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# A COMPARISON OF THE REY COMPLEX FIGURE AND THE WECHSLER SCALES

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# A COMPARISON OF THE REY COMPLEX FIGURE

# AND THE WECHSLER SCALES

A Specialty Study

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AND THE WECHSLER SCALES

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## ACKNOWLEDGEMENTS

The journey to the completion of this Specialty Study and this Specialist's Degree was different than imagined when starting the Master of Arts in Education (MAEd) program in August of 2012. While obtaining the MAEd for School Counseling, a path opened in an area which felt more compatible with my undergraduate degree, sensibilities, and skills. While working towards my Specialist Degree, and this Specialty Study, I was able to practice a skill which has been and will always be important to my success: collaboration. While previous research findings may not always fit with a preferred narrative, they represent truths. The truth here is that I have been seeing clients since 2013, students who were referred to the School Counselor(s) while I completed a Practicum at Calloway County High School and Internships at Benton Elementary School. After my Masters, I had myself step into the role of a School Psychologist. Though it may not be readily apparent within the walls of a University, founded upon the practice of Education, it seems important to note that in a small, rural, public school system, in Western Kentucky, the title of School Psychologist (to which, I always remind them that I am an Intern, or previously, a Practicum student), comes with a form of prestige. Some of these people are truly suffering. Their opinions, stories, and feelings shared with me, take me over, I literally work to see the world through their eyes.

I have committed myself personally and professionally, to this point, to the Western Kentucky region. Before that, I was solely a student; then a student who held a job through the university (in multiple roles as a student worker and as a Graduate Teaching Assistant), or over summer and winter breaks outside of Murray State University. A few semesters after meeting Dr. Mardis Dunham, I worked the standard 20 hours per week for 2 years as his Graduate Assistant, which I had heard nothing but positive statements about from my peers.

Dr. Dunham made an impact when I met him and his continued patience, support, and humor, along with his extensive knowledge regarding School Psychology and school systems at large, are the foremost reasons I have completed this program. Surely, I could have completed a similar program with other professors or at other institutions, but it is not likely that I would have enjoyed it. MSU, and particularly the College of Education…and then the College of Education and Human Services represented a safety net, of sorts, when Internships and outside employment were scarce. Administrative assistants, professors, chairpersons, directors, and even the Dean have appeared to take personal interests in my employment and continued success, which has directly affected my ability to continue my graduate education. Local School Psychologists, Misty Emerson, Tammy Sayle, and Jana Norton were also exceptionally supportive during my Practicum and Internships.

To the best of my knowledge, and ability, all information has been referenced accordingly. The outcome of this study, initially, was unknown and research to support the dialogue was not readily abundant. I struggled with how to frame such a discussion until I understood how it fit with aspects of school life, relevant to a School Psychologist and programs I am already familiar with and passionate about. I dedicate this Specialty Study to the sources referenced, in hopes that I have, in a way, aided their future implications. It is also dedicated to the College of Education and Human Services because they, you, have made me feel like more than just a data point or figure representing the College. Finally, to the retired educators and unofficial educators in my family (both biological family and chosen family), although they are not likely to read this, they will be relieved to know that it is complete.

# ABSTRACT

This study was conducted to determine the correlation among the Wechsler Intelligence Scales and the Rey Complex Figure Test, a measure of visual memory, in a clinical sample. The purpose was to determine the point at which a difference between cognitive ability scores (at the overall ability level or at the index level) and visual memory scores would be statistically meaningful. Participants in this study were selected from clinical client folders with completed variables of interest. The mean age of the 64 participants was 21 years (*SD* = 12.6). Statistically significant correlations were found among three of the four Wechsler indices and the three RCF indices. The Perceptual Reasoning Index accounted for the bulk of the variance. All three correlations were statistically significant at $p = .01$ or less. Given the degree of correlation between the Wechsler Scales and the RCF, these results generated a predictable confidence band allowing practitioners to determine when a difference between obtained visual memory scores and IQ scores is unexpected.

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# CHAPTER ONE: INTRODUCTION

Psychoeducational evaluations are conducted by school psychologists and clinical psychologists as a part of an effort to determine a person's strengths and weaknesses. Knowing an individual student's cognitive and academic strengths and weaknesses is a likely outcome of a psychoeducational evaluation which can assist educators in understanding how to design an effective Individualized Educational Program (IEP) for the student. Specifically, "the role of IQ tests […] should provide the special education team and classroom teacher a means to identify what intervention the child needs" (Holdnack, n.d., p. 7). Additionally, psychologists use a range of instruments to measure intelligence, academic achievement, memory capabilities, and personality characteristics. The definition and interpretation of dysfunctional behavior hinges upon the extent that scores differ in comparison to the normative sample (called a normative comparison) and differences among scores obtained by an individual across the tests, such as between the IQ and memory or IQ and achievement (i.e., ipsative comparison; Sattler, 2008).

Currently, under the Individuals with Disabilities Education Improvement Act (IDEA,2004), public schools in the United States must provide special educational programming for children who qualify based on the presence of a disability. There are approximately 6.5 million students, or 13% of students, served in the United States within special education (National Center for Educational Statistics, 2016). Students categorized under Specific Learning Disabilities (SLD) makes up the largest proportion of students, at 35% (2016). Historically, the

SLD category has been described as being "composed of youngsters who are brain injured, emotionally disturbed, visually impaired, auditorily handicapped, intellectually subnormal, or suffering from some motor imbalance" or a combination of those handicaps (Capobianco, 1964). In the early 1900s, students with SLDs were "assumed to have a congenital brain defect that impaired their visual processing of letters, necessitating a phonetic approach to reading instruction" (Hale & Fiorello, 2004, p. 178). More recently, SLD has been described as "a disorder in one or more of the basic psychological processes involved in understanding or in using language, spoken or written, which may manifest itself in an imperfect ability to listen, think, speak, write, spell or do math calculations" (IDEA, 2004, § 300.8c10). This definition includes conditions such as perceptual disabilities, brain injury, minimal brain dysfunction, dyslexia, and developmental aphasia (IDEA, 2004, § 300.8c10). Currently, students are made eligible for services for SLD through either a discrepancy model, where their cognitive score is compared to their score in the academic area(s), or through a process of tiered interventions that have been determined to be ineffective at improving the student's functioning (referred to as Response to Intervention or RTI). RTI is also defined by Yell as "a method to identify a student with disabilities based on how a student responds to research-based interventions" and also refers to a school's approach to "adapting instruction to meet the needs [of] all students" (2016, p. 360).

