PART

II

Assessment

CHAPTER

6

Assessment of Cognitive and Neuropsychological Processes

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INTRODUCTION

Assessment of intelligence plays an important role in the process of determining if an adolescent or adult has a disability. For those suspected of having a Specific Learning Disability (SLD), the intelligence test provides an important reference point to compare to levels of achievement. For those who may have Attention-Deficit/Hyperactivity Disorder (ADHD), the measure of intelligence is used to rule out other disabilities that may better explain the person's behavior. Intelligence tests have and will continue to provide a critical component of any comprehensive assessment needed to determine the presence of disabilities, such as SLD and ADHD. Their importance, however, demands a thorough understanding of the strengths and limitations of these tests of ability, an appreciation of the research on their effectiveness, and an examination of modern views of assessing intelligence. The goal of this chapter is to address these issues.

This chapter reexamines intelligence as measured by traditional IQ tests with special attention to the utility such tests have for diagnosis. In order to achieve this goal, the chapter includes a brief overview of the history and definitions of intelligence and examines examples of measures of intelligence more closely. Emphasis will be placed on the importance of understanding how intelligence is conceptualized and measured by different tests and the implications this has for assessment. The chapter also provides a conceptual model of assessment of basic psychological processes and how that information can aid in the diagnostic process and treatment of adolescents and adults.

DEFINITIONS OF LEARNING AND ATTENTION DISORDERS

Learning Disabilities and IQ

Learning Disabilities (LD) are defined in the *Diagnostic and Statistical Manual of Mental Disorders* (4th ed., text revision; *DSM-IV-TR*) (American Psychiatric Association [APA], 2000) on the basis of an inconsistency between ability and achievement (reading, math, or written expression, or a nonspecified area) when that difference is not better accounted for by inadequate education, cultural or ethnic differences, impaired vision or hearing, or mental retardation. The definition of LD included in the *DSM-IV* is based on finding achievement scores on individually administered, standardized tests in reading, mathematics, or written expression that are substantially below that expected for age, schooling, and level of intelligence. The size of the discrepancy should be more than 2 standard deviations, but a difference of at least 1 standard deviation is acceptable if the IQ test score may have been influenced by an associated disorder in cognitive processing, a mental disorder, or the ethnic or cultural background of the individual. Importantly, LD should significantly interfere with achievement or daily living that involves reading, math, or writing. The *DSM-IV* also recognizes that problems with cognitive processing (e.g., deficits in visual perception, linguistic processes, attention, or memory) may have preceded or are associated with LD.

The term "Specific Learning Disability" is defined in the Individuals with Disabilities Education Act (IDEA) and is used for students up to age 21 as specified by the U.S. federal government. This definition has similarities and differences from that used in the *DSM-IV*. The similarities include an academic failure despite evidence that the student's scores are not better explained by inadequate education, cultural or ethnic differences, or impaired vision or hearing, mental retardation, or other disability. The differences between IDEA and *DSM-IV* include: (a) the age range for which the definition applies; (b) the disability is described as a "specific" learning disability; and (c) the definition of the disability is a disorder in basic psychological processes. The definition is:

> Specific learning disability means 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, read, write, spell, or to do mathematical calculations. The term includes such conditions as perceptual handicaps, brain injury, minimal brain dysfunction, dyslexia, and developmental aphasia. The term does not include children who have problems that are primarily the result of visual, hearing, or motor disabilities, or mental retardation, emotional disturbance, or of environmental, cultural, or economic disadvantage. (IDEA, 2004)

The two different approaches to defining SLD reflect differences in the field regarding the best way to conceptualize and operationalize identification of the disorder. Insofar as assessment of adolescents and adults is concerned, both the *DSM-IV* and IDEA definitions involve some kind of academic skills deficit despite adequate instruction, making the evaluation of achievement a critical component of the comprehensive assessment. These two definitions also involve assessment of ability, defined either as traditional IQ or as some measure of basic psychological process to establish an ability achievement difference. Such a difference provides evidence of unexpected poor performance relative to ability. Importantly, both approaches to diagnosis stress the importance of ensuring that cultural or linguistic issues do not influence the scores obtained on these tests and thereby bias the process.

ADHD and IQ

The essential feature of ADHD described in the *DSM-IV* (APA, 2000) is a "persistent pattern of inattention and/or hyperactivity-impulsivity that is more frequently displayed and more severe than is typically observed in individuals at a comparable level of development" (p. 78). The diagnostic criteria for the three subtypes of ADHD are:

A. Persistent pattern of inattention and/or hyperactivity-impulsivity that is more frequently displayed and is more severe than is typically observed in individuals at comparable level of development. Individual must meet criteria for either (1) or (2):

   (1) Six (or more) of the following symptoms of inattention have persisted for at least six months to a degree that is maladaptive and inconsistent with developmental level:

   Inattention

   (a) often fails to give close attention to details or makes careless mistakes in schoolwork, work or other activities
   (b) often has difficulty sustaining attention in tasks or play activity
   (c) often does not seem to listen when spoken to directly
   (d) often does not follow through on instructions and fails to finish schoolwork, chores or duties in the workplace (not due to oppositional behavior or failure to understand instructions)
   (e) often has difficulty organizing tasks and activities
   (f) often avoids, dislikes, or is reluctant to engage in tasks that require sustained mental effort (such as schoolwork or homework)
   (g) often looses things necessary for tasks or activities (e.g., toys, school assignments, pencils, books or tools)
   (h) is often easily distracted by extraneous stimuli
   (i) is often forgetful in daily activities

   (2) Six (or more) of the following symptoms of hyperactivity-impulsivity have persisted for at least six months to a degree that is maladaptive and inconsistent with developmental level:

Hyperactivity

(a) often fidgets with hands or feet or squirms in seat
(b) often leaves seat in classroom or in other situations in which remaining seated is expected
(c) often runs about or climbs excessively in situations in which it is inappropriate (in adolescents or adults, may be limited to subjective feelings of restlessness)
(d) often has difficulty playing or engaging in leisure activities quietly
(e) is often "on the go" or often acts as if "driven by a motor"
(f) often talks excessively

Impulsivity

(g) often blurts out answers before questions have been completed
(h) often has difficulty awaiting turn
(i) often interrupts or intrudes on others (e.g., butts into conversations or games)

B. Some hyperactive-impulsive or inattentive symptoms must have been present before age 7 years.

C. Some impairment from the symptoms is present in at least two settings (e.g., at school [or work] and at home).

D. There must be clear evidence of interference with developmentally appropriate social, academic or occupational functioning.

