CURRENT ADVANCES IN ASSESSMENT AND INTERVENTION FOR CHILDREN WITH LEARNING DISABILITIES

Jack A. Naglieri

INTRODUCTION

The chapter begins by presenting a case study of a 4th grade student, who has been referred by his teacher for an evaluation. However before this case can be completely understood, it is necessary to understand the limitations associated with the general intelligence approach of assessment. The chapter provides an overview of these limitations and suggests using a theory-based approach instead of a general intelligence approach. The second section outlines the Planning, Attention, Simultaneous, and Successive (PASS) theory and approach toward assessment, which is supported by neuropsychological research. The final section returns to the case study and demonstrates how the information gathered using the PASS theory and Cognitive Assessment System (CAS) can be used to guide interventions for various learning disabilities.

The Case of Louis

Louis is a sociable and active 4th grade student who is popular with his classmates, likes his teachers, and seems to fit in well at school. In general, Louis works hard

Identification and Assessment
Advances in Learning and Behavioral Disabilities, Volume 16, 163–190

ISSN: 0735-004x/doi:10.1016/S0735-004X(03)16005-3

in class and turns in all his work, however his grades do not reflect the effort he puts in. As a result, Louis does not like school or schoolwork very much, and is getting more and more discouraged. Louis' teacher noticed that he has difficulty following directions that are not written down. Louis' biggest problem, however, is with reading and spelling; he has poor word analysis skills and struggles to sound out new words.

Louis' teacher initiated an evaluation and several tests were given, among them an ability and achievement test was administered. On the ability test, he earned a Verbal IQ score of 92 and a Performance score of 108. Both of these scores are within the average range, which means that Louis' ability test scores are within the average range and consistent with his agemates. In contrast, Louis earned a score of 78 on a test of basic reading, 85 on reading comprehension, and 82 in spelling, which are below average scores compared to peers his age. Based on Louis' test scores, it is apparent that he has a discrepancy between his IQ and achievement scores in reading and writing. These findings along with the observations of Louis' teachers suggest that Louis may have a learning disability.

Although Louis' performance on ability and achievement tests suggest that he ultimately could be identified as a child with a learning disability, the ability/achievement discrepancy finding provides limited information about the possible reasons for the problems he is experiencing. Additionally, while the discrepancy may help qualify a child for services it yields little information that is useful for the development of interventions to help the child with the reading problem. Later in this chapter, additional information will be provided about Louis that helps us understand the nature of his cognitive characteristics and how additional information can be useful for diagnostic and intervention purposes. However before this information is provided, a discussion of current intelligence testing technology and alternatives to these traditional methods will be presented.

Traditional IQ Tests

For the past 50 years the general intelligence approach, defined by the Wechsler scales, has dominated the field of intellectual assessment (Wilson & Reschly, 1996). As a result, most professionals in education and psychology readily accept that there are two types of intelligence – verbal and non-verbal. It is important to consider, however, that the Wechsler approach to measuring intelligence represents a tradition in psychological assessment that began in 1939, with the publication of the Wechsler-Bellevue Scales, which were developed based on methods used by the U.S. military in the early 1900s (Yoakum & Yerkes, 1920). Thus, the Wechsler scales represent the predominant pre-World War I notions of how to assess intelligence. Moreover, Wechsler's view of intelligence was not that verbal and non-verbal were two types of intelligence, but rather that non-verbal tests helped to "minimize the over-diagnosing of feeble-mindness that was, he believed, caused by intelligence tests that were too verbal in content . . . and he viewed verbal and performance tests as equally valid measures of intelligence and criticized the labeling of performance [non-verbal] tests as measures of special abilities" (p. 396; Boake, 2002). The general intelligence approach served to initiate a major contribution made by the field of psychology to society, but the continued reliance on this model over the last century must make one stop and wonder just how well the technology works.

Many have begun to ask how effective the general intelligence approach is, and indeed to wonder about the limitations of this approach (Das, Naglieri & Kirby, 1994; Naglieri, 1999; Sternberg, 1988). The verbal/non-verbal approach to conceptualizing intelligence has considerable limitations, especially for culturally and linguistically diverse populations, those with limited English language skills, and children who are experiencing academic problems, like a learning disability (Naglieri, 2000).

The limited utility of the verbal/non-verbal model for evaluation of specific intellectual problems associated with learning disabled (LD) children's academic failure has led some to argue that intelligence tests are irrelevant to the diagnosis of learning disabilities (Siegle, 1989). In fact, after careful review of the research, Kaufman and Lichtenberger (2000) concluded that WISC-III subtest profiles "do not have adequate power on which to base differential diagnosis" (p. 205) for LD or Attention Deficit/Hyperactivity Disorder (ADHD). This should not be a surprise to anyone who reflects on the developmental history of the Wechsler scales and recognizes that the test was not built to identify LD or ADHD children (the concepts were not yet developed). Instead, it should be recognized that it is unreasonable to expect a verbal/non-verbal model, used to measure general intelligence, to show sensitivity to the cognitive problems these children experience. Nevertheless, it is consistent with the research to conclude that scores on a verbal/non-verbal test of intelligence have not been especially helpful for diagnosis of LD or ADHD (Kaufman & Lichtenberger, 2000; Kavale & Forness, 1984).

Some authors who have noted the limitations of a general intelligence model have embraced alternative perspectives (Das, Naglieri & Kirby, 1994; Kaufman & Kaufman, 1983; Sternberg, 1988). The elimination of the concept of intelligence is ill advised, and instead, an examination of other modern and reconceptualized views, based heavily on important advances in psychology (especially cognitive and neuropsychology) and which have relevance to the evaluation and instruction of children with learning problems, will be reviewed in the following sections.

Winds of Change

One of the most important developments in the field of psychology that has relevance to the evaluation and instructional planning of children with learning disabilities is the growing body of research in cognitive and neuropsychology. Perhaps one of the most important contributions of cognitive psychology is the understanding that a child's cognitive processing competence provides a means of conceptualizing what intelligence could be. In addition, the emphasis on cognitive strategy use and planning provides a new way to conceptualize human functioning. For example, the importance of strategic behavior was amply described in the book, *Plans and the Structure of Behavior* by Miller, Galanter and Pribram (1960). More recently, Goldberg (2001) provided an excellent discussion of the value of strategic thinking, brain functioning, and exceptional children in his book *The Executive Brain: Frontal Lobes and the Civilized Mind*. Miller et al. and Goldberg emphasize the importance of strategic thinking on the part of the child or adult and the relationships between such thinking and specific neuropsychological constructs, as well as success or failure in a wide variety of areas. These ideas are reflected in the practical suggestions of researchers who have argued for the value of cognitive strategy instruction.

Pressley and Woloshyn (1995), in their book *Cognitive Strategy Instruction that Really Improves Children's Academic Performance*, describe the components of strategy use in which students are explicitly encouraged to discover and use methods of doing things, monitor their performance, generalize their use of strategies, be aware of the importance of strategies, achieve self-regulated strategy use, and become thoughtful, planful, and evaluative as they work. These instructional goals are actually teaching children a type of cognitive processing referred to as plans and strategies by Miller et al. (1960), frontal lobe functioning by Goldberg (2001), and planning by Naglieri (1999). There is an important connection between the strategy training instructional methods advocated by educators who have focused on the importance of being strategic, and the neuropsychological writings of those who have recognized the importance of, for example, frontal lobe functioning.

The recognition that strategy use on the part of the child is closely tied to a type of intellectual cognitive process provides an important connection between the cognitive characteristics of a child and the cognitive demands of academic tasks presented by the teacher. Naglieri and Pickering (in press) illustrate that this approach can have a positive influence on children's academic performance and that this approach is very different from processing approaches that were tried in the late 1970s, particularly the modality based methods.

Is This the Same as ATI?

