Seven

THE DISCREPANCY/CONSISTENCY APPROACH TO SLD IDENTIFICATION USING THE PASS THEORY

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There are many reasons why children experience academic failure (e.g., poor instruction, lack of motivation, visual or auditory problems, lack of exposure to books and reading, instruction that does not meet a child's particular style of learning, overall limited intellectual ability, a specific intellectual ability deficit, etc.). This chapter focuses on those children who have a disorder in one or more of the basic psychological processes that underlie academic success and failure; that is, children with scores on a reliable and well-validated multi-dimensional test of cognitive processes that vary from the average to the well below-average ranges, with corresponding variability in standardized achievement test scores. These children can only be identified via a comprehensive assessment using nationally normed tests that uncover the processing deficit(s) and associated academic failure, despite adequate instruction and a consideration of other exclusionary factors. These types of children would meet the criteria for a specific learning disability (SLD) as defined by the 2004 reauthorization of the Individuals with Disabilities Education Improvement Act (IDEA; see Hale, Kaufman, Naglieri, & Kavale, 2006).

This chapter is about children who have a disorder in one or more of the basic psychological processes. These children's academic failure may be exacerbated by poor instruction, but inadequate teaching did not cause the problem. These children would likely benefit from frequent progress monitoring, but ongoing progress monitoring is not enough to ensure academic success. In order to understand the reasons for academic failure, these children need to be carefully evaluated by a qualified professional who can identify a SLD on the basis of a

disorder in one or more of the basic psychological processes. Children with cognitive and academic processing deficits also require instruction that is tailored to their unique learning needs.

This chapter examines the issues related to assessment of cognitive processing, diagnosis, and intervention for children with SLD. The goal is not to compare this method to other possible options, such as response to intervention (RTI), but rather to clarify exactly how identification of children with a *specific* learning disability can be accomplished with recognition of the requirements stipulated by IDEA 2004 and the Federal Regulations (for more information see Hale et al., 2006, and Kavale, Kaufman, Naglieri, & Hale, 2005). In the remainder of this chapter the question of how to measure basic psychological processes is discussed, and details about how measuring basic psychological processes fits the federal law are provided. Next, the Discrepancy/Consistency Model is presented (with a case study), followed by a discussion of the validity of this approach.

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SLD is defined by IDEA as a "disorder in one or more of the basic psychological processes," so these must be measured for a diagnosis to be rendered.

BASIC PSYCHOLOGICAL PROCESSES

The Kaufman Assessment Battery for Children (K-ABC; Kaufman & Kaufman, 1983) was the first well-developed measure of ability to be conceptualized and developed using a cognitive processing perspective. The second test to be specifically developed using a neuropsychological perspective on ability was the Cognitive Assessment System (CAS; Naglieri & Das, 1997a). These tests provided the tools necessary to document a disorder in basic psychological processes central to SLD. That is, the "identification of a core cognitive deficit, or a disorder in one or more psychological processes, that is predictive of an imperfect ability to learn, is a marker for a specific learning disability" (p. 5), as stated by the U.S. Department of Education Roundtable (American Institutes for Research, 2002). In order to utilize a cognitive processing approach to SLD identification, three main components are needed. First, the child must have significant intraindividual differences among the basic psychological processes such that the lowest processing score is substantially below average. Second, there needs to be a significant difference between average processing scores and achievement. Third, there needs to be consistency between poor processing scores and academic deficits (Hale & Fiorello, 2004; Naglieri, 1999, 2005). This is referred to as a Discrepancy/Consistency Model by Naglieri (1999).

≡ *Rapid Reference 7.1*

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Discrepancy/Consistency Model Criteria for Determining SLD

SLD is suggested when the following criteria are met:
1. There is a discrepancy among processing scores;
2. there is a discrepancy among achievement scores;
3. there is a consistency between low processing and low achievement scores; and
4. the low scores are substantially below average.

The Discrepancy/Consistency Model could be applied using any measure of ability (see Rapid Reference 7.1). However, in this chapter the focus is on a theory of basic psychological processes called Planning, Attention, Simultaneous, and Successive (PASS) as it is measured by the CAS (Naglieri & Das, 1997a). This is intended to provide an example of how SLD can be operationalized, and the findings used for diagnostic and instructional decision making. Although this is not intended to be the only way to define what the important cognitive processes may be, PASS is a theory that has been carefully validated along several dimensions. This theory is used to present a method of examining evidence for SLD determination that is intended to be used as a part of a larger collection of data obtained within a problem-solving context. The section that follows begins with a discussion of what cognitive processes are and how they should be measured; then the PASS processing abilities will be presented, followed by a brief review of the validity of the theory.

What Is a Cognitive Process?

Before discussing the basic psychological processes called PASS, the concept of a "cognitive process" needs to be examined. The term *cognitive process* refers to a foundational, neuropsychologically identified ability that provides the means by which an individual functions in this world. A specific cognitive process provides a unique ability to function. For example, Successive processing is used to manage information that is arranged in a specific sequence. A group of cognitive processes is needed to meet the multidimensional demands of our complex environment. That is, multiple processes (e.g., Successive and Attention) provide the ability to notice (attend) the slight difference in the sequence of letters that make up two similar words, for example, *weird* and *wired*. Having several cognitive

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The cognitive demands of a task determine the type of processing needed.

processing abilities affords the capability of completing the same task using different types or various combinations of processes (this is important for intervention planning). For example, reading a word requires blending of the separate sounds that make the word, which involves Successive processing; but seeing the word as a whole involves Simultaneous processing.

Cognitive processes underlie all mental and physical activity. Through the application of cognitive processes humans acquire all types of knowledge and skills. However, it is very important to recognize that skills, such as reading decoding or math reasoning, are *not* examples of cognitive processes; these are sets of specific knowledge and skills acquired by the application of cognitive processes. Further, specific skills such as blending sounds together in order to make a word are not a special type of cognitive processing, but instead, a basic psychological process that is specifically used for working with serial information to perform this act (e.g., Successive processing). 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 separation of cognitive processes from knowledge and skills is critical for effective assessment of the basic psychological processes. Assessment of achievement must be accomplished with tests that adequately evaluate the domain 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. Having separate measures of achievement and cognitive processes maximizes the extent to which scores reflect the processing construct efficiently, rather than the combination of processing and academic skill. Moreover, it is critical to recognize that while achievement domains can be defined effectively by the content of the test, processing tests are defined by the cognitive demands of the test questions or tasks. For this reason, cognitive processes should *not* be defined by the content or modality of the task. For example, a test that is often described as an "auditory processing test" requires repetition of digits in the same sequence that was presented orally by an examiner. The essential requirement of this task is that the child retain the order of the numbers spoken by the examiner long enough to repeat them in the correct order; which means that the task requires successive (from CAS) or sequential (from K-ABC) processing. But the same task can be given visually (e.g., K-ABC Hand Movements subtest) and it still can measure

sequential processing. How can two tasks using different modalities (e.g., auditory and visual) measure the same process (i.e., Successive)? The answer is that the underlying cognitive processing demand is the same—that is, the child's ability to work with information in order—regardless of modality.

