One

THE MOVEMENT OF APPLYING NEUROPSYCHOLOGICAL PRINCIPLES TO THE PRACTICE OF SCHOOL PSYCHOLOGY

RECOGNITION OF THE NEUROBIOLOGICAL BASES OF CHILDHOOD LEARNING AND BEHAVIORAL DISORDERS

The interest in the biological bases of human behavior is not new to the school psychology profession, but it is becoming more relevant to the current generation of school psychologists. Some of the more seasoned veterans, or psychology historians, would suggest that there has always been an interest in the biological bases of behaviors. In fact, the *nature versus nurture* debate is as old as the psychology profession itself. Some major theorists in our shared past, such as B. F. Skinner and John B. Watson, were strict behaviorists. They believed that observable behavior was the only essential element that needed to be considered in human behavior. The curriculum-based measurement/assessment approach touted by many practitioners today has its theoretical roots in behaviorism.

In the late 1950s, researchers came to realize that the behaviorist approaches could not "explain complex mental functions such as language and other perceptual functions" (Gazzaniga, Ivry, & Mangun, 2002, p. 21), and this still holds true today. On the opposite end of the theoretical spectrum were the cognitive psychologists, such as George Miller, Noam Chomsky, and Michael Posner, who believed that brain function needed to be considered in understanding human behaviors. Since the 1970s, cognitive psychologists have been tremendously aided by the development of neuroimaging techniques. Magnetic resonance imaging (MRI), positron emission tomography (PET), and functional MRI (fMRI) are all useful tools in validating or helping to refine theoretical models of cognition developed by cognitive psychologists.

DON'T FORGET

Many parents and educators are looking to school psychologists for answers as to why a student is not achieving at grade level or is behaving in socially inappropriate ways, rather than merely receiving a special education diagnosis.

CAUTION

A chief concern among school neuropsychologists is the increased emphasis in these federal laws and national reports on behavioral techniques at the apparent expense of the role that individual differences in cognitive processes play in the child's learning.

It is important to acknowledge that the integration of neuropsychological principles into educational practice got off to a rough start. Practitioners who predate the mid-1970s may remember the days of Doman and Delcato's perceptual-motor training for children with "minimal brain dysfunction" or tests such as the Illinois Test of Psycholinguistic Abilities. These approaches may have had good face validity, but they did not accurately show treatment efficacy for either perceptual-motor deficits or language deficits. These early missteps in integrating neuropsychological principles into educational practice only reinforced the rising role of behaviorism in school psychology (Hynd & Reynolds, 2005). Some contemporary and influential scholars still cite inadequate findings on the early process assessment approach in the 1970s as the basis for current legislative changes to the definition of a specific learning disability (Reschly, Hosp, & Schmied, 2003). Unfortunately, these influential scholars seem to have omitted an impressive body of empirical research over the past 30 years that supports a biological bases for the majority of childhood disorders.

After passage of P.L. 94-142 in the 1970s, researchers began to investigate the neurobiological bases of learning disabilities and behavioral disorders (Obrzut & Hynd, 1996). There is strong neurobiological evidence for attention deficit hyperactivity disorders (see Pliszka, 2003 for a review), reading disorders (see Feifer & DeFina, 2000; Hale & Fiorello, 2004 for reviews), written language disorders (see Feifer & DeFina, 2002; Hale & Fiorello, 2004 for reviews), mathematics disorders (see Fiefer & DeFina, 2005; Hale & Fiorello, 2004 for reviews), and pervasive developmental disorders (see Bauman & Kemper, 2005 for a review). School psychologists who want to translate this brain-behavior research into practice are increasingly interested in the applying neuropsychological principles into their professional practice.

Influences of Federal Education Laws and National Task Force Reports

Since 2000, there have been several key pieces of federal legislation and national task force reports that will influence the practice of school psychology and the emerging movement toward school neuropsychology for years to come. Rapid Reference 1.1 outlines those recent federal laws and task force reports.

