CONCURRENT VALIDITY OF THE WOODCOCK JOHNSON-III

TESTS OF COGNITIVE ABILITY AND THE DIFFERENTIAL ABILITY SCALES

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ABSTRACT

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Validation studies address how comparable intelligence instruments are in the cognitive abilities they assess. Results derived from validation studies are used to make inferences as to how instruments are similar and how they differ regarding the abilities they are designed to measure. The purpose of this study is to conduct a validation study between two widely used intelligence instruments. This study will compare the Woodcock Johnson-III Tests of Cognitive Ability and the Differential Ability Scales. It is expected that convergent validity will be established between similar measures of each battery, whereas it is expected that discriminant validity will be established between dissimilar abilities within each instrument.

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Chapter I

Introduction

Traditionally, intelligence testing has been a cornerstone of intellectual assessment in the field of school psychology. Results derived from intelligence testing are a critical issue in determining educational outcomes, special education referrals, and determining how children learn (Esters, Ittenbach, & Han, 1997). Debate over the utility of intelligence testing has been argued over the validity of instruments currently used in practice, in addition to whether or not these tests are structurally viable for assessing cognitive processes in children. These issues have become more relevant as federal law, such as the Individuals with Disabilities Education Act (IDEA; 1991, 1997), mandates the use of valid and appropriate intelligence tests for assessing cognitive abilities.

New intelligence tests have been developed that claim to provide an enhanced understanding of cognitive processes underlying an operational definition of intelligence. As new tests emerge, the need for further study into the technical characteristics and constructive frameworks of these instruments is critical in order to substantiate their usefulness in assessing cognitive abilities in children (Anastazi &Urbina, 1997).With this, the need to evaluate the validity of contemporary intelligence tests is necessary to justify their continued use in the field of school psychology (Braden, 1997).

Intelligence tests are generally designed to measure a wide-range of cognitive abilities, which when interpreted, contribute to an estimate of an individual's overall intellectual ability (Sattler, 1992). The central goal of contemporary intelligence testing is to interpret individual differences and attempt to explain the variance in human cognitive functioning (McGrew & Flanagan, 1997). The first intelligence tests widely used in assessment were successful in quantifying differences in overall ability levels and were used to classify children according to educational outcomes. Yet instruments such as the original Binet scales proved to be inadequate in assessing the wide range of cognitive abilities that characterize unique cognitive functioning (Gould, 1981).

Criticisms of the original Binet scales caused a shift in the orientation of testing from an empirical standpoint to a more clinical approach. This was evidenced by the increase in popularity of the Wechsler scales, which focused on profile analysis for interpreting individual cognitive abilities (Kamphaus, Petoskey, & Morgan, 1997). However, this clinical approach to assessment has recently undergone increased scrutiny due to the lack of a theoretical basis for interpreting test outcomes (Harrison, Flanagan, & Genshaft, 1997). In spite of these criticisms, the Wechsler scales continue to be the most widely used instruments in contemporary intellectual assessment (Ittenbach, Esters, & Wainer, 1997).

Theories underlying human cognitive ability have varied substantially in their interpretation of what factors constitute human intelligence. Modern intellectual theory has evolved substantially after the 1900's, when Spearman defined intelligence as a singular construct, to contemporary models such as *Gf-Gc* theory (Horn & Cattell, 1967) and Carroll's Three-Stratum Theory (Carroll, 1993), which describe a broad-based, hierarchical model for interpreting individual cognitive processes. Intelligence tests have been developed and revised largely independent of a strict theoretical orientation, in spite of this increased support in applying theory to testing for the purpose of interpreting individual cognitive functioning (Horn & Noll, 1997; McGrew & Flanagan, 1998).

A recently revised intelligence test based on current intelligence theory is the Woodcock Johnson-Third Edition Tests of Cognitive Abilities (WJ-III COG; Woodcock, McGrew, & Mather, 2000). The WJ-III COG is constructed according to the Carroll-Horn-Cattell theory of intelligence (Carroll, 1993), which outlines a wide range of cognitive abilities in relation to eight broader constructs of ability underlying a general factor of intelligence. The earlier version of the Woodcock Johnson cognitive battery (WJ-R COG; Woodcock & Mather, 1989) has received a great deal of notoriety in being the only intelligence battery available that measures the full range of cognitive abilities outlined in contemporary *Gf-Gc* theory. The WJ-III COG is based on a similar framework, but has expanded to include a broader range of abilities outlined in the most current version of *Gf-Gc* theory.

In contrast, the Differential Ability Scales (DAS; Elliott, 1990) is based on an eclectic theoretical approach in its structure and orientation. Although not based on any specific theory of intelligence, the structure of the battery reflects components of Spearman's notion of general intelligence, *Gf-Gc* theory, and Thurstone's theory of Primary Mental Abilities. Specific abilities measured within the battery are intended to provide unique profiles of cognitive functioning, as well provide support for differences in abilities that contribute to overall cognitive functioning (Elliott, 1990a).

A comparison of WJ-III COG and the DAS is necessary for establishing the level of concurrent validity between each battery. Comparisons across broad and factor scores obtained within each battery clarifies the convergent nature of similar abilities, as well as the discriminant nature of abilities that are purported to be dissimilar from one another. This in turn either confirms of refutes the abilities measured within each respective battery, which is also critical to their use in educational assessment (Anastazi & Urbina, 1997; Braden, 1997; Esters, Ittenbach, & Han, 1997).

Statement of the Problem

The purpose of this study is to determine the level of concurrent validity between two modern intelligence assessment instruments, the Woodcock Johnson-Third Edition Tests of Cognitive Abilities and the Differential Ability Scales. This study will analyze the correlations between broad and cluster scores measured within each respective battery. It is expected that high correlations will be found between the broad scores of each battery, as well as the cluster scores designed to measure similar intellectual constructs. Lower correlations are expected across clusters that are purported to measure dissimilar cognitive abilities.

Research Questions

1. The first question to be addressed in this study is the strength of the relationship between the broad scores of the WJ-III COG and the DAS. The General Intellectual Ability-Std. and General Intellectual Ability-Ext. scores of the WJ-III COG will be compared with the General Conceptual Ability score of the DAS. This study will also examine how comparable the mean overall composite scores are between the two batteries.

2. The second question to be addressed in this study is the level of concurrent validity between the cluster scores of the WJ-III COG and cluster scores and diagnostic subtests of the DAS. Specific questions to be addressed within this study are the strength of correlations between measures of similar abilities, in addition to the weakness of correlations between dissimilar measures of ability within each respective battery.

Definition of Terms

1. Concurrent Validity is defined in this study as the comparison of scores obtained on two intelligence batteries that are administered to subjects within approximately the same time frame. Examination of the patterns of correlations among broad and cluster scores, as well as diagnostic subtests will be conducted in order to establish the convergent and discriminant properties of these abilities measured within each battery.
2. Intelligence Assessment/ Test/ Instrument is defined in this study as an instrument that determines individual cognitive ability levels and characterizes unique cognitive processes. For the purposes of this study, these terms will be used interchangeably.
3. Intelligence is defined in this study as the unique cognitive processes, abilities, and characteristics that comprise individual cognitive functioning as measured by a given intelligence test.

Assumptions of the Study

An assumption of this study is that the instruments administered will be done so according to standardized practices and scored appropriately. Test administrations will be completed by graduate students trained on standardized practices and scoring procedures of the particular batteries under investigation. Another assumption of this study is that the sample of school-aged children comprising the study will be a normal sample, in that the characteristics of the children will represent a broad range of cognitive abilities. With this, it is also assumed that the results of this study can be generalized to a typical sample of seventh and eighth grade students not involved in special education. A final assumption of this study that the instruments being compared have sound construct validity, in that each battery actually measures the cognitive constructs and abilities that they are purported to measure. This will be insured through an investigation of the construct validity of each test.

Limitations of the Study

A limitation of this study is that only children from a narrow geographic area will be represented in this study. Children involved in this study will only be recruited to participate from western Wisconsin and the Twin Cities metropolitan area. Thus, the findings may not generalize to children from other demographic backgrounds. Another limitation of this study is that children targeted for participation will most likely be from middle to upper-middle class economic backgrounds. This may indicate that the results will not be generalized to children of various socio-economic backgrounds. A lack of special education students targeted for this study is also a limitation of the study. Thus, the results may not necessarily be generalized to children referred for or who are currently receiving special education services. Another limitation of the study is that the sample will only be comprised of a sample of seventh and eighth grade students. Further, special education students will not be included in this study. Thus, the results may not generalize to children referred for or who are currently receiving special education services. A final limitation of the study is that the sample will only be comprised of seventh and eighth grade students. Therefore, findings will not generalize to other age groups.

Chapter II

Review of Relevant Literature

The purpose of the chapter is to review literature relevant to the concurrent validity of the Woodcock Johnson Psychoeducational Battery-Third Edition Tests of Cognitive Ability (WJ-III COG; Woodcock, McGrew, & Mather, 2000) and the Differential Ability Scales (DAS; Elliott, 1990). The first part of this chapter will discuss the concept of validity as it relates to test construction. The next part of the chapter will discuss construction of the WJ-III COG and the DAS. Current research concerning concurrent validity studies of each of these batteries will also be reviewed.

Validity

In its broadest sense, validity refers to the inferences that can be made about a test based on scores that are obtained from the instrument. With the information gathered from studies of an instrument’s validity, conclusions can be made about the suitableness, meaningfulness, and value of a specific test score. Therefore, the inferences that can be made about a test based on validity studies can provide information about the value of test scores obtained from children (AERA, APA, NCMA, 1999).

Validation of an intelligence instrument generally requires gathering evidence from three specific types of validity information, namely construct, content, and criterion-related validity. Construct validity is the most comprehensive concept involved in validating the properties of a test, as it involves gathering information to support whether or not a test measures a specific theoretical construct of intelligence or matches the proposed structure of the test (Anastazi & Urbina, 1997). To confirm the structure of a test, construct validation studies require in-depth analysis of the patterns of intercorrelations among the subtest and cluster scores of a test to determine the relationship of among factors within the framework of a test. This can also involve examining a test's convergent and discriminant validity (AERA, APA, NCMA, 1999; Anastazi & Urbina, 1997).

Studies of an instrument's convergent validity involves substantiating that the variables included in the framework of a test that were designed to measure a specific construct correlate with similar variables from other measures. Conversely, studies of an instrument's discriminant validity distinguishes a weaker relationship among variables that are purported to measure dissimilar constructs. The patterns of correlations among similar and dissimilar constructs of an instrument provides evidence that a test is measuring what it is designed to measure, and also allows for analysis of the inferences that can be made about a test (AERA, APA, NCMA, 1999).