Finally, the question of how the processes themselves are identified should be considered. Researchers have used many different ways for determining what the important cognitive processes may be. Some have relied on the experimental literature to define the constructs of interest; others have utilized statistical methods such as factor analysis to discover underlying dimensions; and some rely on abilities defined in the cognitive or neuropsychological literature (e.g., working memory, rationality, etc.). Naglieri and Das (1997a, 2005) defined the essential psychological processes on the basis of an understanding of how the brain functions. This allowed them to be unencumbered by what is included in traditional IQ tests and build explicitly on a theory derived from Luria (1966, 1973, 1980). The next important task was to systematically examine the validity of these constructs, which we have summarized in several sources (Naglieri, 2005; Naglieri & Conway, 2009; Naglieri & Das, 2005) and which will be done briefly in this chapter. First, however, the origins of the PASS theory are described.

> ## DON'T FORGET
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> Measurement of the "basic psychological processes" must be made using tests that are reliable and valid for that specific use.

PASS Theory

Luria's theoretical description of how the human brain functions is considered one of the most complete (Lewandowski & Scott, 2008). In his seminal works *Human Brain and Psychological Processes* (1966), *Higher Cortical Functions of Man* (1980), and *The Working Brain* (1973), he described the brain as a functional mosaic, with parts that make specific contributions to a larger interacting network. Luria stressed that no area of the brain functions without input from other areas so that cognition and behavior result from an interaction of complex brain activity across various areas. Luria's research on the functional aspects of the brain provided the basis for the neuropsychological processing theory of intelligence called PASS, initially described by Das, Naglieri, and Kirby (1994) and operationalized by the CAS (Naglieri & Das, 1997a). The four PASS processes represent a fusion of cognitive and neuropsychological constructs such as executive functioning (Planning and Attention), selective, sustained, and focused activity (Attention), processing of information into a coherent whole

(Simultaneous), and serial processing of information (Successive) (Naglieri & Das, 2005). These four neuropsychologically defined intellectual processes are more fully described in the following sections.

Planning

Planning is a frontal lobe function, especially the prefrontal cortex, and one of the prominent abilities that differentiates humans from other primates. Goldberg (2002) wrote that Planning

> plays a central role in forming goals and objectives and then in devising plans of action required to attain these goals. The cognitive processes required to implement plans, coordinate these activities, and apply them in a correct order are subserved by the prefrontal cortex. Finally, the prefrontal cortex is responsible for evaluating our actions as success or failure relative to our intentions. (p. 23)

Planning helps us achieve goals through the development and use of strategies to accomplish tasks for which a solution is required. Planning is an essential ability for all activities that requires someone to figure out how to solve a problem. The task of problem solving includes self-monitoring and impulse control as well as making, evaluating, and implementing strategies to achieve a goal. Thus, Planning allows for the generation of solutions, discriminating use of knowledge and skills, as well as control of Attention, Simultaneous, and Successive processes (Das, Kar, & Parrila, 1996).

Attention

Attention is a cognitive processing ability that is associated with Luria's first functional unit (the reticular formation), which allows an individual to selectively focus cognitive activity toward a stimulus over a period of time without being distracted by other competing stimuli. The longer attention is needed, the more difficult maintenance of focused activity will be. Intentions and goals (e.g., Planning process) are responsible for control of Attention, which is why these two processes can correlate strongly. The attention work of Schneider, Dumais, and Shiffrin (1984) and the attention selectivity work of Posner and Boies (1971), which relates to deliberate discrimination between stimuli, is similar to the way that the Attention process, included in PASS theory and operationalized by the CAS, was conceptualized.

Simultaneous Processing

Simultaneous processing is needed for organizing information into groups or a coherent whole. The ability to recognize patterns as interrelated elements is made

possible by the parietal-occipital-temporal brain regions. Due to the substantial spatial characteristics of most Simultaneous tasks, there is a visual-spatial dimension to activities that demand this type of process. Conceptually, the examination of Simultaneous processing is achieved using tasks that could be described as involving visual-spatial reasoning found in progressive matrices tests like those originally developed by Penrose and Raven (1936).

Simultaneous processing is not, however, limited to nonverbal content, as demonstrated by the important role it plays in the grammatical components of language and comprehension of word relationships, prepositions, and inflections (Naglieri, 1999), as is illustrated by the Verbal-Spatial Relationship subtest included in the CAS (Naglieri & Das, 1997a). Matrices tests have been included in so-called nonverbal tests such as the Wechsler Nonverbal Scale of Ability (Wechsler & Naglieri, 2006) and the Naglieri Nonverbal Ability Test, Second Edition (NNAT-II; Naglieri, 2008a), or nonverbal portions of intelligence tests, such as the Wechsler Intelligence Scale for Children–Fourth Edition (WISC-IV; Wechsler, 2003), the Stanford-Binet Intelligence Scales–Fifth Edition (SB5; Roid, 2003), or a Simultaneous processing scale, as found on the Kaufman Assessment Battery for Children, Second Edition (KABC-II; Kaufman & Kaufman, 2004) and the CAS.

Successive Processing

Successive processing is needed when working with stimuli arranged in a defined serial order. Successive processing is an integral ability involved with the serial organization of sounds, such as learning sounds in sequence (e.g., phonological skills) and early reading. In fact, Successive processing has been conceptually and experimentally related to the concept of phonological coding (Das, Mishra, & Kirby, 1994). When serial information is grouped into a pattern, however, (like the number 553669 organized into 55–3–66–9), then successful repetition of the string may be related to Planning (i.e., the decision to use a chunking strategy) *and* Simultaneous (organizing the numbers into related groups) *and* Successive (retaining the order of the numbers) processes. *Chunking* is often used by older children and can be used as an effective strategy for those who are weak in Successive processing (see Naglieri & Pickering, 2010). Young children with poor Successive processing often have difficulty following directions or comprehending what is being said to them when sentences are too lengthy (Naglieri, 2005). Teachers and parents often misinterpret this weakness as a failure to comply or as a problem with Attention. The concept of Successive processing is similar to the concept of Sequential processing included in the KABC-II (Kaufman & Kaufman, 2004), and tests that require recall of serial information such as Digit Span Forward on the WISC-IV (Wechsler, 2003).

Operationalization of the PASS Theory

The PASS theory was operationalized on the CAS (Naglieri & Das, 1997a). This instrument is thoroughly described in the *CAS Interpretive Handbook* (Naglieri & Das, 1997b) and other sources (e.g., Naglieri, 1999; Naglieri & Conway, 2009). Naglieri and Das (1997a, b) generated tests to measure the PASS theory following a systematic and empirically based test development program designed to obtain efficient measures of the processes for individual administration. The PASS theory was used as the foundation of the CAS, so the content of the test was determined by the theory and not by previous views of ability. The CAS was standardized on a sample of 2,200 children ages 5 to 17 years who were representative of the U.S. population on a number of important demographic variables. The sample is a nationally representative, stratified sample based on gender, race, ethnicity, region, community setting, classroom placement, and parental education (see Naglieri & Das, 1997a, for more details). The CAS yields four separate standard scores, one for each of the Planning, Attention, Simultaneous, and Successive scales, and a Full Scale standard score, each having a normative mean of 100 and *SD* of 15.