Rapid Reference 1.1

Recent Federal Legislation and National Task Force Reports Influencing the Practice of School Neuropsychology

- No Child Left Behind (NCLB) Act of 2001.
- Rethinking Special Education for a New Century (Finn, Rotherham, & Hokanson, 2001). Report for the Thomas B. Fordham Foundation and the Progressive Policy Institute.
- Report of the President's Commission on Excellence in Special Education (2002).
- Minority students in special and gifted education (Donovan & Cross, 2002). Report for the National Research Council.
- Learning Disabilities Roundtable Report (2002).
- And miles to go . . . :State SLD requirements and authoritative recommendations. Report to the National Center for Learning Disabilities (Reschly, Hosp, & Schmied, 2003).
- Learning Disabilities Roundtable Report (2004).
- Individuals with Disabilities Education Improvement Act (IDEA) of 2004.

The *No Child Left Behind Act of 2001* (NCLB) and the *Individuals with Disabilities Education Improvement Act of 2004* (IDEA) were not designed to be mutually exclusive. Together, these laws envision a seamless system of supports in both general and special education based on evidence-based instruction (Kovaleski & Prasse, 2005). Both laws emphasize scientifically based instruction, curriculum, and interventions; early identification of learning problems (i.e., reading); ongoing monitoring of annual yearly progress (AYP); designing and implementing remedial and individualized interventions for those who do not respond to the general curriculum; and inclusion of students in a single, statewide accountability system (Kovaleski & Prasse, 2005). A chief concern among school psychologists is the increased emphasis in these federal laws and national reports on behavioral techniques at the apparent expense of the role that individual differences in cognitive processes play in the child's learning.

The No Child Left Behind Act (NCLB) of 2001 placed an emphasis on early intervention, particularly with reading problems, state-wide accountability requirements, and alternatives for parents to move their child from a failing school. The NCLB changes have had a profound impact upon public education. After the passage of NCLB in 2001, the focus shifted to what was, and was not, working in special education. The *Rethinking Special Education for a New Cen-*

tury (2001) report for the Thomas B. Fordham Foundation and the Progressive Policy Institute and the *Report of the President's Commission on Excellence in Special Education* (2002) focused clearly on the problems with the operationalization of the specific learning disabled (SLD) classification. The identified problems with SLD identification included:

- Too many students were being identified as SLD as compared to other disabilities.
- There was an overrepresentation of minorities identified as SLD (reiterated in the Overrepresentation of Minorities in Special Education Report by Donovan & Cross, 2002).
- The widespread use of the discrepancy model required a "wait-to-fail" approach, resulting in identification much too late in the educational process.
- Current identification methods were too costly and often identified the wrong students.

In 2002, the Office of Special Education Programs within the U.S. Department of Education sponsored a Learning Disabilities Roundtable discussion. Ten stakeholder organizations, including the National Association of School Psychologists (NASP), participated in this event and issued a final report entitled *Specific Learning Disabilities: Finding Common Ground* (Learning Disabilities Roundtable, 2002). There were several key portions in the consensus statements that are relevant to school neuropsychologists:

- The concept of Specific Learning Disabilities (SLD) is valid and supported by strong converging evidence.
- Specific learning disabilities are neurologically based and intrinsic to the individual (and the statutory definition of SLD should be maintained in IDEA reauthorization).
- Individuals with SLD show intra-individual differences in skills and abilities.
- The ability-achievement discrepancy formula should not be used for determining eligibility.
- Decisions regarding eligibility for special education services must draw from information collected from a comprehensive evaluation using multiple methods and sources in gathering relevant information.

The 2002 Learning Disabilities Roundtable consensus report was not without critics. In the 2003 report for the National Center for Learning Disabilities, *And miles to go . . . :State SLD requirements and authoritative recommendations,* Reschly

and colleagues (2003) expressed a few concerns about the Roundtable report and provided some useful survey data about SLD identification practices across states. Reschly et al. (2003) expressed a concern that:

> The LD Roundtable participants did not recommend changes in the IDEA definition of SLD, although the National Joint Committee on Learning Disabilities (NJCLD) formulated an SLD definition in 1988 that did not mention psychological process disorders (Hammill, 1990). It is likely that this was not a mere oversight, but more likely a conscious effort to focus on the most pressing issues, elimination of the ability-achievement discrepancy and development of a reasonable set of alternative procedures. (p. 7)

Members of the Learning Disabilities Roundtable have reported to this author that when the Roundtable reconvenes, the definition of SLD will be a topic of discussion. Despite years of empirical evidence, which proves that learning disabilities are a result of neuropsychological deficits, some educational policy makers remain unconvinced.

