

Intellectual Classification of Black and White Children in Special Education Programs Using the WISC-III and the Cognitive Assessment System

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The Wechsler Intelligence Scale for Children—Third Edition and the Cognitive Assessment System were compared for a sample of 78 White and Black students in special education programs for children with mental retardation. Results showed that the WISC-III identified more children as having mental retardation than did the Cognitive Assessment System. More important, however, the WISC-III classified disproportionately more Blacks than Whites as having mental retardation as compared to the Cognitive Assessment System. Results imply that the problem of disproportionate representation of Black children in special education classes for children with mental retardation may be addressed if the Cognitive Assessment System were used instead of the WISC-III.

The Wechsler scales have dominated the field of intelligence testing for at least 50 years, and they continue to be the most widely used intelligence tests (Wilson & Reschly, 1996). Despite their popularity, the Wechsler scales have come under attack in recent years. For example, the test has been criticized for being out of step with other developments in cognitive and neuropsychology during the last 50 years, rendering the approach to measuring intelligence antiquated (Naglieri, 1999; Sternberg, 1999). The Wechsler tradition is, in fact, an approach to assessment that is at least 60

years old, having begun with the publication of the Wechsler-Bellevue Scales in 1939. Actually, Wechsler's tests are considerably older because he adopted many of the methods used by the U.S. military in the early part of the 1900s, which are described in the book *Army Mental Testing* (Yoakum & Yerkes, 1920). Recent researchers have suggested that this traditional form of measuring intelligence has particular limitations when exceptional children are evaluated, especially children with disabilities (Das, Naglieri, & Kirby, 1994; Kaufman & Kaufman, 1983; Naglieri, 1999; Sternberg, 1988) and mi-

nority children who are being evaluated for intellectual disabilities (Reschly & Grimes, 1995).

The Wechsler scales have been criticized for being biased against minority children (e.g., Hilliard, 1979). For example, Black students have consistently earned lower mean Full-Scale IQ scores (Kaufman, Harrison, & Ittenbach, 1990; Prifitera & Saklofske, 1998). Mean score differences between racial groups do not necessarily constitute test bias (Reynolds & Kaiser, 1990). However, there has been a disproportionate representation of Black students in special education classes for children with mental retardation (Reschly & Bersoff, 1999). The problem of disproportionate representation has led some investigators to discourage the use of tests such as the Wechsler scales (Reschly & Grimes, 1995) and others to suggest alternative approaches to traditional intelligence testing methodology (Naglieri, 1999; Sternberg, 1999).

Alternative tests of ability based on cognitive and neuropsychological research, which conceivably could challenge the Wechsler Scales, have been published, such as the Kaufman Assessment Battery for Children (Kaufman & Kaufman, 1983). Another test is the Cognitive Assessment System (Naglieri & Das, 1997), which is described as a test of intelligence based on the Planning, Attention, Simultaneous, and Successive (PASS) cognitive processing theory (Naglieri & Das, 1997). According to PASS, *intelligence* is best defined as four cognitive processes of *planning* (development and use of strategies to solve problems), *attention* (focused cognitive activity and resistance to distraction), *simultaneous processing* (needed to work with stimuli arranged in an array), and *successive processing* (required for working with information in a series). The PASS theory was developed largely on the neuropsychological work of Luria (1966a, 1966b, 1973, 1980, 1982). The main difference between the Wechsler scales and the Cognitive Assessment System is that the latter is based on the view

that (a) intelligence should be redefined as cognitive processes; (b) intelligence should be conceptualized and measured using a multidimensional theory of intelligence rather than the concept of 'g' or general ability; and (c) intelligence should be measured with tests that do not have academic content (e.g., arithmetic, general information, word knowledge). The present study was designed to evaluate the Wechsler Intelligence Scale for Children—Third Edition—WISC-III (Wechsler, 1991) and the Cognitive Assessment System in a group of White and Black students in special education programs for children with mental retardation. More specifically, our aims in this study were to (a) evaluate the mean score differences between the tests for the total sample and by racial groups, (b) evaluate the differential effects of the two instruments on identifying mental retardation, (c) and examine the correlations between the WISC-III and the Cognitive Assessment System. The present investigation is the first examination of these important questions.