Evidence supporting the construct validity of a test is most meaningful when it is gathered from a number of sources. Content and concurrent validity studies also support inferences that can be made about the usefulness of a test in specific situations, which in turn underlies the validity of the construct of an instrument. With this, content and concurrent validation studies make a significant contribution to validating the overall construct of a particular instrument (AERA, APA, NCMA, 1999).

Studies of content-related validity refers to the examination of the content of test items to determine if they are representative of the construct they are intended to measure. Methods to validate content of test items includes examination by experts of the subject and examining how examinees that take a test progress from item to item. Methods such as these are intended to eliminate irrelevant items that may skew the content of a test (Scherich & Hanna, 1977).

The focus of this study is on validating test instruments according to specific criteria-related evidence. Criterion-related validity studies provide evidence that scores obtained on a test are related to another set of performance criteria. The two types of criterion-related validity are predictive and concurrent. Studies of predictive validity are designed to determine if performance on a specific test can estimate future performance in a specific area. The objectives of concurrent validity studies are more diagnostic in nature, in that they attempt to gain evidence to support whether or not an instrument measures the constructs it was designed to measure through a comparison study with another instrument thought to measure a similar or dissimilar construct (Anastazi & Urbina, 1997; AERA, APA, NCME, 1999).

The utility of comparing the scores between two intelligence instruments lies with determining that two tests that were designed to measure similar constructs have comparable outcomes. Moderate to high correlations among similar variables measured by two instruments indicates that the constructs being measured are similar in nature. This in turn establishes the convergent validity of an instrument. Lower correlations among dissimilar variables between two instruments establishes indicates that different constructs are being measured by each instrument, which in turn establishes the discriminant properties of each instrument (Anastazi & Urbina, 1997).

Typically, concurrent validity studies will examine the broad, cluster, and subtest scores of an instrument with another test, as well as comparing the overall range of scores obtained. Examination of the broad and cluster scores establishes the strength of the relationship of the broad constructs measured by each instrument. Similarly, the level of correlation between subtest scores between two instruments determines whether or not each test is measuring similar specific abilities, and to what extent. Studying the difference between the mean scores obtained on two instruments helps to determine if the tests have comparable performance outcomes for examinees, and helps to distinguish if there are differences in scores that may be significant to how factors correlate with one another (Anastazi & Urbina, 1997).

The Woodcock Johnson-III Tests of Cognitive Ability

The Woodcock Johnson-Third Edition Psychoeducational Battery Tests of Cognitive Ability (WJ-III COG) (Woodcock, McGrew, & Mather, 2000) is a revised and updated version of the Woodcock Johnson-Revised Tests of Cognitive Ability (WJ-R COG; Woodcock &Mather, 1989). The original WJ COG (Woodcock & Johnson, 1977) was developed to provide a wide measure of cognitive functioning that was not available within other intelligence batteries at that time. The framework of the original WJ COG was not based on any specific theory of intelligence, as it was felt at that time that there was no theory comprehensive enough on which to base the objectives of the battery. Rather, the structure of the battery was allowed to emerge through factor analysis of the standardization data. The model of intelligence derived from this research organized the twelve subtests of the battery into a structure of four broad areas of functioning, namely Reasoning-Thinking, Memory-Learning, Discrimination-Perception, and Knowledge-Comprehension abilities. Individual cognitive ability was interpreted according to the quality of performance within these four broad areas (Woodcock, 1997).

The WJ-R COG (Woodcock & Mather, 1989) was developed in response to criticisms of the lack of theoretical orientation of the original WJ COG (Woodcock & Johnson, 1977). The structure of the WJ-R COG was organized as an operational model of established intelligence theory, of that time, namely Horn & Cattell's *Gf-Gc* model of cognitive abilities (Horn & Noll, 1997). *Gf-Gc* theory describes intelligence as a hierarchical model of cognitive abilities. According to *Gf-Gc* theory, a wide range of abilities account for the variance in individual cognitive functioning. These are referred to as narrow or primary mental abilities. Narrow abilities are thought to cluster together to form eight broad areas of cognitive functioning. The cluster scores included in the structure of *Gf*-Gc theory are outlined in Table 2.1.

Table 2.1

Cluster Areas of *Gf-Gc* Theory

Cluster	Ability Measured
Fluid Reasoning *(Gf)*	The ability to reason and/or problem-solve given novel or unfamiliar information
Crystallized Intelligence *(Gc)*	Knowledge acquired through verbal communication, and/or factual information.
Short-Term Memory *(Gsm)*	The ability to hold information in immediate memory and manipulate it for a task

Table 2.1

Cluster Areas of *Gf-Gc* Theory (cont.)

Cluster	Ability Measured
Quantitative Knowledge *(Gq)*	Ability to reason using numbers and apply numerical concepts
Visual-Spatial Reasoning *(Gv)*	Ability to organize and synthesize visual stimuli.
Long-Term Retrieval *(Glr)*	Ability to store information in memory and retrieve it at a later time.
Auditory Processing *(Ga)*	Ability to organize and synthesize information that is presented auditorily.
Reading and Writing Ability *(Grw)*	Ability to decode and synthesize lexical information and apply this information in written form.

At the time the WJ-R COG was published, it was the only intelligence battery to provide a measurement of the range of cognitive abilities represented by *Gf-Gc* theory as represented by the test's eight cluster scores. Research conducted since the publication of the WJ-R COG suggests that a wider range of broad cognitive abilities exist than are measured within the battery. Further, others have argued that the WJ-R COG may not provide adequate breadth and depth of coverage of each *Gf-Gc* ability assessed (McGrew & Flanagan, 1998; Carroll, 1997). Thus, the latest version to the Tests of Cognitive Abilities attempted to address these concerns as well as maintaining an intelligence test based on contemporary intellectual theory (McGrew & Woodcock, 2001).

As a result, the theoretical foundation of the WJ-III COG is based on two independently derived theories of intelligence, namely *Gf-Gc* theory and Carroll's Three-Stratum Theory of Intelligence (Carroll, 1993). His theory was derived from extensive factor analyses of 461 sets of intelligence data. From this he concluded that a hierarchical model is the most viable structure for conceptualizing human intelligence. Similar to Horn & Cattell, Carroll identified nearly 70 narrow abilities that account for specific intellectual abilities. These specific, or narrow abilities are located at the first stratum of Carroll's model (Carroll, 1997).

Abilities at the first stratum of Carroll's model are grouped to form the basis of broader measures of cognitive ability, which are found at the second stratum of the model. These broader abilities are similar in nature to those described in *Gf-Gc* theory, though they are grouped somewhat differently according to Carroll's model. Stratum II factors include Fluid Intelligence, Crystallized Intelligence, General Memory and Learning, Broad Visual Perception, Broad Auditory Perception, Broad Retrieval Ability, Broad Cognitive Speediness, and Processing Speed (McGrew, Werder, & Woodcock, 2000, p. 11). A general factor, or *g*, forms the apex of Carroll's model at the third stratum, which he identified as a factor of general intelligence (Carroll, 1997).

The similarities underlying *Gf-Gc* theory and Carroll's Three-Stratum Theory of Intelligence have formed the basis of a combined theory of intelligence supported through the research of McGrew & Flanagan (1998). The Carroll-Horn-Cattell (CHC) model provides the foundation of the theoretical structure of the WJ-III COG and seven CHC factors, including Comprehension Knowledge, Fluid Reasoning, Visual-Spatial Reasoning, Auditory Processing, Processing Speed, Short-Term Memory, and Long-Term Memory. The WJ-III COG furthers this structure by grouping individual tests into three categories of cognitive performance; Verbal Ability, Thinking Ability, and Cognitive Efficiency. Combinations of the various tests also contribute to five clinical clusters; Phonemic Awareness, Working Memory, Broad Attention, Cognitive Fluency, and Executive Processes. The structure of the WJ-III COG is found in Table 2.2.

Table 2.2

<u>Structure of the WJ-III COG</u>

Factor/Clusters	Tests of Standard Battery	Tests of Extended Battery
<u>Verbal Ability</u>		
Comprehension-Knowledge (*Gc)*	Test One: Verbal Comprehension	Test Eleven: General Information

Table 2.2

Structure of the WJ-III COG (cont.)

Factor/Clusters	Tests of Standard Battery	Tests of Extended Battery
Thinking Ability		
Long-Term Retrieval (Glr)	Test 2: Visual-Auditory Learning	Test 12: Retrieval Fluency
Visual-Spatial Thinking (Gv)	Test 3: Spatial Relations	Test 13: Picture Recognition
Auditory Processing (Ga)	Test 4: Sound Blending	Test 14: Auditory Attention
Fluid Reasoning (Gf)	Test 5: Concept Formation	Test 15: Analysis-Synthesis
Cognitive Efficiency		
Processing Speed (Gs)	Test 6: Visual Matching	Test 16: Decision Speed
Short-Term Memory *(Gsm)*	Test 7: Numbers Reversed	Test 17: Memory for Words
Supplemental		
(Ga, Gs, Gsm, Gf, Glr)	Test 8: Incomplete Words	Test 18: Rapid Picture Naming
	Test 9: Auditory Working Memory	Test 19: Planning
	Test 10: Visual-Auditory Learning-Delayed	Test 20: Pair Cancellation

From The Woodcock-Johnson-III Technical Manual (2000). R. Woodcock, K. McGrew, & N. Mather. Itasca, IL. Riverside Publishing Company, p. 2

Construct Validity

Pre-publication studies of the structure of the WJ-III COG (Woodcock, Mather, & McGrew, 2000) support the construct validity of the instrument. Confirmatory factor analysis suggests that the test is best represented as a hierarchical-multidimensional model similar to that defined by CHC theory which accounts for narrow abilities, broad abilities, and an overall ability factor. Thus, like the WJ-R COG (Woodcock & Mather, 1989), the WJ-III COG (Woodcock, McGrew, & Mather, 2000) is well matched to contemporary theories of intelligence.

Evidence construed from confirmatory factor analysis of the WJ-III (Woodcock, McGrew, & Mather, 2000) support that the tests of the WJ-III COG represent twenty specific, narrow abilities. Examination of the relationship among subtests supports evidence of seven broader abilities, or clusters (*Gf, Gc, Gv, Gs, Gsm, Ga,* and *Glr*), at the second stratum which are similar to the broad factors outlined in CHC theory. Further, factor analytic data supports that the cluster scores of the WJ-III (Woodcock, McGrew, & Mather, 2000) have a moderate to high degree of relationship with one another, suggesting the existence of a general factor, as represented by the WJ-III COG's General Intellectual Ability (GCA) score. Based on this information, it can be inferred that the results obtained from administering the WJ-III COG will provide evidence of cognitive functioning according to the CHC structure of abilities.