**Memory Testing**

Surprisingly, using visual and auditory memory tests is not an innovative approach to the diagnosis of a learning disability (Bateman, 1964). Memory testing has also been used in neuropsychological investigations and evaluations to determine functional limitations after a traumatic brain injury (TBI) (Ashton, Donders, & Hoffman, 2005). Additionally, studies have assessed how visual memory test scores are affected within individuals with diagnosed psychological disorders (Ha, Kim, Chang, Oh, Her, Cho, Park, Shin, & Ha, 2012; Seidman, Lanca, Kreman, Faraone, & Tsuang, 2003). An increasing trend is the relevance of memory testing in school-based evaluations for psychoeducational testing (Lipowska, Czaplewska, & Wysocka, 2011; Schlooz, Hulstijn, van den Broek, van der Pijll, Gabreels, van der Gaag, & Rotteveel, 2006).

Children with Specific Learning Disabilities in reading were found to have lower scores on the Rey Complex Figure Test (RCF) than those without reading disabilities (Gray, Rogers, Martinussen, & Tannock, 2015; Mati-Zissi & Zafiropoulou, 2003). Although “attention encompasses both behavioural and cognitive components, and these two aspects of attention do not readily map onto each other” (Gray, Rogers, Martinussen, & Tannock, 2015, p.3), students who struggle to pay attention, or appear to have symptoms of Attention-Deficit/Hyperactivity Disorder (ADHD), may struggle with what is generally referred to as ‘executive function.’ Executive functioning is defined as a “collection of processes that are responsible for guiding, directing, and managing cognitive, emotional, and behavioral functions, particularly during active, novel problem solving” (Gioia, Isquith, Guy, & Kenworthy, 2000, p. 1). Completion of the RCF, particularly the subsequent Immediate and Delayed Recall trials, requires planning in order to successfully complete and remember the design. Students who have difficulty with tasks understood to be controlled by their executive functioning may be diagnosed with ADHD and determined eligible for special education under the ‘Other Health Impaired’ category (Sattler, 2008). Students with ADHD account for about 5% percent of children, in most cultures, and occurs in around 2.5% of adults (American Psychiatric Association [APA], 2013). It is also known that “specific learning disorder commonly co-occurs with ADHD” (APA, 2013, p. 65).

The use of the RCF is common among clinical adult samples because of its ease in administration and overall sensitivity to cognitive dysfunction (Meyers & Meyers, 1995; Spreen & Strauss, 1991). Gallagher and Burke (2007) found that younger individuals (ages 20-29) were better able to complete the first (Copy) trial of the test, while older individuals (ages 50-59) generally produced lower scores on the Copy Trial. This was also true during the Immediate Recall Trial (participants ages 20-29 and 30-39 produced more accurate recalls than those ages 50-59 and 60-69). Gallagher and Burke (2007) also found that the same held true for the Delayed Recall Trial (ages 20-29 remembered more of the design than those ages 50-59). The RCF has also been used with adults who have been diagnosed with schizophrenia and bipolar disorder (Seidman et al., 2003). This research found that patients with schizophrenia were significantly less effective than controls regarding the accuracy and organization of the Immediate Recall trial, regardless of medication or measured IQ.

Standardized memory measurements assess a range of specific memory abilities including verbal and visual memory. Lipowska, Chzaplewska, & Wysocka (2011) reported that “there exists a substantially smaller amount of research concerning visuospatial function deficits in dyslexia when compared to the existing data referring to the linguistic functioning” (p. 220); in fact, these researchers noted that difficulty completing the RCF may be related to a deficit within one’s visuospatial orientation, instead of a memory deficit. IQ test scores and visual memory scores are correlated (Chinulli, Yeo, Haaland, & Garry, 1989) and there is research on the link between memory abilities and measured IQ, even the visuospatial aspects of IQ (Lipowska, Czaplewska, & Wysocka, 2011). However, no studies were found that explain when poor visual memory is relevant for a person with an IQ that is below the average range of measured intelligence.

Essentially, because of the moderate correlation between IQ and visual memory, if someone has a low average IQ, they can be expected, most of the time, to have a low average visual memory score. As a result, the relative importance or interpretive value of the visual memory test is diminished, since it is unclear if one's low intellectual ability contributed to their low visual memory score. However, without knowing when a discrepancy between the cognitive testing and the memory testing is statistically significant, problems with over-interpreting the discrepancy can arise.

The Rey Complex Figure test (RCF) is relatively easy to administer and score, and provides information regarding how a person plans, organizes, processes, encodes, and retains novel visual information (Meyers & Meyers, 1995). It provides a norm-referenced copy score, a time to copy score, an immediate recall score, a delayed recall score, and a recognition memory score. The results provided from RCF may be determined to fit one of the researched memory profile patterns. These profiles may be 'normal' or may reveal dysfunction regarding the individual's attention, encoding, storage, or retrieval processes (Meyers & Meyers, 1995). Baddeley (1986, 1994, 1996, 2001) and Baddeley and Hitch (1974, 1994; as cited in Floyd & Kranzler, 2012) stated that short-term memory information is stored in the phonological loop (for auditory stimuli) and the visuo-spatial sketchpad (for visual and spatial stimuli). The information stored in the phonological loop and the visuo-spatial "sketchpad" remains for a limited amount of time. While there, it is rehearsed, in preparation for long-term storage. Another aspect of working memory is the 'central executive' which Gathercole (1994) reported as being responsible for processing and storing functions, in addition to control activities (as cited in Floyd & Kranzler, 2012). The central executive aspects of processing and storage "include maintenance rehearsal, the analysis of information, and the storage and retrieval of memories held in the long-term store” (Floyd & Kranzler, 2012, p. 500). The central executive aspect of control activities includes “the management of attention and behavior, as well as the regulation of information in the memory system” (Floyd & Kranzler, 2012, p. 500). Memory processes such as encoding and consolidation are known to occur in the hippocampus within the limbic structure of the forebrain, while being oriented to a stimulus relies on the cingulate within the limbic structure (Hale & Fiorello, 2004).