E. The disturbance does not occur exclusively during the course of a Pervasive Developmental Disorder, Schizophrenia, or other Psychotic Disorders and is not better accounted for by another mental disorder (e.g., Mood Disorder, Anxiety Disorder, Dissociative Disorder, or a Personality Disorder) (APA, 2000, pp. 92–93).

The three subtypes of ADHD are:

ADHD, Predominantly Inattentive Type: This subtype is used if 6 (or more) symptoms of inattention (but fewer than 6 symptoms of hyperactivity-impulsivity) have persisted for at least 6 months.

ADHD Predominantly Hyperactive-Impulsive Type: This subtype should be used if 6 (or more) symptoms of hyperactivity-impulsivity (but fewer than 6 of inattention) have persisted for at least 6 months.

ADHD Combined Type: This subtype should be used if 6 (or more) symptoms of inattention and 6 (or more) symptoms of hyperactivity-impulsivity have persisted for at least 6 months.

Adolescents with ADHD are identified within the schools using the *Other health impairment designation* in IDEA, which is described without specific reference to IQ in this way:

> Other health impairment means having limited strength, vitality, or alertness, including a heightened alertness to environmental stimuli, that results in limited alertness with respect to the educational environment, that
> (i) Is due to chronic or acute health problems such as asthma, attention deficit disorder or attention deficit hyperactivity disorder, diabetes, epilepsy, a heart condition, hemophilia, lead poisoning, leukemia, nephritis, rheumatic fever, sickle cell anemia, and Tourette syndrome; and
> (ii) Adversely affects a child's educational performance. (*U.S. Department of Education*, 2006, p. 46757)

The role IQ tests have in diagnosis of these two disorders differs in that ability is necessary for meeting the requirements of the *DSM-IV* when assessing children with SLD but not for ADHD. For SLD, IQ plays a key role in differentiating those whose low achievement is related to low ability (e.g., no discrepancy between IQ and achievement) and those for whom achievement is unexpected given their overall ability (Kavale, 2002). For ADHD, IQ is used to determine if the symptoms related to this disorder are related to a disorder other than attention deficit. In both these instances, however, the way in which intelligence is measured has a direct impact on the information that is received. This fact can lead to obstacles for individuals with disabilities as well as those from culturally and linguistically diverse populations. It is important to reexamine the scores obtained using these various measures of ability.

HOW IS IQ MEASURED?

IQ has been measured for more than 100 years using verbal, quantitative, and nonverbal test questions. The tests of today were initially formulated in 1905 (Binet & Simon, 1905) and in 1939 with the publication of the Wechsler-Bellevue Scales (Wechsler, 1939). These tests measure *general ability* through questions that can be described as verbal (e.g., vocabulary or word analogies), performance (arranging blocks to match a simple design or assembling puzzles to make a common object), or quantitative (e.g., math word problems or math calculation). The performance tests have been described as nonverbal because it is an easier concept to understand, not because of any intention to measure nonverbal ability. Similarly, the verbal tests have come to be described

as measures of verbal ability. In fact, these tests were developed without a theoretical basis, as noted by Pintner (1923) when he wrote, "we did not start with a clear definition of general intelligence . . . [but] borrowed from every-day life a vague term implying all-round ability and . . . we [are] still attempting to define it more sharply and endow it with a stricter scientific connotation" (p. 53). Despite the theoretical limitations, these tests represent one of the most influential contributions made by psychology to society in general (Anastasi & Urbina, 1997). They also have become ingrained in our culture as *the* way to measure ability.

There is considerable empirical support for the concept of general intelligence (see Jensen, 1998, for a review), especially when measured by tests such as the Wechsler and the Stanford-Binet. Among the most important sources of validity evidence for IQ tests is the fact that the tests predict school achievement, even though they do not correlate more highly with achievement than more modern measures of intelligence (Naglieri & Bornstein, 2003; Ramsey & Reynolds, 2004). Researchers have recognized that the content of the verbal and quantitative tests on these measures of ability are often similar to those included on tests of achievement. This is problematic for individuals who have a history of academic failure due to a disability or have had limited opportunity to learn and therefore have not had the chance to acquire verbal and quantitative skills. Suzuki and Valencia (1997) argued that verbal and quantitative questions found on most traditional IQ tests interfere with accurate assessment, especially for minority children.

Test questions that require knowledge of English are found on both traditional IQ tests and measures of achievement. For example, IQ tests require knowledge of English, and sometimes very similar words are used on both types of tests. For example, examinees are required to define a word like "bat" on subtests included in the Stanford-Binet-5 or Wechsler Intelligence Scale for Children–4th Edition intelligence tests and the Woodcock-Johnson Tests of Achievement (WJ-III Achievement; Woodcock, McGrew, & Mather, 2001a). The WJ-III Tests of Cognitive Abilities (WJ-III Cognitive; Woodcock, McGrew, & Mather, 2001b) battery contains a Verbal Comprehension subtest that has an item similar to "Tell me another word for small." The WJ-III Achievement contains a Reading Vocabulary question like, "Tell me another word for little." In addition, an item on the WJ-III Achievement Reading Vocabulary test is something like, "Tell me another word for (examiner points to the word big)," and in the WJ-III Cognitive, the examiner asks something like, "Tell me another word for tiny." Additionally, the WJ-III Cognitive Verbal Comprehension test contains Picture Vocabulary items, and the WJ-III Achievement includes Picture Vocabulary items, some of which are very similar. The lack of distinction between these items exaggerates the relationship between IQ and achievement (Naglieri & Bornstein, 2003).