Method

Participants

The participants were a subgroup of the standardization sample of the Cognitive Assessment System (Naglieri & Das, 1997). A total of 78 children and adolescents (47 boys, 31 girls; 45 Black, 33 White) from 4 states (Georgia, Nebraska, Ohio, and Tennessee) participated in the study (see Table 1). All of them were in special education programs for children with mental retardation. They ranged in age from 6.5 to 16.8 years (mean = 11.1, *SD* = 2.5). The parents of the students had predominately lower levels of education (less than one quarter of the sample had parents who were college educated). Black and White children were similar on a number of demographic variables shown in Table 1. There were slightly more females among White

Table 1
Demographic Data of the Samples

Characteristic	Total sample (<i>N</i> = 78)	Black (<i>n</i> = 45)	White (<i>n</i> = 33)
Age			
Mean	10.6	10.5	10.8
SD	2.5	2.8	2.2
Range	6–16	6–16	7–16
Gender (%)			
Females	39.7	35.6	45.5
Males	60.3	64.4	54.5
Parental education levels (%)			
Less than high school	46.2	60.0	27.3
High school graduate	35.9	28.9	45.5
Some college	14.1	8.9	21.2
College graduate	3.8	2.2	6.1
Community setting (%)			
Rural	44.4	56.4	30.3
Urban/suburban	55.6	43.6	69.7
Region (%)			
South	66.7	80.0	48.5
North central	33.3	20.0	51.5
Class placement (%)			
Full time special ed	50.6	62.2	33.3
Part time special ed	49.4	35.6	66.7

participants. Most children in the Black group had parents with less than a high school education and the majority came from Georgia (80%); many of the White children were from Nebraska and Tennessee (75%). The majority of children in the Black sample (60.0%) had parents with the lowest educational level, whereas 27.3% of children in the White sample had parents with less than a high school education. A large percentage of both samples, however, had parents who did not attend college (Black = 88.9%; White = 72.8%). Most of the Black children were in full-time special educational settings, and most of the children in the White sample were in part-time special educational settings around the country. All children had been evaluated and placed by multidisciplinary assessment teams in the school districts where the children resided. Unfortunately, there was no access to the original test scores that led to the placement of these participants.

Measures

The WISC-III (Wechsler, 1991) is a widely used individually administered

test for children ages 6 to 16 years comprised of both verbal and nonverbal (performance) subtests. The test yields three IQ Scales (Verbal, Performance, and Full-Scale) in addition to four factorially derived indexes (Verbal Comprehension, Perceptual Organization, Freedom From Distractibility, and Processing Speed). All these scales and indexes are set at a mean of 100 and *SD* of 15. The WISC-III was standardized on a representative sample of 2,200 children who closely match the U.S. Census on a number of key variables, and evidence for reliability and validity were presented in the WISC-III manual (Wechsler, 1991) and other sources (e.g., Kaufman, 1994).

The Cognitive Assessment System (Naglieri & Das, 1997) is an individually administered test for children ages 5 through 17 years. This instrument is organized into four scales (Planning, Attention, Simultaneous, and Successive), according to the PASS theory, and a Full-Scale standard score, each with a mean of 100 and *SD* of 15. It is comprised of 12 subtests that have undergone extensive development and validation (see Das et al., 1994; Naglieri, 1999; Naglieri & Das, 1997). The test was standardized on 2,200 persons age 5.0 years to 17.92 years who closely matched the United States population on the basis of gender, race, region, community setting, classroom placement, educational classification, and parental education. Extensive reliability and validity research was presented in Naglieri and Das (1997) and by Naglieri (1999).

Procedure

Participants from around the country were selected if they had previously been evaluated by multidisciplinary assessment teams and placed in special education programs for persons with mental retardation based on the respective state as well as federal regulations. A portion of these participants was included as special cases in the standardization sample for development of the Cognitive

Assessment System norms (Naglieri & Das, 1997), and the balance was included in a validity study. After parental permission was obtained by the administrators of the study, trained examiners administered the WISC-III and Cognitive Assessment System in counterbalanced order. The examiners were unaware of the specific purpose of this study. Standard scores were obtained for both tests from their respective manuals and used in all data analyses. Prior to data entry trained personnel checked all test record forms for accuracy.

Data analysis included examination of means and standard deviations (*SDs*), ANOVA, Pearson correlations, and calculation of *d* ratios. Also, the percentages of individuals who would be identified as having mental retardation based on their Full-Scale scores were evaluated. Most definitions refer to *mental retardation* as a condition that is characterized by significantly subaverage intellectual functioning that co-exists with limitations in adaptive skills (e.g., American Association on Mental Retardation—Luckasson et al., 1992; American Psychological Association—Jacobson & Mulick,

1996; American Psychiatric Association, 1994, and ICD-9—U.S. Department of Human Services, 1980). Recommendations for the cut-off for subaverage intellectual abilities are typically a score of two *SDs* or less below the normative mean on a general intelligence test, with a mean of 100 and *SD* of 15 and standard error of measurement of about 5 points. Thus, a score of 70 was used as a cut-off for both the WISC-III and Cognitive Assessment System.