When information about a child's cognitive characteristics is used to guide the development or selection of academic interventions, the concept of an aptitude-treatment interaction (ATI) is invoked. The essence of this approach is intuitively attractive and logical; to take individual differences in aptitude (ability) or underlying cognitive processes (a more modern term) into account when interventions or treatments are being planned (Cole, Dale, Mills & Jenkins, 1993; Snow, 1991). Snow (1991) defined aptitude or ability as "a complex of personal characteristics identified before and during treatment that accounts for a person's end state after a particular treatment" (p. 205). That is, an interaction between aptitude and treatment is present when a child's intellectual characteristics influence to what extent he or she benefits from one type of intervention over another. Although the term aptitude is not limited to intelligence (it could include variables such as personality, motivation, etc.), in this chapter aptitude is defined as an intellectual (cognitive processing) attribute of a child. In this discussion, the way in which the aptitude of intelligence is defined takes on critical importance.

Practicing school psychologists have attempted to obtain information that can be used within an ATI conceptualization for years by evaluating information beyond the composite IQ scores from the Wechsler Intelligence Scales. To do so, they have interpreted the Wechsler subtests, scales, and indices in many ways to extract meaning out of this test of general intelligence. Unfortunately, school psychologists have used the Wechsler scales in ways that go well beyond its capabilities because intervention design demands more information than the IQ scores provide.

Moving from IQ to Cognitive Processes

In the past 15 years, researchers have become interested in reformulating the concept of intelligence using a cognitive processing perspective. Luria is perhaps the leading cognitive and neuropsychological researcher to have influenced test developers. In fact, he is the "most frequently cited Soviet scholar in American, British, and Canadian psychology periodicals" (Solso & Hoffman, 1991, p. 251). Luria's most influential works include *Higher Cortical Functions in Man*

(1966a), *Human Brain and Psychological Processes* (1966b), *The Working Brain* (1973), and *Language and Cognition* (1982). These, and his other works, have helped stimulate an increased awareness of the relationships between cognitive processing and human performance. Luria has influenced how intelligence is conceptualized and measured.

The Kaufman Assessment Battery for Children (K-ABC; Kaufman & Kaufman, 1983) was the first test to implement Luria's cognitive processing theory of human functioning. The K-ABC reflected the authors' conceptualization of intelligence according to cognitive and neuropsychological perspectives, rather than the general intelligence model that dominated the field since the early part of the last century. Kaufman and Kaufman based their view of intelligence on Luria's theory as well as the theories of Gazzaniga (1975), Kinsborne (1978), Jensen (1980), Neisser (1967), and Das, Kirby and Jarman (1975, 1979).

The K-ABC model was based on the finding that many different theories of intelligence had two basic processes in common – Sequential and Simultaneous processes. This approach was conceptually very different from the verbal/non-verbal intelligence model used in most individual and group tests of ability. The K-ABC test was, in particular, based on two very important concepts. First, that verbal IQ is not intelligence, but rather better conceptualized as achievement. Second, that intelligence was best redefined as basic cognitive processes. Kaufman and Kaufman's idea that IQ tests could be improved through modification and redefinition using a cognitive processing theory was, in the mid-1980s, a revolutionary concept.

The successes and limitations of the K-ABC formed the background for the development of another approach to redefine ability from a cognitive processing theory. The theory is the Planning, Attention, Simultaneous, and Successive (PASS) cognitive processes (Naglieri & Das, 1997a) and is based largely on the neuropsychological work of Luria (1966a, b, 1973, 1980, 1982). The PASS theory was used as the underlying framework of the Cognitive Assessment System (CAS; Naglieri & Das, 1997a).

The CAS uses a theory-based view of cognitive processing that puts emphasis on basic psychological processes that are related to performance, rather than a general intelligence verbal/non-verbal IQ model. The four PASS scales represent the kinds of basic psychological processes described in the Individuals with Disabilities Education Act Amendments of 1997 (IDEA'97, see Naglieri & Sullivan, 1998) that are used, for example, in the definition of a specific learning disability. The four basic psychological processes can be used: (1) to gain an understanding of how well the child thinks; (2) to discover strengths and needs of children that can then be used for effective differential diagnosis, instructional development; and (3) to select or design appropriate interventions.

THE PASS THEORY: AN ALTERNATIVE TO GENERAL INTELLIGENCE

PASS Theory

PASS cognitive processes are the basic building blocks of human intellectual functioning (Naglieri, 1999). The PASS processes form an inter-related system of cognitive processes or abilities that interact with an individual's base of knowledge and skills. The four constructs are defined as follows:

Planning is a mental activity that provides cognitive control, use of processes, knowledge and skills, intentionality, and self-regulation;

Attention is a mental activity that provides focused, selective cognitive activity over time and resistance to distraction;

Simultaneous is a mental activity by which the child integrates stimuli into groups; and

Successive is a mental activity by which the person integrates stimuli in a specific serial order to form a chain-like progression.

Planning

This process provides the means to solve problems of varying complexity and may involve control of attention, simultaneous, and successive processes, as well as acquisition of knowledge and skills. Planning is critical to all activities where the child or adult has to determine how to solve a problem. This includes self-monitoring and impulse control as well as generation, evaluation, and execution of a plan. Planning can be measured using the CAS planning tests that require the child to develop a plan of action, evaluate the value of the method, monitor its effectiveness, revise or reject a plan to meet the demands of the task, and control the impulse to act without careful consideration. All of the CAS planning subtests require the use of strategies for efficient performance and the application of these strategies to novel tasks of relatively reduced complexity (Naglieri & Das, 1997b).

Attention

Attention is a mental process by which the person selectively focuses on particular stimuli and inhibits responses to competing stimuli. Attention is involved when there is a demand for focused, selective, sustained, and effortful activity. Focused attention involves directed concentration toward a particular activity and selective attention is important for the inhibition of responses to distracting stimuli. Sustained attention refers to the variation of performance over time, which can be influenced by the different amount of effort required to solve the test. All CAS attention subtests present children with competing demands on their attention and require sustained focus.

Simultaneous Processing

Simultaneous processing is a type of mental process that gives the child the means to integrate separate stimuli into a single whole or group. An essential aspect of simultaneous processing is the need to recognize how the separate elements of a stimulus array are interrelated into a whole. For this reason, simultaneous processing tests have strong spatial aspects. The spatial aspect of simultaneous processing includes perception of stimuli as a whole. For example, simultaneous processing is involved in grammatical statements that demand the integration of words into a whole idea. This integration involves comprehension of word relationships, prepositions, and inflections so the person can obtain meaning based on the whole idea. Simultaneous processing can be measured using CAS tasks that require integration of parts into a single whole and understanding of logical and grammatical relationships. These processes vary on the basis of non-verbal and verbal content, but the essential requirement is simultaneous processing.

Successive Processing

Successive processing is a mental process by which the person works with stimuli in a specific serial order that forms a chain-like progression. Successive processing is required when a person must arrange things in a strictly defined order where each element is only related to those that precede it and these stimuli are not interrelated. This process involves both the perception of stimuli in sequence and the formation of sounds and movements in order. For this reason, successive processing is involved with activities such as phonological awareness (Das, Naglieri & Kirby, 1994) and the syntax of language. This process can be measured using the *CAS* successive tests which demand use, repetition, or comprehension based on order.

PASS Processes

The four PASS processes are inter-related constructs that function as a whole as described by Luria (1973), who stated this when he wrote, “each form of conscious activity is always a complex functional system and takes place through the combined working of all three brain units, each of which makes its own contribution” (p. 99). This conception means that the four PASS processes can be thought of as a "working constellation" (Luria, 1966b, p. 70) of cognitive activity. This means that a child may perform the same task with various contributions of the PASS processes along with the application of a child's knowledge and skills. Although effective functioning is accomplished through the integration of all PASS processes as demanded by the particular task, not every process is equally involved in every task. For example, tests like math calculation may be heavily weighted, or influenced, by a single PASS process such as planning, while reading decoding is strongly related to successive processing. Because of the inter-related nature of the processes and their interaction with achievement based upon the particular demands of that task, a through understanding of a child's competence in all these areas is important for addressing educational problems.