**Specific Learning Disabilities**

Discrepancy models or RTI are currently the primary ways a student can be identified as having a specific learning disability (SLD). In Kentucky, if schools use the discrepancy model, school psychologists must use the “Reference Tables for Identifying Students with a Specific Learning Disability,” based on the cognitive assessment and achievement assessment pairings and their correlations (2017). Mather and Tanner (2014) describe some of the faults with the discrepancy model and the Response to Intervention model. Jenson (1998; 2006; as cited in Floyd & Kranzler, 2012) gives credence to an “information processing model,” which is becoming increasing popular (Flanagan, Alfonso, Costa, Palma, & Leahy, 2018; McGill, Styck, Palomares, & Hass, 2016). The processing model may also be referred to as “processing strengths and weaknesses” (Carmichael, Fraccaro, Miller, & Maricle, 2014, p. 11). Sotelo-Dynega, Flanagan, and Alfonso (2018) state that traditional identification of SLD relies on strengths and weaknesses, in relation to one’s cognitive abilities (as cited in Flanagan, Alfonso, Costa, Palma, & Leahy, 2018). The “processing disorder causes academic deficits, and that it is not due to another disability or disadvantage” (Hale & Fiorello, 2004, p. 179). When “interpreting test results, the child’s performance is viewed through an information processing model. In this model the child is considered as a mini-computer. The diagnostician controls what is input to the computer and how it is input, either visually, auditorily, by touch or in combination" (Baum & Plata, 1976, p. 14). The amount of information the subject can reproduce allows for interpretation of the central processing functions working properly (in line with the normative sample) and which appear to be dysfunctional (significantly different than the normative sample). Dehn (2006) reported that identifying the processing deficits can assist in determining effective interventions (as cited in Floyd & Kranzler, 2012). However, McGill and colleagues have reported that the processing model "may result in inconsistent diagnostic decisions across practitioners and educational agencies" (2016, p. 163).

IQ tests do not always directly measure short-term and long-term memory abilities but measure them indirectly through the indices and subtests (Hale & Fiorello, 2004). Hale and Fiorello discussed a specific model to determine learning disabilities, from testing, to determine a standard error of difference "between the strength cluster and the weakness cluster, but no significant difference between the weakness cluster and the achievement deficit score" (2004, p. 180). Memory testing does not consume much additional time during the course of typical testing, but can add useful information (i.e., one's ability to encode, store, consolidate, and retrieve information) to assist in making informed decisions about students' future education (Drozdick, Raiford, Wahlstrom, & Weiss, 2018) and even offers insight into the functioning of their medial and lateral ventral temporal lobe (Hale & Fiorello, 2004).

If the RCF is found to be significantly correlated with a standard cognitive assessment with a clinical sample presenting with predominantly academic concerns, then use of this memory test, and others, in schools would be supported. Introducing further memory testing could allow for a more in-depth understanding of the memory impairments and educational needs of students, especially when the Working Memory Index score from an IQ test is uninterpretable (i.e., when there is a statistically significant discrepancy between the subtests within the Working Memory Index). Although the RCF is typically used in clinical settings, it could offer a deeper insight into a student's visual working memory and offer deeper insight for teachers, according to how an individual student is most likely to learn. It has been found that visual-spatial working memory acts as a "mediator between classroom inattention and math outcomes for boys" (Gray et al., 2015, p.16). Reasonably, working memory is likely to account for how students are able to accomplish early academic goals like spelling, site words, phonics, math facts, and even classroom rules and routines.

**Purpose of the Study**

There were two primary purposes of this study. First, this study was conducted to determine the correlation among various cognitive ability variables and a measure of visual memory in a clinical sample. Intelligence tests are used extensively in schools, clinical psychology practices, and neuropsychology clinics, yet these tests do not measure visual memory directly. As memory tests have become increasingly common within clinical practice (Davies, Field, Andersen, & Pestell, 2011) and contribute to the processing model for SLD identification in schools, it would be helpful to determine the extent to which the constructs of intelligence, especially visual-spatial intelligence, overlap or share variance with visual memory. Indeed, research has shown a strong correlation between visual memory and other cognitive and academic factors (Davies et al., 2011; Grey et al., 2015; Mati-Zissi & Zafiropoulou, 2003) and it would be helpful to determine if (and when) these two constructs (intelligence and visual memory) are distinct. The second purpose of the study was to determine the point at which a difference between cognitive functioning (i.e., the overall ability level or in terms of indices) and visual memory would be meaningful (that is, statistically statistically).

**Significance of the Study**

If visual memory and cognitive functioning as measured by intelligence tests are indistinguishable, then the rationale for conducting visual memory testing becomes moot. If, on the other hand, a statistical point of discrepancy between the two constructs could be reliably and meaningfully determined, then continued use of visual memory tests in clinical practice would be justified and this evidence could justify the expansion of visual memory testing within applied settings. Since IQ tests do not measure visual memory directly, it would be important to determine the point at which a discrepancy between the two constructs (that is, intelligence and visual memory) indicates problems with visual memory and not overarching difficulties in intellectual functioning.

**Terms and Definitions**

- Wechsler Intelligence Scales–Two Wechsler scales were used in this study—the Wechsler Intelligence Scale for Children—Fourth Edition (WISC-IV) and the Wechsler Adult Intelligence Scale—Fourth Edition (WAIS-IV). The WISC-IV is designed for children age 6:0 to 16:11 while the WAIS-IV is designed for individuals 16:0 through older adulthood. Both tests include a full scale IQ as well as four index scores (Wechsler, 2003). The four indices for the WISC-IV and WAIS-IV are the Verbal Comprehension Index, Perceptual Reasoning Index, Working Memory Index, and the Processing Speed Index.
- Full Scale Intelligence Quotient (FSIQ) Score – The Verbal Comprehension Index (VCI), Perceptual Reasoning Index (PRI), Working Memory Index (WMI), and the Processing Speed Index (PSI) are combined to generate the FSIQ.

- Verbal Comprehension Index (VCI) –The VCI is designed to provide a measure of verbal acquired knowledge and verbal reasoning.
- Perceptual Reasoning Index (PRI) – The PRI measures nonverbal fluid reasoning abilities (i.e., the mental operations used to solve novel problems, organize thoughts, grasp logical relationships, and create and test solutions). Additionally, the PRI provides a direct assessment of cognitive processes including visual perception, visual-motor integration, visuospatial processing and coordination.
- Working Memory Index (WMI) – The WMI measures the ability to attend to information presented verbally, manipulate that information in short-term immediate memory, and then formulate a response.
- Processing Speed Index (PSI) – The PSI measures the ability to quickly and accurately process and respond to visual material. It requires visual perception and organization, visual scanning, and hand-eye coordination.
- Rey Complex Figure Test (RCF) – This test requires the individual to copy a geometric design (the Rey Figure), draw it again three minutes later, and then draw it once again 30 minutes later. The test also provides a measure of recognition—the extent that the individual recognizes aspects of the Rey Figure when they first copied it. The RCF measures visuo-construction, immediate memory, delayed memory, and recognition memory for visual information and can describe an individual's difficulties with attention to, encoding of, retrieval of, and storage of visual information (Meyers & Meyers, 1995).