HOW TO USE PROCESSING FOR SLD DETERMINATION

IDEA 2004 describes several important criteria of a comprehensive evaluation that should be used for SLD eligibility:

> First, a variety of assessment tools and strategies must be used to gather relevant information about the child.
> Second, the use of any single measure or assessment as the sole criterion for determining whether a child has SLD is not permitted.
> Third, practitioners must use technically sound instruments to assess the relative contribution of cognitive and behavioral factors.
> Fourth, assessments must be selected and administered so as not to be discriminatory on the basis of race or culture, and these tests are administered in a form most likely to yield accurate information.
> Fifth, the measures used are reliable and valid for the purposes for which they were intended.

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IDEA is unambiguous about the nature of a comprehensive assessment. A variety of assessment tools and strategies must be used.

The Federal Regulations (2006) clarified that states are not allowed to prohibit the use of a severe discrepancy between ability and achievement for SLD determination, but use of the traditional ability-achievement discrepancy was discouraged. Also clarified was the following: Screening to determine appropriate instructional strategies for curriculum implementation shall not be considered an evaluation for special education eligibility. RTI may be used as a part of the SLD eligibility process but "determining why a child has not responded to research-based interventions *requires* [italics added] a comprehensive evaluation" (p. 46647) and "RTI does not replace the need for a comprehensive evaluation" (p. 46648). What RTI does provide is greater assurance that (a) adequate learning experiences have been provided before initiating a comprehensive evaluation; and (b) the child's failure to respond is not the result of inadequate instruction. These regulations also further clarify that assessments used in the comprehensive evaluation "include those tailored to assess specific areas of educational need and not merely those that are designed to provide a single general intelligence quotient" (p. 43785). Despite these changes in the methodology for identifying SLD, the definition of this disorder remains a "disorder in one or more of the basic psychological processes" (see Rapid Reference 7.2).

The definition of SLD and the method used to identify children with this disorder should be consistent (Hale et al., 2006; Kavale et al., 2005). Because IDEA 2004 clearly specifies that children must have a disorder in "one or more of the basic psychological processes," which is the underlying cause of a SLD,

≡ *Rapid Reference 7.2*
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Definition of SLD

Section 602 of IDEA defines an SLD as follows:

(A) *In general*: The term specific learning disability means a disorder in 1 or more of the basic psychological processes involved in understanding or in using language, spoken or written, which disorder may manifest itself in the imperfect ability to listen, think, speak, read, write, spell, or do mathematical calculations.

(B) *Disorders included*: Such term includes conditions as perceptual disabilities, brain injury, minimal brain dysfunction, dyslexia, and developmental aphasia.

(C) *Disorders not included*: Such term does not include a learning problem that is primarily the result of visual, hearing, or motor disabilities, of mental retardation, of emotional disturbance, or of environmental, cultural, or economic disadvantage.

cognitive processes must be measured. A comprehensive evaluation of the basic psychological processes unites the statutory and regulatory components of IDEA 2004, and ensures that the methods used for identification more closely reflect the definition. Any defensible eligibility system would demand continuity between the statutory and regulatory definitions, and for this reason alone SLD determination requires the documentation of a basic psychological processing disorder. Moreover, the tools used for this assessment must meet the technical criteria included in IDEA 2004. There is ample evidence that the CAS, and the theory it was based on, meets these requirements (Naglieri & Conway, 2009).

The PASS theory as operationalized by the CAS provides a means to define the basic psychological processes included in the definition of SLD. In order to apply this approach, an individual child's PASS profile must be examined to determine if a relative or cognitive weakness exists. A *relative weakness* is found when at least one PASS scale standard score is significantly lower than the child's mean PASS score. Because the PASS scores are compared to the individual child's average (and not the normative mean of 100), a "relative" strength or weakness indicates that there is variability in the cognitive profile. For example, a child who has standard scores of 114 (Planning), 116 (Simultaneous), 94 (Attention), and 109 (Successive) has a relative weakness in Attention because this score is 14.25 standard score points below the child's mean of 108.25. A relative weakness is not sufficient for identification of a disorder in processing. In contrast, a dual criterion is used to determine if a *cognitive weakness* is found. That is, the score is significantly below the child's mean *and* that score is also well below average. For example, a child who has standard scores of 102, 104, 82, and 97 for

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A "cognitive weakness" provides the strongest evidence of a "disorder in one or more of the basic psychological processes" because it is relatively lower than the child's mean and lower in relation to the national norm.

Planning, Simultaneous, Attention, and Successive, respectively, has a cognitive weakness in Attention. This is determined because the Attention score is 14.25 standard scores below the child's mean of 96.25 *and* the 82 is very low (12th percentile) in relation to the norm.

DISCREPANCY/CONSISTENCY MODEL

Naglieri (1999) suggested that evidence of a disorder in one of the four PASS basic psychological processes should be based on a cognitive weakness because (a) the child's ipsative weakness is evidence of a *specific* disorder in processing and (b) the score is low relative to a national norm and therefore unusual.
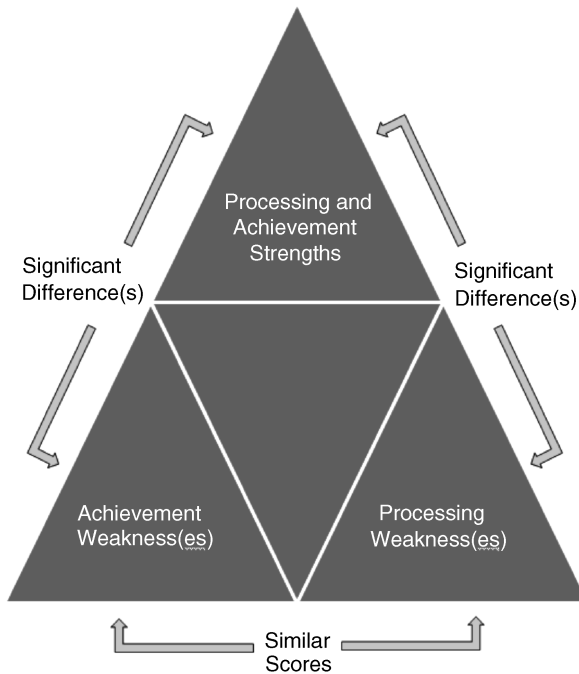
Figure 7.1. Discrepancy/Consistency Model for SLD Diagnosis

Additionally, the child must have deficient academic performance in a specific area to be considered eligible for programming for children with a *specific* learning disability. The relationship among the variables is illustrated in Figure 7.1. This figure includes a significant *discrepancy* between the child's high cognitive processing scores and some specific academic achievement, a significant *discrepancy* between the child's high and low cognitive processing scores, and *consistency* between the child's low processing and low achievement scores.