Description of the CAS

In order to operationalize the PASS theory, Naglieri and Das (1997a) developed the CAS following a systematic and empirically based method to obtain efficient measures of the PASS processes that could be individually administered. The PASS theory was used as the foundation of the CAS, so the content of the test was not constrained by previous approaches to intelligence. The CAS reflects the merging of the best in psychometric test development methods with a theory of intelligence redefined as cognitive processing within the context of a user-friendly practical test.

There were several assumptions and goals that were used during the development of the CAS (see Naglieri & Das, 1997b for more details), which are as follows:

(1) Theory should proceed a test of ability;
(2) A test of intelligence should be based on a sound theory;
(3) The concepts of IQ, intelligence, aptitude, ability, or any other similar terms should be replaced with the concept of cognitive processes;
(4) Before being considered as the foundation for a test, a possible theory of cognitive processing should be based on a sizable research base and have been proposed, tested, modified, and shown to have several types of validity;
(5) A theory of cognitive processes should inform the user about those specific abilities that are related to academic successes and failures, have relevance to differential diagnosis, and provide guidance to the selection and/or development of effective programming for intervention;
(6) A test of cognitive processing should evaluate an individual using items that are as free from acquired knowledge as possible.

Development of CAS

Subtests for the CAS were developed specifically to operationalize the PASS theory over a period of about 25 years (summarized in three sources: Das et al., 1994; Das, Kirby & Jarman, 1979; Naglieri & Das, 1997b). The sole criterion for inclusion was each subtest's correspondence to the theoretical framework of the PASS theory. This means that selection of subtests was not constrained by the content of traditional tests of intelligence nor was the method used one that relies on factorial approaches to the development of theories of human abilities (e.g. Carroll, 1993). Development of the CAS subtests was accomplished following a carefully prescribed sequence of item generation, experimental research, test revision, and re-examination until the instructions, items, and other dimensions were refined. Following a careful and thorough period of pilot tests, research studies, national tryouts, and national standardization, the instrument was finalized. This process allowed for the identification of subtests that provide an efficient way to measure each of the processes (Das et al., 1994; Naglieri & Das, 1997b).

The PASS Theory was used as the organizational plan for the CAS and for that reason the test's structure includes four scales. The Planning, Attention, Simultaneous, and Successive Scale standard scores are derived from the sum of subtests included in each respective scale. Like the Full Scale score (derived from the sum of all subtests), each PASS Scale has a normative mean of 100 and a standard deviation of 15. The PASS Scales represent a child's cognitive functioning in each of the four theoretical areas and are used in identification of specific strengths and weaknesses in cognitive processing. Information about a child's PASS characteristics can be used when making diagnostic as well as instructional decisions for a child.

CAS Standardization

The CAS was standardized on a large representative sample of children aged 5–17 years, who closely match the U.S. population on a number of important demographic variables. The CAS standardization sample was stratified on the basis of: Age (5 years 0 months through 17 years 11 months); Gender (Female, Male); Race (Black, White, Asian, Native American, Other); Hispanic origin (Hispanic, Non-Hispanic); Region (Midwest, Northeast, South, West); Community Setting (Urban/Suburban, Rural); Classroom Placement (Full-time Regular Classroom, Part-time Special Education Resource, Full-time Self-Contained Special Education); Educational Classification (Learning Disability, Speech/Language Impairment, Social-Emotional Disability, Mental Retardation, Giftedness, and Non-special Education); and Parental Educational Attainment Level (less than high school degree, high school graduate or equivalent, some college or technical school, four or more years of college). For details on the representativeness of the sample see the *CAS Interpretive Handbook* (Naglieri & Das, 1997b). Additionally, children from both regular education and special education settings were included in their appropriate proportions. During the standardization and validity study data collection phase a total of 3,072 children were administered the CAS (2,200 for the normative sample and 872 in reliability and validity studies). Further, a portion (1,600) of the standardization sample was also administered a group of achievement tests.

Validity of PASS

Naglieri and Das (1997b) and Naglieri (1999) provide considerable information about the validity of CAS that suggests the approach may offer many advantages for professionals working to improve educational outcomes for children. In this section several important points will be covered. First, research will be summarized that suggests that different PASS profiles have been found for children with Reading Disabilities and Attention Deficit Hyperactivity Disorders (ADHD). Second, that the CAS is more strongly related to achievement than similar tests (Naglieri, 1999). Third, research has found the CAS to be useful with diverse populations, thus fairer than traditional measures of intelligence (Naglieri & Rojahn, 2001; Wasserman & Becker, 2000). Fourth, the CAS has been shown to have strong links to intervention (Naglieri, 1999). Each of these points will be more fully discussed below.

PASS Profiles

Several studies of the performance of children with ADHD and the PASS theory have now been completed. Paolitto (1999) studied matched samples of ADHD and normal children and found that the group of children with ADHD earned significantly lower scores on the Planning scale. He concluded that his results supported the view of Barkley (1997, 1998) that ADHD involves problems with behavioral inhibition and self-control, which is associated with poor executive control (e.g. planning from PASS). Paolitto also concluded “the CAS was able to successfully identify about three of every four children having ADHD” (p. 4). Similarly, Dehn (2001), Naglieri, Goldstein and Iseman (in press), and Naglieri, Salter and Edwards (2002) found that groups of children who met diagnostic criteria for ADHD earned significantly lower mean scores on measures of planning. Importantly, Naglieri, Goldstein and Iseman (in press) also found that children with ADHD had a different PASS profile than those with anxiety disorders and Naglieri, Salter and Edwards (2002) found that children with ADHD had a different PASS profile than those with specific reading difficulties. The averaged mean

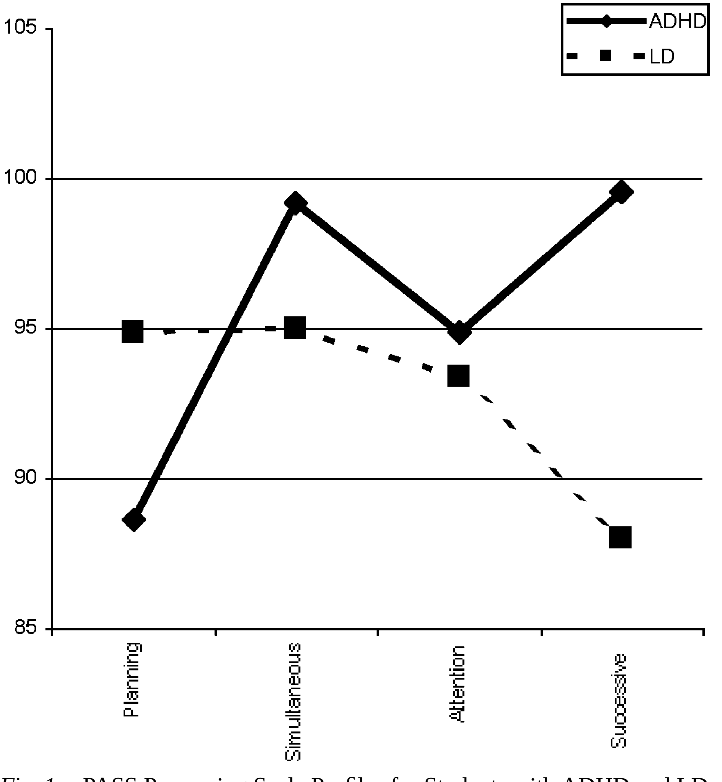

Fig. 1. PASS Processing Scale Profiles for Students with ADHD and LD.

PASS scores across these studies are graphically presented along with a sample of children with reading disabilities (Naglieri & Das, 1997b) in Fig. 1. The figure illustrates the differences that have been found for these populations.

Relationships to Achievement

One way to test the validity of a theory like PASS is to examine the extent to which the PASS scales relate to some important outcome variable like achievement. To examine this question, Naglieri (1999) summarized several investigations involving large samples of children and several important tests of ability into one table. To that table the NNAT has been added as an additional point of reference (a traditional test of ability that does not contain verbal/achievement based subtests). Each of the data sets used to obtain these correlations were large (greater than 500) and all included children from all regions of the country, who

Table 1. Relationships between Achievement and Ability as Measured by Several Intelligence Tests.