The Stanford-Binet-5 (SB-5 Roid, 2003) includes Quantitative Reasoning questions that, for example, require the student to calculate the total number of circles on a page

(e.g., 3 circles in one box plus 4 in a second box plus 1 in a third box). The same type of question appears on the Wechsler Adult Intelligence Scale–4th Edition (WAIS-IV; Wechsler, 2008) Arithmetic subtest, which requires the examinee to answer word problems read by the examiner (e.g., Bob has 20 toys and 5 children; if each child gets the same number of toys, how many toys will each child have?). Tests of achievement require these same skills. For example, on the WJ-III Achievement Applied Problems subtest, items are also math word problems (e.g., A boy saved 50 cents each week for 2 years; how much did he have?). Similarly, an SB-5 Quantitative Reasoning item requires the child to complete a simple math problem (e.g., 4 + 2 = ?) just as the WJ-III Achievement test on Math Fluency (e.g., 7 + 2 = ?) and the Wechsler Individual Achievement Test–2nd Edition (WIAT-II; Wechsler, 1992) on Numerical Operations (e.g., 3 + 2 = ?) do.

The similarity of questions on tests of ability and achievement increases their apparent validity when the IQ and achievement tests are correlated. And although it is reasonable that verbal and math skills should be part of a test of achievement, the inclusion of these test questions on measures of ability is problematic for two reasons. First, there are many adolescents and adults who have had a low-quality education. For example, Hispanics age 25 and older are less likely to have a high school diploma (57%) than non-Hispanic Whites (88.7%). Importantly, 27.0% of Hispanics have less than a ninth-grade education compared with only 4.0% of non-Hispanic Whites, and only 14.2% of Hispanics are in managerial or professional occupations compared with 35.1% of non-Hispanic Whites (Ramirez & de la Cruz, 2002). In order to equitably evaluate the level of ability for a population such as this, or any others with limited opportunity to learn due to some SLD, tests that do not assess intelligence using verbal and quantitative skills are necessary. Second, because when SLD is defined as an ability/achievement discrepancy, the similarity in the content of the two tests decreases the probability that the scores will differ. What is known about the performance of individuals with SLD and ADHD and those with limited academic skills on these measures of ability?

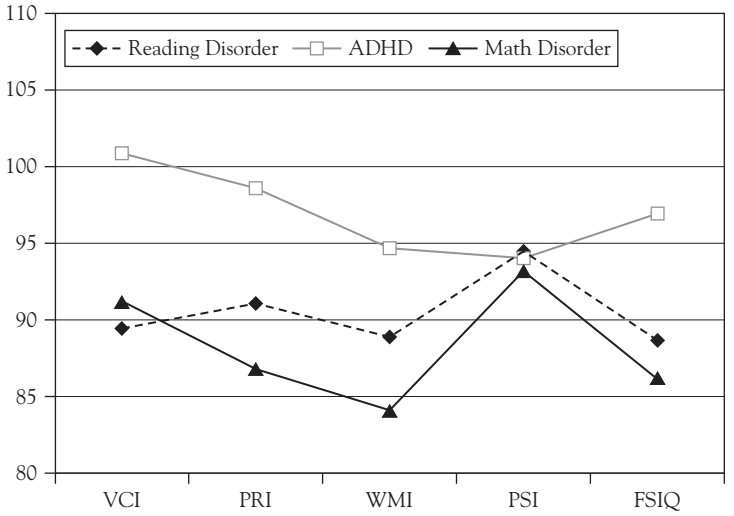
GROUP PROFILES BY ABILITY TEST

Because ability tests play such an important role in the diagnostic process, it is crucial to understand the sensitivity each test may have to any unique characteristics of those with an SLD or attention deficit. Clinicians need to know if an adolescent or adult has a specific deficit in ability that is related to a specific academic learning problem. There has been considerable research on, for example, Wechsler subtest profile analysis, and most researchers conclude that no profile has diagnostic utility for individuals with SLD or ADHD (Kavale & Forness, 1995). The failure of subtest profiles has led some to argue (e.g., Naglieri, 1999) that scale, rather than subtest, variability should

be examined, especially if the separate scales have ample theoretical and empirical support. In the sections that follow, research on the scale profiles is presented first for those ability tests that are used for adolescents and adults, and then for those that can be used only with adolescents. The goal is not to describe these instruments; interested readers should examine their respective test manuals. Instead, the goal is to examine the mean scores of the scales from each test. This examination helps us understand if the ability test shows a particular pattern for a specific clinical group. Such information could have important implications for understanding the cognitive characteristics of that clinical group and allow for possible diagnostic and intervention considerations. These findings, however, must be taken with recognition that the samples are not matched across the various studies, the accuracy of the diagnosis may not have been verified, and some of the sample sizes may be small. Notwithstanding these limitations, the findings do provide important insights into the extent to which these various tests can be used for assessment of adolescents and adults suspected of having an SLD or attention deficit.

WAIS-IV

The WAIS-IV manual (Wechsler, 2008) is a valuable resource for information about the performance of several diagnostic groups on the test. The research evidence was drawn from a variety of clinical settings using well articulated criteria for inclusion. The manual states that limitations regarding these samples included: lack of random selection, diagnostic procedures may have varied from clinician to clinician, sample sizes were limited, and the groups were not necessarily representative of the diagnostic or national sample. Despite these limitations, the data do provide some useful information. Figure 6.1 provides a summary of the WAIS-IV research for groups of individuals with Reading Disabilities (RD), Math Disorder (MD), and attention deficits. These three groups were mostly diagnosed according to the *DSM-IV-TR* or, for the SLD students, a discrepancy between ability and achievement as specified by school district guidelines. The WAIS-IV manual also provides comparisons to matched control groups. The results suggested that individuals with RD had low scores on all the scales with the highest score on the Processing Speed Index (PSI). Similarly, the group with MD was low on all scales except PSI. Interestingly, this group was lowest on the Working Memory Index (WMI). The mean Verbal Comprehension Index (VCI) and Perceptual Reasoning Index (PRI) scores of the group with ADHD were about average, and the WMI and PSI scales were only slightly lower. In summary, these findings suggest that the WAIS-IV Index profiles for individuals with RD and MD were similar in shape. The group with MD typically earned lower means with the exception of the VCI and PSI, on which the groups differed minimally. The sample of individuals with ADHD was generally average with somewhat lower scores on the WMI and PSI scales.