Concurrent Validity

Studies of the relationship between the broad and cluster scores of the WJ-III COG with those of other intelligence batteries supported the convergent and discriminant properties of the instrument. Correlations between the WJ-III COG, the Wechsler Intelligence Scale for Children-Third Edition (WISC-III; Wechsler, 1991), and the Das-Naglieri Cognitive Assessment System (CAS; Das & Naglieri, 1997) are found in Table 2.3 and 2.4.

Table 2.3

Correlations between broad and cluster scores of the WJ-III COG and the WISC-III

	WISC-III						
	FSIQ	VIQ	PIQ	VC	PO	PS	FFD
WJ-III COG							
Verbal Ability (Ext.)	.73	.79	.42	.78	.41	.28	.46
Verbal Ability (Std.)	.68	.73	.40	.71	.39	.26	.46
Thinking Ability (Ext.)	.57	.50	.47	.43	.47	.28	.50
Thinking Ability (Std.)	.58	.50	.48	.43	.51	.25	.48
Cog. Efficiency (Ext.)	.55	.47	.45	.41	.37	.49	.62
Cog. Efficiency (Std.)	.44	.36	.40	.28	.30	.52	.60
Comprehension-Knowledge (*Gc*)	.73	.79	.42	.78	.41	.28	.46
Knowledge (*Gc*)	.71	.76	.43	.75	.42	.25	.45
Long-Term Retrieval (*Glr*)	.52	.50	.38	.45	.40	.12	.38
Visual-Spatial Thinking (*Gv*)	.22	.15	.23	.10	.23	.10	.17
Auditory Processing (*Ga*)	.21	.16	.20	.10	.19	.22	.25
Phonemic Awareness (*Ga*)	.17	.18	.10	.17	.10	.13	.22
Fluid Reasoning (*Gf*)	.58	.53	.45	.49	.46	.26	.51
Processing Speed (*Gs*)	.43	.29	.45	.23	.33	.59	.39
Cognitive Fluency (*Gs*)	.27	.24	.22	.20	.12	.41	.25
Short-Term Memory (*Gsm*)	.42	.44	.26	.41	.24	.18	.58
Working Memory (*Gsm*)	.40	.38	.28	.32	.23	.31	.57
General Intellectual Ability (GIA)	.69	.62	.55	.56	.48	.53	.60

Table 2.4

Correlations between the broad and cluster scores of the WJ-III COG and the CAS

	CAS				
	Full Scale Score	Planning	Attention	Simultaneous Processing	Successive Processing
WJ-III					
Long-Term Retrieval (*Glr*)	.51	.46	.38	.50	.31
Auditory Processing (*Ga*)	.49	.34	.30	.45	.36
Phonemic Awareness (*Ga*)	.42	.25	.29	.46	.35
Fluid Reasoning (*Gf*)	.53	.38	.28	.54	.34
Processing Speed (*Gs*)	.60	.57	.54	.39	.16
Cognitive Fluency (*Gs*)	.57	.45	.46	.37	.17
General Intellectual Ability (GIA)	.70	.61	.52	.63	.39

Evidence of the WJ-III COG General Intellectual Ability (GIA) score's validity was supported through concurrent studies with the WISC-III and the CAS. Correlations of the GIA ranged from .69 with the Full Scale Intelligence Quotient (FSIQ) of the WISC-III and .70 with the Full-Scale score of the CAS, suggesting that the broad constructs measured by the WJ-III COG is similar to those of other intelligence instruments yet measure unique features of intelligence. Mean scores were similar between the WJ-III COG with those of the WISC-III and the CAS, though scores on the WJ-III COG were an average of 3-5 points lower than those obtained on other instruments.

The WJ-III COG Verbal Ability clusters are comprised of subtests measuring language and communication abilities. The Verbal Ability-Standard cluster has a correlation of .73, while the Verbal Ability-Extended cluster has a correlation of .79 with the Verbal Intelligence Quotient (VIQ) of the WISC-III. Similarly strong correlations were found between the Verbal Ability-Standard and Verbal Ability-Extended clusters of the WJ-II COG with the Verbal Comprehension (VC) index of the WISC-III (r = .78 and .71, respectfully). The strength of correlations between the Verbal Ability clusters of the WJ-III COG with similar measures of ability establish the convergent validity of measures of verbal intelligence. In contrast, correlations were low to moderate between the Verbal Ability clusters of the WJ-III COG and indices of nonverbal abilities within the WISC-III. Correlations ranged from .40-.42 between the Performance Intelligence Quotient (PIQ), and .26-.46 with the Perceptual-Organization (PO) and Freedom from Distractability (FFD) indices of the WISC-III, supporting the discriminant validity of the Verbal Ability clusters.

Validity of the Comprehension-Knowledge (*Gc*) cluster of the WJ-III COG was established through the pattern of correlations between cluster scores measuring similar abilities on other intelligence batteries. Coefficients ranged from .71-.79 between the *Gc* cluster of the WJ-III COG and the Verbal Intelligence Quotient (VIQ) and Verbal Comprehension (VC) index of the WISC-III, providing support that the *Gc* cluster of the WJ-III COG measures similar verbal reasoning and comprehension abilities. Low to moderate correlations were found between the *Gc* cluster of the WJ-III COG with cluster scores measuring nonverbal abilities. Correlations ranged from .28-.42 with the PIQ of the WISC-III, suggesting that reasoning abilities may be measured within the *Gc* cluster of the WJ-III COG. Moderate correlations were also found with the Perceptual Organization (PO) (.41-.42) and Freedom from Distractability (.45-.46) indices of the WISC-III, suggesting that the *Gc* cluster may measure mental organization and attention abilities. The relationship between the *Gc* cluster and the Processing Speed (PS) index (.25-.28) establishes the discriminant validity of the *Gc* cluster of the WJ-III COG.

The Thinking Ability clusters of the WJ-III COG is a composite measure of fluid reasoning, visual-spatial reasoning, auditory processing, and long-term memory abilities. Correlations of the Thinking Ability-Std. and Thinking Ability-Ext. clusters were consistently moderate to weak across batteries. The strongest relationship was found between Thinking Ability clusters and the VIQ (.50) and VC index (.43) of the WISC-III. Comparable results were also found between the PIQ (.47-.48) and Freedom from Distractability (FFD) (.48-.50) and Perceptual Organization (PO) (.47-.51) indices of the WISC-III. This suggests that the abilities measured by the Thinking Ability clusters may be influenced by comprehension, concentration, mental organization, and attention. Conversely, the discriminant validity of the Thinking Ability clusters was supported through weak correlations with the Processing Speed (PS) index (.25-.28) of the WISC-III.

The Fluid Reasoning *(Gf)* cluster of the WJ-III COG demonstrated the strongest relationship with the Simultaneous Processing cluster of the CAS (.54), which is also purported to be a measure of fluid reasoning abilities. Correlations with nonverbal indices of the WISC-III also support the measure of fluid reasoning abilities within the *Gf* cluster, specifically in the relationship between the PIQ (.45) and Perceptual Organization (PO) index (.46) of the WISC-III. Moderate correlations were also evidenced in the relationship between the *Gf* cluster and the VIQ and VC index of the WISC-III (.53 and .49), suggesting that the *Gf* cluster may contain some indices of comprehension abilities. The discriminant validity of the *Gf* cluster was established by the weak correlations with the Processing Speed (PS) index of the WISC-III (.26) and the Planning and Successive Processing clusters of the CAS (.38 and .34).

The *Gv* cluster of the WJ-III COG demonstrated weak correlations with comparable measures of the WISC-III. The strongest correlations were among the PIQ (.23) and PO index (.23) scores of the WISC-III, which both contain components of visual organization and awareness of spatial relations. However, the weakness of these relationships suggest that the magnitude of correlations may be affected by differences within the abilities measured, or by confounding variables within each factor. The weakness of correlations between the *Gv* cluster with measures of verbal comprehension, processing speed, and attention abilities does support the discriminant validity of the cluster, and also suggests that unique visual-processing abilities are being measured within this cluster.

Interpretation of specific patterns of convergent and discriminant validity of the *Glr* cluster of the WJ-III COG is difficult, given that few other intelligence batteries provide specific measures of these abilities. Moderate correlations were found between the *Glr* cluster and the VIQ and VC and PO indices of the WISC-III (.50, .45, and .40, respectfully). Similarly, moderate correlations were found between the *Glr* cluster and the Planning and Simultaneous Processing clusters of the CAS (.46 and .50). Overall, this suggests that the abilities measured by the *Glr* cluster may be influenced by comprehension, mental organization, and simultaneous processing abilities. Conversely, the discriminant validity of the *Glr* cluster was evidenced through correlations with the PS index of the WISC-III (.12).

Establishing the validity of the *Ga* cluster of the WJ-III COG is also difficult to ascertain, given a lack of similar measures on other intelligence batteries. Patterns of correlations support that this cluster is not strongly related to the clusters of the WISC-III or CAS, which in turn implies that the measurement of *Ga* abilities is unique to the WJ-III COG battery.

The Cognitive Efficiency-Std. and Cognitive Efficiency-Ext. clusters of the WJ-III COG are comprised of processing speed and short-term memory abilities. The Cognitive Efficiency clusters appear to be most strongly related to the FFD index of the WISC-III (60-.62), which contain indicators of processing speed abilities. Convergent validity of the Cognitive Efficiency clusters was also supported through moderate correlations with the PIQ and PS index of the WISC-III (40-.45 and .49-.52, respectfully), supporting the measurement of similar yet unique abilities within each cluster. Lower correlations between the Cognitive Efficiency clusters with the VC index (.28-.41) and PO index (.30-.37) of the WISC-III supports the discriminant validity of these clusters.

The Processing Speed and Cognitive Fluency *(Gs)* cluster of the WJ-III COG appears to be most strongly related to the Processsing Speed index of the WISC-III (.41-.59). A similarly strong relationship was found between the *Gs* cluster with the Planning and Attention clusters of the CAS (.45-.57 and .46-.54, respectfully), which are highly time-oriented measures of cognitive functioning. Low correlations with verbal measures of the WISC-III (.20-.29) support the discriminatory validity of processing speed and fluency from those abilities influenced by comprehension and knowledge.

Interpretation of the Short-Term Memory *(Gsm)* cluster as a measure of short-term and/or working memory abilities was supported through correlations with FFD index of the WISC-III (.57-.58), which contains some indicators of similar abilities. Moderate correlations with the VIQ and VC index of the WISC-III (.32-.44) also suggest that these abilities may be influenced by comprehension abilities. Weaker correlations with measures of processing speed (.18-.31) and perceptual organization (.23-.24) supports the discriminant validity of the *Gs* cluster of the WJ-III COG.