Ability Test	*N*	Correlation	Variance
WISC-III	1,284	0.59	35%
N-NATT	24,108	0.63	40%
Woodcock–Johnson cognitive	888	0.63	40%
K-ABC	2,636	0.63	40%
CAS	1,600	0.70	49%

differed in racial and ethnic composition and varied on the basis of community characteristics, as well as, parental educational levels. See Naglieri (1999) for details about how these data were obtained. The results are provided in Table 1.

The findings of the relationships between ability, defined in a number of different ways, and achievement are quite enlightening. First, the correlation between the NNAT and Stanford Achievement Test (SAT^9) scores of 0.63 ($N = 24{,}108$) is similar to the correlation of 0.59 between the WISC-III (Wechsler, 1991) Full Scale IQ and all WIAT achievement scores (Wechsler, 1992). This suggests that a 38-item progressive matrix test that is completely nonverbal (NNAT) can correlate with achievement as well as a test that contains both nonverbal and verbal content. Thus, verbal tests are not necessarily needed to predict achievement. Interestingly, the results for the seven-scale Woodcock–Johnson Revised Broad Cognitive Ability Extended Battery (0.63) are about the same as these two correlations. This suggests that the WJ-R, a cognitive test that also contains verbal achievement, but has nearly two times as many scales as the WISC-III, does not predict achievement much better and in fact, the correlation is the same as the NNAT/SAT^9. Most importantly, the correlation of 0.63 between the K-ABC (Kaufman & Kaufman, 1983) and the SAT^9 suggests that a cognitively based measure of ability that does not contain verbal achievement can correlate with achievement. Similarly, the correlation between the CAS and WJ-R achievement of 0.70 shows that the PASS processes are important for predicting academic success and failure.

The correlations between the various ability tests and achievement presented in Table 1 illustrate that the CAS is a powerful predictor of achievement, accounting for considerably more variance in achievement than traditional tests of intelligence. These findings in particular cause doubt on statements by McGrew, Keith, Flanagan and Vanderwood (1997) that the Gf-Gc theory used for the WJ-R is the "most useful framework for understanding cognitive functioning" (p. 1994). Instead, these data illustrate that seven Gf-Gc scales are needed to do as well as the two (Sequential and Simultaneous) K-ABC scales. Finally, these results are particularly important for two reasons. First, one of the most important dimensions of validity for a test of cognitive ability is the relationship to achievement (Brody, 1992; Cohen, Swerdlik & Smith, 1992). Second, the CAS and K-ABC, unlike the Wechsler scales, do not have subtests that are highly reliant on acquired knowledge (e.g. Arithmetic, Information, Vocabulary).

Fairness

The changing characteristics of the U.S. population have made fair assessment of children increasingly important in recent years. One way to ensure appropriate and fair assessment of diverse populations is to reduce the amount of knowledge needed to correctly answer the questions on tests of intelligence. However, it is common on traditional IQ tests to have items that measure vocabulary, general information, similarities between two words, math word problems. It is also, of course, common to have vocabulary, information, word analogies, and math word problems on tests of *achievement*. This overlap in content is considered undesirable by some test developers (Kaufman & Kaufman, 1983; Naglieri & Das, 1997a) and is amply noted by Kaufman and Lichtenberger (1999) when they wrote that the most commonly used IQ test, the Wechsler "Verbal Scale does measure achievement" (p. 133). This simple conclusion is a very important admission that the inclusion of tests that are very dependent upon knowledge, a problem not unique to the Wechsler scales, places persons with limited verbal knowledge at a significant disadvantage. Children from disadvantaged populations, those that have had limited or insufficient educational instruction, and those who are culturally and especially linguistically different (non-English) are at a considerable disadvantage. This is one of the reasons that some have argued that traditional IQ tests are biased.

The Wechsler scales have been criticized for being biased against minority children (e.g. Hilliard, 1979) for a variety of reasons. Of considerable concern is that African-Americans have consistently earned lower mean Full Scale IQ scores than whites (Kaufman, Harrison & Ittenbach, 1990; Prifitera & Saklofske, 1998). Although most psychometric experts reject the use of mean score differences as evidence of test bias (Reynolds & Kaiser, 1990) there has been overrepresentation of African-American students in special education classes for children with mental retardation (Reschly & Bersoff, 1999). Some would take this as evidence of test bias because elements of any IQ test that are: (1) irrelevant to the construct being measured; and (2) systematically cause differences between groups is problematic. Further, Messick (1995) argued that because the consequences of the test scores may contribute to issues such as overrepresentation of minorities in classes for children with mental retardation and under-representation of minorities in programs for the gifted that the validity of the instruments are questioned. How

Table 2. Ability Test Total or Full Scale Standard Scores by Race.

Test	Blacks	Whites	*N*	Difference	Effect Size
WISC-III FSIQ	89.9	100.9	252	11.0	0.73
WJ-R cognitive	90.9	102.6	854	11.7	0.69
Stanford-Binet IV	98.0	106.1	364	8.1	0.54
UNIT	91.6	99.1	222	7.5	0.54
K-ABC	91.5	97.6	172	6.1	0.59
CAS	95.3	98.8	238	3.5	0.26
NNAT	99.3	95.1	4,612	4.2	0.25

Note: Sample sizes are for both White and Black groups combined.

big are the differences between race groups and are they influenced by the nature of the ability test that is used? Wasserman and Becker (2000) addressed this question.

An excellent study of race differences on several different IQ tests was conducted by Wasserman and Becker (2000) for a symposium on fair assessment at the American Psychological Association annual convention. These investigators used or conducted studies of race differences for all major intelligence tests that employed a matched group design. This means that samples of Black and White children who were similar on as many demographic variables as available (e.g. age, sex, parent education, community setting, and region) were compared. Group mean scores were then compared and effect sizes (differences between the means divided by the groups' average standard deviation) were computed. Wasserman and Becker examined the Wechsler Intelligence Scale for Children – Third Edition (WISC-III; Wechsler, 1991); Woodcock–Johnson Tests of Cognitive Ability (WJ-R; Woodcock & Johnson, 1989); Stanford-Binet Fourth Edition (SB-IV; Thorndike, Hagan & Sattler, 1986); Universal Nonverbal Intelligence Test (UNIT; Bracken & McCallum, 1998); and the CAS (Naglieri & Das, 1997a). Results from two additional studies (Naglieri, 1986; Naglieri & Ronning, 2000) were added to their results to include the K-ABC (Kaufman & Kaufman, 1983) and the Naglieri Nonverbal Ability Test (NNAT; Naglieri, 1997), respectively, both of which measure ability without inclusion of traditional verbal and arithmetic tests. The results of this summary are presented in Table 2.

The findings in Table 2 should be considered in light of the fact that the concepts used to conceptualize and measure intelligence across these tests are very different. The difference in how intelligence is defined by these various tests provides a way to examine differences between race groups. What is striking about these results, and consistent with conclusions provided by Wasserman and Becker (2000) is the following:

- The size of the race differences varies with the particular test;
- The size of the differences are related to the degree to which the test includes measures that are achievement-like;
- Tests that rely heavily on verbal achievement (WISC-III, WJ-R; SB-IV) yielded larger race differences;
- Measures of cognitive processing (CAS & KABC) that require less verbal achievement demands yield smaller race differences;
- Non-verbal tests (e.g. NNAT & UNIT) that require minimal verbal achievement yield smaller race differences.

