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The Correlation between Wechsler Adult Intelligence Scale III and Woodcock-Johnson III Cognitive Abilities and WJ III Achievement for College Students: Which is a Better Predictor of Reading Achievement?

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The Correlation between Wechsler Adult Intelligence Scale III and
Woodcock-Johnson III Cognitive Abilities and
WJ III Achievement for College Students:
Which is a better predictor of reading achievement?

Thesis submitted to
the Graduate College
of Marshall University

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the requirements for the degree of
Educational Specialist
in School Psychology

By

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Abstract

The present study is intended to examine whether the Wechsler Adult Intelligence Scale III or Woodcock-Johnson III Cognitive Abilities would better predict reading achievement on the WJ III Achievement in the college student population. Participants included 29 college students attending a university in the Midwest, being evaluated for a learning disability or academic accommodations. Data were analyzed using Pearson r correlation, Fisher z, and t-test for each intelligence test in comparison to achievement subtests. Results from this study indicated that both IQ scores obtained from the WAIS-III and the WJ-III COG correlated with reading significantly, but not highly enough to be construed as achievement tests due to only moderate correlations. Considering the results of this study an examiner may choose either instrument to use when assessing intelligence. Limitations to this study are presented.

Introduction

For the most part, testing occurs in order to match an individual with the appropriate learning standards. There are a variety of assessment tools used by school psychologists to determine an individual's intellectual abilities, along with one's scholastic aptitude. Achievement tests can be defined as examinations that measure educationally relevant skills or knowledge in such subjects as reading, spelling, or mathematics (Sattler, 2002). Intelligence tests can be characterized as psychological tests designed to measure cognitive functions, such as reasoning, comprehension, and judgment. (Sattler, 2002). Knowledge of the relationship among achievement tests and intelligence tests are important for several reasons: it is critical to know whether tests that purport to measure the same construct (such as intelligence) yield similar scores when administered to the same individual; and, knowledge of the correlational relationships among tests provides insight into the amount of overlap that exists between the constructs measured by the tests.

There are numerous instruments that profess to measure adult intelligence abilities; the most popular of these instruments include the Wechsler Adult Intelligence Scale and the Woodcock-Johnson Tests of Cognitive Abilities. The earliest Wechsler scale was the Wechsler-Bellevue Intelligence Scale (1939) by David Wechsler. This scale was replaced in 1955 by the Wechsler Adult Intelligence Scale, followed by a revision in 1981, and a subsequent revision in 1997 (WAIS-III). The WAIS-III consists of 14 separate subtests (Vocabulary, Similarities, Arithmetic, Digit Span, Information, Comprehension, and Letter-Number Sequencing, Picture Completion, Digit Symbol-Coding, Block Design, Matrix Reasoning, Picture Arrangement, Symbol Search, and

Object Assembly) broken into the Verbal Scale (tests 1-7) and the Performance Scale (tests 8-14). Object Assembly can substitute for a Performance subtest for ages 16 to 74.

The WAIS-R was standardized in a sample of 1,800 U.S. subjects, ranging from 16 to 74 years of age. It was a highly stratified sample, broken down into nine different age groups. Equal numbers of men and women were used, as were white and nonwhite subjects, in line with census figures. It was further broken down into four geographic U.S. regions and six occupational categories. There was also an attempt to balance urban and rural subjects (Internet source-Wilderdom, 2005).

Wechsler originally defined intelligence as the “capacity of the individual to act purposefully, to think rationally, and to deal effectively with his environment” (Wechsler, 1944). According to the theory, Wechsler believed that intelligence should measure verbal, performance, and later in his career “nonintellective” factors of intelligence, which included abilities to perceive and respond to social, moral, and aesthetic values (Technical Manual, 1997). The subtests were developed to indicate an individual’s overall intellectual potential. The WAIS also provides information of an individual’s relative strengths and weaknesses in a short amount of time.