The IDEA (2004) law and rules have provided states the option of not using a discrepancy-based formula for the identification of specific learning disabilities. As an alternative to the discrepancy-based formula identification method a response-to-intervention model is being suggested. The long-standing definition of SLD has remained in the IDEA law and regulations. The IDEA law requires the use of a variety of assessment tools and the use of any single measure or assessment as the sole criterion for determining SLD is *not permitted.* Finally, the IDEA law requires that assessments must not be discriminatory based on race or culture. The nonmandated use of the ability achievement discrepancies in the identification of SLD opens the door for practitioners to implement alternative methods of assessment and identification. In this book, the author will be advocating for a process assessment approach for evaluating children with neurocognitive processing disorders (e.g., ADHD, SLD, TBI).

Increased Number of Children with Medical Conditions that Affect School Performance

An increasing number of children in the schools are affected with known or suspected neurological conditions. Unfortunately, many of these children rarely have their educational needs addressed. Accurate developmental histories may not be available to reflect early developmental concerns, medical conditions, or genetic predispositions.

As an example, if you were to walk into a neonatal intensive care unit, you

would find many infants who were born prematurely and with very low birth weight. Many of these infants are so small that you might hold them in the palm of your hand. These infants often spend the first several months of their lives attached to ventilators and a mass of other medical monitors. Researchers have been increasingly interested in the potential negative academic and behavioral consequences of these premature and low birth weight babies as they reach school age and beyond (see Dooley, 2005 for review).

When a school neuropsychologist reviews the cumulative record of a child referred for special education services, it is not uncommon to find a positive history of birth trauma or neonatal risk factors. While there has been no noticeable decrease in the number of low birth weight infants born annually, gradually advancement in quality neonatal intensive care has resulted in an increased survival rate. Whereas in the recent past, low birth weight and premature infants faced a high mortality rate, more of these at-risk infants are surviving. It is estimated that roughly 400,000 infants a year or 11.6 percent of all live births are premature (York & Devoe, 2002). Nathanielsz (1995) reported that although premature births may appear somewhat infrequent when compared to all live births, prematurity is still responsible for 75 percent of perinatal mortality. In addition to prematurity and low birth weight, Rapid Reference 1.2 lists several other major medical influences on school neuropsychology.

Despite this high perinatal mortality rate, there has been an improvement in the overall survival of low birth weight infants, most likely associated with advanced technology (Horbar & Lucey, 1995). Interestingly, the actual cause of preterm

Rapid Reference 1.2

Increased Medical Influences on School Neuropsychology

- More children are surviving birth traumas and other major medical illnesses with known correlates to later academic and behavioral concerns.
- Children and adolescents with traumatic brain injury present unique challenges to educators.
- There has been a tremendous increase in the number of children who are prescribed medications to control mood and behavioral disorders.
- There has been an increased number of research studies illuminating neuropsychological deficits associated with chronic illnesses such as asthma, diabetes, and heart disease.
- There has been an increased discovery of the limitations of clinical treatment for neurological disorders such as autism in school-based settings

birth remains somewhat elusive. While there are definite risk factors (e.g., cigarette smoking, first births, female sex, maternal low birth weight, fetal infections, metabolic and genetic disorders), there is essentially no known identifiable cause (Shiono & Behrman, 1995). A review of the literature reveals that low birth weight infants are at risk for neurosensory, cognitive/neuropsychological, behavioral, and academic difficulties (Dooley, 2005; Hack, Klein, & Taylor, 1995; Litt, Taylor, Klein, & Hack, 2005; Parker, 1998).

