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ABSTRACT

The position that intelligence and achievement are essentially different measures of the same construct has often been referred to as a "jangle fallacy." Such a position challenges the present practice of placing children in learning disabilities programs based on a discrepancy between Intelligence Quotient (IQ) and achievement. This study examined scores on the Wechsler Intelligence Scale for Children-Revised (WISC-R) and the Wide Range Achievement Test (WRAT) for 1,090 children (818 boys and 272 girls) ages 8-16 from a large midwestern school district. These children were all referred for learning problems and were determined to have IQ and achievement discrepancies. Results showed an asymmetrical redundancy between measures, with 18.8% of the WRAT found to be redundant with 7.2% of the WISC-R. This finding suggests that there was little overlap between the measures of achievement and intelligence. Results were interpreted in light of the differential format of measurement instruments when used with various levels of academic ability. (21 references) (Author)

The 'Jangle Fallacy' Revisited: IQ and Achievement with Learning Disabled Children

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Abstract

The position that intelligence and achievement are essentially different measures of the same construct has often been referred to as a 'jangle fallacy'. Such a position challenges the present practice of placing children in learning disabilities programs based on a discrepancy between IQ and achievement (PL 94-142). The present study examined scores on the Wechsler Intelligence Scale for Children-Revised, and the Wide Range Achievement Test for 1090 children (818 boys and 272 girls) from a large midwestern school district. These children were all referred for learning problems and were determined to have IQ and achievement discrepancies. A canonical analysis conducted for these two measures, with the objective of understanding the redundancy between IQ and achievement. This analysis indicated that there was an asymmetrical redundancy between measures, with 18.8% of the WRAT found to be redundant with 7 2% of the WISC-R. Results were interpreted in light of the differential format of measurement instruments when used with various levels of academic ability.

The 'Jangle Fallacy' Revisited: IQ and Achievement with Learning Disabled Children

The correspondence between measures of intelligence and achievement continues to be of theoretical and applied interest (Reynolds, 1984; Brown & Campione, 1986). Research on this issue is pivotal to our present scheme of identifying childhood learning disabilities. Indeed, recent mandates stress a discrepancy between intelligence and achievement as the criterion for diagnosis (PL 94-142, 1975). Because standardized measures are used to operationalize this criterion, the independence of these constructs is crucial.

Although discussion of formulae for estimating intelligence and achievement discrepancy continues (Reynolds, 1984; Schulte and Borich, 1984; and, Wilson & Cone, 1984), much less attention has been paid to the underlying constructs measured by tests of intelligence and achievement. Dean (1982) argued that considering measured intelligence and achievement as distinct conctructs lacks empirical support. This position has a good deal of historical precedence. Indeed, some sixty years ago Kelly (1927) demonstrated that with age held constant, the overlap or redundancy between group measures of intelligence and achievement was approximately 90%. Based on these data he argued that the difference between intelligence and achievement measures may be in name only, or a 'jangle fallacy'. Kelly's (1927) data have since been replicated with other group measures (Coleman & Cureton, 1954; Cronbach, 1970). Dean (1982) has pointed out a problem in the generalization of these data in that group measures have a common dependence upon reading ability. With reading being a common element of both tests, the high overlap between IQ and achievement may be due in part to reading ability.

More recent studies of the relationship between intelligence and achievement, have focused upon individually administered measures. Wright (1987) factor analyzed the WRAT and WISC-R along with a group measure of achievement (SRA Achievement Series, Primary Edition; Naslund, Thorpe, and Lefever, 1972) for a group of normal children. His four factor solution which resulted was consistent with a previous study (Brock, 1982). He interpreted his four factors as Verbal Comprehension, Numerical, Written Language, and Performance. Further canonical analysis indicated that a functional overlap that accounted for 31% of the variance of the WISC-R and over 31% of the combined WRAT and SRA. Although, factor analysis yields information as to the similarity in the underlying structure of intelligence and achievement tests, this approach fails to address the redundancy of measures directly. Indeed, it seems that a canonical analysis would offer a better understanding of the multivariate overlap between tests. Using this approach, Dean (1982) also considered the degree of redundancy between the PIAT and WISC-R. The results of this study showed that there was an asymmetrical overlap between the WISC-R Verbal subtests and some 60% of the PIAT variability. Wright suggested that differences between the achievement measures used in his study (i.e., the WRAT and the SRA) were distinct in both presentation and response format compared to the achievement measure used in Dean's studies (1977; 1982). Clearly, differences in presentation and response formats would seem to reduce the amount of overlap.