The current edition of the Woodcock-Johnson III Tests of Cognitive Ability was originally published by Richard W. Woodcock and Mary Bonner Johnson as the Woodcock-Johnson Psycho-Educational Battery (WJPEB) in 1977. The WJPEB consisted of three parts: Part 1: Tests of Cognitive Ability, Part II: Tests of Achievement, and Part III: Tests of Interest Level (Cantrell, 1992). The Woodcock-Johnson III is an individually administered battery of tests that provide a comprehensive measure of abilities and achievement across a wide age range. To expand specific skill

and content areas for assessment, eight new tests were added to the Woodcock-Johnson III Tests of Cognitive Abilities producing 20 tests, each developed to measure a different aspect of the seven broad fluid and crystallized intellectual abilities (Woodcock, McGrew, & Mather, 2001). These tests are divided into two batteries, the standard battery and the extended battery. The standard battery consists of tests one through ten (Verbal Comprehension, Visual-Auditory Learning, Spatial Relations, Sound Blending, Concept Formation, Visual Matching, Numbers Reversed, Incomplete Words, Auditory Working Memory, Visual-Auditory Learning-Delayed). The extended battery consists of tests eleven through twenty (General Information, Retrieval Fluency, Picture Recognition, Auditory Attention, Analysis-Synthesis, Decision Speed, Memory for Words, Rapid Picture Naming, Planning, and Pair Cancellation). The WJ-TCA may be used alone in standard or extended format or in combination with tests and clusters from the other battery. There is also a Brief Intellectual Ability (BIA) measure (consists of Tests 1-Verbal Comprehension, 5-Concept Formation, and 6-Visual Matching) that may be used for screening purposes (Woodcock et.al, 2001).

The Woodcock-Johnson Tests of Cognitive Abilities was normed on a sample of 4732 subjects from communities across the United States. The norming sample was selected to be representative of the United States population from three years of age through 65 and older as determined by the 1970 United States Census (Cantrell, 1992). The sample was stratified across the following variables: age, sex, race, occupational status, geographic region, and type of community (urban or nonurban).

The Woodcock-Johnson III Cognitive was based on the theory of Cattell-Horn-Carol model of cognitive processing from an earlier Gf (fluid intelligence) and Gc

(crystallized intelligence) model. The Horn Cattell Theory is based on a four-tier hierarchy. Fluid reasoning (Gf) and crystallized intelligence (Gc) is the apex of the hierarchy. The second level is perceptual organization, which is divided into visual processing (Gv), auditory processing (Ga), and processing speed (Gs). Tier three, association processing, is composed of short-term memory (Gsm), long-term retrieval (Glr), and correct decision speed (CDS). At the fourth and final level is sensory reception, which is subdivided into visual and auditory sensory detectors (Cantrell, 1992). The subtests of the WJ-R COG each measure a different aspect of intellectual ability of the Horn and Cattell Theory.

Along with the development of the Woodcock-Johnson Psycho-Educational Battery (WJPEB) Part I: Tests of Cognitive Ability, also came Part II: Tests of Achievement. The Woodcock-Johnson III Tests of Achievement consists of a standard and extended battery, available in two forms (A and B). There are 22 tests. The standard battery is made up of tests one through twelve (Letter-Word Identification, Reading Fluency, Story Recall, Understanding Directions, Calculation, Math Fluency, Spelling, Writing Fluency, Passage Comprehension, Applied Problems, Writing Samples, and Story Recall-Delayed) and the extended battery, tests thirteen through twenty-two (Word Attack, Picture Vocabulary, Oral Comprehension, Editing, Reading Vocabulary, Quantitative Concepts, Academic Knowledge, Spelling of Sounds, Sound Awareness, and Punctuation and Capitalization). The WJ-III ACH tests are grouped into five curricular areas: Reading, Mathematics, Written Language, Oral Language, and Academic Knowledge. Each broad achievement cluster contains three tests measuring basic skills, fluency, and application.