Note: VCI = Verbal Comprehension Index; PRI = Perceptual Reasoning Index; WMI = Working Memory Index; PSI = Processing Speed Index; FSIQ = Full Scale IQ.

Figure 6.1 Graphic Representation of Mean Scores for Various Groups on the WAIS-IV

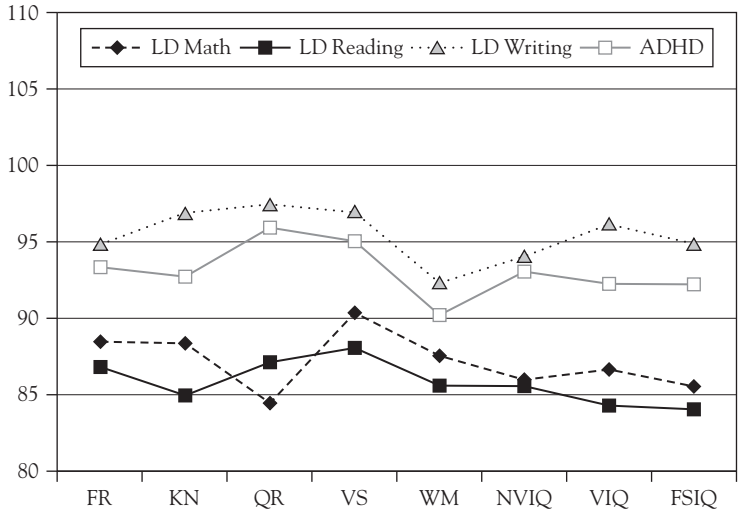
All three groups earned essentially the same PSI mean score. These findings do not suggest that there are distinctive profiles for these groups of individuals, although analysis of the frequency of individual WAIS-IV profiles could yield useful information.

SB-5

The SB-5 (Roid, 2003) manual provides helpful information about scale profiles for students with LD in math ($N = 49$), reading ($N = 212$), and writing ($N = 44$), and those with ADHD ($N = 94$). The groups were identified by school district personnel and enrolled in public school programs. The method used for diagnosis of the children and adolescents with ADHD was not specified. The results illustrated in Figure 6.2 suggest that these various groups had some similarities and differences. For example, the group with ADHD had a low score on Working Memory, as did the group with a Writing Learning Disability. These two groups showed considerable similarity in profiles across the SB-5 scales. The groups with Reading and Math disabilities were similar on all scales, except the group with Math disability had a low score on the Quantitative scale. Interestingly, the highest SB-5 scores were obtained by the sample of students with a learning disability in writing. These comparisons need to be considered in light of the fact that there was no matching of samples on the basis of demographic variables, which could have influenced the findings.

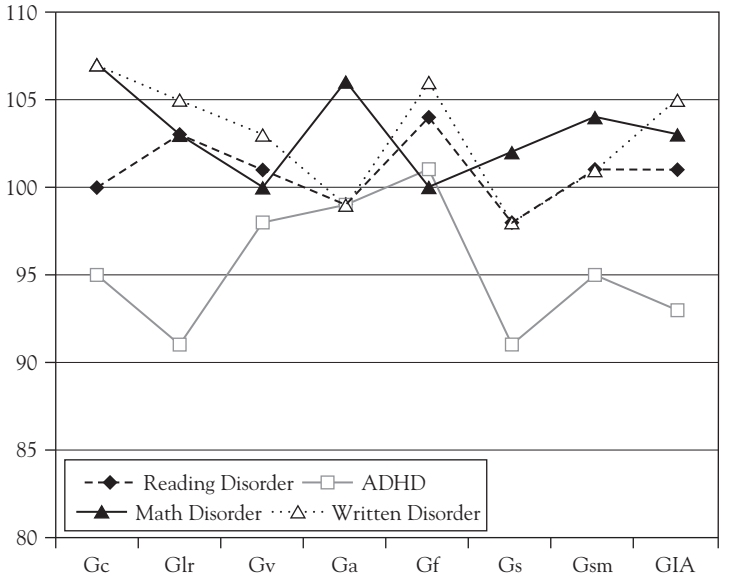
WJ-III

Wendling, Mather, and Shrank (2009) provide a summary of the performance of individuals greater than 18 years of age on the WJ-III. The samples utilized in their



Note: FR = Fluid Reasoning; KN= Knowledge; QR = Quantitative Reasoning; VS = Visual-Spatial Processing; WM = Working Memory; NVIQ = Nonverbal IQ; VIQ = Verbal IQ; FSIQ = Full Scale IQ.

Figure 6.2 Graphic Representation of Mean Scores for Various Groups on the SB-5



Note: Gc = Comprehension-Knowledge; Glr = Long-Term Retrieval; Gv = Visual-Spatial Thinking; Ga = Auditory Processing; Gf = Fluid Reasoning; Gs = Processing Speed; Gsm = Short-Term Memory; GIA = General Intellectual Ability.

Figure 6.3 Graphic Representation of Mean Scores for Various Groups on the WJ-III

study differed for each variable. For example, the sample sizes for the group with ADHD ranged from 39 to 117 for the Gc (Verbal Comprehension) and Gf (Concept Formation) variables, respectively. The results provided in Figure 6.3 are also limited by the lack of matching of groups on demographic variables, yet the findings are still