In an attempt to replicate Wright (1987), and Dean (1982), the present investigation was also designed to examine both the underlying factor structure and the redundancy of the WISC-R and the WRAT.

Method

Subjects

The subjects were 1090 children (818 males and 272 females) who were referred for psychological evaluations as a result of general learning problems in the regular classroom. Subjects were assessed with intelligence and achievement measures (WISC-R, and WRAT), and retained in the sample only if they met the criteria (PL #94-142, 1975) for placement as a learning disabled child which included an IQ-Achievement discrepancy. Students in the sample ranged in age from 8 to 16 years (X = 11.02 years, SD = 1.86). All children had a negative history for neurologic and psychiatric disorders. The subjects, from lower-middle to middle class backgrounds were enrolled in a large Midwestern school district.

Procedures

Each subject was administered the regular subtests of the Wechsler Intelligence Scale for Children-Revised (WISC-R; Wechsler, 1974) excluding the Mazes and the three subtests of the Wide Range Achievement Test in the standard fashion (WRAT; Jastak & Jastak, 1965).

Results and Discussion

Means and standard deviations for the WISC-R and WRAT subtests are displayed in Table 1. In an effort to evaluate the constructs shared by the WISC-R and the WRAT further, a factor analysis was computed. Specifically, the total correlation matrix was submitted to a principle-component analysis, and those factors with eigenvalues greater than 1.0 were rotated to a final varimax solution. When considering the individual subtests loadings, only weights of +/-.3 were considered large enough for interpretation (see Nunnally, 1967). The rotated interpretable rotated factor loadings for subtests/tests are reported in Table 2.

Consistent with some previous findings a four factor solution emerged (Brock, 1982; Wright, 1987) as seen in Table 2. The first factor accounted for 27.7% of the total variance, with loadings ranging from .34

to .83. Loadings on this factor for the WRAT ranged from .05 to .14. This factor bore some resemblance to the Verbal Comprehension Factor as discussed by Kaufman (1975). A second factor accounted for 13.3% of the total variance. Loadings on this factor showed it to be exclusively of the three WRAT achievement subtests, i.e. Reading, Spelling, and Arithmetic. The interpretive loadings on this second factor ranged from .57 to .93. and appeared rather unique to the WRAT with few interpretable loadings from WISC-R subtests. The third or Visual-Spatial Factor, accounted for 7.3% of the total variance, and was made up of four WISC-R Performance subtests having interpretive loadings which ranged from .45 to .73. A fourth factor, seemed to correspond to the Attentional Component was composed of WRAT-Arithmetic, and the WISC-R subtests, Picture Arrangement, Digit Span, and, Coding with interpretive loadings ranging from .39 to .52. This factor accounted for 3.2 % of the total variance.

Data from the subtests of the WISC-R and the WRAT were next submitted to a canonical correlation analysis. As reported in Table 3, there were three significant correlations between linear components of the WISC-R and WRAT subtests (R_c = .491, χ^2 (33) = 419.13 p <

.0001; R_c = .337, X^2 (20) = 148.01 p < .0001; R_c .171, X^2 (9) = 29.35 p > .001, Table 3).

The interpretable weights for the three significant canonical correlations are presented in Table 4. These loadings suggested that the first canonical correlation related to general ability with interpretable loadings for all three WRAT subtests relating to a linear composite of all the WISC-R subtests except WISC-R Picture Completion and WISC-R Object Assembly. On the second canonical interpretable loadings of WRAT Reading and WRAT Spelling related to a linear composite which included WISC-R Verbal test Information and WISC-R Performance tests Picture Completion, Picture Arrangement, Block Design, and Object Assembly. On the third canonical correlation interpretable loadings of the WRAT Reading related to a WISC-R Information, Picture Completion, and Coding.