- Copy trial – Here, the client is given a copy of the RCF Stimulus Figure and is asked to draw the image, to the best of their ability, drawing their own as similarly to the original as possible. After they have finished, the images (original and recreation) are removed from the client's sight.
- Immediate trial – 3 minutes after the Copy trial the client is asked to draw the image again, but this time without the model.
- Delayed trial – 30 minutes after the Copy trial the client is asked to draw the image again, without the model.
- Recognition trial – this aspect of the RCF test presents 12 of the 18 scoring elements of the Rey Figure along with 12 designs that serve as foils. The respondent is required to indicate which elements they recognized from the original figure.

# CHAPTER TWO: REVIEW OF LITERATURE

The history of Special Education in school systems as it appears today is relatively new and has been evolving since the first federal mandates. The first meaningful and far-reaching law governing the education of children with disabilities was Public Law 94-142 (Individuals with Disabilities Education Act, 1975). This law required schools to identify and serve children with disabilities. There are several important aspects to the law, which have been maintained in all revisions to the law. Specifically, the Free Appropriate Public Education (FAPE), Least Restrictive Environment (LRE), Child-Find, age ranges, Individualized Education Program (IEP), and parental rights components (as well as the mandate for a non-discriminatory evaluation and due process). This law and subsequent revisions, identified categories where children could be served, including specific learning disabilities or SLD. SLD is defined as "a disorder in one or more of the basic psychological processes involved in understanding or in using language, spoken or written, which may manifest itself in an imperfect ability to listen, think, speak, write, spell or do math calculations. The term includes conditions such as perceptual disabilities, brain injury, minimal brain dysfunction, dyslexia, and developmental aphasia (IDEA, 2004, § 300.8c10). In addition to PL-94-142, in 2004, the Individuals with Disabilities Education Improvement Act (IDEIA) increased requirements for special education teachers, changed the focus for many special education students to long-term, rather than short-term goals, no longer required states to use a discrepancy model for identification of students with disabilities, and actually encouraged schools to use their RTI model as a major component when identifying SLDs (Yell, 2016). This law represented the most meaningful and important shift in identifying and serving children with learning disabilities because of the RTI component and because it generated more research regarding the processing model (Floyd & Kranzler, 2012; McGill et al., 2016).

**Statistics on Children Served**

Currently, schools must identify and serve children ages 3 through 21 who are eligible for special education programming and related services in one of the eligibility categories (United States Department of Education, 2018). In Kentucky, students can be made eligible for services under the categories of: Autism, Deaf-Blindness, Developmental Delay, Emotional-Behavioral Disability, Intellectual Disability, Hearing Impairment, Multiple Disabilities, Orthopedic Impairment, Other Health Impairment, Specific Learning Disability, Speech or Language Disability, Traumatic Brain Injury, and Visual Impairment (Kentucky Department of Education, 2017). Data from 2017-2018 (United States Department of Education, 2018, para. 14) reported that, nationally, 773,595 students ages 3-5 were provided special education services; there were 18,070 students ages 3-5, in Kentucky, who were served by special education services. There were 6,069,912 students ages 6-21, nationally, who were served by special education services; there were 86,200 students ages 6-21, in Kentucky, who were served by special education services (para. 15). Of the 86,200 in Kentucky, 1,530 were served in correctional facilities, residential facilities, via homebound or hospital, or the parent placed their child in a private school or a separate school setting; this means that 84,670 were served within Kentucky’s public schools. A review of the total disability category percentages from 2017-2018 revealed that in

Kentucky, 20.31% of students were served through special education, compared to 15.62% served nationally.

Children with specific learning disabilities currently comprise 34% of children served in special education programs (National Center for Educational Statistics, 2018); nationally, this represents 3.57% of all students and in Kentucky, 1.88% of all students. As noted previously, under IDEA (2004, § 300.8c10), SLD is defined as “a disorder in one or more of the basic psychological processes involved in understanding or in using language, spoken or written, which may manifest itself in an imperfect ability to listen, think, speak, write, spell or do math calculations” and includes conditions such as perceptual disabilities, brain injury, minimal brain dysfunction, dyslexia, and developmental aphasia. There are three methods for determining eligibility for a SLD under the IDEA—the IQ/achievement discrepancy model, the RTI model, and other alternative methods, namely, the processing model (or pattern of strengths and weaknesses model). The IQ/Achievement discrepancy model is based on earlier interpretation of the nature of learning disabilities and requires a large and unexpected difference between the child’s level of intelligence and the child’s actual academic skills as measured by standardized achievement tests (Lichtenstein, 2014). This model had a host of problems according to some researchers (see Lichtenstein, 2014) and in 2004 the federal government, under the IDEIA, gave schools the option to employ a child’s response to research-based interventions (RTI model) as a method of determining eligibility. An alternative approach, which appears to be growing in popularity, is the processing model. This model considers unexpected differences among various cognitive processes, such as verbal reasoning, visual perception, memory, and so forth as a basis for eligibility (Carmichael, et al., 2014). The role of visual memory, in particular, comes into play here since deficits in immediate visual memory are associated with problems remembering faces, objects, and pictures (Miller & Maricle, 2018).

Again, it is important to note when a discrepancy between one's visual memory and one's measured IQ becomes meaningful because of the moderate correlation between IQ tests and visual memory tests (Chinulli et al., 1989; Lipowska, et al., 2011). IQ test scores and visual memory scores are correlated (Chinulli et al., 1989;) and research exists on the link between memory abilities and measured Index Scores (IQ). Frijters, Lovett, Steinback, Wolf, Sevcik, and Morris reported that "there exists enough research and knowledge about the development of reading processes to suggest that short-term memory, visual memory, and IQ are important factors" (2011, p. 153). By using the visuospatial aspects of IQ and comparing them to memory tests, Lipowska and colleagues discussed that "the difficulty with making a copy in the Rey-Osterrieth Complex Figure Test may be connected with a lowered level of executive functions and some deficits in the frontal lobe area" (2011, p. 220). Adding on the consistent strength of memory testing, separately from the IQ test, comparing them, linking them, and determining differences could be instrumental in pinpointing how students learn.