Some might argue that ability tests that do not contain verbal achievement tests are somehow less valid measures of ability and therefore, the differences between race groups reduced. However, as addressed earlier, tests like the K-ABC, NNAT, and CAS correlate with achievement as well as or better than traditional IQ tests that contain verbal achievement subtests. It is, therefore, reasonable to conclude that redefining intelligence in terms of basic cognitive processes or using non-verbal tests is a viable option for fair assessment. The shortcoming of using non-verbal tests for identification of children with learning disabilities is that such tests are general measures of ability and do not measure multiple forms of ability – something that is very important for differential diagnosis and treatment planning. Additionally, research suggests that tests with academic content (arithmetic, general information, word knowledge, for example) should be avoided in a test of ability, if for no other reason than to eliminate the verbal/achievement component to a test of ability. Following these guidelines will result in a more equitable system for evaluating diverse populations of children.

Interventions Related to PASS Theory

Two approaches, which have been successfully used to translate CAS results into interventions for children with learning problems, will be discussed in the next section. The first is the PASS Remedial Program (PREP by Das, 1999) and the second is the Planning Facilitation Method described by Naglieri (1999). These approaches are based on the PASS theory and use the information gained about students' processing abilities to build a cognitively based intervention method. The following section presents both interventions and provides empirical support for both.

PREP Remedial Program

The PREP program is based on research by Brailsford, Snart and Das (1984), Kaufman and Kaufman (1979), and Krywaniuk and Das (1976). These researchers showed that students could be trained to use simultaneous and successive

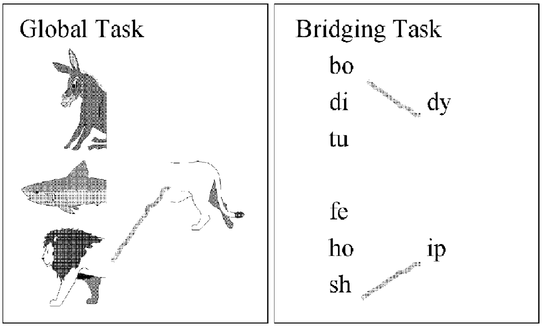

Fig. 2. Illustration of PREP Global and Bridging Tasks.

processes more efficiently and thereby improve "their performance on that process and some transfer to specific reading tasks also occurred" (Ashman & Conway, 1997, p. 169). The current version of PREP (Das, 1999) makes the connection between successive and simultaneous cognitive processes and reading more explicit and includes more tasks that focus on successive processing than simultaneous processing.

The PREP program includes tasks that are non-academic in content and do not require the student to read, but still illustrate the concept behind reading. For example, Fig. 2 shows an illustration of two conceptually related successive tasks in PREP. In this example, the child is being taught about a two-step sequence using the beginning and endings of pictures of animals. To extend this to the beginning and endings of words, the second task is provided. Similar tasks are used to teach the children to effectively work with longer sequences.

Carlson and Das (1997) and Das, Mishra and Pool (1995) conducted studies of the effectiveness of PREP for children with reading decoding problems. Carlson and Das (1997) studied Chapter 1 children who received PREP ($n = 22$) in comparison to a regular reading program (control $n = 15$). The samples were tested before and after intervention using two WJ-R subtests: Word Attack and Word Identification. The intervention was conducted in two 50-minute sessions each week for 12 weeks. Similarly, Das et al.'s (1995) study involved 51 Reading Disabled children who were divided into a PREP ($n = 31$) and control ($n = 20$) groups. There were 15 PREP sessions given to small groups of four children. Word Attack and Word Identification tests were administered pre- and post-treatment. In both studies PREP groups outperformed the control groups. These findings, summarized in Fig. 3, "suggest that process training can assist in specific aspects of beginning reading" (Ashman & Conway, 1997, p. 171).

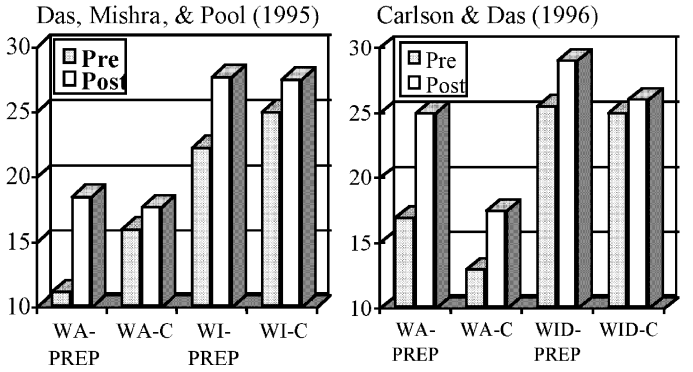

Fig. 3. Research Report of Two Experiments on the Effectiveness of PREP.

Planning Facilitation

Several research studies have examined how PASS scores can be used to select effective interventions for children with learning disabilities. These intervention studies focused on planning and math based on similar research by Cormier, Carlson and Das (1990) and Kar, Dash, Das and Carlson (1992). Cormier et al. and Kar et al. used a method that stimulated children's use of planning, which was shown to have had positive effects on performance. In this approach children are taught to discover the value of strategy use without being specifically instructed to do so. Cormier et al. (1990) and Kar et al. (1992) demonstrated that students differentially benefited from the technique that facilitated planning. They found that children who performed poorly on measures of planning earned significantly higher scores than those with good scores in planning. The children were encouraged to examine the demands of the task in a strategic and organized manner. The results indicated that those children with low planning scores (the ones that needed to use this technique the most) were significantly helped by the planning facilitation.

Naglieri and Gottling (1995, 1997) and Naglieri and Johnson (2000) used these studies as the basis for their work that focused on improving math calculation performance. The two studies by Naglieri and Gottling (1995, 1997) demonstrated that planning facilitation led to improved performance on multiplication problems for those with low scores in planning, but not for those with high planning scores. In other words, learning disabled students benefited differentially from the instruction based on their cognitive processing status. Thus, it is important to match the instruction to the cognitive weakness of the child.

In the studies by Naglieri and Gottling (1995, 1997) and Naglieri and Johnson (2000) students completed mathematics work sheets in a sequence of baseline and intervention sessions over about a two-month period. The method used to indirectly teach planning was applied to individual or groups of children about 2–3 times per week in half hour blocks of time. In the intervention phase, the students were given a 10-minute period for completing a mathematics page, a 10-minute period was used for facilitating planning and another 10-minute period for mathematics. All students were exposed to the intervention sessions that involved the three 10-minute segments of mathematics/discussion/mathematics in 30-minute instructional periods. During the discussion periods, students were encouraged to recognize the need to plan and use strategies when completing mathematic problems. The teachers provided probes that facilitated discussion and encouraged the children to consider various ways to be more successful. When a student provided a response, this often became the beginning point for discussion and further development of the strategy.

The teachers used probes like "How did you do the math," "What could you do to get more correct," or "What will you do next time," but they made no direct statements like, "That is correct," or "Remember to use that same strategy," nor did they provide feedback on the accuracy on previous pages, and they did not give mathematics instruction. The role of the teacher was to facilitate self-reflection and, therefore, encourage the students to plan so that they could complete the work sheets. The students made statements such as "I have to remember to borrow," " I have to keep the columns straight or I get the wrong answer," and "Be sure to get them right not just get it done."

The relationship between the Planning Facilitation method and PASS profiles was studied by Naglieri and Johnson (2000). The purpose of their study was to determine if children with cognitive weaknesses in each of the four PASS processes would show different rates of improvement when given the Planning Facilitation method. In this study children were selected to form groups based on their PASS scores. Children with a cognitive weakness (an individual PASS score significantly lower than the child's mean and below 85) in Planning, Attention, Simultaneous, and Successive Scales were used to form contrast groups. In addition, a no cognitive weakness group was identified. The importance of this study was that the five groups of children responded very differently to the intervention.

Naglieri and Johnson (2000) 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, Attention, and no cognitive weakness also showed substantially lower rates of improvement. The results of this study are provided in Table 3 and illustrate that PASS processes are relevant to intervention for children with learning disabilities.

Table 3. Summary of Research Investigations of the Percentage of Change from Baseline to Intervention for Children with Good or Poor Planning Scores.