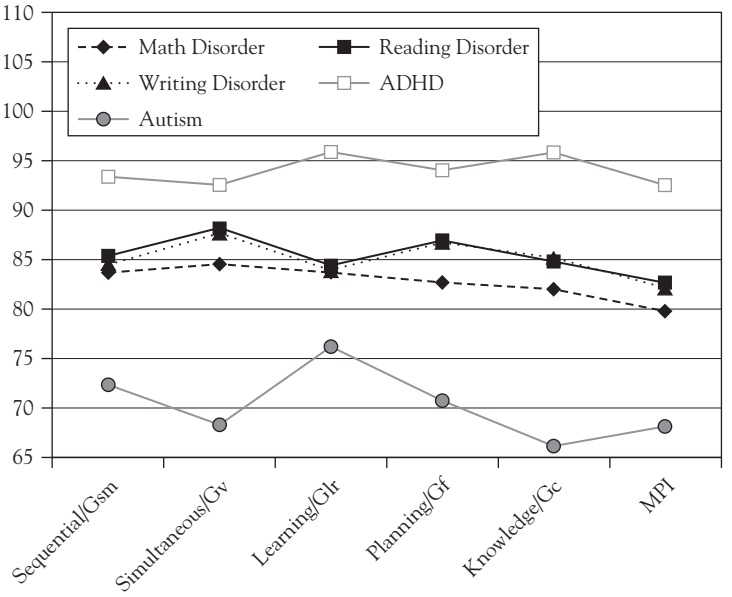
important. The individuals with WD and RD had similar profiles except for the Gc. Those with MD were similar to the group with WD except for Gf and Gc. Interestingly, all of the scores for these three groups of individuals with a disorder were very close to or above 100. The sample with ADHD differed the most from the other three groups on the Glr (Visual Auditory Learning) and Gs (Visual Matching speed test).

RESULTS FOR OTHER ABILITY TESTS

Two important measures of ability can be used for adolescents but for which adult norms have not been developed. These are the Kaufman Assessment Battery for Children–2nd Edition (KABC-II; Kaufman & Kaufman, 2004) and the Cognitive Assessment System (CAS; Naglieri & Das, 1997). The KABC-II uses two different conceptual frameworks, one based on the work of A. R. Luria and another that uses the Cattell-Horn-Carroll (CHC) theory of cognitive abilities. (For more detail, see Kaufman & Kaufman, 2004, and Lichtenberger, Sotelo-Dynega, & Kaufman, 2009.) The CAS is a multidimensional measure of cognitive processing based on the Planning, Attention, Simultaneous, and Successive (PASS) theory of intelligence (see Naglieri, 1999, 2005; Naglieri & Das, 1997). These two instruments were designed to measure intelligence from a cognitive processing perspective and therefore utilize tests developed to measure abilities apart from verbal and quantitative skills. There are several sources of information about the profiles these tests yield for children and adolescents with various LD.

KABC-II

The KABC-II manual provides information about scale profiles for a variety of special populations. The clinical validity studies were conducted during standardization of the test, and only those cases that met specific classification criteria of the diagnostic category were used. Figure 6.4 provides a summary of the KABC-II findings for groups of individuals with RD, MD, Writing Disorder (WD), and ADHD. The test manual also provides comparisons to groups applying statistical controls for differences in demographic variables. The results suggest that groups with RD and WD were very similar; both had their lowest scores on Learning and Sequential scales. The group with WD was generally similar across all KABC-II scales. All three of these groups earned mean scores that were less than 90. In contrast, the group with ADHD earned higher scores that were similar and ranged from 93 to 96. The sample with autism was generally low on all variables and differed from the other groups on that basis. These findings suggest that there are no distinctive profiles for these groups of individuals, although analysis of each child's individual profiles could yield useful information in clinical settings.



Note: Glr = Long-Term Retrieval; Gv = Visual-Spatial Thinking; Gf = Fluid Reasoning; Gsm = Short-Term Memory; Gc = Crystallized; MPI = Mental Processing Index.

Figure 6.4 Graphic Representation of Mean Scores for Various Groups on the KABC-II

CAS

The CAS manual provides research on PASS scale profiles for a variety of special groups. The samples were conducted during standardization of the test using specific classification criteria for each diagnostic category, but like the data provided earlier, the samples were not matched on basic demographic characteristics. Findings for the CAS are provided in the manual (Naglieri & Das, 1997) for individuals with RD (N = 22) and ADHD (N = 66). These samples were combined with more recent studies of children with ADHD (Naglieri, Goldstein, Iseman, & Schweback, 2003; Van Luit, Kroesbergen, & Naglieri, 2005), RD (Naglieri, Otero, DeLauder, & Matto, 2007), and Autism Spectrum Disorder (Goldstein & Naglieri, 2009). The results presented in Figure 6.5 suggest that groups with RD and attention disorders were similar on Simultaneous and Attention scales but not on Planning and Successive scales. The group of students with ADHD had a specific weakness in Planning, and those in the RD group had a specific weakness in Successive processing ability. The group with autism showed a different profile: specifically, low on the Attention scale. These findings suggest that these three groups showed different PASS profiles that are related to their respective cognitive descriptions seen in the literature. That is, the low score in Planning supports Barkley's (1997) view that ADHD involves problems with behavioral inhibition and self-control, which is associated with poor executive control (Planning, as described by Goldberg, 2002, and Naglieri & Das, 2005).

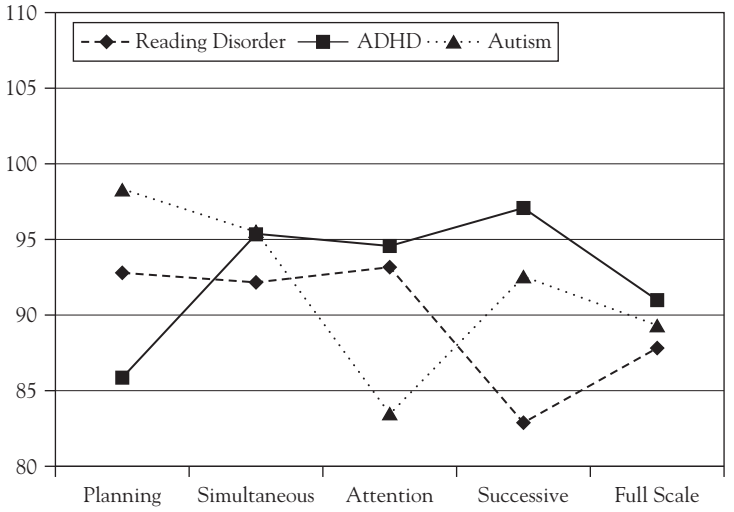


Figure 6.5 Graphic Representation of Mean Scores for Various Groups on the CAS

Low scores in Successive processing for the sample with reading decoding problems is consistent with the phonological skills deficit these individuals, experience (Das, Naglieri, & Kirby, 1994). Children with autism have been described as having difficulties in shifting attention (Klinger, O'Kelly, & Mussey, 2009), which was supported by these CAS data.