**Services for Adults**

Like children, adults are not immune to persisting problems with learning disabilities or acquired disorders, such as traumatic brain injuries, age-related memory decline, and dementia, including Alzheimer's disease. And, like children, eligibility for insurance-supported or state-supported services, such as rehabilitation and work support, hinge upon accurate diagnosis and documentation of the condition and its functional limitations (Disability Benefits Help, 2019). Often, eligibility determination is provided by hospitals, mental health clinics, licensed psychologists, and other appropriately trained practitioners. Unlike eligibility for school-based services (such as special education) which rely upon definitional criteria established under IDEA, non-school practitioners must use the Diagnostic and Statistical Manual—Fifth Edition (DSM-5; American Psychiatric Association, 2013) or the International Statistical Classification of Diseases and Related Health Problems—19th Edition (Revision) (ICD-10; World Health Organization, 2016).

There are a number of specific disorders in adults that require specialized assessments to diagnose the condition and to establish eligibility for insurance or government supported services, such as vocational rehabilitation, community living supports, and social security disability benefits. Memory abilities assessed indirectly via intelligence tests, or directly via memory tests, certainly can play a role in establishing eligibility (Frijters, et al., 2011). Hale and Fiorello (2004) purported that to do this, clinical and legal definitions of learning disabilities must be defined.

Learning disabilities can and do persist into adulthood although the functional limitations associated with the disability hinges largely upon the vocation the adult has chosen and the severity of the disability/disabilities. Indeed, vocational rehabilitation, a state-federal program designed to provide employment opportunities for adults with all sorts of disabilities, provides assessment, counseling, training, and employment supports for adults with learning disabilities who are eligible (KY Skills, 2015). Vocational rehabilitation requires current testing to establish eligibility. Similarly, those with traumatic brain injuries, accounted for 0.82% of "emergency department […] visits, hospitalizations and deaths" in 2010 and "often require substantial government-funded supports" (CDC, 2016). In 2014, around 5 million adults (~1.43%) of those in the United States population were reported to have had dementia (CDC, 2018). Here too, diagnosis and subsequent eligibility for services hinges upon neuropsychological testing, of which memory testing plays a vital role (Frijters et al., 2011)  Lastly, adults seeking accommodations on high-stakes exams such as the ACT, SAT, GED, and/or GRE, which are needed to enter post-secondary training, or exams needed to obtain licensure to work in some professions (e.g., attorneys, psychologists, nurses, counselors) must provide evidence of the disorder(s). Comprehensive tests are needed to establish the nature of the condition and the need for accommodations, such as extended time, on exams (ACT, 2019; Drozdick et al., 2018; GED Testing Services, 2019).

## Intelligence Test Constructs

Although earlier conceptualizations of intelligence relied upon a single score to represent one's level of intellectual functioning (e.g., the original Stanford-Binet), advances in research and computer modeling have led to multi-factored theories of intelligence. Currently, the Cattell-Horn-Carroll (CHC) model of intelligence is the most thoroughly researched and validated theory of intelligence (Woodcock, Maricle, Miller & McGill, 2018). The CHC model includes specific abilities that are measured directly (Schneider & McGrew, 2018). These areas include: Crystallized Knowledge, Fluid Reasoning, Long-Term Retrieval, Short-Term Memory, Auditory Processing, Processing Speed, and Visual Processing. First, the Comprehensive-Knowledge factor (i.e., Gc) "refers to the accumulated knowledge generated via fluid intelligence" (Schneider & McGrew, 2018, p. 90); it is defined as "the ability to comprehend and communicate culturally valued knowledge" (Schneider & McGrew, 2018, p. 114). The Fluid Reasoning factor (i.e., Gf) is the "use of deliberate and controlled procedures (often requiring focused attention) to solve novel, 'on-the-spot' problems that cannot be solved using previously learned habits, schemas, and scripts" (p. 93). Next, the Working Memory Capacity (i.e., Gwm) is "the ability to maintain and manipulate information in active attention" (p. 97). The Gwm includes “Auditory short-term storage (Wa): The ability to encode and maintain verbal information in primary memory” (p. 99) and “Visual-spatial short-term storage (Wv): The ability to encode and maintain visual information in primary memory” (p. 99). Visual/Spatial Processing (i.e., Gv) is “the ability to make use of simulated mental imagery to solve problems – perceiving, discriminating, manipulating, and recalling nonlinguistic images in the ‘mind’s eye.’” (p. 125). Auditory Processing (Ga) is auditory synthesis and discrimination (Schneider & McGrew, 2018). Processing Speed (Gs) “refers to the average speed at which a series of simple items is completed in succession, with sustained concentration over all items over a sustained period” (p. 105).

Following advances in research, test-developmental companies have published multi-factored intelligence tests that measure the CHC model. The current version of the Woodcock-Johnson Tests of Cognitive Abilities—Fourth Edition (Schrank, McGrew, & Mather, 2014) measures the Comprehension-Knowledge (Gc), Fluid Reasoning (Gf), Short-Term Working Memory (Gsm), Cognitive Processing Speed (Gs), Auditory Processing (Ga), Long-Term Retrieval (Glr), and Visual Processing (Gv) constructs from the CHC model. The Kaufman Assessment Battery for Children—Second Edition Normative Update (Kaufman & Kaufman, 2018) measures Fluid Reasoning (Gf), Crystalized Ability (Gc), Short-Term Memory (Gsm), Visual-Spatial Processing (Gv), and Long-Term Storage and Retrieval (Glr). Lastly, the current Wechsler Intelligence Scale for Children—Fifth Edition (Wechsler, 2014) includes a Verbal Comprehension index (categorized as Gc), Fluid Reasoning Index, a Visual-Spatial Index, a Working Memory Index (Gsm), and a Processing Speed Index. Lastly, the Wechsler Adult Intelligence Scale—Fourth Edition (Wechsler, 2008) includes a Verbal Comprehension factor

(Gv), a Perceptual Reasoning index (Gf and Gv), Working Memory (Gsm), and Processing Speed (Gs).