The Differential Ability Scales

The Differential Ability Scales (DAS; Elliott, 1990) is a revised and restandardized version of the British Ability Scales (BAS; Elliott, Murray, & Peterson, 1979). The structure and orientation of the DAS closely resembles that of the BAS. The BAS was designed as an individually administered scale that had been developed within the context of British culture and standardized on a population of British school children. It was the intention of the developers of the BAS to design subtests which are based on a wide range of abilities, yet do not conform to any specific theoretical orientation. Rather, abilities measured by the BAS were intended to provide cognitive profiles of children as well as interpretation of specific abilities for the purpose of differential diagnosis (Byrd & Buckhalt, 1991; Elliott, 1990).

The development of the DAS was guided by goals that were similar to those of the BAS, though the shortcomings of the BAS were taken into account during the initial development of the battery. The BAS had been criticized mainly for not providing distinct cognitive profiles in children; to achieve this goal, developers of the DAS deleted or modified six subtests and subsequently added four new subtests to the battery. New content was added to the subtests retained in the DAS to make these subtests more reliable indicators of cognitive ability. Lastly, the DAS differed from the BAS in the fact that the battery was developed within the context of United States culture and standardized on a sample of United States school children (Elliott, 1990).

The DAS is comprised of two separate levels, a preschool and a school-age battery. Thirteen subtests comprise the school-age battery, which are differentiated into three distinct areas, a core, diagnostic, and achievement battery. The core battery consists of those six subtests that loaded most strongly on the general factor. Thus, they are thought to measure complex cognitive functioning. These subtests are organized according to a hierarchical format ranging from specific to general ability. At the subtest levels each subtest was designed to represent a specific or unique type of cognitive ability, such as visual perception, spatial visualization, numerical concepts, and receptive or expressive language. The subtests then group together to form the basis of broader clusters including Verbal Ability, Nonverbal Ability, and Spatial Ability factors. A broad factor, or General Conceptual Ability (GCA) score at the highest level encompasses the narrow and broad abilities measured by the core battery (Elliott, 1990, 1997).

The diagnostic subtests of the DAS are those that do not load highly on the general factor and therefore are thought to measure less complex cognitive ability. Specific abilities measured by the diagnostic battery include short-term memory and processing speed.

The theoretical framework of the DAS is eclectic in nature, in that it does not conform to a specific theory of cognitive abilities. However, independent studies have suggested notable similarities between the hierarchical nature of the battery with several well-known factor-analytic theories of intelligence. E.L. Thurstone's Theory of Primary Mental Abilities (PMAs) appears to have had notable influence on the development of the individual subtests as providing narrow, distinct indicators of multiple cognitive abilities (Carroll & Maxwell, 1979; Elliott, 1990). Similarities between the Verbal

Ability, Nonverbal Ability, and Spatial Ability clusters with the Crystallized (*Gc*), Fluid (*Gf*), and Spatial-Visualization (*Gv*) factors of *Gf-Gc* theory has also been noted in research (Carroll & Maxwell, 1979; Elliott, 1990b; McGrew & Flanagan, 1998).

Lastly, the composition of the DAS's GCA, is strongly reflective of Spearman's theory of general intellectual ability. More specifically, the overall GCA score on the DAS is determined only by those subtests that loaded most strongly on the first unrotated factor when all DAS subtests are analyzed together. Thus, Spearman's influence is apparent in the general factor of the DAS, lending credibility to the interpretation of abilities measured by the DAS according to prominent intellectual theory (Elliott, 1990, 1990b; Keith, 1990). The structure of the DAS is outlined in Table 2.5.

Table 2.5

<u>Structure of subtests and clusters of the DAS</u>

Subtest	Ability Measured	Contribution to Composite	McGrew & Flanagan *Gf-Gc* factor
Core Subtests:			
Matrices	Nonverbal logic and reasoning	Nonverbal Reasoning, GCA	*Gf*
Sequential and Quantitative Reasoning	Detection of sequential patterns in numbers or figures	Nonverbal Reasoning, GCA	*Gf*

Table 2.5

Structure of subtests and clusters of the DAS (cont.)

Subtest	Ability Measured	Contribution to Composite	Mc Grew & Flanagan *Gf-Gc* factor
Recall of Designs	Short-term memory of visual-spatial relationships	Spatial Ability, GCA	*Gv*
Pattern Construction	Nonverbal spatial reasoning	Spatial Ability, GCA	*Gv*
Diagnostic subtests:			
Recall of Digits	Short-term auditory memory	NA	*Gsm*
Recall of Objects	Short and immediate term recall of pictures	NA	*Glr*
Speed of Information Processing	Speed of performing simple mental operations	NA	*Gs*

Construct Validity

Studies cited in the technical manual of the DAS (Elliott, 1990) support the construct validity of the instrument. Confirmatory factor analysis supports a hierarchical, three-factor model to explain the structure of abilities measured by the core battery of the DAS with a school-age sample of children. Differences in performance across age ranges also supports the hypothesis that abilities become more differentiated with increasing age. Weaknessees in the correlation coefficients of the diagnostic subtests with the general factor confirmed the distinction between abilities that contribute to general intelligence with less complex cognitive functioning abilities.

An independent study conducted by Keith (1990) also found strong support for the construct validity of the DAS. Results from this study were consistent with those discussed in the technical manual (Elliott, 1990) and supported a three-factor hierarchical model of abilities of the core subtests among school-aged children. Keith related the Verbal Ability factor as an indicator of verbal abilities, the Nonverbal Ability factor as an indicator of fluid reasoning abilities, and the Spatial Ability factor as an indicator of nonverbal reasoning abilities. The core subtests of Keith’s study loaded highly on the general factor, supporting the results of Elliott’s (1990) analysis. Keith also grouped those subtests that did not load highly on the general factor into a separate cluster independent of the core battery, which is consistent with the structure of the diagnostic cluster of the DAS (Keith, 1990).

Another independent study conducted by Parker (1996) failed to confirm the three-factor hierarchical structure of the core battery among a sample of school-aged mentally handicapped children. The results of this study support a one-factor model for interpreting cognitive abilities in mentally handicapped children. This suggests that the structure of cognitive abilities presented in the technical manual of the DAS (1990) may not be generalized to special populations of children, namely in that Verbal Ability, Nonverbal Reasoning Ability, and Spatial Ability may not be distinguishable from one another among low functioning children.

An additional joint confirmatory factor analytic study conducted by Byrd & Buckhalt (1991) between the DAS and the WISC-R (Wechsler, 1974) supported the structure of the DAS. The results of this study suggest that while the DAS tends to measure broad constructs that are similar to other intelligence batteries, the specific abilities measured by each subtests tends to diverge from those of other intelligence batteries. More specifically, the narrow abilities measured by each subtest tend to be unique from those of other intelligence batteries, which provides support for the broad and narrow abilities measured by the DAS.

<u>Concurrent Validity</u>

Evidence for the concurrent validity of the DAS is supported through studies reported in the technical manual (Elliott, 1990) in which the DAS is compared to the Stanford-Binet Fourth Edition (SB-IV; Thorndike, Hagan, & Sattler, 1986), and the Kaufman Assessment Battery for Children (K-ABC; Kaufman & Kaufman, 1985). Further evidence for the concurrent validity of the instrument was evidenced through a study reported in the technical manual of the Wechsler Intelligence Scale for Children-Third Edition (WISC-III; Wechsler, 1991). Correlations between the DAS, the SB-IV the K-ABC, and the WISC-III are reported in Table 2.6, 2.7, and 2.8.

Table 2.6

Correlations and mean scores between broad and cluster scores of

the DAS and the SB-IV

	DAS			
	Verbal Ability	Nonverbal Reasoning Ability	Spatial Ability	GCA
SB-IV				
Verbal Reasoning	.79	.58	.37	.73
Abstract-Visual Reasoning	.44	.76	.67	.77
Quant. Reasoning	.63	.75	.46	.76
Short-Term Memory	.50	.55	.42	.61
Standard Area Score	.73	.82	.60	.88

Table 2.7

Correlations between broad and cluster scores of the DAS and the K-ABC

	DAS			
	Verbal Ability	Nonverbal Reasoning Ability	Spatial Ability	GCA
K-ABC				
Sequential Processing	.18	.24	.62	.46
Simultaneous Processing	.35	.68	.74	.78
Mental Processing Composite	.32	.56	.81	.75
Achievement	.64	.72	.39	.78

Table 2.8

Correlations between broad and cluster scores of the DAS and the WISC-III

	DAS			
	Verbal Ability	Nonverbal Reasoning Ability	Spatial Ability	GCA
WISC-III				
Verbal IQ	.87	.58	.66	.82
Performance IQ	.31	.78	.82	.80
Full Scale IQ	.71	.81	.86	.92
Verbal Comprehension Index (VC)	.85	.54	.66	.80
Perceptual Organization Index (PO	.30	.75	.82	.78
Freedom from Distractability Index (FFD)	.66	.50	.46	.65
Processing Speed Index (PS)	.29	.58	.39	.53

Research supports the concurrent validity of the GCA score of the DAS with the broad scores of other intelligence batteries. The GCA of the DAS is strongly related to the Full Scale IQ (FSIQ) of the WISC-III (.92) and the Standard Area Score (SAS) of the SB-IV (.88), suggesting that the broad abilities measured by each respective battery are similar. Mean scores between the DAS with the WISC-III and the SB-IV were also comparable, although scores were more differentiated within the sample of gifted children (Elliott, 1990a). Mean scores between the DAS and the K-ABC differed by nine points, which was expected due to the lapse of time in which each battery was standardized.

Correlations between the cluster scores of the DAS with those of other intelligence instruments support the convergent and discriminant properties of the battery. The Verbal Ability cluster of the DAS correlates highly with the Verbal Reasoning cluster of the SB-IV (.79) with a sample of regular education and gifted students (Elliott, 1990a), while correlations with measures of visual-spatial, numerical reasoning, and short-term memory, specifically the Abstract-Reasoning, Quantitative Reasoning, and Short-Term Memory SAS's of the SB-IV were somewhat lower (.44-.63). This suggests some differentiation between the abilities measured by the Verbal Ability cluster of the DAS and clusters of the SB-IV measuring dissimilar abilities. Similarly, the Verbal cluster of the DAS correlated highly with the Verbal IQ scale of the WISC-III with the sample of regular education students (.87) (Wechsler, 1991). Conversely, low correlations were found between the Verbal Ability cluster of the DAS and the Performance IQ scale of the WISC-III with both regular education students (.78) and students with learning disabilities (Dumont, Cruse, Price, & Whelley, 1996). Moderate to high correlations were found between Verbal Ability cluster of the DAS and the Achievement cluster of the K-ABC (.64), while the Simultaneous and Sequential clusters were weakly correlated (.18 and .35, respectfully) with the Verbal Ability Cluster. This suggests a strong crystallized component in the abilities measured by the Verbal Ability cluster of the DAS.