Results

Means and *SDs* of all WISC-III and Cognitive Assessment System scales are provided for the total sample and the two racial samples in Table 2. The table also contains *d* ratios that allow for an examination of the differences between groups apart from the issue of statistical significance (Becker, 1991). A 2 (race) × 2 (test) repeated measures factorial ANOVA yielded a significant interaction effect, $F(1, 76) = 9.0, p < .001$, and a significant main effect for the test factor, $F(1, 76) = 28.6, p < .001$. The data in

Table 2
Means, *SDs*, and *d* Ratios on the WISC-III and Cognitive Assessment System (CAS) for the Total Sample

Test	Total sample			Whites			Blacks			<i>d</i> ratio ^c
	<i>N</i>	Mean	<i>SD</i>	<i>n</i>	Mean	<i>SD</i>	<i>n</i>	Mean	<i>SD</i>	
WISC-III										
IQ scales ^a										
VIQ	78	63.1	9.9	33	65.2	10.4	45	61.6	9.4	.38
PIQ	78	65.2	9.3	33	63.3	9.2	45	66.6	9.3	.36
FSIQ	78	61.1	8.8	33	61.2	9.7	45	61.0	8.1	.01
Index scales ^b										
VCI	78	64.0	9.8	33	66.9	10.1	45	61.9	9.1	.53
POI	78	65.1	9.7	33	63.8	8.9	45	66.0	10.1	.23
FDI	71	70.9	12.1	28	70.3	13.6	43	71.3	11.1	.08
PSI	65	76.6	13.0	22	76.6	14.0	43	76.7	12.6	.00
CAS										
Planning	78	74.5	12.6	33	69.1	10.7	45	78.5	12.4	.81
Simultaneous	78	71.2	10.0	33	68.1	11.9	45	73.5	7.8	.55
Attention	78	77.8	12.8	33	72.9	13.2	45	81.4	11.3	.70
Successive	78	73.6	16.7	33	75.2	19.0	45	72.4	14.9	.17
Full Scale	78	66.4	11.5	33	63.3	13.4	45	68.7	9.5	.48

^a VIQ = Verbal IQ, PIQ = Performance IQ, FSIQ = Full Scale IQ. ^b VCI = Verbal Comprehension Index; POI = Perceptual Organization Index; FDI = Freedom From Distractibility Index; PSI = Processing Speed Index. ^c The *d* ratio was calculated using the formula:

$$\frac{\text{Mean}_1 - \text{Mean}_2}{\sqrt{\frac{[(n_1 - 1) \times SD_1^2 + (n_2 - 1) \times SD_2^2]}{(n_1 + n_2 - 2)}}$$

that table suggest that the tests had differential effects on the two races: Black children scored considerably higher than did White children on the Cognitive Assessment System, but the races differed little if at all from one another on the WISC-III. This conclusion was substantiated by independent samples *t*-test post-hoc analyses: There was no difference between the two racial groups in terms of their WISC-III scores, whereas their Cognitive Assessment System scores did reveal differences (although they barely missed statistical significance; $t[54.6] = 2.0, p = .052$). The absence of a main effect between the races suggests that there was no racial difference on the two combined IQs. The *d* ratios for the Wechsler Scales showed that there was a large difference in the Verbal Comprehension Index (.53) in favor of the White children. Cognitive Assessment System scales of Planning, Simultaneous, and Attention showed large *d*-ratio values in favor of the Black children.

To examine whether there was a differential effect of the WISC-III Verbal IQ and Performance IQ on the racial groups, a 2 (race) \times 2 (Verbal IQ/Performance IQ) repeated measures factorial ANOVA was computed. A significant interaction effect, but no significant main effects

were found. Post hoc paired samples *t* tests explained the interaction effect as follows: The Black students earned significantly lower WISC-III verbal scores than performance scores, $t(45) = 3.2, p < .01$, whereas there was no significant difference between scores among Whites. This suggests that the Verbal IQ scale (and Verbal Comprehension Index) of the WISC-III, which contains achievement-like tests such as Vocabulary, Arithmetic, and Information, posed particular difficulty for these Black children.