Modern medical advances have also had an impact on the lives of children with other medical conditions such as cancer, AIDS, demylenating diseases, traumatic brain injuries, and more rare medical diseases and conditions. Chronic illnesses affect approximately 20 percent of all children in the United States (Newacheck & Stoddard, 1994; Sexton & Madan-Swain, 1995). Kline, Silver, and Russell (2001) reported that within the population of chronically ill children, 30 to 40 percent have school-related problems. The majority of these children would qualify under the IDEA category of other health impaired. These health problems and their treatments can cause secondary academic and behavioral problems that could also lead to classification under other IDEA categories (e.g., specific learning disabilities, serious emotional disturbance).

In the early 1990s, a child with a head injury would move from an acute care hospital setting, where the physical and medical needs were met, to an intermediate rehabilitation setting for an extended period of time, where cognitive rehabilitation took place (Miller, 2004). Today it is typical for a child to forego any formal cognitive rehabilitation and return to school soon after being medically stabilized. During the past 10 to 15 years, managed health care has led to a reduction in cognitive rehabilitation services offered to children and youth with TBIs. In defense of the managed health care industry, the literature on the effectiveness of cognitive rehabilitation with children has been sparse (McCoy, Gelder, Van Horn, & Dean, 1997).

Despite the fact that TBI and OHI have been disability classifications for decades, school personnel are often ill-prepared to educate children with, or recovering from, severe and chronic illnesses, including TBI. Children and adolescents with TBI require specialized treatment and monitoring different from children within other special education classifications. Due to uneven spontaneous recovery of brain function and continued developmental changes, the clinical manifestation of TBI is constantly changing and requires frequent monitoring. Unlike some disabilities that only require 3-year reevaluations, children with TBI need frequent monitoring for changes in academic, behavioral, adaptive, and social-emotional functioning (McCoy et al., 1997). School neuropsychologists can play a major role in being the liaisons between

the school and the medical community, developing transitional/reentry plans for school-aged children after injury or insult, assisting with IEP development and monitoring, and general case management.

Increased Use of Medications with School-Aged Children

There has been a dramatic increase in the number of school-aged children taking psychotropic medications. Patel (2005) examined the prevalence rates of antipsychotic use in children and adolescents from 1996 to 2001 across three Medicare states (Ohio, Texas, and California) and one private managed care organization. The prevalence of atypical antipsychotic use increased dramatically (Ohio Medicaid: 1.4 to 13.1 per 1,000; Texas Medicaid: 2.5 to 14.9; California Medi-Cal: 0.3 to 6.2; and, Managed Care Organization: 0.4 to 2.7). Disruptive behavioral disorders were most commonly associated with antipsychotic prescription.

Another disturbing trend with school-age children is the multiple types of medications prescribed without apparent regard for the potential drug interactions and adverse side effects. Zonfrillo, Penn, and Leonard (2005) reviewed the research studies published from 1994 to 2004 regarding the practice of prescribing multiple medications to treat mental conditions in children and adolescents. The results suggested that there was a marked increase in the use of multiple medications (or polypharmacy) with children, despite a lack of research in this area.

School neuropsychologists are not physicians, but they can provide information about how psychotropic medication used to treat common problems like depression, anxiety, attentional processing disorders, and so on can affect learning and behavior. There is a wealth of information available about medication interactions and potential side effects on the Internet. Questions concerning the interactions and long-term consequences of polypharmacy and the neuropsychological effects of medications are currently being researched.

Increase in the Number of Challenging Educational and Behavioral Issues in the Schools

School psychologists note that there appear to be more children today, than 10 to 20 years ago, who are exhibiting severe behavioral, social-emotional, and academic problems. There is evidence to support that consensus. In the Report of the Surgeon General's Conference on Children's Mental Health: A National Action Agenda (2000), it was reported that there are approximately 6 to 9 million U.S. children and adolescents with serious emotional disturbances, which accounts for 9 to 13 percent of all children. Unfortunately, many children with

diagnosable mental disorders do not receive services. The Surgeon General's Report on Children's Mental Health: A National Action Agenda (2000) indicated that approximately 70 percent of children and adolescents who are in need of treatment do not receive services. Many of the serious emotional disturbances experienced by children such as depression, anxiety-related disorders, and ADHD have known or suspected neurological etiology. Therefore, many children with known or suspected neurological impairments who exhibit symptoms of mental health problems are not identified, or are identified and not receiving services.