After searching major databases, there were no studies that neither confirm nor refute these results or instruments. In 1992, Joseph Cantrell presented a study in which he compared the WAIS-R and WJ-R in the measurement of intellectual ability, and prediction of achievement in a referred population of college students. The results of Cantrell's study found that the WAIS-R and the WJ-R COG had much in common, in terms of the broad or global measure of ability, the Full Scale IQ and the Broad Cognitive Ability score. Richard Woodcock, in 1990, performed a confirmatory joint-factor analysis of the WAIS-R and WJ-R COG. In this analysis, Woodcock determined that the WAIS-R measured five of the eight WJ-R COG factors.

Due to the lack of current research, this study is intended to find the relationship between the WAIS-III and WJ-III COG and academic achievement when tests are administered to the same students. It is imperative to know whether tests that profess to measure that same construct (such as intelligence) generate similar scores when administered to the same individual; and, knowledge of the correlational relationships among tests provides insight into the amount of overlap that exists between the constructs measured by the tests.

Method

Participants

The participants were 29 college students attending a university in the Midwest. The sample consisted of eight males and twenty-one females. These students were being evaluated to determine if they had a specific learning disability and if they qualified for academic accommodations. The mean age of the sample was 30 years (range = 18 years

to 51 years, 2 months). Table 1 represents the sample size and demographic characteristics of the participants.

Table 1
Demographic Characteristics of the Total Sample and Male and Female Groups

	<u>n</u>	<u>Age*</u>		
		M	SD	Range
Males	8	349.38	141.21	216-614
Females	21	359.38	111.09	228-540
Total	29	360.07	115.72	216-614

*Age is given in months

Procedures

The study used data that was previously collected. The WAIS-III was administered by a school psychologist. A learning disability specialist administered the WJ-III Cognitive and Achievement tests. The WJ-III Cognitive and Achievement tests were administered first and the WAIS-III was administered 1 to 2 weeks later. The individuals' age, grade, gender, and tests scores were entered into an Excel spreadsheet by a university employee who was not involved in the data collection. An ID number replaced the students' names on these spreadsheets. The researchers for this project did not have access to the original protocols or the individuals' names.

Results

Table 2 presents the descriptive statistics of the WAIS-III, WJ-III COG, and WJ-III ACH tests. There was a significant correlation ($r = .56, p < .01$) between the Full Scale IQ of the WAIS-III and the Letter-Word Identification score of the WJ III Achievement Test as measured using the Pearson-Product correlation. When comparing the GIA score of the WJ-III Cognitive Abilities with the Letter Word Identification score of the WJ III Achievement Test, as measured using the Pearson-Product correlation, there was a

significant correlation of $r = .62, p < .01$. The Fisher's Z score for comparing two correlations yielded non significant values, $F(27) = .26, p < .01$, between the correlations from the WAIS-III Full Scale IQ and the WJ-III ACH Letter-Word Identification subtest as compared to the WJ-III COG GIA and the WJ-III ACH Letter-Word Identification subtest. A t-test was used to measure whether there was a significant difference between the mean score of the WAIS-III FSIQ/ WJ Cognitive Abilities GIA and the mean score of the WJ-III Letter Word Identification. A t-test when measuring means resulted in non significant values, $t(28) = .002, p < .05$, in means scores on the WAIS-III and the WJ-III ACH Letter- Word Identification subtest. A t-test when comparing means resulted in non significant values, $t(28) = .06, p < .05$, in means scores on the WJ-III COG and the WJ-III ACH Letter-Word Identification subtest.