We evaluated the practical significance of the differences between the two test's Full-Scale scores by comparing the proportion of cases that fell below the IQ cut-off score (< 71) for mental retardation. Table 3 compares the classification outcomes of the two measures of intelligence by cross-tabulating the test results for the full sample and the two racial samples. It presents the percentages of those individuals identified by the WISC-III and Cognitive Assessment System as having or not having mental retardation. In the total sample, 83.3% fell below the cut-off for the WISC-III and 57.7% for the Cognitive Assessment System; both tests were consistent in showing that 53.8% of the total sample fell below the cut-off and 12.8% of

Table 3
Percentage of Cases Classified as Having or Not Having Mental Retardation Based on WISC-III Full-Scale IQs and Cognitive Assessment System (CAS) Full-Scale Scores of Less Than 71 by Sample

Sample/Test	WISC-III		CAS classifications
	Mental retardation	No mental retardation	
White ($n = 33$)			
CAS			
Mental retardation	57.6	6.1	63.6
No mental retardation	18.2	18.2	36.4
WISC-III classifications	75.8	24.2	100.0
Black ($n = 45$)			
CAS			
Mental retardation	51.1	2.2	53.3
No mental retardation	37.8	8.9	46.7
WISC-III classifications	88.9	11.1	100.0
Total sample ($N = 78$)			
CAS			
Mental retardation	53.8	3.8	57.7
No mental retardation	29.5	12.8	42.3
WISC-III classifications	83.3	16.7	100.0

Note: Mental retardation was defined as a standard score of 70 or less.

children rose above the cut-off. In the total sample, the WISC-III and Cognitive Assessment System produced significantly different results with regard to classification of mental retardation, $\chi^2(1, N = 78) = 7.7, p < .01$. These results are more fully understood when the proportion of individuals who fell below the cut-off was examined separately by race.

Table 3 also shows that although 75.8% of the White children earned WISC-III Full-Scale IQs of 70 or below, 88.9% of the Black children fell below the cut-off score. In contrast, 63.6% and 53.3% of the White and Black children, respectively, earned Cognitive Assessment System Full-Scale scores in the mental retardation range. Statistical analyses revealed that the two tests of intelligence classified White children as falling above or into the mental retardation range of cognitive functioning in a significantly similar fashion, $\chi^2(1, N = 33) = 6.8; p < .01, \kappa = .44$, whereas there was no statistically significant relationship between the classification outcome of the tests in Black children, $\kappa = .16$. As can be seen in Table 3, the WISC-III classified 35.6% more Black children as having mental retardation than did the Cognitive Assessment System (88.9 % vs. 53.3 %), as opposed to only 12.2% more White children (75.8 % vs. 63.6 %).

Pearson correlations between the WISC-III and Cognitive Assessment System Scales provided in Table 4 suggest that some of these scales were correlated and others were not. For example, the Wechsler Verbal IQ correlated significantly with the Cognitive Assessment

System Simultaneous and Successive Scales only. In contrast, the Performance IQ correlated significantly with each of the four PASS Scales, but highest with the Planning and Attention scale of the Cognitive Assessment System. Interestingly, both the WISC-III Verbal Comprehension and Perceptual Organization Index scores correlated similarly with the Simultaneous and Successive Scales but not the Planning or Attention scales of the Cognitive Assessment System. The Freedom From Distractibility Index correlated significantly with all PASS scales but the lowest, $r = .37$, with the Cognitive Assessment System Attention scale and highest, $r = .66$, with the Successive scale. The Processing Speed Index correlated significantly with all PASS scales but highest with Planning and Attention. The correlation between the WISC-III Full-Scale IQ and Cognitive Assessment System Full-Scale was significant, $r = .69$, and at a level that is expected given the theoretical makeup of the two tests (Naglieri, 1999).

Discussion

This study is the first in which the relationships between the WISC-III and Cognitive Assessment System for persons with mental retardation was examined, and it raises several important diagnostic and theoretical questions about these two tests of intelligence. One important finding was that the WISC-III classified a larger portion of individuals in the mental retardation range of intelligence than

Table 4
Correlations Between WISC-III and Cognitive Assessment System (CAS) for the Total Sample

Variable	PL	SIM	ATT	SUC	FS
Verbal IQ	.23	.51*	.18	.48*	.47*
Performance IQ	.69*	.51*	.61*	.42*	.52*
Full Scale IQ	.44*	.65*	.36*	.59*	.69*
Verbal Comprehension	.14	.43*	.09	.44*	.38*
Perceptual Organization	.30	.54*	.22	.51*	.54*
Freedom From Distractibility	.42*	.57*	.37*	.66*	.71*
Processing Speed	.63*	.41*	.58*	.37*	.73*