Study	High Planning	Low Planning
Cormier, Carlson and Das (1990)	5%	29%
Kar, Dash, Das and Carlson (1992)	15%	84%
Naglieri and Gottling (1995)	26%	178%
Naglieri and Gottling (1997)	42%	80%
Naglieri and Johnson (2000)	11%	143%
Median values across all studies	15%	84%

How PASS Can be Used for LD Diagnosis

At the beginning of this chapter the case of Louis, whose ability scores were within the average range (Verbal IQ score of 92 and Performance score of 108), but his achievement scores were below average (basic reading score of 78, a reading comprehension score of 85, and a written expression score of 82), was presented. Based on this information it was clear that there was an ability achievement discrepancy, but no detected intellectual problems. That is, the general intelligence model based on the Verbal/Performance organization did not inform us of any cognitive difficulty. In contrast, the child's performance on PASS tests does offer some additional information that has both diagnostic and instructional relevance.

Louis' performance on the PASS tests clearly indicated that the young man has a cognitive weakness that is related to his academic weakness. Louis earned a CAS Planning score of 104, Attention score of 98, Simultaneous score of 92, and Successive score of 84. Louis' Successive score is 15 points below his PASS mean of 99 and his Successive score is below average when compared to the normative mean of 100 – making it a "cognitive weakness." This failure in a basic psychological process along with poor scores in reading (78), reading comprehension (85), and spelling (82) achievement has utility for eligibility as well as instruction.

IDEA'97 defines a Specific Learning Disability (SLD) as "a disorder in one or more of the basic psychological processes involved in understanding or in using language, spoken or written, that may manifest itself in an imperfect ability to listen, think, read, write, spell, or to do mathematical calculations." Louis has a documented disorder in Successive processing that underlies has academic failure in reading and spelling. The difficulty with Successive processing has made attempts to teach him ineffective and the need for some types of specialized instruction more obvious. IDEA'97 regulations state that the disorder of basic psychological processes must be documented using a standardized instrument

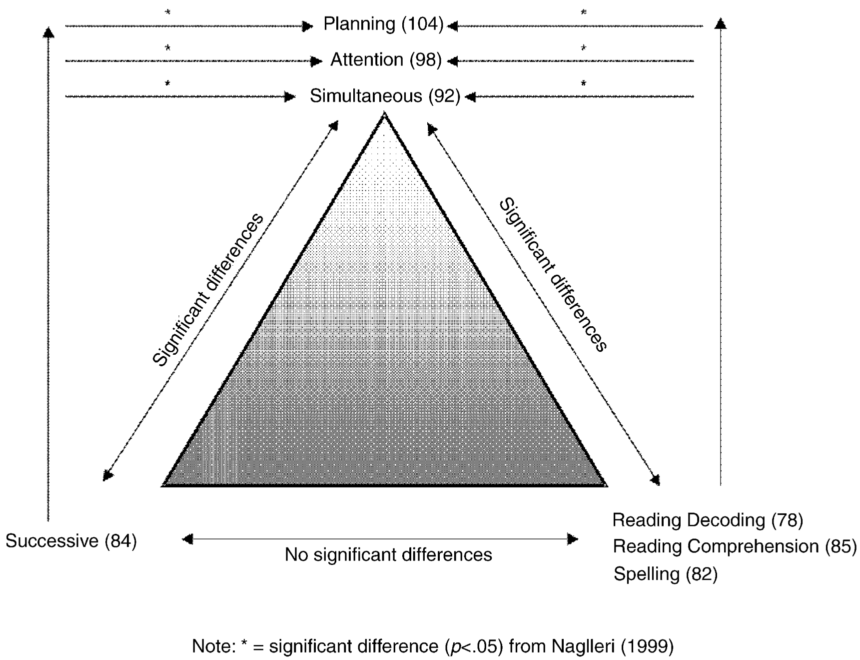

Fig. 4. CAS Discrepancy/Consistency Method Using PASS and Achievement Scores for Louis.

(which was accomplished with the PASS theory and CAS) and there is evidence of an ability/achievement discrepancy. This is graphically illustrated in Fig. 4.

The differences between the scores Louis earned on each PASS scale and achievement demonstrate that some of the scores are similar and others very different. Louis' achievement scores in reading (78), reading comprehension (85), and spelling (82) are significantly different than his Planning, Attention, and Simultaneous scores, but not significantly different from his Successive score (values needed for significance are provided by Naglieri, 2002). In other words, Louis' cognitive weakness in Successive processing is consistent with his poor academic scores. His poor academic scores are significantly lower than his scores of 104, 98, and 92, in Planning, Attention, and Simultaneous processing, respectively. The relationships among these scores are graphically presented in Fig. 4. Note that at the base of the diagram are the two areas of concern – low processing and low achievement. This association allows for the formulation of instructions that can be used to help Louis with his reading and spelling problems.

From

Intervention Handouts for Teachers and Parents

Jack A. Naglieri & Eric Pickering

Brookes Publishing Company

Background

Decoding a written word requires the person to make sense out of printed letters and words and translate letter sequences into sounds. This demands understanding the sounds letters represent and how they work together to make sounds. Sometimes words can be segmented into parts for easier and faster reading. The word "into" is a good example because it contains two words that a child may already know – "in" and "to". Segmenting words can be a helpful strategy for reading as well as spelling.

Segmenting Words

Segmenting words is an effective strategy to help students read and spell. By dividing the words into groups students will also learn about how words are constructed and how the parts are related to one another. Students should be taught that words can be broken down into segments or chunks. The following methods should be directly taught.

- *Take Your Words Apart*. Break down your words into their component parts or syllables. For example, look at the word "reshaped". It included the main word "shape" with the prefix "re" and the ending "-d". Knowing that the main word "shape" had "re" and "d" added makes it easier to recognize than to try and sound out r-e-s-h-a-p-e-d.
- *Identify Prefixes*. A prefix is a letter or group of letters at the beginning of a word. When a word has a prefix, imagine that there is a hyphen between the word and the prefix, and you will generally see the main word. For example, 'misstep' includes the words 'miss' and 'step' that are simply put together.
- *Identify Suffixes*. Similarly, when a word has a suffix (a letter or group of letters at the end), you can often use a strategy similar to the prefix strategy. Just imagine a hyphen between the word and the suffix, for example: heart-less.

Who should use this technique

This instruction will likely benefit students who are poor in reading and spelling. Because this intervention gives students strategies (plans) for solving the reading or spelling activity is uses planning processing. For this reason, students who are poor in planning should be taught to use this strategy. This strategy should also be use with students who are good in planning but have a successive processing weakness and problems with reading and spelling because it will help them approach reading in a different (strategic) way that does not rely on their problem area (successive processing).

References

More examples, written instructions, lessons and classroom handouts can often be found in libraries, educational bookstores, at educational resource centers, and on the web. Excellent resources found at: www.ezschool.com, www.lessonplans.com, and www.rhlschool.com.

Naglieri, J. A. (1999) *Essentials of CAS Assessment*. New York, NY, John Wiley.

Fig. 5. Segmenting Words for Reading, Decoding and Spelling Handout.

From

Intervention Handouts for Teachers and Parents

Jack A. Naglieri & Eric Pickering

Brookes Publishing Company

Background

Comprehension of written text requires students to understand the different parts of what are read, how they relate to one another, and the overall idea of the text. Good reading comprehension instruction should focus on how all the facts of a story can be connected and related to the main idea. Some students have trouble comprehending what is read because they don't understand how the various parts of the story fit together. These students may benefit from a reading strategy that helps them focus on and graphically represent the parts of a story and how those parts relate to one another. Story Maps can help students organize information, see how it interrelates and thus overcome their difficulties with comprehension.

Story Maps

A Story Map is a diagram of the important parts of a story or text (see Fig.). The purpose is to help the child see the parts of a story and the relationships among those parts. This helps students see how the parts relate, including how parts of the text fit in sections, chapters, or under titles. It can be used both to help a student organize and understand what has been read but also to organize and plan what is to be written.

How to Use Story Maps

To use this intervention, follow these steps:

Step 1. Use the Fig. shown as an example to create a Story Map with the specified dimensions.