PROFILES ACROSS ABILITY TESTS

Groups with RD

The comparison of scale profiles for individuals with RD across the various ability tests is shown in Figure 6.6. Examination of the mean scores by scale for the several ability tests suggests that some are more sensitive to the cognitive characteristics of individuals with RD than others. The WAIS-IV, WJ-III, SB-5, and KABC-II showed relatively little variability within each test with a range of means of 5.6, 6.0, 3.8, and 3.8 standard scores, respectively. That is, the pattern of scores on the separate scales of which these tests are comprised did not suggest that a specific cognitive disorder was uncovered. The sample of individuals with RD earned their lowest score on the WJ-III Processing Speed (98), which was a few points higher than their PSI on the WAIS-IV (standard score of about 95). The WJ-III PSI scores were the lowest score on that test but the WAIS-IV PSI score was the highest of the four scores on that test. Interestingly, the individuals with RD earned scores that clustered around 90 on the WAIS-IV and 100 on the WJ-III. In fact, none of the WJ-III scores was less than 98.

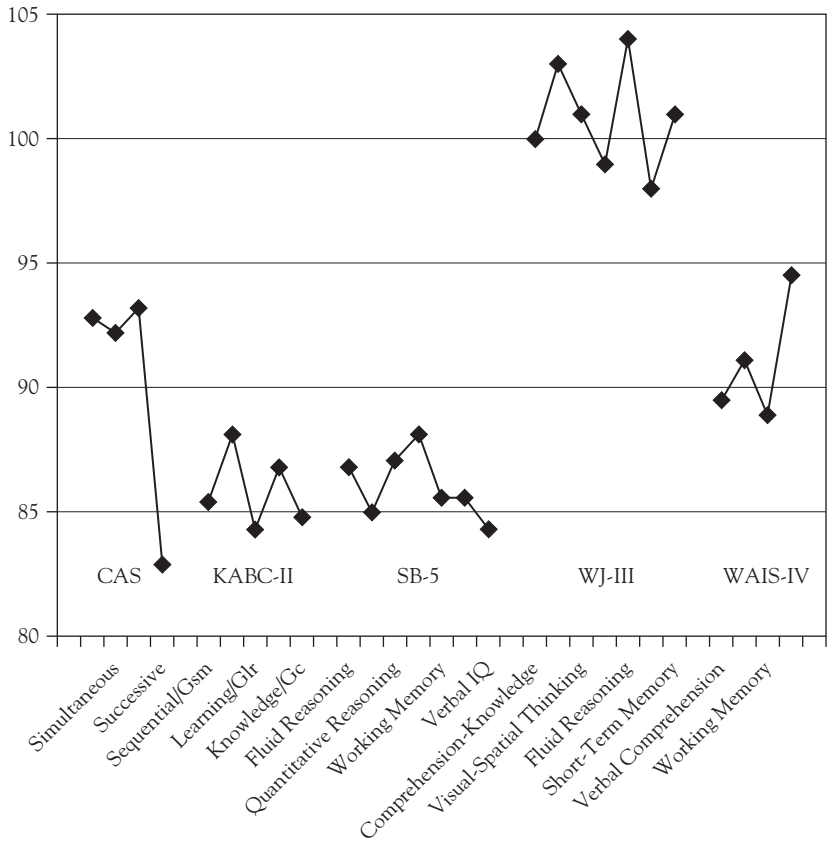


Figure 6.6 Graphic Representation of Mean Scores for Individuals with RD across Several Tests of Ability

These findings suggest that the WJ-III yielded the highest scores among the five ability tests and none of that test's scale mean scores indicated that as a group, these individuals with RD were below normal. Both the SB-5 and the KABC-II scores were around 86, but also with a relatively small range. That is, these two tests did not show evidence of a specific cognitive weakness but rather overall depressed performance.

The group with RD earned scores that ranged from 83 on the CAS Successive processing scale to a high score of 93 in Planning ability (range of scores is 10 points). The CAS showed the most variability; there were scores in the average range (Planning, Simultaneous, and Attention) and one score that was at about the 12th percentile. The CAS profile for the sample with RD suggested that this group has a specific academic (Reading) *and* a specific cognitive (Successive) weakness. This means that as a group, these individuals have difficulty working with stimuli that are arranged in a specific serial order, as in the sequence of sounds that make words, sequence of letters to spell words, and the sequences of groups of sounds and

letters needed to make words. Whereas some of the other tests do include scales that are sensitive to Successive processing ability, such as the KABC-II Sequential/Gsm scale, the remaining scales on that test were low, reducing the range of scores. The findings for the samples of individuals with ADHD are similar to those for RD.

Groups with ADHD

The mean scores by scale for the several ability tests for individuals with ADHD found in Figure 6.7 suggest that scores for most of the tests were within the 90 to 100 range. The WAIS-IV, SB-5, and KABC-II showed relatively little variability within each test (range means was 6.9, 5.7, and 3.4 standard scores, respectively). The WJ-III showed more variability (range of 10) with the lowest score (91) in Long-Term Retrieval and the highest in Fluid Reasoning. The Long-Term Retrieval (Glr) score measures "a person's facility in storing and recalling associations" (Wendling et al., 2009, p. 192)