Note. PL = Planning, SIM = Simultaneous, ATT = Attention, SUC = Successive, FS = CAS Full-Scale.
* $p < .01$.

did the Cognitive Assessment System. In other words, if the Cognitive Assessment System would replace the WISC-III as the common instrument of classification for mental retardation services eligibility, the number of beneficiaries would drop by about 30%. Thus, the use of the Cognitive Assessment System is a more conservative approach to placement for this population. The practical and fiscal implications of this finding could be considerable. These results are particularly important because the WISC-III is commonly used to determine mental retardation eligibility (MacMillan, Gresham, & Siperstein, 1993; Sattler, 1988).

Another important finding was that the WISC-III identified disproportionately more Black children as having mental retardation than did the Cognitive Assessment System. This finding is consistent with earlier criticism of the WISC-III as being responsible for the overrepresentation of Black children in special education classes (Reschly & Grimes, 1995). Thus, if the Cognitive Assessment System were used in place of the WISC-III, fewer Black children would be considered for placement in special education classes for children with mental retardation.

It is important to point out that if the Cognitive Assessment System were to replace the WISC-III for service eligibility assessments, the implications for children in the borderline range of intelligence could be either positive or negative. If a child were wrongly placed in special education settings because the classroom is underchallenging, replacing the WISC-III with the Cognitive Assessment System would be beneficial for that child. For those children, however, who are wrongly kept in regular classrooms that are too challenging, replacing the WISC-III with the Cognitive Assessment System would be detrimental. The long-term benefits and costs of different measures for special education placement decisions need to be studied more.

The differential classification effect of the two tests across racial groups may

be the result of their different content. The WISC-III Verbal Scale contains subtests that can be viewed as highly achievement loaded (Kaufman, 1994; Naglieri, 1999), whereas the Cognitive Assessment System does not include measures of general information, vocabulary, and arithmetic. In this study we found that Black children did earn lower Verbal scores than did White participants. In addition, the Cognitive Assessment System measures planning and attention, two scales that are not represented by the Wechsler, on which the Black children earned higher scores than did the White children. These important differences between the content of the two tests appear to have led to the differences in classification rates.

Whether the differences between the WISC-III and Cognitive Assessment System found here can be generalized beyond the populations of this study needs to be confirmed by replication studies with participant samples in the borderline range of mental retardation who are especially recruited for that purpose. It will also be valuable to determine whether the lower WISC-III or higher Cognitive Assessment System scores are more indicative of actual levels of performance. It is important to point out that the differences do not appear to be the result of different ranges of scores in the two test norms. The lowest possible score for the Wechsler Verbal and Performance IQs, Full-Scale, and Index Scales was 46, 40, and 50, respectively. Similarly, the lowest possible Cognitive Assessment System standard score for each PASS Scale is 45, and Cognitive Assessment System Full-Scale is 40. Thus, the reasons for the differences do not appear to lie in psychometric qualities but are more likely the result of the differences in what the two tests measure.

The results of this study and the conclusions they suggest need to be considered in light of a few methodological limitations. Given that this is the first examination of the differential identification rates of classification of children in

special education programs for mental retardation in which the Cognitive Assessment System and WISC-III were used, replication is necessary. Although the sample sizes were adequate, larger, more precisely matched groups who were specifically sampled to study this issue should be included in future research. In addition, the validity of the different classification rates generated by the WISC-III and the Cognitive Assessment System also need to be studied, based on comprehensive criteria of educational and psychological advantages and drawbacks for certain types of children being placed in special needs classes as opposed to regular classrooms.

Although this study involved children who were placed in classes for children with mental retardation, the IQs alone suggest that some of the participants may not have qualified as having mental retardation. Different assessment teams may arrive at other placement recommendations. It is also possible that some of the children with IQs of 70 or slightly above were placed in special education classrooms based on low adaptive skills scores, which, unfortunately, were unavailable in this study. Furthermore, some of these children may have achieved IQs above the cutoff due to regression effects. Whatever the reason may have been, it was not our intent in this study to validate the placement of these children.

In conclusion, the results of this initial study of the differences between the WISC-III and Cognitive Assessment System for identification of White and Black children suggest that these two tests yield different results. Whereas groups of children typically earn similar Full-Scale mean scores on these two tests (see Naglieri & Das, 1997), this was not true for the current sample of persons with mental retardation. The reason for the varying performance of these samples appears to rest on the differences between what these two tests measure.

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