**Rey Complex Figure Test**

There are several memory constructs that are measured by modern psychological and neuropsychological tests. Regarding specific constructs, researchers agree that there is an immediate memory factor, a long-term or delayed memory factor, episodic memory, procedural memory, and semantic memory. Immediate memory is an individual's ability to remember information (verbal or visual), while long-term memory "involves associative memory or the process of storing and retrieving information" (Mather & Wendling, 2018, p. 790). Episodic memory is "the recollection of personal events and the contexts in which they occur" (Drozdick et al., 2018, p. 493). Implicit or Procedural memory is "learning from experiences without being consciously aware of learning, such as learning to ride a bike or drive a car" (Drozdick et al., 2018, p. 493). Semantic memory is "the memory for facts and concepts" (Drozdick et al., 2018, p. 493). Regarding standardized, norm-referenced tests of memory, there are several popular and commercially available tests, including the Children's Memory Scale (CMS), The Wechsler Memory Scale—Fourth Edition, the Test of Memory and Learning, and the Rey Tests (Rey Auditory-Verbal Learning Test and the Rey Complex Figure test).

The RCF boasts test-retest reliability and "the Copy score was significantly related to performance on Immediate Recall, Delayed Recall, and Recognition Total Correct" (Meyers & Meyers, 1995, p. 67); this means that the initial attention and ability of the client to copy the image directly relates to, or predicts, one's performance on subsequent trials. Examiner and client should be seated, across from each other, in a quiet, distraction-free environment. During the Copy trial, the examiner presents the client with the "Copy trial" (blank sheets) from the test booklet, the RCF Stimulus Card (the image), and a #2 pencil to the client. Then the examiner says, “Look at this figure” (Meyers & Meyers, 1995, p. 7). Next, the examiner points to the blank response sheet and says, “I would like you to copy that figure onto this sheet of paper.” Then the examiner points back to the stimulus card and says, “Copy it so that I would know that this is the figure you drew. Do a good job.” (Meyers & Meyers, 1995, p. 7). The image is large and centered on the page, but it is not simple. The image has intricate designs which appear to require forethought and planning of actions, tasks which are known to be difficult for individuals who have attentional, or executive functioning, issues (Maricle & Avirett, 2018). Then, when the client appears to be finished, the examiner verifies that they are finished and takes the drawing, and the example from the client. Three minutes later the examiner gives the client another sheet of blank paper and pencil and asks them to draw the image from memory, this is the Immediate Recall trial. During this trial, the examiner says, “A short time ago I had you copy a figure. I would like you to draw that figure again, but this time from memory” then they point to the blank sheet and say, “Draw that figure here” (Meyers & Meyers, 1995, p. 8). Next, after 30 minutes, the examiner, again, gives the client a blank sheet of paper and pencil and repeats, “A short time ago, I had you copy a figure. I would like you to draw that figure again, but this time from memory.” Then they point to the blank sheet and say, “Draw that figure here” (p. 8). The examiner gives them ample time to reproduce the example image to the best of their memory. Finally, and immediately after the Delayed Recall trial, the examiner provides the Recognition trial response sheets, for the client to circle which segments of the original image they recognize.

The assessment’s scores depend on the client’s ability to copy the image closely, with attention to detail and spacing, down to 1/8 of an inch, at times (Meyers & Meyers, 1995). Then the raw scores are converted to t-scores, based on the individual’s age, by comparing the client’s raw score to the raw score of the original normative sample of 601 individuals (Meyers & Meyers, 1995). Finally, when scoring the RCF, the examiner should compare the client's score to "*Figure 2*. Typical RCF memory profile patterns" (Meyers & Meyers, 1995, p. 41), which offers a possible category, or memory profile, on the RCF. Profiles, for the purposes of this investigation described, include: Attention, Encoding, Storage, Retrieval, and Normal. Encoding can be described as "new learning" while Retrieval is "accessing old memories" (Hale & Fiorello, 2004, p. 65). An 'Attention profile' is characterized by low scores on all trials and relates to the individual having been unable to commit the necessary attention to the task. Encoding is also described as "the transformation of external information into mental representations or memories; it reflects the entry of information into the memory system" (Drozdick et al., 2018, p. 493). Storage is related to an individual's ability to accurately "file" information for later use.

**Summary**

Currently, there are a range of services for children and adults with disabilities although access to these services requires documentation of the disorder and the nature and extent of the functional limitations associated with it. Intelligence tests and memory tests play a pivotal role in the identification of those individuals needing services. However, intelligence tests and memory tests share considerable variance because they are correlated (Chiulli et al., 1989) and this makes it difficult for the examiner to determine if one's assessed memory deficits are due to limited or impaired cognitive functioning in general or, more specifically, related to limited or impaired memory functioning. Therefore, to determine when memory test results may represent a specific problem, independent of cognitive or intellectual functioning, research regarding when differences between the two constructs needs to be conducted. To date, no studies were found that specifically examined the relationship between the RCF and common measures of intelligence with the goal of determining the presence of unexpected memory impairment.

# CHAPTER THREE: METHODS

## Participants

Participants in this study were obtained from client folders housed in Murray State University's Counseling and Assessment Center. The mean age of participants was 21 years (*SD* = 12.6). Within the sample 47% were male and 53% were female. Upon arrival at the clinic, clients were asked for their presenting concern, or the reason they came for an evaluation. Some clients presented with more than one concern; a summary of presenting concerns is summarized below. The combination of general academic concerns and specific academic concerns (reading, writing, and math) accounted for 49% of the sample population.

The most common presenting problem reported was a previous diagnosis of ADHD, or concerns that the client might have ADHD (e.g. significant inattention or hyperactivity); this represented 25% of the sample population. However, 49% of the sample had academic concerns related to one or more subject areas. Specifically, concerns regarding the client's 'ability to read' represented 16% of the sample population, general concerns with 'cognition and academic skills' represented 14% of the sample population, 'SLD' concerns represented 7% of the sample population, and 5% had concerns with writing; another 7% had "academic" concerns. Referrals from vocational rehabilitation represented another sizable aspect of the sample at 17% of the sample population. Lastly, the clinical population included clients with presenting problems involving behavior problems, anxiety, and mood disorders. These people represented 9% of the sample.

**Procedures**

The Counseling and Assessment Center is housed within the College of Education and Human Services, in Alexander Hall, on the Murray State University campus. The purpose of the Counseling and Assessment Center is to provide low-cost assessment, counseling, and consultation services to the local and regional community, and to provide graduate students in school psychology and mental health counseling with training opportunities. It is staffed by graduate students who are supervised by a licensed psychologist (for the assessment aspect of the clinic) and a licensed mental health counselor (for the counseling aspect of the clinic). Typical assessments take four hours and include interviews, observations, and the administration of IQ, achievement, memory, and/or behavior tests. All data for this study came from archives housed in the clinic supervisor's records. Consistent with the approved IRB protocol, the faculty supervisor pulled the records from the first 70 files that contained all required data. The data were then documented on a spread sheet and the complete set was ultimately uploaded to IBM's Statistical Package for Social Sciences (SPSS) for further analysis. No names or other identifying information were obtained.