The Nonverbal Reasoning cluster of the DAS demonstrated a strong relationship with the Abstract-Visual Reasoning and Quantitative Reasoning clusters of the SB-IV (.75-.76) with a sample of regular education students cited in the technical manual of the DAS (Elliott, 1990a). Correlations were somewhat weaker between the Nonverbal Reasoning ability cluster of the DAS and the Verbal Reasoning cluster of the SB-IV (.58), while only a moderate relationship was supported with the Short-Term Memory cluster of the SB-IV (.55). Similarly, the Nonverbal Reasoning cluster was strongly related to the Simultaneous Processing and Achievement clusters of the K-ABC (.68 and .72), though weakly related to the Sequential Processing cluster (.24), suggesting that the

Nonverbal Reasoning cluster may be influenced by information/knowledge and simultaneous processing abilities. The Nonverbal Reasoning cluster of the DAS correlated most strongly with the Performance IQ scale of the WISC-III (.78), supporting the convergent validity of the abilities measured within the Nonverbal Reasoning Ability cluster. A similar relationship was found between the Nonverbal Reasoning Ability cluster and the Perceptual Organization index of the WISC-III (.75), a measure of accuracy of memory and nonverbal reasoning abilities. Moderate correlations were found between the Nonverbal Reasoning Ability cluster of the DAS and the Verbal IQ and Verbal Comprehension index of the WISC-III (.58 and .54), suggesting that unique abilities are being measured within each respective cluster.

The Spatial Reasoning Ability cluster of the DAS correlated most strongly the PIQ of the WISC-III (.82), as well as the Simultaneous Processing cluster of the K-ABC (.74). This strongly suggests that nonverbal and simultaneous processing abilities are being measured within the Spatial Reasoning Ability cluster. Moderate correlations were also found between the Spatial Reasoning Ability cluster and the Abstract-Visual Reasoning SAS of the SB-IV (.67), the Sequential Processing cluster of the K-ABC (.62), and the VIQ of the WISC-III (.66). This supports the measurement of similar yet unique visual-spatial abilities within the Spatial Reasoning Ability cluster of the DAS, and also suggests that sequential processing and comprehension abilities may be indicated within this area of the DAS.

The Relationship of the Woodcock Johnson-Third Edition and the Differential Ability Scales

Concurrent validity of the WJ-R COG and the DAS is supported through a study of the relationship between the broad and subtest scores of each battery among a sample of students referred for special education evaluations (Dumont, Willis, Farr, McCarthy, & Price, 2000). The concurrent validity of the DAS and the WJ-III COG is also supported by a study conducted by McIntosh & Dunham reported in the WJ-III COG technical manual (McGrew & Woodcock, 2001).

The DAS and the WJ-R COG

Correlations between the broad scores of the WJ-R COG and the DAS were low to moderate (.65). This suggests some overlap of the abilities being measured by each battery, yet confirms that each battery is measuring distinct cognitive abilities. Mean scores obtained on the DAS were 2-3 points lower than those obtained on the WJ-R COG, supporting the notion that similar broad scores will be obtained across batteries. Correlations between the WJ-R COG and the DAS are listed in Table 2.7.

Table 2.9

Correlations and mean scores between tests and the BCA of the WJ-R COG and the subtests and GCA of the DAS

	WJ-R COG							
	(*Gc*) PVoc	(*Gf*) AnSyn	(*Gv*) Vcl	(*Gsm*) Ms	(*Glr*) Mn	(*Gs*) Vm	(*Ga*) Incw	DAS Mean
DAS								
(*Gc*)								
Word Def.	.53	.51		.43	.35	.23		96.48
Sim.	.62	.39		.46			.23	97.61
(*Gf*)								
Matrices	.40	.37		.27		.29		91.06
Seq. & Quant. Reasoning	.32	.54		.25		.34		93.48
(*Gv*)								
Recall of Designs	.34	.44		.31				100.07
Pat. Constr.	.36	.44	.22		.32			96.84
(*Gsm*)								
Recall of Digits				.62				90.52
(Glr)								
Recall of Obj.								92.75
Recall of Obj. (Delayed)								90.25
WJ-R COG Mean	98.68	102.5	106.5	100.8	95.52	93.41	94.15	

Adapted from "The Relationship Between the Differential Ability Scales (DAS) and the Woodcock-Johnson Tests of Cognitive Ability-Revised (WJ-R COG) for Students Referred for Special Education Evaluations" by R. Dumont, J.O. Willis, L.P. Farr, T. McCarthy, and L. Price, 2000. Journal of Psychoeducational Assessment, 18, p.34.

Subtests corresponding with specific *Gf*-*Gc* abilities were also compared in this study to determine the degree of similarity. Correlations were moderate between subtests measuring *Gc* abilities (.53-.62), suggesting that the abilities measured by these subtests within each battery may be comparable yet still measure unique abilities. Correlations between *Gf* subtests measured on the DAS were moderate with those of the WJ-R COG, with stronger correlations between the Analysis-Synthesis subtest of the WJ-R COG and the Sequential and Quantitative Reasoning subtest of the DAS (.54) than with the Matrices subtest of the DAS (.37). This supports the convergent validity of the Analysis-Synthesis and Sequential and Quantitative Reasoning subtests in measuring sequential reasoning abilities, as well as the discriminant validity of the Matrices subtest from these measures as it is purported to measure inductive reasoning although both DAS subtests are characterized as fluid reasoning factors. Also, the discriminant validity of the Matrices subtest was further supported by weak correlations with measures of memory and spatial factors within the WJ-R COG. Correlations were also weak between *Gv* measures within each battery (.22), although interestingly, correlations were stronger between *Gv* abilities of the DAS and *Gf* abilities of the WJ-R COG (.44). This suggests that the fluid reasoning factor of the DAS may be a measure of visual-spatial reasoning abilities in addition to measuring components of sequential processing and inductive reasoning.

Correlations between subtests measuring *Glr* abilities were not reported in this study. The DAS Recall of Digits subtest and the WJ-R COG Memory for Sentences subtest, both measures of *Gsm* abilities, correlated moderately (.62), supporting the convergent validity of these factors. However, the pattern of correlations between subtests within the DAS and the WJ-R COG suggest that the abilities being measured may not necessarily be what they are purported to measure in theory, making the need for further research into the nature of abilities measured within each battery imminent.

The WJ-III COG and the DAS

A study conducted by McIntosh & Dunham cited in the technical manual of the WJ-III COG (2001) compared select clusters of the WJ-III COG and the DAS. Subjects in this study were administered subtests that contributed to the GIA and select factor clusters of the WJ-III COG. Correlations between these measures are listed in Table 2.8.

Table 2.10

Correlations between the broad and cluster scores of the WJ-III COG and the DAS

	DAS			
	Verbal Ability	Nonverbal Reasoning Ability	Spatial Ability	GCA
WJ-III COG				
Verbal Ability-Std.	.71	.55	.32	
Verbal Ability-Ext.	.50	.64	.50	
Cog. Efficiency-Std.	.41	.41	.38	
Cog. Efficiency-Ext.	.30	.35	.34	
Vis.-Spat. Thinking (Gv)	.16	.29	.19	
Aud. Processing (Ga)	.34	.41	.39	
Phon. Aware. (Ga)	.42	.45	.38	
Fluid Reasoning (Gf)	.55	.67	.47	
Processing Speed (Gs)	.32	.31	.40	
Short-Term Mem. (Gsm)	.35	.36	.24	
Working Memory (Gsm)	.39	.39	.34	
General Intellectual Ability				
Standard Scale				.76
Extended Scale				.76

Strong correlations between the GIA-Std. and GIA-Ext. scores of the WJ-III COG and the GCA of the DAS (.76) support the convergent validity of the broad constructs being measured within each battery. Mean scores were also comparable, with scores obtained on the DAS an average of four points higher than those obtained on the WJ-III COG. The results of this study support that similar broad scores will be obtained within each battery.

Convergent validity of the Verbal Ability-Std. cluster of the WJ-III COG was also supported by a strong correlation with the Verbal Reasoning Ability cluster of the DAS (.71). Moderate correlations between the Verbal Ability-Std. cluster of the WJ-III COG with the Nonverbal Reasoning Ability cluster of the DAS (.55) suggests that the Verbal Ability cluster may be an indicator of some fluid reasoning abilities. Low correlations with the Spatial Reasoning Ability cluster of the DAS (.32) supports the disriminant validity between measures of verbal comprehension and visual-spatial reasoning abilities.

The Thinking Ability-Ext. cluster correlated moderately with the Verbal Reasoning Ability, Nonverbal Reasoning Ability, and Spatial Reasoning Ability clusters of the DAS (.50, .64, and .50, respectfully). This suggests some overlap in comprehension, fluid reasoning, and visual-spatial abilities within the Thinking Ability-Ext. cluster, which could be expected given the breadth of abilities measured within this area of the WJ-III COG.

Interpretation of the measures of fluid reasoning within each battery was supported by patterns of convergent validity between the Fluid Reasoning *(Gf)* cluster of the WJ-III COG and the Nonverbal Reasoning Ability cluster of the DAS (.67). Moderate correlations were also found between the *Gf* cluster and the Verbal Reasoning Ability and Spatial Reasoning Ability clusters of the DAS, suggesting that the *Gf* cluster may contain indices of similar abilities.

Interestingly, the Visual-Spatial Thinking *(Gv)* cluster of the WJ-III COG correlated weakly with the Spatial Reasoning Ability cluster of the DAS (.19) although these clusters are based on similar abilities in theory. However, the weakness of correlations suggest that unique visual-spatial reasoning are being measured within each battery. Discriminant validity of the *Gv* cluster was also established by weak correlations with the Verbal Reasoning Ability (.16) and Nonverbal Reasoning Ability (.29) clusters of the DAS.

Establishing validity of the *Ga* cluster of the WJ-III COG is hampered by a lack of similar measures within the DAS. Moderate correlations with the Verbal Reasoning Ability (.34-.42) and Nonverbal Reasoning Ability (.38-.39) clusters suggest that auditory processing and phonemic awareness as measured by the WJ-III COG may be influenced by comprehension and fluid reasoning abilities. However, further research into the convergent patterns of the *Ga* cluster of the WJ-III COG is needed to substantiate the validity of this cluster.

The Cognitive Efficiency-Std. and Cognitive Efficiency-Ext. clusters of the WJ-III COG demonstrated low correlations with clusters the DAS. Correlations with the Verbal Reasoning Ability cluster fell in the range of .30-.41, while correlations with the Nonverbal Reasoning Ability and Spatial Reasoning Ability clusters of the DAS fell in the range of .35-.41 and .34-.38, respectfully. The weakness of correlations between these clusters supports the discriminant validity of the abilities measured within each respective battery.