Another major concern in educational practice is the inaccurate diagnoses and placements of children and adolescents with known or suspected neurological impairments. Neurologically impaired children are often mislabeled as Seriously Emotionally Disturbed or Specific Learning Disabled. These diagnoses and subsequent educational and behavioral interventions do not address underlying neuropsychological dysfunction. Misdiagnosis or misclassification can lead to serious consequences in a child's lifetime. Lewis, Pincus, Bard, Richardson, and colleagues (1988) evaluated 14 juveniles incarcerated in four U.S. states using comprehensive psychiatric, neurological, neuropsychological, and educational evaluations. The results were alarming. Nine of the 14 juveniles had symptoms consistent with major neurological impairment, 7 suffered from psychotic disorders that preceded incarceration, 7 showed symptoms of significant organic brain dysfunction on neuropsychological testing, and only 2 had Full Scale IQ scores above 90.

From a prevention and early intervention perspective, it seems to make sense that children with known or suspected neurological disorders must be educated appropriately. Too often, educators treat only the symptoms and not the underlying problems. Even though the classification of TBI has been in the IDEA law since 1990, many educators and school psychologists are ill equipped to deal with the special needs of this population.

In summary, school psychologists have been interested in applying neuropsychological principles since the early 1980s. Since then, there has been an explosion of research that provides support for the biological bases of learning and behavior. In the more recent past, there has been a resurgence of interest in school neuropsychology due to the convergence of several factors. First, federal legislation such as NCLB and the 2004 reauthorization of IDEA has caused school psychologists to critically evaluate their service delivery models. Old models, such as using the ability-achievement discrepancy model for the identification of SLD, have proven to be ineffective. There is a conceptual tug-of-war taking place as the school psychology profession struggles to come to terms with all of the

CAUTION

Access to clinical and pediatric neuropsychologists is often difficult or impossible in some portions of the country. At a minimum, school psychologists need to enhance their knowledge base about the biological bases of behavior.

systemic changes in education: on one side the strict behaviorists (the curriculum-based assessment advocates), who discount the value of individualized assessment of cognitive abilities, and on the other side the school psychologists and school neuropsychologists, who advocate for a more individualized process-based assessment to guide interventions.

School psychologists are also working with more children who have survived major medical insults and children who are taking more medications that affect learning and behavior. The effects of changing educational law, policies, and practices on the emerging specialization of school neuropsychology have been reviewed in this section of the chapter. In the next section, the reasons for neuropsychological assessment to be in included in the schools will be reviewed.

THE NEED FOR NEUROPSYCHOLOGICAL ASSESSMENT IN THE SCHOOLS

Access to Neuropsychological Services in the Schools

Access to neuropsychological services both inside and outside of the schools is often limited. Due to a supply and demand problem, even if a school district locates a neuropsychologist to evaluate a child, the evaluation may be costly and there may be a long wait time to have it completed. Access to neuropsychological services is even more difficult, if not impossible, in rural portions of the country where there are often no neuropsychologists.

In an ideal world, each school district would have access to a pediatric neuropsychologist who would write reports that were both informative and educationally relevant and who would consult regularly with educators and parents. Across the country, clinical neuropsychologists are more plentiful than pediatric neuropsychologists, but most clinical neuropsychologists are trained to work with adult populations, not school-aged children. A pediatric neuropsychologist would typically be found working in a hospital or rehabilitation setting with severely impaired children and generally would not have time for school-based assessments. Therefore, access to neuropsychological services from a clinical neuropsychologist for school-aged children is often difficult.

Limited Usefulness of Some Neuropsychological Reports

DON'T FORGET

The delivery of neuropsychological services in the schools is more than completing comprehensive assessments. Overseeing the implementation of the evidenced-based interventions is crucial.

Educators may have experienced sitting in an IEP meeting where a parent brings in a report from an outside neuropsychologist. Too frequently, neuropsychological reports from outside consultants are filled with diagnostic conclusions and much test data, but lack prescriptive recommendations that would be useful interventions in educational settings. Pelletier, Hiemenz, and Shapiro (2004) refer to this report as a "pin the tail on a lesion" type of report (p. 19). In these cases, the very expensive report that the parent brings to the school is frequently filed in the child's academic folder as educationally irrelevant and the experience becomes frustrating for all parties concerned.