**Instrumentation**

Wechsler Scales. The Wechsler Intelligence Scale for Children—Fourth Edition (WISC-IV) (Wechsler, 2003) and the Wechsler Adult Intelligence Scale—Fourth Edition (WAIS-IV) (Wechsler, 2008) were used to determine the client's level of cognitive functioning. The WISC-IV was administered to those ages 6 through 16, while the WAIS-IV was administered to those older than 16. Wechsler tests have a long history of use in clinical and school practice in United States, beginning in 1939 (Sattler, 2008). Both measures provide a measure of overall IQ via the full scale IQ (Drozdick, Wahlstrom, Zhu, & Weiss, 2012), well as four different indices. The Verbal Comprehension Index (VCI) measures verbal concept formation, verbal reasoning and comprehension, acquired knowledge, and attention to verbal stimuli (Drozdick et al., 2012). The Perceptual Reasoning Index (PRI) provides a measure of fluid reasoning, visual-spatial processing, and visual-motor integration" (Drozdick et al., 2012). Wechsler (2008) and Zhu, Weiss, Prifitera, and Coalson (2003) describe the Working Memory Index (WMI) as a measure of one's "capacity to store incoming auditory information temporarily, as well as the ability to manipulate this information mentally and hold it in storage for later goal-directed use" (as cited in Drozdick et al., 2012, p. 203). Finally, the Processing Speed Index (PSI) is a measure of processing speed and decision-making fluency (Drozdick et al., 2012). Both measures have been thoroughly researched and have been determined to have exceptional validity and reliability (Wahlstrom, Rairford, Breaux, Zhu, & Weiss, 2018; Drozdick et al., 2018).

Rey Complex Figure Test. The Rey Complex Figure Test (RCF) (Meyers & Meyers, 1995) is an individually administered, norm-referenced test of visuospatial ability, visual memory, and visual information encoding. It provides scores for initial copy accuracy (the client copies the figure), time to copy the figure, immediate recall (three minutes after the copy), and delayed recall trial (30 minutes later). The RCF also provides a measure of recognition memory, where the client is asked to identify aspects of the figure from a multiple-choice array, without the figure in view. The RCF provides T-scores for the Immediate, Delayed, and Recognition trials. The normative sample for the RCF included "601 normal subjects aggregated from several distinct samples" and "a subset of the normative sample (*n* = 394) was selected to reflect the age distribution of the United States population" (Meyers & Meyers, 1995, p. 33). The RCF has been thoroughly researched and determined to have strong validity and reliability (Meyers & Meyers, 1995). The RCF may be “used to supplement tests of cognitive ability” (Miller & Maricle, 2018, p. 917) and specifically measures “visual-spatial constructional ability.”

**Hypotheses**

First, and consistent with previous research (Meyer & Meyer, 1995), a strong correlation between the three aspects of the Rey Complex Figure (Immediate Memory, Delayed Memory, and the Recognition Memory trials/indices) and the Perceptual Reasoning Index from the Wechsler scales were anticipated. The Rey Complex Figure test and the Perceptual Reasoning Index both require visual processing, visual analysis, and visual reasoning on the part of the test-taker. Second, it was hypothesized that an index of statistical difference could be determined using these correlations that would allow for more precise interpretation of the difference between the RCF and the PRI.

**Analyses**

To address the hypotheses, the sample was scanned for outliers, skewness, and kurtosis. After the omission of six outliers and the tests for skewness, Pearson correlations were computed, followed by a multiple regression to see which Wechsler variable or variables best predicted the three RCF test indices. Lastly, an analysis of the residuals was used to establish a confidence band that could provide a statistically supported interpretation of the discrepancy between the RCF and the Wechsler scale(s), to describe “how much of the variation cannot be explained” (Field, 2013, p. 553).

# CHAPTER FOUR: RESULTS AND DISCUSSION

## Results

A review of the skewness and kurtosis indices revealed that both data sets (the Wechsler scales and the Rey test were normally distributed, thus allowing for parametric statistical tests (rather than non-parametric tests). As a group, the mean Wechsler scale scores and the mean RCF scores were within the average range. Statistically significant correlations were found among three of the four Wechsler indices and the three RCF indices. Mild to moderate correlations were noted between the Verbal Comprehension Index and RCF and between the Processing Speed Index and the RCF while stronger correlations were found with the full scale IQ and the Perceptual Reasoning Index. As expected, the Perceptual Reasoning Index was most highly associated with the three RCF indices.

A multiple regression, using the four Wechsler indices as the predictor variables with the three individual RCF indices as the predicted variable, revealed that the PRI accounted for the bulk of the variance. This was computed using the "Enter" method and is shown in Table 1. Next, a linear regression using just the PRI to predict each of the three RCF indices revealed statistically significant results. Specifically, when using the PRI to predict the RCF Immediate Memory score, the resulting r. value was .602 ($F$ = 35.23, $df$ = 1, $p$ = .000). For the Delayed

Memory score, the resulting r. value was .591 ($F = 32.78$, $df = 1$, $p = .000$) and for the Recognition Memory score the resulting r. was .332 ($F = 7.06$, $df = 1$, $p = .010$).

Lastly, by using the residuals and their distribution, the standard deviation of the predicted value revealed a T-score discrepancy of plus or minus 8.1 points when using the PRI in combination with the Immediate Memory score. This means that given any PRI score, 68% of the time the RCF Immediate T-score will fall 8.1 points above or below that score. For the Delayed Memory, the standard deviation of the predicted value was 7.7 and for the Recognition T score it was 4.2. These results are provided in Table 2.

**Discussion**

There were two hypotheses for this study—that the nonverbal aspects of the Wechsler scales would reliably predict scores on the Rey Complex Figure and that an index of statistical difference could be generated for each aspect of the RCF. Both hypotheses were confirmed, although all four of the Wechsler indices, when used together, generated higher correlations than the Perceptual Reasoning Index. The Perceptual Reasoning Index accounted for the most variance on the Rey Immediate, Rey Delayed, and Rey Recognition scales. The Perceptual Reasoning Index best predicted the Recognition memory score from the RCT, followed by the Delayed score and the Immediate memory score. All three correlations were statistically significant at $p = .01$ or less. Regarding the second hypothesis, and by using the correlations between the PRI and the Rey scales, a 68% confidence band was generated. This confidence band permits examiners to determine when differences between the PRI and the different Rey scales becomes statistically uncommon. This is meaningful since no research was found that statistically compared the Wechsler scales and the RCF with the intention of determining when a difference between the two measures is meaningful and not simply due to chance.