Weak correlations were evidenced in the relationship between the Processing Speed *(Gs)* cluster of the WJ-III COG and the Verbal Reasoning Ability (.32), the

Nonverbal Reasoning Ability (.31), and Spatial Reasoning Ability (.24) clusters of the DAS, supporting the discriminant validity of these clusters across batteries. Similarly weak correlations were found between the *Gsm* cluster of the WJ-III COG with the Verbal Reasoning Ability (.35-.39) and Nonverbal Reasoning Ability (.36-.39) clusters of the DAS, again supporting the discriminant validity of these measures. Although the Spatial Reasoning Ability cluster of the DAS contains indices of short-term memory abilities, correlations failed to support a relationship between the *Gsm* cluster of the WJ-III COG with this cluster of the DAS. This suggests that unique short-term memory abilities are being measured within each battery.

Critical Analysis

Previous research supports the construct validity of the WJ-III COG and the DAS in providing a sound framework for assessing cognitive abilities. The literature supporting the WJ-III COG suggests that the abilities measured within the battery are convergent in large part with similar abilities measured within other widely-used intelligence instruments, while dissimilar abilities tend to be supported by evidence of discriminant validity. The literature also supports the measurement of unique characteristics of human cognitive abilities within the WJ-III COG battery. Similar findings were also evident in the literature supporting the concurrent validity of the DAS, although the WJ-III COG is purported to assess a broader range of abilities than the DAS.

This study addresses the concurrent validity of the broad and cluster scores of the WJ-III COG and the DAS, as well as the comparability of the broad mean scores between the two batteries. Few published studies have provided information on the relationship between the WJ-III COG and the DAS; a study comparing the WJ-R COG and the DAS fails to confirm the relationship between the updated version of the Woodcock Johnson battery with the DAS, thus the results from this study are not as relevant. This study does suggest, however, that there is some similarity in the abilities being measured within the two batteries, yet each retains the quality of providing unique information of human cognitive functioning.

The study examining the relationship between the WJ-III COG and the DAS cited in the technical manual of the WJ-III COG (McGrew & Woodcock, 2001) provides important information regarding the similarities and dissimilarities of the abilities measured within each battery. This study supported the convergent validity of the GIA-Std. and GIA-Ext. scores of the WJ-III COG and the GCA of the DAS, as well as comparable results in the relationship between the mean scores obtained within each battery. Significant patterns of convergent and discriminant validity between the cluster scores of the WJ-III COG and the DAS were also demonstrated in this study that provided significant information about the relationship between the abilities measured within each battery. However, this study did not provide information on the concurrent validity of the two batteries based on all of the clusters represented within the WJ-III COG, and also excluded a comparison of the diagnostic subtests of the DAS with the cluster scores of the WJ-III COG. Thus, to give an accurate summary of the concurrent validity between the WJ-III COG and the DAS, all clusters of each battery would need to be examined for patterns of convergent and discriminant validity. Therefore, this study provides a greater breadth of analysis than that of previous research, and is also the first independent study to be conducted examining the relationship between these two batteries.

Based on the results of previous research and the findings of the study examining the concurrent validity between the WJ-III COG and the DAS, the following patterns of correlations are expected:

- A high correlation is expected between the GIA-Std. and GIA-Ext. scores of the WJ-III COG and the GCA of the DAS. Mean scores are also expected to be comparable within this study.
- Patterns of correlations are expected to support the convergent validity of the Verbal Ability-Std. and Verbal Ability-Std. scores of the WJ-III COG and the Verbal Reasoning Ability cluster of the DAS. A strong relationship is also expected between the Comprehension-Knowledge *(Gc)* cluster of the WJ-III COG and the Verbal Reasoning Ability cluster of the DAS. Low correlations are expected between other clusters scores of each battery with these clusters.
- Moderate correlations are expected between the Thinking Ability-Std. and Thinking Ability-Ext. clusters of the WJ-III COG and the Nonverbal Reasoning Ability and Spatial Reasoning Ability clusters, as well as the Recall of Objects subtest of the DAS. Similarly, strong correlations are expected between the Fluid Reasoning *(Gf)* cluster of the WJ-III COG and the Nonverbal Reasoning Ability cluster of the DAS, as is a strong relationship between the Visual-Spatial Thinking *(Gv)* cluster of the WJ-III COG and the Spatial Reasoning Ability cluster of the DAS. Strong

correlations are likewise expected between the Long-Term Retrieval *(Glr)* cluster of the WJ-III and the Recall of Objects subtest of the DAS. Weak correlations are expected among the remaining clusters of the WJ-III COG and the DAS with these measures. Also, weak correlations are expected between Auditory Processing *(Ga)* clusters of the WJ-III COG with clusters and diagnostic subtests of the DAS due to a lack of similar measures within the DAS battery.

- The Cognitive Efficiency-Std. and Cognitive Efficiency-Ext. clusters of the WJ-III COG are expected to demonstrate a strong relationship with the Speed of Information Processing and Recall of Digits diagnostic subtests of the DAS. Weaker correlations among the remaining clusters of the WJ-III COG and the DAS with these measures are expected to establish the disciminant validity of these abilities. Strong correlations are expected between the Processing Speed *(Gs)* cluster of the WJ-III COG and the Speed of Information Processing subtest of the DAS. Likewise, a strong relationship is expected in the relationship between the Short-Term Memory *(Gsm)* cluster of the WJ-III COG and the Recall of Digits subtest of the DAS.

Chapter III

Methodology

The purpose of this study is to provide information regarding the technical characteristics of two modern intelligence instruments, the Woodcock Johnson-Third Edition Tests of Cognitive Ability (WJ-III COG; Woodcock, McGrew, & Mather, 2000), and the Differential Ability Scales (DAS; Elliott, 1990). The relationship between the broad scores as well as the cluster scores of each battery will be examined in order to establish the level of concurrent validity between each battery. The following specific questions will be examined:

1. What is the relationship between the General Intellectual Ability (GIA) score of the WJ-III COG and the General Conceptual Ability (GCA) score of the DAS? How comparable are mean scores obtained within each battery?
2. What is the relationship between the Comprehension-Knowledge, Fluid Reasoning, Visual-Spatial Thinking, Processing Speed, Auditory Processing, Long-Term Retrieval, and Short-Term Memory clusters of the WJ-III COG and the Verbal Ability, Nonverbal Ability, and Spatial Ability clusters and diagnostic subtests of the DAS among school-age children?

Participants

Participants will be school-age children in grades seven and eight. The children involved in this study will not have been identified as needing or receiving special education services. The sample will consist of equal numbers of seventh and eighth graders, as well as equal numbers of males and females will comprise the sample. The size of this sample will be approximately forty children, thus each grade represented in the sample will consist of ten females and ten males.

Procedures

School boards of middle and junior high schools within the Minneapolis/St. Paul, Minnesota and Menomonie, Wisconsin areas will be contacted for permission to solicit subjects from the school district. Permission to recruit subjects within each respective school involved will also be obtained from the principal of each school. After permission has been granted, a brief description of the study and a letter of permission will be sent to families of children who are eligible to participate in this study. Parents interested in allowing their children to participate will be contacted via a letter with a brief description of the procedures and instruments involved in this study. Guidelines for informed consent will be discussed with each child’s parent(s).

Once parent permission has been obtained, children will be tested with the WJ-III COG and the DAS following standardized testing procedures indicated within each testing manual. Each child will be assigned a code number for testing to insure confidentiality of scores. Test administrators will be graduate students in school psychology who have been trained on the procedures and practices specific to each test battery. Each battery will be administered in alternate order to avoid practice effects. Children will be tested in a private room at their school or at the local library. Each child’s name will be entered into a drawing for a prize yet to be determined in exchange for their participation.

Instrumentation

Woodcock Johnson- Third Edition Tests of Cognitive Abilities. The WJ-III COG was designed to assess cognitive abilities for people between 2 to 95 years of age. The entire battery is comprised of two components, a standard and an extended battery. Twenty individual tests compose the cognitive battery, which combine to form seven clusters for the purpose of interpreting individual cognitive abilities. Tests comprising the standard and extended batteries of the WJ-III COG can be found in Table 3.1.

Table 3.1

Tests Comprising the Standard and Extended Batteries of the WJ-III COG

Tests of the Standard Battery	Tests of the Extended Battery
Test One: Verbal Comprehension	Test Eleven: General Information
Test Two: Visual-Auditory Learning	Test Twelve: Retrieval Fluency
Test Three: Spatial Relations	Test Thirteen: Picture Recognition
Test Four: Sound Blending	Test Fourteen: Auditory Attention
Test Five: Concept Formation	Test Fifteen: Analysis-Synthesis
Test Six: Visual Matching	Test Sixteen: Decision Speed
Test Seven: Numbers Reversed	Test Seventeen: Memory for Words
Test Eight: Incomplete Words	Test Eighteen: Rapid Picture Naming
Test Nine: Auditory Working Memory	Test Nineteen: Planning
Test Ten: Visual-Auditory Learning-Delayed	Test Twenty: Pair Cancellation

An overall composite score known as the General Intellectual Ability (GIA) score is derived from an examinee's performance on a combination of several subtests. The General Intellectual Ability (GIA) score is a weighted score based on those tests that loaded most highly on the first principal components analysis of all tests. Thus it is thought to be reflective of general intellectual ability, or *g*. The General Intellectual Ability-Standard Scale (GIA-Std) is based on Tests 1-7 of the Standard Battery. The General Intellectual Ability-Extended Scale (GIA-Ext) provides a broader measure, as it is based on Tests 1-7 and Tests 11-17.

The tests of the WJ-III can be grouped into three distinct groups of clusters for the purposes of interpreting individual ability; cognitive performance clusters, Carroll-Horn-Cattell (CHC) factors, and clinical clusters. Cognitive performance clusters are based on performance on thirteen tests that provide an indication of cognitive abilities that are casually related to cognitive performance. Tests underlying CHC factor clusters each represent a distinct narrow ability that contributes to the broad area of cognitive functioning represented by this cluster. Fourteen tests contribute to the seven CHC factor clusters. Eighteen of the tests of the WJ-III COG are also grouped according to clinical clusters for the purpose of providing diagnostic information regarding an examinee. Tables 3.3, 3.4, 3.5, and 3.6 provides a synopsis of the tests underlying the General Intellectual Ability-Std. and General Intellectual Ability-Ext. scores, cognitive performance clusters, CHC factor clusters, and clinical clusters of the WJ-III COG. Table 3.2, 3.3, and 3.4 provides a synopsis of the tests comprising the GIA-Std., GIA-Ext., CHC clusters, and clinical clusters of the WJ-III COG.