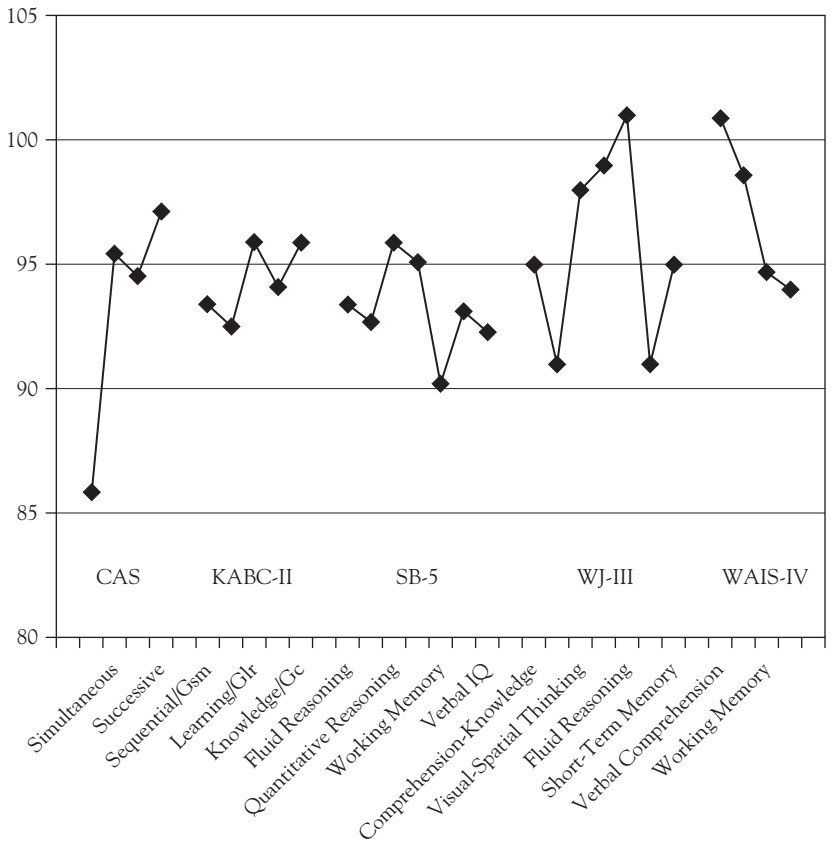


Figure 6.7 Graphic Representation of Mean Scores for Individuals with ADHD across Several Tests of Ability

using a test that requires the child to associate simple shapes and drawings with words and then to use those shapes to make a statement. The CAS showed the most variability (range of 11.3) of the five tests with the lowest score in Planning (85) and highest in Successive (97) processing abilities. This finding suggests that the sample with ADHD had considerable difficulty with use of strategies for solving problems, self-monitoring, and regulation of activity. The CAS is the only test that provides a measure of this neuopsychologically derived ability that is critical to all activities where the person has to determine how to solve a problem; the activities include self-monitoring and impulse control and generation, evaluation, and execution of strategies. This finding is consistent with Barkley's (1997) conceptualization of individuals with ADHD. That is, they have difficulty with planning and anticipation, organization, development and use of organizational strategies, and self-regulation, which, according to Goldberg (2002), is associated with the prefrontal areas of the brain and can be assessed using the Planning scale of the CAS (Goldstein & Naglieri, 2006). These findings suggest that these several tests of ability yield different information about the cognitive ability characteristics of individuals with ADHD. Like the findings for individuals with RD, these results provide some evidence that individuals with reading and attention disorders have a specific cognitive disorder detected by the CAS that helps explain their disability and has implications for intervention. In order to more explicitly explain how a disorder in one or more of the basic psychological processes could be determined, we first discuss how a cognitive process can be defined and then how this view can be applied. These questions were amply discussed by Naglieri (2008) and are summarized here.

HOW TO USE A PROCESSING APPROACH TO SLD DIAGNOSIS

In the current system based on *DSM* and IDEA, ability tests can be used in two ways:

1. A 2 standard deviation discrepancy between ability (e.g., WAIS-IV, SB-5, WJ-III) and achievement may be used.
2. Following from the definition of an SLD in IDEA, a "disorder in one or more of the basic psychological processes" may be identified using the KABC-II or CAS when there is academic failure.

When choosing a test of basic psychological processes, we suggest that the practitioner carefully examine the various options and select those tests that best meet appropriate reliability, validity, and related psychometric qualities. Choosing the best measure of basic psychological processes requires particular attention to the theory used by the test author.

DEFINING A COGNITIVE PROCESS

We suggest that the term "cognitive process" should be used to describe foundational abilities that provide the means by which individuals meet the demands of their environment. These abilities could be defined using statistical methods, such as factor analysis, or they could be defined following neuropsychologically identified abilities. We prefer the latter method. We also suggest that intelligence is best conceptualized as multiple abilities and that, although these abilities act in unison at the same time, each provides a unique contribution to the whole. A group of cognitive processes is needed to meet the multidimensional demands of our complex environment. Multiple cognitive processing abilities provide the ability to complete the same task using different types or various combinations of processes. Because the same task can be achieved using different abilities, interventions can be devised that teach a person to select the cognitive process that works best for him or her. For example, reading requires blending of the separate sounds that make the word (which involves Successive processing), but seeing the word as a whole uses Simultaneous processing.

Cognitive processes are the basis of all mental and physical activity. The application of cognitive processes leads to the acquisition of knowledge and skills. What we know and can do are the result of, not in and of themselves, a cognitive process. For example, a skill, such as reading decoding or math reasoning, is not an example of a cognitive process. A skill like reading is the application of knowledge to achieve some goal. Moreover, a specific skill, such as sound blending to make a word, is not a special type of cognitive processing but instead a basic psychological process that is specifically used for working with serial information (e.g., Successive processing from PASS theory) is used to perform this act. It is the interaction of basic cognitive processes with instruction (and related factors, such as motivation, emotional status, quality of instruction, etc.) that leads to learning and social competence.

The distinction between cognitive processes and knowledge is critical for effective assessment of ability when ability is defined from a processing perspective. Assessment of achievement must be accomplished using tests that adequately evaluate the area of interest (e.g., reading, math, etc.). Assessment of cognitive processes must be conducted using tests that are as free of academic content as possible. Separating measures of achievement and cognitive processes is essential to accurately assess these two constructs. Moreover, it is critical to recognize that while the scope of questions needed to measure knowledge in an achievement test can be aligned with recognized curriculum, cognitive processing tests should be defined by the theory they represent and constructed accordingly.

Using a carefully prescribed approach to defining a basic psychological process is essential for understanding the cognitive weaknesses that underlie both SLD and ADHD. Users should carefully select tests for this purpose and consult the test manuals

for information about the theoretical basis of the instrument as well as its psychometric characteristics and especially its validity (Naglieri & Goldstein, 2009).