The Discrepancy/Consistency Model for the identification of specific learning disabilities was described first by Naglieri (1999). The goal of the method is to obtain a systematic examination of variability of both cognitive and academic achievement test scores. Determining whether the cognitive processing scores differ significantly is accomplished using the method originally proposed by Davis (1959), popularized by Kaufman (1979), and modified by Silverstein

(1993). This so-called, ipsative method determines when the child's scores are reliably different from the child'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, 1997a), and the SB5 (Roid, 2003). It is important to note that in the Discrepancy/Consistency Model described by Naglieri (1999), the ipsative approach is applied to the PASS scales, which represent four neuropsychologically defined constructs, *not* the subtests as is usually done, for example, with the Wechsler scales. This changes the method from one that demands considerable clinical interpretation of the meaning of *subtest* variability to analysis of *scales* that have been theoretically defined and have higher reliability and validity. This distinction is important because the criticisms of the ipsative method (McDermott, Fantuzzo & Glutting, 1990) have centered around subtest-, not scale-level, analysis.

Naglieri (1999) and Flanagan and Kaufman (2004) stressed the importance of recognizing that because a low score relative to the child's mean could still be within the average range, adding the requirement that the weakness in a processing test score is also well below average is important. In a study of PASS profiles for the CAS standardization and validity samples Naglieri (2000) found that those students who had a cognitive weakness were likely to have significantly lower achievement scores and more likely to have been identified as in need of special education. That study was described by Carroll (2000) as one that illustrated what a more successful profile method could be. Davison and Kuang (2000) suggested that "adding information about the absolute level of the lowest score improves identification over what can be achieved using ipsative profile pattern information alone" (p. 462).

The utility of PASS profiles was examined in a recent study by Huang, Bardos, and D'Amato (2010). They studied PASS profiles on the CAS for large samples of students in general education ($N = 1,692$) and students with learning disabilities ($N = 367$). They found 10 core PASS profiles for those in regular education and 8 unique profiles from students with SLD. Huang et al., concluded that "a student with a true LD has a relatively high chance of being accurately identified when using profiles analysis on composite [PASS] scores (p. 28)." They added that their "analysis has provided evidence for the use of the PASS theory and that it appears that it has sufficient applications for diagnosis for students suspected of having a LD" (p. 28).

DON'T FORGET

The Discrepancy/Consistency Model is used to determine whether the child has a cognitive weakness and academic failure that are consistent with a specific learning disability.

In summary, there are important data suggesting that PASS scale discrepancies that are significant relative to the child's overall level (the ipsative method) and substantially below what would be considered typical (normative) provide evidence that a child has "a disorder in the basic psychological processes" necessary for SLD identification (Naglieri, 2005). Finding a specific cognitive processing weakness and evidence of academic failure provide evidence that contributes to the diagnosis of an SLD, especially if other inclusionary/exclusionary conditions are also met. The steps to apply this method are provided in Figure 7.2 and are demonstrated in the case that follows.

Case Illustration

This case illustration (provided by Linda Marcoux, school psychologist, Charles County, Maryland) is intended to demonstrate how the Discrepancy/Consistency Model can be applied as a part of a comprehensive evaluation. Rather than provide an entire case study with all the details ordinarily included with such an evaluation, the essential elements that illustrate how the PASS theory can be used to understand a child's past and present behavior and test scores are provided.

Background
Daniel is a 5th grader who was referred for testing after problems with reading and writing persisted following participation in interventions at school. The majority of Daniel's difficulties are related to spelling and writing, and he experiences some difficulties with decoding unfamiliar words. When Daniel is unable to read an unfamiliar word in a sentence he is often able to use context clues to make reasonable guesses at the words, but resists using decoding strategies he has been taught. Daniel's parents and teachers report that he often reverses letters within words on spelling tests, and writes letters, and occasionally numbers, backwards. In class, there are times when he refuses to sound out words by combining letter sounds, or implement other decoding strategies he has learned. Decoding is typically very labor-intensive for Daniel, and when he has to decode several words within a sentence he does not necessarily comprehend what he reads. Overall comprehension is not problematic for Daniel, but on occasion his poor decoding interferes with his understanding of written material. The evidence of difficulty decoding unfamiliar words and resistance to using decoding strategies suggests a possible weakness in Successive processing, and the tendency to use context clues to gain meaning from text implies good Simultaneous processing ability.

Daniel's parents and teachers report that Daniel is readily able to comprehend and draw meaningful inferences from spoken information and that he performs
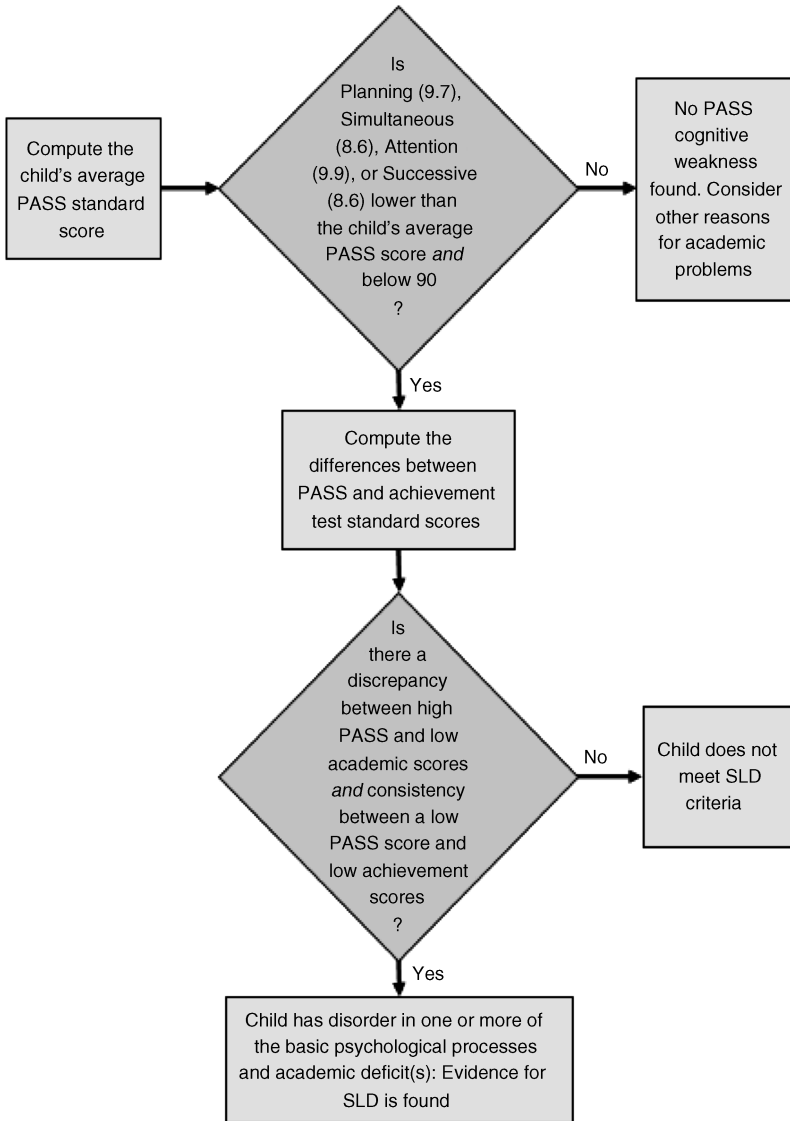
Figure 7.2. Flowchart for Planning, Attention, Simultaneous, and Successive (PASS) and Achievement Comparisons

Source: Values needed for significance when comparing PASS scale standard scores are from Naglieri (1999). Copyright © Jack A. Naglieri, 2010. All rights reserved.

well in math. He participates enthusiastically in class discussions and often provides meaningful insight. The ability to connect pieces of information into a whole (Simultaneous processing) underlies Daniel's ability to make insightful inferences. However, when Daniel is given a written assignment to complete, he often acts out and can become extremely disruptive. Historically, Daniel's problematic behavior has often been a primary concern, but strong academic and behavioral interventions have helped to decrease the outbursts. Nevertheless, his problems with decoding and writing persist.