Table 3.2

Tests contributing to the GIA-Std. and GIA-Ext. scores of the WJ-III COG

General Intellectual Ability-Std.	General Intellectual Ability-Ext.
Test One: Verbal Comprehension	Test One: Verbal Comprehension
Test Two: Visual-Auditory Learning	Test Two: Visual-Auditory Learning
Test Three: Spatial Relations	Test Three: Spatial Relations
Test Four: Sound Blending	Test Four: Sound Blending
Test Five: Concept Formation	Test Five: Concept Formation
Test Six: Visual Matching	Test Six: Visual Matching
Test Seven: Numbers Reversed	Test Seven: Numbers Reversed
	Test Eleven: General Information
	Test Twelve: Retrieval Fluency
	Test Thirteen: Picture Recognition
	Test Fourteen: Auditory Attention
	Test Fifteen: Analysis-Synthesis
	Test Sixteen: Decision Speed
	Test Seventeen: Memory for Words

Table 3.3

Tests comprising CHC clusters of the WJ-III COG

CHC Cluster	Tests
Comprehension-Knowledge *(Gc)*	Test One: Verbal Comprehension
	Test Eleven: General Information
Long-Term Retrieval *(Glr)*	Test Two: Visual-Auditory Learning
	Test Twelve: Retrieval Fluency
Visual-Spatial Thinking *(Gv)*	Test Three: Spatial Relations
	Test Thirteen: Picture Recognition
Auditory Processing *(Ga)*	Test Four: Sound Blending
	Test Fourteen: Auditory Attention
Fluid Reasoning *(Gf)*	Test Five: Concept Formation
	Test Fifteen: Analysis-Synthesis
Processing Speed *(Gs)*	Test Six: Visual Matching
	Test Sixteen: Decision Speed
Short-Term Memory *(Gsm)*	Test Seven: Numbers Reversed
	Test Seventeen: Memory for Words

Table 3.4

Tests comprising clinical clusters of the WJ-III COG

Clinical Cluster	Tests
Phonemic Awareness	Test Four: Sound Blending
	Test Eight: Incomplete Words
Working Memory	Test Seven: Numbers Reversed
	Test Nine: Auditory Working Memory
Broad Attention	Test Seven: Numbers Reversed
	Test Nine: Auditory Working Memory
Cognitive Fluency	Test Twelve: Retrieval Fluency
	Test Sixteen: Decision Speed
	Test Eighteen: Rapid Picture Naming
Executive Processes	Test Five: Concept Formation
	Test Nineteen: Planning
	Test Twenty: Pair Cancellation

Table 3.4

Tests comprising clinical clusters of the WJ-III COG (cont.)

Clinical Cluster	Tests
Delayed Recall	Test Ten: Visual-Auditory Learning-Delayed
Knowledge	Test Eleven: General Knowledge

Normative data for the WJ-III were gathered from 100 communities in the United States. The norming sample was selected to be representative of the United States population according to U.S. census data. Stratification variables included region, community size, sex, race, and the type of school each child attended. Approximately 8,800 subjects comprised the entire norming sample. Test norms are represented by age groups in which standard scores are calculated in one month intervals for the ages of five through nineteen years (M = 100, SD = 15). Raw score, percentiles, age and grade equivalents, W difference scores, and Relative Proficiency Index (RPI) scores can also be calculated for further score interpretation. Table 3.5 provides a description of tests comprising the WJ-III COG battery.

Table 3.5

Description of tests comprising the WJ-III COG battery

Test	Description
Standard Battery:	
Test One: Verbal Comprehension	Measure of acquired knowledge. Examinees are required to verbally identify synonyms, antonyms, and verbal analogies that are orally presented by the examiner.
Test Two: Visual-Auditory Learning	Measures an examinee's ability to learn and recall rebuses. Examinees are required to verbalize each symbol name, and read each symbol point-by point in a story format.
Test Three: Spatial Relations	Assesses the ability to identify two or three pieces that form a complete shape.
Test Four: Sound Blending	Assesses the ability to synthesize phonemes. The examinee listens to an audio recording and is blends the sounds heard into a coherent word.

Table 3.5

Description of tests comprising the WJ-III COG battery (cont.)

Test	Abilities Measured
Test Five: Concept Formation	Assesses the ability to derive concepts from a set of items. Each examinees is required to derive a rule from complex stimulus.
Test Six: Visual Matching	Measures the ability to match two identical numbers in a row of six numbers. The tasks increases in difficulty from two to three digits within a three-minute time limit.
Test Seven: Numbers Reversed	Measures an examinee’s ability to hold numbers in immediate memory while reversing the sequence. Examinees are required to repeat the reversed sequence verbally.

Table 3.5

Description of tests comprising the WJ-III COG battery (cont.)

Tests	Abilities Measured
Test Eight: Incomplete Words	Assesses an examinee's auditory analysis and closure abilities. An examinee is required to identify a word after hearing the word with one or more phonemes missing (via audio recording).
Test Nine: Auditory Working Memory	Requires an examinee to listen to a series that contains digits and letters, then reorder the information in repeating the letters first then the digits in sequential order.
Test Ten: Visual-Auditory Learning-Delayed	The examinee is required to relearn the stimulus items presented in the Visual-Auditory Learning test. How well an examinee relearns the previously learned information provides an index of their long-term retrieval abilities.

Table 3.5

Description of tests comprising the WJ-III COG battery (cont.)

Tests	Abilities Measured
Extended Battery:	
Test Eleven: General Information	Measures an examinee’s depth of general knowledge. Two tests measure an examinee’s conceptualizations of where you find objects common to an environment and what you do with objects common to an environment.
Test Twelve: Retrieval Fluency	Assesses fluency of an examinee’s retrieval of stored knowledge. This test requires an examinee to list as many items as possible from a given category within a one-minute time limit.
Test Thirteen: Picture Recognition	Assesses an examinee’s ability to recognize a set of pictures within a field of other distracting pictures.

Table 3.5

Description of tests comprising the WJ-III COG battery (cont.)

Test	Abilities Measured
Test Fourteen: Auditory Attention	Assesses the ability to overcome the effects of auditory discrimination. The examinee listens to a word and is asked to point to the correct picture out of a set of four pictures amid increasing background noise.
Test Fifteen: Analysis-Synthesis	Measures an examinee’s ability to draw conclusions based on a given set of conditions. The examinee is given instructions on how to perform a procedure, which becomes increasingly complex with the progression of items.
Test Sixteen: Decision Speed	Measures an examinee’s speed at processing simple concepts. The examinee is required to locate similar pictures in a set of stimuli.

Table 3.5

Description of tests comprising the WJ-III COG battery (cont.)

Tests	Abilities Measured
Test Seventeen: Memory for Words	Assesses the ability of an examinee to repeat lists of unfamiliar words in correct sequences
Test Eighteen: Rapid Picture Naming	Assesses the ability to quickly identify common pictures within a two-minute time limit.
Test Nineteen: Planning	Measures the ability to use forethought in problem-solving. An examinee is required to trace an object without retracing any lines or lifting the pencil from the paper.
Test Twenty: Pair Cancellation	Measures the ability to stay on task under time restraints. The task requires an examinee to locate and mark a pattern as quickly as possible within a three-minute time limit.

<u>Differential Ability Scales: School-Age Level:</u> The school-age battery of the Differential Ability Scales (DAS; Elliott, 1990) is designed to assess cognitive abilities in children between the ages of 6:0 and 17:11 years of age. The school-age battery is divided into two components, a core battery which consists of six subtests, and three additional diagnostic subtests. Subtests of the core battery include Pattern Construction, Recall of Designs, Word Definitions, Matrices, Similarities, and Sequential and Quantitative Reasoning. Diagnostic subtests of the school-age battery include Recall of Digits, Recall of Objects, and Speed of Information Processing.

A composite score referred to as the General Conceptual Ability (GCA) score is derived from the six subtests of the core battery. These subtests load most highly on the first unrotated factor, or *g*, in factor analysis. Cluster scores of Verbal Ability (comprised of the Word Definitions and Similarities subtests), Nonverbal Ability (comprised of the Matrices and Sequential and Quantitative Reasoning subtests), and Spatial Ability (comprised of the Recall of Designs and Pattern Construction subtests) are also derived from the six subtests of the core battery. Diagnostic subtests do not contribute to the GCA score of the DAS.

Subtest norms are represented in two months intervals for the ages of 6:0 to 7:11, and five month intervals for the ages of 8:0 to 17:11. Scores available include T-scores (M = 50, SD = 10), percentile ranks, and age equivalents. Norms for the GCA and cluster scores are represented by standard scores (M = 100 and SD = 15). Please refer to Table 3.6 for a description of DAS subtests.

Table 3.6

Description of subtests comprising the DAS

Subtest	Abilities Measured
Core Battery:	
Recall of Designs	Assesses a child's ability to draw pictures from memory. Each picture is presented to the child for five seconds. After the picture has been removed from view, the child is asked to draw the picture from memory.
Word Definitions	Measures a child's ability to give verbal definitions to vocabulary words. Each word is presented orally to the child, and asked what each word means.
Similarities	Assesses a child's ability to make comparisons between objects. Items are orally presented to the child, and a response asking how two items are alike is indicated.

Table 3.6

Description of subtests comprising the DAS (cont.)

Subtest	Abilities Measured
Matrices	Assesses a child’s ability to solve reasoning problems without verbal mediation. Each child is presented with a pattern of matrix problems, and they are required to deduce a pattern that best fits the sequence from a multiple choice format.
Sequential and Quantitative Reasoning	Measures a child’s ability to solve problems presented visually. Each item contains a missing object, where the child must deduce the missing pattern based on the sequence of other objects.
Pattern Construction	Assesses a child’s ability to construct patterns using three-dimensional plastic blocks based on visually presented two-dimensional designs.

Table 3.6

Description of subtests comprising the DAS (cont.)

Subtest	Abilities Measured
Diagnostic Subtests:	
Recall of Digits	Measures a child's ability to repeat sequences of digits that are presented verbally. Digits are presented at a rate of one per second, with the number of digits in each sequence increasing progressively.
Recall of Objects-Immediate	Assesses a child's ability to recall the names of twenty objects presented on a card.
Recall of Objects-Delayed	Assesses a child's long-term memory abilities by requiring them to attempt to remember the objects presented in the Recall of Objects-Immediate subtest after two nonverbal subtests have been administered and without prior warning.

Table 3.6

Description of subtests comprising the DAS (cont.)

Subtest	Abilities Measured
Speed of Information Processing	Assesses a child's ability to solve problems using speed and accuracy. The child is required to scan a set of simple numerical items for the largest number and mark the correct response.

Analyses

Analyses of the data will be performed to examine the outcomes of scores with the WJ-III COG and the DAS. For this, Pearson product-moment correlation coefficients will be calculated to examine the nature of the relationship between the broad and cluster scores of each battery. Means, standard deviations, and range of scores will be calculated for the broad scores of each battery in order to determine whether there are significantly different outcomes across performance levels on both batteries. Analysis of variance (ANOVA) techniques will also be implemented to examine possible practice effects caused by the order of test administration.