Because a canonical correlation represents a relationship between two linear composites rather than individual variables themselves, Stewart and Love's (1968) procedure was utilized to extract the redundant variance. This analysis indicated an asymmetrical redundancy with 18.8% of the functions measured by the WRAT redundant with 7.2% of the WISC-R.

This finding suggested that there was little overlap between the measures of achievement and intelligence for this population with these measures. In sum, the 'jangle fallacy' seems clearest where subjects are of normal intelligence, and measures are similar in format. There would appear to be less overlap when subjects are less academically able and are further required to use paper and pencil tests.

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Table 1

Means and Standard Deviations for Scaled Scores on the Wechsler Intelligence Scale for Children-Revised (WISC-R) and the Wide Range Achievement Test (WRAT)

Subtest	M	SD
WISC-R		
Information	7.73	2.60
Comprehension	8.86	2.67
Arithmetic	7.54	2.28
Similarities	9.123	2.97
Digit Span	7.44	2.43
Vocabulary	2.50	2.50
Picture Completion	10.15	2.66
Picture Arrangement	10.36	2.76
Block Design	9.45	2.79
Object Assembly	10.21	3.20
Coding	8.64	3.01
Verbal IQ [a]	89.37	12.12
Performance IQ [a]	98.22	13.34
Full Scale IQ [a]	92.95	11.49
WRAT		
Reading	83.11	10.39
Spelling	76.90	11.37
Arithmetic	79.75	14.19

[a] Variables not included in factor or canonical analyses.

Table 2

Factor Loadings for all Subtest Variables: Four Factor Solution

Subtest	Factors Factor 1	 Factor 2	 Factor 3	 Factor 4
WRAT Arithmetic	.05	.58	.20	.39
WRAT Spelling	.11	.91	-.08	.14
WRAT Reading	.15	.93	.00	.07
WISC-R Information	.66	.24	.16	.19
WISC-R Comprehension	.66	.05	.18	.15
WISC-R Arithmetic	.34	.21	.16	.54
WISC-R Similarities	.64	.04	.19	.27
WISC-R Digit Span	.20	.18	-.02	.39
WISC-R Vocabulary	.83	.07	.17	.09
WISC-R Picture Completion	.23	-.00	.54	-.01
WISC-R Picture Arrangement	.21	.02	.45	.12
WISC-R Block Design	.12	.04	.69	.26
WISC-R Object Assembly	.05	.00	.73	.06
WISC-R Coding	.08	.04	.17	.43
Percentage Variance	27.7	13.3	7.3	3.2
Eigenvalue	3.88	1.87	1.02	0.45

Table 3

Canonical Correlation and Redundancies Between WISC-R and WRAT Subtests

Canonical Variate	Canonical Correlation	Lambda (R^2)	Variance Extracted WRAT	Variance Extracted WISC-R	Redundancy WRAT	Redundancy WISC-R	Proportion of Total Redundancy WRAT	Proportion of Total Redundancy WISC-R
1	0.491*	0.241	0.623	0.230	0.150	0.055	.799	.773
2	0.337*	0.114	0.316	0.112	0.036	0.013	.191	.178
3	0.171*	0.029	0.061	0.120	0.002	0.004	.009	.049
					.188	.072	.999	1.000

*$p < .001$

Table 4

Canonical Loadings for each Significant Canonical Correlation

Subtests	Rc^1	Rc^2	Rc^3
WISC-R			
Information	0.623	0.419	0.496
Comprehension	0.392	0.049	0.357
Arithmetic	0.844	0.041	-0.211
Similarities	0.374	0.051	0.355
Digit Span	0.545	0.301	-0.059
Vocabulary	0.309	0.268	0.290
Picture Completion	0.270	-0.426	0.412
Picture Arrangement	0.396	-0.454	-0.316
Block Design	0.495	-0.489	0.281
Object Assembly	0.295	-0.476	0.259
Coding	0.424	-0.193	-0.502
WRAT			
Reading	0.667	0.615	0.421
Spelling	0.657	0.752	-0.061
Achievement	0.997	-0.072	-0.033