During administration of the various tests, Daniel became noticeably agitated during tasks that required him to write or otherwise use information in a specific linear order. He shook his head and occasionally rubbed or closed his eyes while listening to information that required him to rely on the order of the words to complete the task. At times, he even refused to respond.

Selected Assessment Results

Daniel's performance on the CAS showed considerable variability across his PASS scale scores (see Rapid Reference 7.3). His Simultaneous standard score (114) is significantly above his average, and his Successive standard score (73) is significantly below his average and well below the Average range. Daniel's cognitive weakness in Successive processing is also consistent with his perform-ance on academic tasks. For example, he earned low scores on spelling and memory tasks that demanded he work with information in a specific linear order. On the spelling subtests Daniel frequently reversed the order of letters within words. Similarly, he had considerable difficulty on the Understanding Directions subtest when directed to "Point to the chair if the TV is on, and if the TV is off,

≡ *Rapid Reference 7.3*
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Selected Scores for the Case of Daniel

	Standard Scores	Difference From Child's Mean
Planning	106	9.25
Simultaneous	114	17.25
Attention	94	−2.75
Successive	73	−23.75
Child's Mean	96.75	

point to the table after pointing to the cat." Instructions like these require that he recall the sentence in the correct order and obtain meaning based on the sequence of the information provided—which demands considerable Successive processing. At times, Daniel refused to attempt a response, and at other times he pointed to the correct objects but in the incorrect order. Additionally, Daniel performed poorly on the Memory Index from a test of phonological processing (see Figure 7.3), which required him to remember words and numbers in a specific linear order. He also performed poorly when he was asked to repeat a word without a designated sound or syllable. Daniel had considerable difficulty completing these tests accurately because they rely on Successive processing ability.
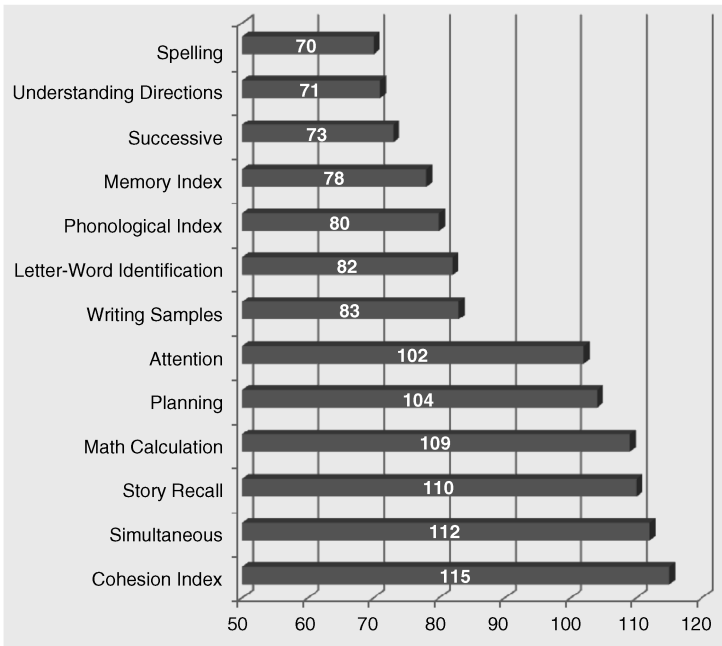

Figure 7.3. Planning, Attention, Simultaneous, and Successive (PASS) and Achievement Standard Scores for Daniel

Source: Planning, Attention, Simultaneous and Successive scores from CAS; Spelling, Understanding Directions, Letter-Word Identification, Writing Samples, Math Calculation from Woodcock-Johnson III Tests of Cognitive Abilities (WJ III COG; Woodcock, McGrew, and Mather, 2001); and Phonological Index, Memory Index, and Cohesion Index from the Test of Auditory Processing Skills–Third Edition (TAPS-3; 2005). Standard scores are based on a mean of 100 and *SD* of 15.

Daniel demonstrated a strength in Simultaneous processing (standard score of 114), which was also consistent with his good performance on certain academic tasks. For instance, Daniel performed well on a test that required him to listen to and recall spoken information from a story, as well as several other tasks that do not primarily rely on Successive processing. It is likely that Daniel's cognitive strength in Simultaneous processing, coupled with his behavior problems, masked his difficulties with tasks that demand Successive processing.

Daniel's standard scores on the CAS and the achievement tests fit the Discrepancy/Consistency Model. He has a significant cognitive weakness in Successive processing (standard score of 73), which is significantly lower than his PASS mean score and well below average for children his age. Similarly, Daniel scored in the 70s and 80s on a variety of academic tasks that rely heavily on Successive processing ability, such as spelling, following directions in order, and remembering phonological information in a specific sequence. His score on the Successive processing scale is consistent with his low scores on certain academic tasks. Moreover, there is a discrepancy between Daniel's low academic scores and his average to high average scores on the other PASS scales.

Although Daniel's overall Full Scale standard score on the CAS was in the average range, his standard score on the Successive processing scale indicates a deficit in a basic psychological process. This processing deficit, along with his academic failure that has not been managed through typical and additional academic interventions in the classroom, indicates that more specialized instruction will be necessary for Daniel to make sufficient academic gains (see Figure 7.4). It is also likely that Daniel's deficit in Successive processing led him to be very frustrated in the classroom. Interventions that take this weakness into consideration are needed (see Naglieri & Pickering, 2010).