DISABILITY DETERMINATION: A PRACTICAL SOLUTION

The definition of a learning disability and the method used to identify individuals with the disorder should be consistent (Hale, Kaufman, Naglieri, & Kavale, 2006; Kavale, Kaufman, Naglieri, & Hale, 2005). When using the *DSM* definition of a learning disability, it is important to look at the separate scales the test yields as well as the total IQ score in contrast to achievement test scores to compute the discrepancy. Because the *DSM* does not specify that the total test IQ score must be used, a discrepancy between separate scales from the ability and achievement tests should be examined. According to Naglieri (1999), the goal should be to find a discrepancy between ability and achievement along with a consistency between low achievement and low ability scores. This approach, called the discrepancy/consistency model, can be used with all of the IQ and processing tests described in this chapter. The model is illustrated in Figure 6.8.

When using the IDEA (2004) definition for individuals up to age 21 years, practitioners should aim to determine if the individual has a disorder in "one or more of the basic psychological processes," which is the underlying cause of an SLD. A comprehensive evaluation of the basic psychological processes unites the statutory and regulatory

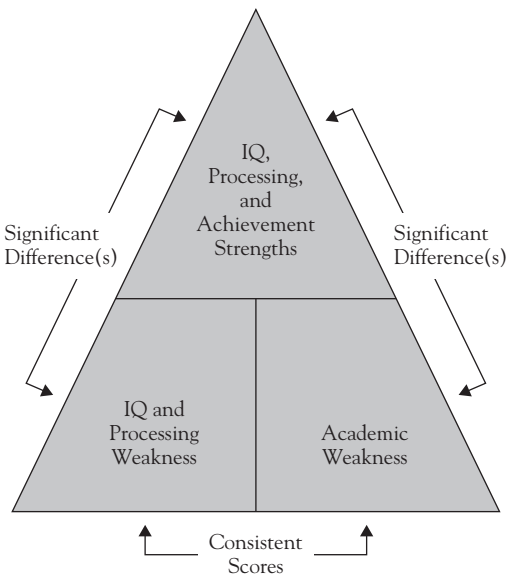


Figure 6.8 Illustration of the Discrepancy/Consistency Model for Disability Determination

components of IDEA. This unites the methods used for identification more closely with the definition, leading to a more defensible approach to diagnosis. The tools used for this assessment, however, must meet the technical criteria included in IDEA. This means valid and reliable tests that are nondiscriminatory. We suggest either the KABC-II (Kaufman & Kaufman, 2008) or the CAS (Naglieri & Das, 1997) or the forthcoming CAS-2 (Naglieri, Das, & Goldstein, in press). There is ample evidence that the CAS in particular, and the theory it was based on, meets the requirements specified in IDEA (see Naglieri, 2005, 2008; Naglieri & Conway, 2009).

Naglieri's (1999) discrepancy/consistency model includes an important component that operationalizes the notion of an exceptional (e.g., unusual) finding. That is, the low ability score should be low relative to the individual's *average* ability score. This is accomplished using the so-called ipsative method originally proposed by Davis (1959), popularized by Kaufman (1979), and modified by Silverstein (1993), which determines when an individual score is reliably different from the individual's average score. This technique has been applied to a number of tests, including, for example, the WISC-IV (Naglieri & Paolitto, 2005), the CAS (Naglieri & Das, 1997), and the SB-5 (Roid, 2003). Naglieri (1999) proposed, however, that in order to be considered evidence of a disability, the low scores should also be well below the national norm. This means that determining if a person's scores within a multiability test vary from one another is important, but the lowest score must be below some reasonable normative value (e.g., 16th percentile). For example, if an adolescent has standard scores of 104 (Planning), 96 (Simultaneous), 95 (Attention), and 84 (Successive), the Successive score is significantly different from the person's average because it is 10.75 standard score points below the mean of 94.75. (See Naglieri, 1999 for details and the values needed for significance for this test.) Because the 84 in Successive is below the person's mean *and* is well below the norm of 100, there is evidence of a disorder in one or more of the basic psychological processes. Combine low processing ability with similar variability in achievement test scores (as shown in Figure 6.8), and evidence for LD is obtained.

SUMMARY AND CONCLUSIONS

The purpose of this chapter was to examine the role various IQ tests and tests of cognitive processing play in determining if an adolescent or adult meets criteria for LD and/or ADD. We reexamined the content of IQ tests prior to looking at the validity of these instruments. In order to determine if these tests yield profiles for groups of individuals previously diagnosed, we summarized research provided by the respective test authors. Overall, we found that no distinctive IQ test profiles were found for the groups of individuals with LD. The test of basic psychological processes that did show a specific cognitive weakness (e.g., a score that was low relative to the other

scales provided on the test that were also in the average range *and* low in relation to the norm) for those with a specific reading decoding disorder was the CAS. Similarly, the only test to show evidence of a specific cognitive weakness for individuals with ADHD was also the CAS. This information is useful when the discrepancy/consistency approach is used.

The findings presented in this chapter suggest that traditional IQ tests that use subtests built on the verbal, quantitative, and nonverbal formats do not appear to be sensitive to the cognitive disorders underlying a learning or attention disorder. In contrast, the cognitive processing tests described here have more carefully defined abilities that, in the case of the CAS, do appear to identify the cognitive processing weakness for those with specific RD and ADHD. Importantly, the cognitive processing weakness found for these two groups are consistent with an understanding of each disorder. For example, those with reading decoding difficulty have problems working with information that is arranged or has to be recalled in a specific sequence (Das et al., 1994). Those with ADHD have a specific problem related to self-regulation of thoughts and actions (Goldstein & Naglieri, 2006). Knowing the cognitive processing failure related to the academic failure not only provides important information for diagnosis/eligibility, but it also provides the opportunity for successful intervention design and/or selection (see Naglieri, 2008; Naglieri & Pickering, 2010).

Since their introduction in the early 1900s, IQ tests have provided a valuable way to measure general ability. As the findings summarized in this chapter suggest, however, the tests have limited utility for diagnosis for persons with LD and ADHD. With the more recent development of new tests that measure basic psychological processes comes the hope of increased utility for diagnosis and treatment. Tests of basic psychological processes offer potential advantages by providing measures of theoretically defined constructs that appear to identify specific areas of cognitive deficits related to the academic failure. More research into the utility of these tests for diagnostic and intervention purposes is clearly warranted.

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