twelve. *Journal of School Psychology*, 1979, *17*, 270-274.(a)

Reynolds, C. R. A factor analytic study of the Metropolitan Readiness Tests. *Contemporary Educational Psychology*, 1979, *4*, 315-317.(b)

Thorndike, R. L. Concepts of culture-fairness. *Journal of Educational Measurement*, 1971, *8*, 63-70.

Vance, H. B., Huelsman, C. B., & Wherry, R. J. The hierarchical factor structure of the Wechsler Intelligence Scale for Children as it relates to disadvantaged white and black children. *Journal of General Psychology*, 1976, *95*, 287-293.

Vance, H. B., & Wallbrown, F. H. The structure of intelligence for black children: A hierarchical approach. *The Psychological Record*, 1978, *28*, 31-39.

Wallbrown, F., Blaha, J., & Wherry, R. J. The hierarchical factor structure of the Wechsler Preschool and Primary Scale of Intelligence. *Journal of Consulting and Clinical Psychology*, 1973, *41*, 356-363.

Wechsler, D. *The Wechsler Intelligence Scale for Children-Revised*. New York: The Psychological Corporation, 1974.

Witelson, S. F. Sex and the single hemisphere: Right hemisphere specialization for spatial processing. *Science*, 1976, *193*, 425-427.

Witelson, S. F. Developmental dyslexia: Two right hemispheres and none left. *Science*, 1977, *195*, 309-311.

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