CORRESPONDENCE BETWEEN IDEA AND THE DISCREPANCY/CONSISTENCY MODEL

According to Kavale, Kaufman, Naglieri, and Hale (2005), SLD identification procedures therefore should address the components in the conceptual definition in a systematic manner to accurately identify the presence of an SLD. Importantly, they argued that the identification of children with an SLD should include a comprehensive evaluation that ensures students who have a learning disability are accurately identified. The Discrepancy/Consistency Model provides
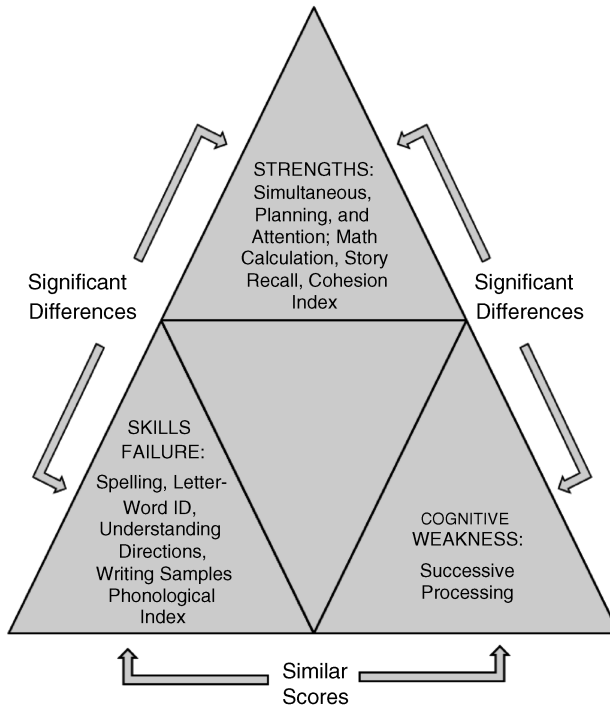
Figure 7.4. Discrepancy/Consistency Results for Daniel

an important component of the procedure for identifying SLD. Perhaps most importantly, using this method unifies the definition of SLD and the method used to identify children as suggested by Kavale et al., (2005) and Hale, Kaufman, Naglieri, and Kavale (2006). These authors further argued that because IDEA 2004 clearly states that children must have a disorder in "one or more of the basic psychological processes," a comprehensive evaluation of the basic psychological processes unites the statutory and regulatory components of the law.

DON'T FORGET

The Discrepancy/Consistency Model should be part of a larger comprehensive assessment process to identify a child with SLD. No one method alone is sufficient.

Does the Discrepancy/Consistency Model Meet IDEA Requirements?

In recent years there had been an increasing emphasis on empirically supported methods, as evidenced by several requirements that appear in IDEA. In order to understand the science behind any proposed method of SLD diagnosis, as well as the tests used to obtain important information, each of the requirements found in IDEA should be carefully considered. The validity of the PASS theory vis-à-vis SLD diagnosis and intervention has been presented in several sources (Naglieri, 1999, 2005, 2008b; Naglieri & Das, 1997a, 2005; Naglieri & Conway, 2009; Naglieri & Otero, in press) and, therefore, only a few points relevant to the Discrepancy/Consistency Model are briefly summarized here. The first relates to nondiscriminatory assessment, and the second to using measures that are valid for the purposes they were intended.

Is Cognitive Processing Assessment Nondiscriminatory?

The need for fair assessment of diverse populations of children has become progressively more important as the U.S. population continues to become more diverse. Recognizing this change, IDEA stresses that assessments (this includes measures of basic psychological processes as well as methods such as RTI) must not discriminate on the basis of race, culture, or language background. Appropriate assessment of children who may have SLD from all race and ethnic groups must be accomplished using tools that are nondiscriminatory. At the heart of this issue is selection of the tool that can be most effectively used within a diverse context. Fagan (2000) and Suzuki and Valencia (1997) argued that because processing tests do not rely on test items with language and quantitative content they are more appropriate for assessment of culturally and linguistically diverse populations. Ceci (2000) suggested that a processing approach could (a) allow for early detection of disabilities before academic failure is experienced, (b) have better diagnostic utility, and (c) provide a way to better understand children's disabilities. All of these authors suggest that traditional IQ tests that yield large mean score differences should be avoided and measures of cognitive processing used instead.

CAUTION

Always ask the question "What empirical evidence is there that supports a particular approach to measuring basic psychological processes?"

There is evidence that PASS cognitive processing scores differ minimally between race and ethnic groups and when the test is given in different languages. For example, PASS cognitive processing scores of 298 African American children and 1,691 white children were compared by Naglieri, Rojahn, Matto, and Aquilino (2005). Controlling for key demographic variables, they found that regression analyses showed a CAS Full Scale mean standard score difference of 4.8 points in favor of white children. Naglieri et al. also found that correlations between the CAS scores and the achievement tests of the Woodcock-Johnson Psych-educational Battery–Revised (WJ-R; Woodcock & Johnson, 1989, 1990) were very similar for African Americans (.70) and whites (.64), suggesting that the PASS scales show little predictive bias. Similarly, Naglieri, Rojahn, and Matto (2007) examined the utility of the PASS theory with Hispanic children by comparing performance on the CAS of Hispanic and white children from the standardization sample. The study showed that the two groups differed by 4.8 standard score points when demographics differences were statistically controlled. They also found that the correlations between achievement and the CAS scores did not differ significantly for the Hispanic and white samples (Naglieri et al., 2007). The results of these studies are consistent with suggestions by Fagan (2000) and Suzuki and Valencia (1997) that processing tests are more appropriate for assessment of culturally and linguistically diverse populations because language and quantitative content are not included.

Comparisons of PASS scores obtained for different linguistic versions of the CAS have also been conducted. Naglieri, Otero, DeLauder, and Matto (2007) compared PASS standard scores on the CAS administered in English and Spanish to bilingual children referred for reading problems. The children earned similar Full Scale scores on the English and Spanish versions of the CAS (using norms based on the original standardization sample) that were highly correlated ($r = .96$). Importantly, deficits in Successive processing were found on both versions of the test (consistent with the view that children with reading disabilities are poor in this process); and 90% of children who had a cognitive weakness on the English version of the CAS also had the same cognitive weakness on the Spanish version of the CAS. Natur (2009) compared Arabic-speaking Palestinian students using the Arabic version of the CAS to a matched sample of children from the United States. He found a very small difference between the Arab (Full Scale standard score mean of 101.0) and U.S. (Full Scale standard score mean of 102.7) scores using the U.S. norms. Similarly, Taddei and Naglieri (2006) found that Italian children's ($N = 809$) Full Scale standard score of 100.9 on the Italian version of the CAS (Naglieri & Das, 2006) was very similar to the Full Scale of 100.5 for a matched sample of U.S. children ($N = 1,174$) from the original

standardization sample. The small mean score differences between the performance of U.S. versus Arabic and U.S. versus Italian children, as well as the similarity in findings when the English and Spanish versions of the CAS are administered to the same children, suggests that the neuropsy-

DON'T FORGET
....
There is considerable evidence that the PASS theory as measured by the CAS can be appropriately used for culturally and linguistically diverse populations.

chologically based PASS theory as measured by the CAS appears to be robust across cultures and language.

Do Exceptional Children Have Specific PASS Profiles?

The Discrepancy/Consistency Model for SLD diagnosis requires that a child shows a *specific* PASS cognitive weakness and academic failure. For this reason, research on intraindividual differences in PASS scores related to the specific disability is important. Research on the profiles found for children with different types of disabilities is an important source of validity for the discrepancy and consistency procedures. The profiles of the PASS processing standard scores obtained from children with reading disabilities and attention deficit hyperactivity disorder (ADHD) was summarized by Naglieri (2005). Children with specific reading decoding problems obtain low Successive processing standard scores (Naglieri, 1999; Naglieri, et al., 2007). In contrast, children diagnosed with ADHD hyperactive/impulsive (ADHD-H) type earned low standard scores in Planning (Dehn, 2000; Naglieri, Salter, & Edwards, 2004). Children with an autism spectrum disorder had low standard scores on the Attention scale (Goldstein & Naglieri, 2009). These groups are graphically described in Figure 7.5.