# CHAPTER FIVE: IMPLICATIONS, LIMITATIONS, AND FUTURE RESEARCH

## Implications

Intelligence tests are used frequently in schools to determine eligibility for special educational programming and in clinical settings with children and adults to determine eligibility for accommodations, to diagnose learning and intellectual disabilities, and as part of a neuropsychological battery to determine the nature and extent of one's functional abilities (Disability Benefits Help, 2019). Recently there has been an increased focused on memory abilities when measuring a student's processing abilities, particularly in regard to the processing model of determining eligibility for learning disabilities (Carmichael et al., 2014). Memory tests are routinely used in clinical settings (that is, non-school settings) as part of a battery of tests to explore an individual's neuropsychological functioning, for example, in cases where Alzheimer's or traumatic brain injury is suspected (Bigler, Rosa, Schultz, Hall, & Harris, 1989). Despite the use of memory tests, no research to date has specifically examined the relationship between commonly used measures of intelligence (i.e., Wechsler scales) and the Rey Complex Figure test, a measure of visual memory, with the purpose of determining when differences in scores between the two tests are uncommon or meaningful. The association between IQ tests and memory tests has been known for some time (Chinulli et al., 1989; Lipowska, Czaplewska, & Wysocka, 2011); this correlation renders interpretation of memory tests especially difficult, particularly when IQ scores and memory scores are similar. In essence, it is difficult to know when to attribute low memory scores to poor memory or to low IQ.

When using the Rey Complex Figure in conjunction with IQ tests, whether in schools or in rehabilitation or clinical settings, examiners should consider the natural overlap between the two measures and to interpret low (or high) memory scores in relation to unexpected differences. The results of this study establish the discrepancy needed between the nonverbal aspects of the Wechsler IQ and the RCF in order to interpret the memory results as a separate construct from the nonverbal IQ. Specifically, differences between the PRI and the RCF Immediate Recall and the Delayed Recall of 8 T-score should be considered statistically different; differences of 4 T-score points between the PRI and the Recognition index should be considered statistically significant. These statistically significant differences are associated with a 68% confidence band, meaning that one can be 68% confident that such differences are real. By essentially doubling these values, one can be 95% confident that differences are real. Which discrepancy to employ (the 68% or 95%) should be left to the judgment of the clinician.

Within a school system, students are expected to learn to identify letters, read individual words, comprehend the meaning of words and comprehend the overall meaning of sentences. They also read paragraphs, articles, and stories, learn to write legibly, and write in a way so that others can determine the student's understanding of the material. Similarly, they identify numbers, effectively solve mathematical problems to varying degrees of difficulty, with increasing speeds, are also required to learn, and abide by, rules during their school day, in addition to other factors relevant to the school day. Achieving these goals requires memorization in order to become proficient with one's academic functioning. When students are referred for special education, school psychologists are likely to find lower than average Working Memory scores. According to Gathercole, Alloway, Willis, and Adams (2006) one's ability to develop skills in reading and math is negatively impacted in those with Working Memory deficits (as cited in Carmichael et al., 2014). However, a student's memory, alone, is not tested. Using the RCF within a school-based evaluation could help to elaborate on deficits the student may be exhibiting in the classroom and other settings.

**Limitations**

As with all research, this study has limitations that hinders its generalizability. First, the sample represented one of convenience and was not random, since all 64 participant files were obtained from one clinic, where clients came because of known or suspected disabilities or difficulties. Next, the individual clients who visited the clinic where the data sets were obtained represented a range of different presenting problems (e.g., learning, attention, mood, behavior problems) and ages. It could be, for example, that consumers with learning problems might demonstrate more differences between the PRI and the RCF than those with mood or behavior problems. Similarly, discrepancies between the PRI and the RCF could increase as one ages, due to age-related memory decline. Lastly, the sample was primarily Caucasian. This will limit generalizability of the current study to Caucasians.

**Future Research**

Future researchers interested in this subject should consider obtaining a more homogeneous sample regarding the reason for referral and obtaining samples from children, adolescents, adults, and older adults. Specifically, it would help to investigate the relationship between nonverbal intelligence and nonverbal memory in a nonclinical population, a population of children and adults referred for learning disabilities in distinctive subject areas, and a population of children and adults referred for ADHD. This is especially relevant since individuals suspected of learning disabilities and ADHD often exhibit problems with memory and/or executive functioning (Hale & Fiorello, 2004). Post-evaluation data (e.g. diagnosis/es) should account for the overlap in clients with a history or presentation of ADHD and those with Specific Learning Disabilities. Learning Disabilities are, by definition, expansive in terms of the processes/abilities effected, therefore future research must differentiate between types of Learning Disabilities to determine underlying deficits, related to each area (Hale & Fiorello, 2004). Researchers could expand this study by examining the association between other measures of intelligence (such as the current versions of the Stanford-Binet, Woodcock-Johnson Tests of Cognitive Abilities, and Kaufman Assessment Battery for Children) and other measures of visual memory (such as the Children's Memory Scale, the Wechsler Memory Scale, and the Test of Memory and Learning). Additionally, more racially diverse samples would help with generalizability.

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# Tables

Table 1.

*Results of Multiple Regression using Wechsler Scales to Predict Rey Figure Tests*

| Wechsler Variables | Rey Variables | *r.* | *F* | *df* | *p* |
|---|---|---|---|---|---|
| Four Indices | Rey Immediate | .659 | 7.47 | 4 | .000 |
| Four Indices | Rey Delayed | .667 | 7.63 | 4 | .000 |
| Four Indices | Recognition | .492 | 3.11 | 4 | .026 |
| PRI | Rey Immediate | .602 | 35.23 | 1 | .000 |
| PRI | Rey Delayed | .591 | 32.78 | 1 | .000 |
| PRI | Recognition | .322 | 7.06 | 1 | .010 |

*N* = 64

Table 2.

*Standard Deviation of the Rey Complex Figure Predicted Values*

| Index | 68% Confidence Band | 95% Confidence Band |
|---|---|---|
| Immediate Memory | +/- 8.1 | +/- 15.36 |
| Delayed Memory | +/- 7.7 | +/- 15.092 |
| Recognition Memory | +/- 4.2 | +/- 8.232 |

*N* = 64