There was a significant correlation ($r = .66, p < .01$) between the Full Scale IQ of the WAIS-III and the Passage Comprehension score of the WJ III Achievement Test as measured using the Pearson-Product correlation. When comparing the GIA score of the WJ-III Cognitive Abilities with the Passage Comprehension score of the WJ III Achievement Test, as measured using the Pearson-Product correlation, there was a significant correlation of $r = .65, p < .01$. The Fisher's Z score for comparing two correlations yielded non significant values, $F(27) = .45, p < .01$, between the correlations from the WAIS-III Full Scale IQ and the WJ-III ACH Passage Comprehension subtest as compared to the WJ-III COG GIA and the WJ-III ACH Passage Comprehension subtest. A t-test was used to measure whether there was a significant difference between the mean score of the WAIS-III FSIQ/ WJ Cognitive Abilities GIA and the mean score of the WJ-III Passage Comprehension. A t-test when measuring means resulted in non significant

values, $t(28) = .69, p < .05$, in means scores on the WAIS-III and the WJ-III ACH Passage Comprehension subtest. A t-test when comparing means resulted in non significant values, $t(28) = .04, p < .05$, in means scores on the WJ-III COG and the WJ-III ACH Passage Comprehension subtest.

There correlation between the Full Scale IQ of the WAIS-III and the Reading Fluency score of the WJ III Achievement Test as measured using the Pearson-Product correlation was not significant ($r = .24, p < .01$). When comparing the GIA score of the WJ-III Cognitive Abilities with the Reading Fluency score of the WJ III Achievement Test, as measured using the Pearson-Product correlation, there was a significant correlation of $r = .34, p < .05$. The Fisher's Z score for comparing two correlations yielded non significant values, $F(27) = .12, p < .01$, between the correlations from the WAIS-III Full Scale IQ and the WJ-III ACH Reading Fluency subtest as compared to the WJ-III COG GIA and the WJ-III ACH Reading Fluency subtest. A t-test was used to measure whether there was a significant difference between the mean score of the WAIS-III FSIQ/ WJ Cognitive Abilities GIA and the mean score of the WJ-III Letter Word Identification. A t-test when measuring means resulted in non significant values, $t(28) = .06, p < .05$, in means scores on the WAIS-III and the WJ-III ACH Reading Fluency subtest. A t-test when comparing means resulted in non significant values, $t(28) = .53, p < .05$, in means scores on the WJ-III COG and the WJ-III ACH Reading Fluency subtest.

Table 2
Means, Standard Deviations, and Ranges of Test Scores for WAIS-III and WJ-III

Test	M	SD	Range
WAIS IQ*	98.21	14.73	70-145
WJ GIA*	93.66	10.09	66-118
WJ LW*	90.41	9.77	64-115
WJ RF*	92.21	11.40	69-115
WJ PC*	97.38	11.68	61-130

*Note: WAIS IQ=Weschler Adult Intelligence Scale Full Scale IQ

WJ GIA=Woodcock-Johnson Tests of Cognitive Abilities General Index Ability

WJ LW=Woodcock-Johnson Tests of Achievement Letter Word Sequencing Subtest

WJ RF=Woodcock-Johnson Tests of Achievement Reading Fluency Subtest

WJ PC=Woodcock-Johnson Tests of Achievement Passage Comprehension Subtest

Discussion

The WAIS-III and the WJ COG are commonly used intelligence tests for the adult population. In most situations, such as college, achievement tests also accompany the intelligence testing. By completing achievement tests as well as intelligence tests, the examiner may acquire a more thorough understanding of the nature of the disability or why an examinee is being referred for evaluation. This study examined whether or not the WAIS-III or the WJ-III COG would better predict reading achievement on the WJ-III Tests of Achievement. Results from this study indicated that both IQ scores obtained from the WAIS-III and the WJ-III COG correlated with reading significantly, but not too highly. Considering both intelligence measurements correlate with reading, an examiner may choose either instrument to use when assessing intelligence. This study supports the criterion related validity of these tests meaning they predict reading but cannot be construed as achievement tests because the correlations are only moderate.

The results of this study may restrict the generalizability to dissimilar populations. In order to further validate these results, this study or similar studies need to be replicated

with a larger sample size to indicate a more significant difference. Additional research with a more diverse sample that includes more minorities and more students of the non-referred population would help verify whether the present results are more universal to other groups or whether they are limited to the present sample of referred students.

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