Reading decoding is a common problem for many children, and this disorder has been related to a cognitive weakness in Successive processing. Das et al. (1994) suggest that a Successive processing deficit underlies a phonological skills deficit and associated reading decoding failure. Successive processing involvement increases if the word is not easily recognized, and this process is even more important if the words are to be read aloud, because articulation also requires a considerable amount of Successive processing. For this reason, a test of phonemic skills, such as phonemic separation, is sensitive to reading failure (Das, et al., 2000. Several studies on the relationship between PASS and reading disability have shown that Successive processing, in particular, is an important ability that underlies phonological skills (Das et al., 2000).
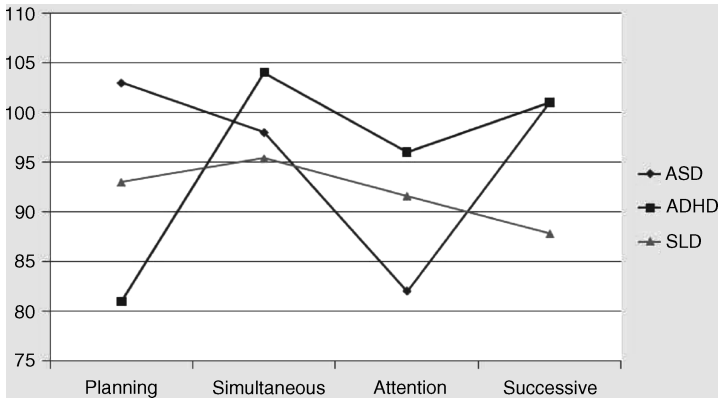
Figure 7.5. Planning, Attention, Simultaneous, and Successive (PASS) Profiles From the Cognitive Assessment System (CAS) for Children With Specific Learning Disabilities (SLD), Attention Deficit Hyperactivity Disorders (ADHD), and Autism Spectrum Disorders (ASD)

Note. Standard scores are based on a mean of 100 and SD of 15.

Does PASS Have Relevance to Reading Instruction?

The connection between assessment of psychological processes and intervention is an important one, especially for children with SLD. There is a line of research that illustrates how the PASS theory can be used within an instructional environment and for academic remediation. The PASS Remedial Program (PREP; Das, 1999) and the Planning Strategy Instruction, also known as Planning Facilitation, are described by Naglieri and Pickering (2010) as the two main approaches that have been studied. These methods are described in the sections that follow.

PREP is a remedial program based on the PASS theory and supported by several initial studies beginning with Krywaniuk and Das (1976), Kaufman and Kaufman (1979), and Brailsford, Snart, and Das (1984). These researchers demonstrated that students could be taught by the regular education teacher to more effectively apply Successive processing to reading, for example, by paying attention to the sequences of the sounds and letters. Subsequently, considerable research support for PREP has been reported (Boden & Kirby, 1995; Carlson & Das, 1997; Das, Mishra, & Pool, 1995; Das et al., 2000; Parrila, Das, Kendrick, Papadopoulos, & Kirby, 1999). PREP is a structured program of tasks designed to improve the use of Simultaneous and Successive processes that underlie reading and integrate these processes into word reading skills such as phoneme segmentation and sound blending. Each PREP task was designed to facilitate the

development and use of strategies such as rehearsal, monitoring performance, revision of expectations, and sound blending. Children's ability to use these strategies is improved through experience with the tasks. Importantly, children are encouraged to use strategies, rather than being explicitly taught these strategies by the teacher.

Two studies particularly illustrate the value of PREP. First, Parrila et al., (1999) compared PREP with a whole-language reading program using two carefully matched groups of 1st grade children. The results showed a significant improvement of reading (Word Identification and Word Attack from the Woodcock Reading Mastery Test–Revised [WRMT–R]; Woodcock, 1987) for the PREP group, and the gain in reading was greater than it was for the whole-language control group. They also found that children with a higher level of Successive processing as measured by the CAS at the beginning of the program benefited the most from the PREP instruction; but those with the greatest improvement in the whole-language program had higher levels of Planning. The second study by Das et al. (2000) found 23 children who were taught using PREP improved significantly more in Word Attack and Word Identification from the WRMT–R (Woodcock 1987) than did the 17 children in the control group. In total, these studies suggest that teaching children to better utilize PASS processes as delivered by the PREP program appears to be effective for remediating deficient reading skills during the elementary school years, as suggested by Ashman and Conway (1997).

Does PASS Have Relevance to Math Instruction?

The Planning component of the PASS theory has been shown to be important to classroom performance in math in a series of intervention studies. These investigations showed that children can be taught to better utilize their planning ability to be more strategic when they complete math tasks, and that the facilitation of plans improves academic performance. The initial concept for Planning Strategy Instruction was based on the research of Cormier, Carlson, and Das (1990) and Kar, Dash, Das, and Carlson (1992) within a mediated learning experience context. This means that an environment is created that encourages children to discover the value of strategy use without being specifically instructed on what to do. This is accomplished by asking the children questions about how they completed the tasks, what they noticed about the questions, which methods worked for them, and what would they do in the future to be more successful. These authors found that students who performed poorly on measures of Planning from the CAS demonstrated significantly greater gains than those with

higher Planning standard scores. A series of studies followed that showed that the so-called Planning Strategy Instruction method improved children's performance in math calculation (Naglieri & Gottling, 1995, 1997). The students with learning disabilities who participated in these studies learned to recognize the need to plan and use strategies when completing math computation problems. (More details about the method are provided by Naglieri and Gottling [1995, 1997] and by Naglieri and Pickering [2010]).

Naglieri and Johnson (2000) further extended this Planning Strategy Instruction research with students who had learning disabilities and mild mental impairments. They found that children with a cognitive weakness in Planning improved considerably over baseline rates while those with no cognitive weakness improved only marginally. Similarly, children with cognitive weaknesses in Simultaneous, Successive, and Attention showed substantially lower rates of improvement. The importance of this study was that the five groups of children responded very differently to the same intervention, that is, the PASS processing standard scores were predictive of the children's response to this math intervention. In summary, these studies of PASS and math illustrate a connection between CAS Planning standard scores and instruction.

Children With ADHD

Iseman and Naglieri (in press) examined the effectiveness of teaching strategies to students with ADHD randomly assigned to an experimental group who received the Planning Strategy Instruction method, or a control group that received additional math instruction. They found large prepost effect sizes for students in the experimental group (.85), but not the control group on classroom math worksheets (.26), as well as standardized test score differences in Math Fluency (1.17 and .09, respectively) from the Woodcock-Johnson III Tests of Achievement (WJ III ACH; Woodcock, McGrew, and Mather, 2001) and Numerical Operations (.40 and –.14, respectively) from the Wechsler Individual Achievement Test (WIAT-II; Wechsler, 2001). One year later, the experimental group continued to outperform the control group. These findings suggest that students in the experimental group outperformed the control group on (a) math computation worksheets, (b) standardized tests of math at the end of the study, and (c) standardized tests of math one year later. This study further illustrated the importance PASS processes have to the acquisition of academic skills.