Research Question One

Within this study, the General Intellectual Ability-Standard (GIA-Std.) and the General Intellectual Ability-Extended (GIA-Ext.) scores of the WJ-III COG will be compared with the General Conceptual Ability (GCA) score of the DAS. Pearson-product correlation coefficients will be calculated between standard scores to determine the strength of the relationship between the scores. Mean scores, standard deviations, and range of scores will be calculated in order to estimate the amount of difference between standard scores obtained between each battery. Analysis of variance (ANOVA) will also be performed to determine the effect of administration order and how this may affect potential test outcomes.

Research Question Two

This research question addresses the concurrent validity between the cluster scores of the WJ-III COG and the cluster scores and diagnostic subtests of the DAS. This study will compare the seven CHC cluster scores of the WJ-III COG (Comprehension-Knowledge, Fluid Intelligence, Visual-Spatial Reasoning, Long-Term Retrieval, Auditory Processing, Processing Speed, and Short-Term Memory) and the cluster scores (Verbal Reasoning Ability, Nonverbal Reasoning Ability, and Spatial Reasoning Ability) and diagnostic subtests (Recall of Objects-Immediate, Recall of Objects-Delayed, Speed of Information Processing, and Recall of Digits) of the DAS. Pearson product-moment correlations will be calculated between the cluster scores of the WJ-III COG and the DAS and the diagnostic subtests of the DAS to determine the convergent and discriminant validity of each cluster.

REFERENCES

American Educational Research Association (AERA), American Psychological Association (APA), & National Council on Measurement in Education (NCME). (1999). Standards for educational and psychological testing. Washington, DC: American Educational Research Association.

Anastazi, A. and Urbina, S. (1997). Psychological Testing. Upper Saddle River, NJ.: Prentice Hall.

Bracken, B. A. & McCallum, R.S. (1998). Universal Nonverbal Intelligence Test. Itasca, IL: Riverside Publishing.

Braden, J.P. (1997). The practical impact of intellectual assessment issues. School Psychology Review, 26, 242-248.

Byrd, P.B. & Buckhalt, J.A. (1991). A multitrait-multimethod construct validity study of the Differential Ability Scales. Journal of Psychoeducational Assessment, 9, 121-129.

Carroll, J.B. & Maxwell, S.E. (1979). Individual differences in cognitive abilities. Annual Review of Psychology, 30, 603-640.

Carroll, J.B. (1993). Human cognitive abilities: A survey of factor-analytic studies. Cambridge, England: Cambridge University Press.

Carroll, J.B. (1997). The three-stratum theory of cognitive abilities. In Flanagan, D., Genshaft, J., and Harrison, P. (Eds.), Contemporary Intellectual Assessment: Theories, Tests, and Issues. New York: Guilford Press.

Das, J.P. & Naglieri, J.A. (1997). Cognitive Assessment System. Itasca, IL: Riverside Publishing.

Dumont, R, Willis, J.O., Farr, L.P., McCarthy, T., & Price, L. (2000). The relationship between the Differential Ability Scales (DAS) and the Woodcock-Johnson Tests of Cognitive Ability-Revised (WJ-R COG) for students referred for special education evaluations. Journal of Psychoeducational Assessment, 18, 27-38.

Dumont, R., Cruse, C., Price, L., & Whelley, P. (1996). The relationship between the Differential Ability Scales (DAS) and the Wechsler Intelligence Scale for Children-Third Edition (WISC-III) for students with learning disabilities. Psychology in the Schools, 3, 18

Elliott, C.D., Murray, D.J., & Pearson, L.S. (1979). British Ability Scales. Windsor, England: National Foundation for Educational Research.

Elliott, C. (1990). Differential Ability Scales: Introductory and Technical Handbook. San Antonio: The Psychological Corporation.

Elliott, C. (1990b). The nature and structure of children's abilities: Evidence from the Differential Ability Scales. Journal of Psychoeducational Assessment, 8, 376-390.

Elliott, C. (1997). The Differential Ability Scales. In Flanagan, D., Genshaft, J., and Harrison, P. (Eds.), Contemporary Intellectual Assessment: Theories, Tests, and Issues. New York: Guilford Press.

Esters, I.G., Ittenbach, R.F., and Han, K. (1997). Today's IQ tests: Are they really better than their historical predecessors?. School Psychology Review, 26, 211-224.

Flanagan, D., McGrew, K.S., & Ortiz, S.O. (2000). The Wechsler Intelligence Scales and Gf-Gc Theory. Needham Heights, MA: Allyn and Bacon.

Gould, S.J. (1981). The Mismeasure of Man. New York: W.W. Norton & Company.

Harrison, P.L., Flanagan, D.P., and Genshaft, J.L. (1997). An integration of contemporary theories, tests, and issues in the field of intellectual assessment. In Flanagan, D., Genshaft, J., and Harrison, P. (Eds.), Contemporary Intellectual Assessment: Theories, Tests, and Issues. New York: Guilford Press.

Horn J.L. & Cattell, R.B. (1967). Age differences in fluid and crystallized intelligence. Acta Psychologica, 26, 107-129.

Hoy, C, Gregg, N., Jagota, M., King, M., Moreland, C., & Manglitz, E. (1993). Relationship between the Wechsler Adult Intelligence Scale-Revised and the Woodcock-Johnson Test of Cognitive Ability-Revised among adults with learning disabilities in university and rehabilitation settings. Journal of Psychoeducational Assessment, Monograph Series, Advances in Psychoeducational Assessmment.

Individuals with Disabilities Education Act (IDEA). H.R. 5, Fed. Reg. 101-476. (1991, 1997).

Ittenbach, R.F., Esters, I.G., & Wainer, H. (1997). The history of test development. In Flanagan, D., Genshaft, J., and Harrison, P. (Eds.), Contemporary Intellectual Assessment: Theories, Tests, and Issues. New York: Guilford Press.

Kamphaus, R.W., Petoskey, M.D., & Morgan, A.W. (1997). A history of intelligence test interpretation. In Flanagan, D., Genshaft, J., and Harrison, P. (Eds.), Contemporary Intellectual Assessment: Theories, Tests, and Issues. New York: Guilford Press.

Kaufman, A.S. & Kaufman, N. L. (1985). Kaufman Assessment Battery for Children. Circle Pines, MN: American Guidance Services.

Keith, T.Z. (1990). Confirmatory and hierarchical confirmatory analysis of the Differential Ability Scales. Journal of Psychoeducational Assessment, 3, 391-405.

Keith, T.Z. (1997). Using confirmatory factor analysis to aid in understanding the constructs measured by intelligence tests. In Flanagan, D., Genshaft, J., and Harrison, P. (Eds.), Contemporary Intellectual Assessment: Theories, Tests, and Issues. New York: Guilford Press.

Kranzler, J.H. (1997). Educational and policy issues related to the use and interpretation of intelligence tests in the schools. School Psychology Review, 26, 150-162

McGrew & Woodcock, R. (2001). Woodcock-Johnson Psychoeducational Battery-Revised Technical Manual. Allen, TX: DLM Teaching Resources.

McGrew, K. (1997). Analysis of major intelligence batteries according to a proposed comprehensive *Gf-Gc* framework. In Flanagan, D., Genshaft, J. & Harrison, P. (Eds.), Contemporary Intellectual Assessment: Theories, Tests, and Issues. New York: Guilford Press.

McGrew, K. & Flanagan, D. (1998). The Intelligence Test Desk Reference (ITDR): Gf-Gc Cross-Battery Assessment. Boston: Allyn & Bacon.

Parker, K.S. (1996). Construct validity of the Differential Ability Scales with a mentally handicapped population: An investigation into the interpretability of cluster scores. Dissertation Abstracts International.

Sattler, J. (1992). Assessment of Children: Revised and Updated Third Edition. San Diego, CA: Jerome Sattler, Publisher, Inc.

Scherich, H.H. & Hanna, G.S. (1977). Passage dependency data in the selection of reading comprehension items. Educational and Psychological Measurement, 37, 4, 991-997.

Thorndike, R.L., Hagan, E.P., & Sattler, J.S. (1986). Stanford-Binet Intelligence Scale: Fourth Edition. Itasca, IL: Riverside Publishing.

Thorndike, R.M. (1997). The early history of intelligence testing. In Flanagan, D., Genshaft, J., and Harrison, P. (Eds.), Contemporary Intellectual Assessment: Theories, Tests, and Issues. New York: Guilford Press.

Wechsler, D. (1991). Wechsler Intelligence Scale for Children-Third Edition. San Antonio, TX: Psychological Corporation.

Woodcock, R.W. & Johnson, M.B. (1977). Woodcock-Johnson Psychoeducational Battery. Itasca, IL: Riverside Publishing.

Woodcock, R.W. & Mather, N. (1989, 1990). Woodcock Johnson-Revised Tests of Cognitive Ability-Standard and Supplemental Batteries: Examiner's Manual. In R.W. Woodcock & M.B. Johnson, Woodcock-Johnson Psychoeducational Battery-Revised. Allen, TX: DLM Teaching Resources.

Woodcock, R.W. (1997). The Woodcock-Johnson Tests of Cognitive Ability-Revised. In Flanagan, D., Genshaft, J. & Harrison, P. (Eds.), Contemporary Intellectual Assessment: Theories, Tests, and Issues. New York: Guilford Press.

Woodcock, R.W., McGrew, K.S., & Mather, N. (2000). Woodcock Johnson-III Tests of Cognitive Abilities. Itasca, IL: Riverside Publishing.

Appendix A
Consent Form

Dear Parent:

I am a graduate student in the School Psychology training program at the University of Wisconsin-Stout. Currently I am obtaining data for my master's thesis. The purpose of the study is to examine the differences in cognitive abilities in children. This is important for professionals who work with children in providing appropriate educational services according to a child's academic abilities.

I would like to ask for your permission for your child to participate in this study. This involves administering three intellectual assessments to your child. These are the Differential Ability Scales, the Cognitive Assessment System, and the Woodcock Johnson-Third Edition Test of Cognitive Ability. Administration of these assessments will take approximately two and one-half hours.

Children who participate in this study will be kept completely anonymous. Only the scores received by each child will be recorded along with any pertinent demographic data to ensure confidentiality.

If you would like more information about this study, please complete this form and return it to your child's teacher. You will be contacted shortly thereafter with further information about the nature of the study and your child's participation. If you have any additional questions, please contact the University of Wisconsin-Stout at 715-232-2211.

Thank you,

Greg Kolar and Karen Hendershott
University of Wisconsin-Stout

_____ Please contact me regarding this study

Child's name ____________________

The best time to reach me is:

____ morning
____ afternoon
____ evening
____ other (fill in)

Phone number: __________________