Step 2. Have the student read the story and look for those features in the story which fit in the various categories included in the Story Map.

Step 3. Have the student use arrows or draw pictures to show the connections between the various facts of the story.

Step 4. Have the student re-read the passage and check the accuracy of the Story Map and make corrections as needed.

Step 5. The teacher and student discuss the story and how it was summarized in the Story Map, its correctness, and its usefulness.

A similar sequence may be used but for mapping out a story to be written. Story Maps can easily be used individually with a student or with an entire class as a lesson.

Who should use Story Maps

This strategy will likely benefit students who have trouble with reading comprehension. Students who have a simultaneous processing weakness may have a particularly difficult time reading for understanding or comprehension. This strategy helps the student focus on the parts of a story and how they are connected, the simultaneous processing part. Also, this technique may be used for students with a planning weakness. It will help them approach reading in a more strategic (i.e. planful) way that prompts them to look for the important parts of a story.

Resources

More examples, written instructions, lessons and classroom handouts can often be found in libraries, educational bookstores, at educational resource centers, and on the web. Two excellent resources related to mapping of ideas can be found at, and www.iss.stthomas.edu/studyguides/mapping.htm,

Idol, L. (1987). Group Story Mapping: A comprehension strategy fro both skilled and unskilled readers. *Journal of Learning Disabilities, 20 (4),* 196–205.

Idol, L., & Croll, V. J., (1987). Story Mapping Training as a Means of Improving Reading Comprehension. *Learning Disability Quarterly, 10,* 214–229.

Kirby, J., & Williams, N., (1991). *Learning problems: A cognitive approach.* Toronto, ON: Kagan & Woo Limited.

Naglieri, J. A. (1999) *Essentials of CAS Assessment.* New York, NY, Wiley and Sons.

Pressley, M., & Woloshyn, V., (1995). *Cognitive strategy instruction: that really improves children's academic performance.* Cambridge, MA: Brookline Books.

Fig. 6. Story Maps for Reading Comprehension Handout.

My Story Map		
Name	Date	
Characters	Theme	Place
The Problem		
The Goal		
What Happened		
The Result		

Fig. 7. Story Maps Worksheet.

Louis' low score in Successive processing provides an explanation as to why he is having reading problems. The sequential demands of Successive processing allows a child to organize incoming information in a proper order, which is important for remembering information in order as well as the formation of sounds and movements in order. For this reason, Successive processing is involved with blending of sounds to form words as well as the syntax of language. Successive processing is important for reading decoding because this academic skill requires making sense out of printed letters and words. Knowing what order letters, letter sounds, and words must be in to make sense requires careful examination of the successive series or order of the sounds. Louis needs instruction with reduced successive processing demands. For example, Louis would likely benefit from *Segmenting Words for Reading and Spelling*, an intervention suggested by Naglieri and Pickering (in press). This intervention can provide Louis with a strategic way to approach reading and spelling that does not rely on his problem area (successive processing), but rather focuses on Planning. The goal of the intervention is to teach students that words can be broken down into smaller parts and helps them understand how words are constructed and how the various parts are related to one another (see Fig. 5). If *Segmenting Words for Reading and Spelling* does not help Louis with his reading and spelling then the PREP intervention discussed earlier is recommended.

Louis is also having a difficult time with reading comprehension and remembering the order in which various events of the story unfold. *Story Maps* is an intervention that focuses on teaching students how all the facts of the story are related to the main idea (Naglieri & Pickering, in press). This intervention can help Louis organize what he reads by having him graphically represent the important parts of the story and the relationships among these parts (see Figs 6 and 7).

CONCLUSIONS

This chapter began with the assumption that intelligence tests have not changed appreciably since the beginning of the 20th century and that advances in cognitive and neuropsychology have provided the opportunity for change in this field. Tests like the K-ABC and CAS offer cognitive processing alternatives to the general intelligence model. The CAS, which is based on the PASS theory, offers a strong alternative to traditional tests as evidenced by three important findings. First, children's PASS profiles are relevant to differential diagnosis and especially helpful for those with learning disabilities and attention deficits. Second, the CAS is an excellent predictor of achievement despite that fact that it does not contain verbal and achievement-based tests like those found in traditional measures of IQ. Third, the PASS theory provides information that is relevant to intervention and instructional planning. A case study was presented to illustrate how the CAS can help practitioners evaluate students consistent with state and Federal (IDEA'97) guidelines and can provide valuable information for intervention planning.

REFERENCES

Ashman, A. F., & Conway, R. N. F. (1997). *An introduction to cognitive education: Theory and applications*. London: Routledge.

Barkley, R. A. (1997). *ADHD and the nature of self-control*. New York, NY: Gilford Press.

Barkley, R. A. (1998). *Attention-deficit hyperactivity disorder: A handbook for diagnosis and treatment* (2nd ed.). New York, NY: Gilford Press.

Boake, C. (2002). From the Binet-Simon to the Wechsler-Bellevue: Tracing the history of intelligence testing. *Journal of Clinical* & *Experimental Neuropsychology*, *24*(3), 383–405.

Bracken, B. A., & McCallum, R. S. (1998). *The universal non-verbal intelligence test*. Itasca: Riverside Publishing Company.

Brailsford, A., Snart, F., & Das, J. P. (1984). Strategy training and reading comprehension. *Journal of Learning Disabilities*, *17*, 287–290.

Brody, N. (1992). *Intelligence*. San Diego: Academic Press.

Carlson, J., & Das, J. P. (1997). A process approach to remediating word decoding deficiencies in Chapter 1 children. *Learning Disabilities Quarterly*, *20*, 93–102.

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

Cohen, R. J., Swerdlik, M. E., & Smith, D. K. (1992). *Psychological testing and assessment*. Mountain View, CA: Mayfield Publishing.

Cole, K. N., Dale, P. S., Mills, P. E., & Jenkins, J. R. (1993). Interaction between early intervention curricula and student characteristics. *Exceptional Children*, *60*(1), 17–28.

Cormier, P., Carlson, J. S., & Das, J. P. (1990). Planning ability and cognitive performance: The compensatory effects of a dynamic assessment approach. *Learning and Individual Differences*, *2*, 437–449.

Das, J. P. (1999). *PASS reading enhancement program*. Deal, NJ: Sarka Educational Resources.

Das, J. P., Kirby, J. R., & Jarman, R. F. (1975). Simultaneous and successive syntheses: An alternative model for cognitive abilities. *Psychological Bulletin*, *82*, 87–103.

Das, J. P., Kirby, J. R., & Jarman, R. F. (1979). *Simultaneous and successive cognitive processes*. New York: Academic Press.

Das, J. P., Mishra, R. K., & Pool, J. E. (1995). An experiment on cognitive remediation or word-reading difficulty. *Journal of Learning Disabilities*, *28*, 66–79.

Das, J. P., Naglieri, J. A., & Kirby, J. R. (1994). *Assessment of cognitive processes*. Needham Heights, MA: Allyn & Bacon Publishers.

Dehn, M. (2001). Cognitive assessment system performance of children with ADHD. Manuscript submitted for publication.

Gazzaniga, M. S. (1975). Recent research on hemispheric lateralization of the human brain: Review of the split-brain. *UCLA Educator*, *17*, 9–12.

Goldberg, E. (2001). *The executive brain: Frontal lobes and the civilized mind*. New York, NY: Oxford University Press.

Hilliard, A. G. (1979). Standardization and cultural bias as impediments to the scientific study and validation of “intelligence”. *Journal of Research and Development in Education*, *12*, 47–58.

Jensen, A. R. (1980). *Bias in mental testing*. New York: Free Press.

Kar, B. C., Dash, U. N., Das, J. P., & Carlson, J. S. (1992). Two experiments on the dynamic assessment of planning. *Learning and Individual Differences*, *5*, 13–29.

Kaufman, A. S., Harrison, P. L., & Ittenbach, R. F. (1990). Intelligence testing in the schools. In: T. B. Gutkin & C. R. Reynolds (Eds), *Handbook of School Psychology* (pp. 289–327). New York: Wiley.