The Planning Strategy Instruction method was also applied to reading comprehension by Haddad et al. (2003). Their study involved 45 children in regular education programs who were encouraged to be more strategic when completing reading comprehension tasks. They found that children with a Planning weakness

benefited substantially (effect size of 1.4) from the instruction designed to encourage the use of strategies and plans. In contrast, children with no PASS weakness or a Successive weakness only showed smaller effect sizes (.52 and .06, respectively). Their re-

> # DON'T FORGET
> ADHD is described as a failure of self-control associated with the frontal lobes, and this is why these children perform poorly on the Planning Scale of the CAS.

sults suggested that PASS profiles are relevant to instruction and, specifically, that teaching children to be more strategic improved reading comprehension the most for those children with low Planning ability.

PASS Theory and Game-Based Learning

Computer games are often considered a form of entertainment, but a growing body of research suggests that these activities can be effective learning tools (e.g., Flowers, 2007; Pivec, 2007). The underlying rationale behind Digital Game-Based Learning (DGBL) is that humans learn through observation, imitation, and play. Perhaps most importantly, DGBL may be an effective learning tool because it engages and immerses the learner in the tasks, while traditional classrooms are more restricted to lectures and books that limit the learning to

an audience-based experience (Foreman, 2004). In fact, researchers have found that DGBL can help literacy development (Flowers; Segers & Verhoeven, 2005). One such program called Skatekids (SKO; www.skatekids.com) is linked to the PASS theory.

> # DON'T FORGET
> One may think that children don't learn academic skills from video games, but there are "serious games" designed to teach children to read, and they work.

   The designers of SKO built this game with recognition of the cognitive processing demands of reading, similar to the efforts made when PREP was constructed. This type of so-called, serious game teaches children to (a) use strategies, (b) attend to details, (c) focus on the sequences of letters and sounds, and (d) focus on the relationships among information while also learning reading skills. This combination of skill training and processing-based instruction has recently been tested in a series of studies. Naglieri, Conway, and Rowe (2010) found that 3rd grade students' Dynamic Indicators of Basic Early Literacy Skills (DIBELS; Good & Kaminski, 2002) Oral Reading Fluency (ORF) scores improved more for those with high usage of SKO than for the students in the low usage group. In a second study, Naglieri, Rowe, & Conway

(2010) found that DIBELS ORF scores from a high usage group of 2nd grade students improved significantly more than medium and low usage groups. The third study (Rowe, Naglieri, & Conway, 2010) found evidence that the amount of time students spent playing SKO was related to posttest reading scores, over and above the effects of pre-test reading scores. Finally, Naglieri, Rowe, and Conway (2010) found that students at risk (based on DIBELS ORF scores at the beginning of the school year) who were exposed to SKO improved by midyear substantially more than a no-use control group. In total, these studies of this innovative way to help improve children's reading skills suggest that a game-based method has considerable promise. Due to the fact that children with SLD often have associated anxiety, and typically resist reading, an engaging game that is highly motivating and also improves reading skills offers considerable promise.

CONCLUSION

The purpose of this chapter was to describe a procedure that can be used to identify children with SLD in a manner consistent with the definition of SLD found in IDEA, something neither the ability-achievement discrepancy model nor the RTI method do. Importantly, there is good evidence that the Discrepancy/Consistency Model described in this chapter, when operationalized using the CAS, is nondiscriminatory and has good validity for the purposes that it was intended. That is, there is strong evidence showing that the CAS measures of cognitive processing correlate strongly with achievement (see Naglieri & Rojahn, 2004), which indicates that the PASS scores derived from the CAS assist in explaining academic success and failure. Research also shows small differences between African American and white groups, Hispanic and white groups, as well as Hispanic bilingual children and cross-cultural populations. This evidence suggests that the CAS measures of PASS cognitive processes are appropriate for nonbiased assessment of diverse groups. The PASS cognitive processing abilities also appear to vary with the type of disability in predictable ways; for example, reading decoding problems are associated with Successive processing scores, and children with ADHD are low in Planning. The evidence of specific PASS profiles for children with different disabilities is important for eligibility determination as well as instructional planning, and suggests that, when used within a larger context of a comprehensive assessment, information about a child's basic psychological processes can provide a vital source of information for determining if an SLD exists and how greater academic gains can be achieved.

✍ TEST YOURSELF ✍

1. **The first two intelligence tests explicitly developed to measure ability from a processing perspective were**

   (a) WISC-III and WJ-R.

   (b) WISC-IV and K-ABC.

   (c) K-ABC and CAS.

   (d) K-ABC and WISC-III.

   (e) SB-V and CAS.

2. **The definition of a specific learning disability in IDEA is based on**

   (a) a specific academic deficiency.

   (b) a disorder in one or more of the basic psychological processes.

   (c) failure to respond to instruction.

   (d) a and b

   (e) a and c

3. **The definition of a cognitive process presented here is based on**

   (a) the cognitive demands of the task.

   (b) the content of the task.

   (c) the modality of the task.

   (d) curriculum-based measurement.

   (e) the procedural demands of the task.

4. **Which of the following criteria of a comprehensive evaluation are included in IDEA?**

   (a) A variety of assessment tools must be used.

   (b) No single measure or assessment can be used to determine SLD.

   (c) Technically sound tests of cognitive and behavioral factors must be used.

   (d) Assessments must be discriminatory.

   (e) All of the above

5. **Kavale, Kaufman, Naglieri, and Hale (2005) suggested that**

   (a) RTI is an acceptable first step in SLD determination.

   (b) the ability achievement discrepancy method is best for determining SLD.

   (c) determining whether a disorder in a basic psychological process is essential for SLD determination.

   (d) a and c

   (e) a and b

6. **Which of the following are true about a relative weakness and a cognitive weakness?**

   (a) A relative weakness is not sufficient for SLD diagnosis.

   (b) A cognitive weakness is a relative weakness with a processing score that is also well below average.

(c) A cognitive weakness is based on subtest level ipsative analysis and clinical judgment

(d) a and c

(e) a and b

7. **Federal law (IDEA 2004) and the Federal Regulations (2006) state that the long-standing approach of using an ability-achievement discrepancy to determine whether a child has a SLD is not permitted. True or False?**

8. **Children with specific learning disabilities, attention deficit hyperactivity disorder and autism spectrum disorder have different PASS profiles on the CAS. True or False?**

9. **Researchers have found that the phonological skill deficit that underlies specific reading disability is related to**

(a) planning processing.

(b) attention processing.

(c) simultaneous processing.

(d) successive processing.

10. **There is research evidence that PASS theory as measured by the CAS has relevance to intervention and instruction. True or False?**

Answers: 1. c; 2. d; 3. a; 4. e; 5. d; 6. e; 7. False; 8. True; 9. d; 10. True.