Kaufman, D., & Kaufman, P. (1979). Strategy training and remedial techniques. *Journal of Learning Disabilities*, *12*, 63–66.

Kaufman, A. S., & Kaufman, N. L. (1983). *Kaufman assessment battery for children*. Circle Pines, MN: American Guidance Service.

Kaufman, A. S., & Lichtenberger, E. O. (1999). *Essentials of WAIS-III assessment*. New York: Wiley.

Kaufman, A. S, & Lichtenberger, E. O. (2000). *Essentials of WISC-III and WPPSI-R assessment*. New York: Wiley.

Kavale, K. A., & Forness, S. R. (1984). A meta-analysis of the validity of the Wechsler scale profiles and recategorizations: Patterns or parodies? *Leaning Disability Quarterly*, *7*, 136–151.

Kinsborne, M. (1978). *Asymmetrical function of the brain*. Cambridge, MA: Cambridge University Press.

Krywaniuk, L. W., & Das, J. P. (1976). Cognitive strategies in native children: Analysis and intervention. *Alberta Journal of Educational Research*, *22*, 271–280.

Luria, A. R. (1966a). *Higher cortical functions in man* (2nd ed., revised and expanded). New York: Basic Books.

Luria, A. R. (1966b). *Human brain and psychological processes*. New York: Harper & Row.

Luria, A. R. (1973). *The working brain: An introduction to neuropsychology*. New York: Basic Books.

Luria, A. R. (1980). *Higher cortical functions in man* (2nd ed.). New York: Basic Books.

Luria, A. R. (1982). *Language and cognition*. New York: Wiley.

McGrew, K. S., Keith, T. Z., Flanagan, D. P., & Vanderwood, M. (1997). Beyond g: The impact of Gf-Gc specific cognitive abilities research on the future use and interpretation of intelligence tests in the schools. *School Psychology Review*, *26*, 189–210.

Messick, S. (1995). Validity of psychological assessment: Validation of inferences from persons' responses and performances as scientific inquiry into score meaning. *American Psychologist*, *50*(9), 741–749.

Miller, G., Galanter, E., & Pribram, K. (1960). *Plans and the structure of behavior*. New York: Henry Holt and Company.

Naglieri, J. A. (1986). WISC-R and K-ABC comparison for matched samples of Black and White children. *Journal of School Psychology*, *24*, 81–88.

Naglieri, J. A. (1997). *Naglieri non-verbal ability test*. San Antonio: Psychological Corporation.

Naglieri, J. A. (1999). *Essentials of CAS assessment*. New York: Wiley.

Naglieri, J. A. (2000). Can profile analysis of ability test scores work? An illustration using the PASS theory and CAS with an unselected cohort. *School Psychology Quarterly*, *15*(4), 419–433.

Naglieri, J. A. (2002). *CAS rapid score*. Centreville, VA: NL Associates.

Naglieri, J. A., & Das, J. P. (1997a). *Cognitive assessment system*. Itasca: Riverside Publishing Company.

Naglieri, J. A., & Das, J. P. (1997b). *Cognitive assessment system interpretive handbook*. Chicago: Riverside Publishing Company.

Naglieri, J. A., Goldstein, S., Iseman, J. S., & Schwebach, A. (in press). Performance of children with attention deficit hyperactivity disorder and anxiety/depression on the WISC-III and cognitive assessment system (CAS). *Journal of Psychoeducational Assessment*.

Pl. update ref. Naglieri, J. A., Goldstein, S., Iseman, J. S., & **Schwebach, A.**

Naglieri, J. A., & Gottling, S. H. (1995). A cognitive education approach to math instruction for the learning disabled: An individual study. *Psychological Reports*, *76*, 1343–1354.

Naglieri, J. A., & Gottling, S. H. (1997). Mathematics instruction and PASS cognitive processes: An intervention study. *Journal of Learning Disabilities*, *30*, 513–520.

Naglieri, J. A., & Johnson, D. (2000). Effectiveness of a cognitive strategy intervention to improve math calculation based on the PASS theory. *Journal of Learning Disabilities*, *33*, 591–597.

Naglieri, J. A., & Pickering, E. (in press). Using a cognitive processing approach for identifying children with specific learning disabilities. *Virginia Psychological Association Newsletter*.

Pl. update reference Naglieri, J. A., & **Pickering, E.**

Naglieri, J. A., & Rojahn, J. (2001). Gender differences in planning, attention, simultaneous, and successive (PASS) cognitive processes and achievement. *Journal of Educational Psychology*, *93*, 430–437.

Naglieri, J. A., & Ronning, M. E. (2000). The relationships between general ability using the NNAT and SAT reading achievement. *Journal of Psychoeducational Assessment*, *18*, 230–239.

Naglieri, J. A., Salter, C. J., & Edwards, G. H. (2002). Performance of children with assessment of ADHD and reading disabilities using the PASS theory and Cognitive Assessment System. Manuscript submitted for publication.

Naglieri, J. A., & Sullivan, L. (December, 1998). IDEA and identification of children with specific learning disabilities. *Communiqué*.

Neisser, U. (1967). *Cognitive psychology*. New York: Appleton-Century-Crofts.

Paolitto, A. W. (1999). Clinical validation of the Cognitive Assessment System with children with ADHD. *ADHD Report*, *7*, 1–5.

Pressley, M. P., & Woloshyn, V. (1995). *Cognitive strategy instruction that really improves children's academic performance* (2nd ed.). Cambridge: Brookline Books.

Prifitera, A., & Saklofske, D. (1998). *WISC-III clinical use and interpretation: Scientist-practitioner perspectives*. New York: Academic Press.

Reschly, D. J., & Bersoff, D. N. (1999). Law and school psychology. In: C. R. Reynolds & T. B. Gutkin (Eds), *The Handbook of School Psychology* (3rd ed., pp. 1077–1112). New York: Wiley.

Reynolds, C. R., & Kaiser, S. M. (1990). Bias in assessment of aptitude. In: C. R. Reynolds & R. W. Kamphaus (Eds), *Handbook of Psychological* & *Educational Assessment of Children: Intelligence and Achievement* (pp. 611–653). New York: Wiley.

Siegle, L. S. (1989). IQ is irrelevant to the definition of learning disabilities. *Journal of Learning Disabilities*, *22*, 469–479.

Snow, R. E. (1991). Aptitude-treatment interaction as a framework for research on individual differences in psychotherapy. *Journal of Consulting and Clinical Psychology*, *59*, 205–216.

Solso, R. L., & Hoffman, C. A. (1991). Influence of Soviet scholars. *American Psychologist*, *46*, 251–253.

Sternberg, R. J. (1988). *The triarchic mind: A new theory of human intelligence*. New York: Viking.

Thorndike, R. L., Hagen, E. P., & Sattler, J. M. (1986a). *The Stanford-Binet intelligence scale, Fourth edition: Guide for administering and scoring*. Chicago: Riverside.

Wasserman, J. D., & Becker, K. A. (August, 2000). Racial and ethnic group mean score differences on intelligence tests. In: J. A. Naglieri (Chair), *Making Assessment More Fair – Taking Verbal and Achievement out of Ability Tests*. Symposium conducted at the annual meeting of the American Psychological Association, Washington, DC.

Wechsler, D. (1991). *Wechsler intelligence scale for children* (3rd ed.). San Antonio, TX: Psychological Corporation.

Wechsler, D. (1992). *Wechsler individual achievement test*. San Antonio, TX: Psychological Corporation.

Wilson, M. S., & Reschly, D. J. (1996). Assessment in school psychology training and practice. *School Psychology Review*, *25*, 9–23.

Woodcock, R. W., & Johnson, M. B. (1989). *Woodcock-Johnson revised tests of achievement: Standard and supplemental batteries*. Itasca, IL: Riverside Publishing.

Yoakum, C. S., & Yerkes, R. M. (1920). *Army mental tests*. New York: Henry Holt and Company.