Historically, neuropsychologists come from clinical psychology doctoral programs and have been trained in clinical psychopathology models of assessment and intervention for adults. These practitioners are often unfamiliar with educational laws such as IDEA, NCLB, and Section 504 of the Rehabilitation Act, or the organization and operations of schools in general. Fletcher-Janzen (2005) presented a chart showing a clear comparison of the differences between neuropsychologists that practice in the schools and neuropsychologists that practice in private agencies. School neuropsychologists have the advantage of working with children with whom they have a long educational history and multiple opportunities for assessment and intervention progress monitoring. Comparatively, pediatric neuropsychologists typically only see children outside of the school setting for a brief period of time (e.g., during a hospital stay) and are not able to observe the child in the natural school setting, nor follow-up on the effectiveness of their recommended interventions.

Also, clinical neuropsychologists may not understand that a clinical report with a *DSM* diagnosis does not always equate to a child's need for special education services. There is an obvious need for more cross training between school psychologists and clinical neuropsychologists (pediatric neuropsychologists included). In order to best help the child, clinical neuropsychologists must learn which diagnoses and educational interventions are useful to school districts. School psychologists with training in neuropsychology can play a role in consulting with clinical neuropsychologists to help determine services needed by the school districts.

Keeping in mind the limited access to neuropsychologists and the docu-

mented needs of children with known or suspected neurological conditions in the schools, we turn our attention to the approximately 35,000 school psychologists in the United States who have direct access to children. Miller (2004) pointed out that many of the new cognitive abilities tests and tests of memory and learning routinely used by school psychologists have strong theoretical foundations in neuropsychological theory. At a minimum, all school psychologists will have to improve their knowledge base about neuropsychological theories if they are going to appropriately interpret these new tests. The advantage of having a school psychologist trained in integrating neuropsychological principles into practice is that the end product of all services delivered by the school psychologist will be generally more pragmatic for the school and the child. However, as Miller (2004) pointed out, although a school neuropsychologist writes an insightful report and makes practical, evidence-based recommendations, there is no guarantee that the recommendations will be implemented. A major role of a neuropsychologist, whether an external consultant or an internal school psychologist with neuropsychology expertise, is to help teachers implement the educational recommendations using their consultation skills, instructional design knowledge, and program evaluation skills. An excellent neuropsychological evaluation filed away in the child's cumulative folder will benefit neither the school nor the child.

In summary, there is a documented need for neuropsychological services within the schools. However, finding a neuropsychologist with an understanding of developmental issues and the rules and regulations that guide educational practice is very difficult. Traditional reports written by clinical neuropsychologists are often not very useful in the schools. These reports tend to be too long and cumbersome, often describe the tests more than the child, and have recommendations not terribly relevant for most school-based learning environments. In addition, clinical neuropsychologists are not in a position to be held accountable for evidence of the success or failure of interventions. School psychologists, on the other hand, are directly responsible for outcomes and therefore are close at hand on a daily basis to see the interventions through to fruition. School psychologists are ideal candidates to broaden their competencies in neuropsychology to better serve educators, children, and their families.

DON'T FORGET

School psychologists are ideal candidates to broaden their competencies in neuropsychology because they are increasingly being held accountable for evidence of success or failure of interventions.

The integration of neuropsychological principles into the practice of school psychology and into the educational setting has its theoretical roots in clinical and pediatric neuro-

psychology. These historical influences on school neuropsychology along with the current trends in the field will be discussed in the next section.

HISTORICAL INFLUENCES OF CLINICAL AND PEDIATRIC NEUROPSYCHOLOGY

To understand and appreciate the emerging specialty of school neuropsychology, one must review the influences of adult clinical neuropsychology, pediatric neuropsychology, school psychology, and education in general (see Figure 1.1). Several authors (Hartlage, Asken, & Hornsby, 1987; Rourke, 1982) reviewed the history of adult clinical neuropsychology. Rourke (1982) labeled the first three historical stages of clinical neuropsychology as (1) the *single test approach stage,* (2) the *test battery/lesion specification stage,* and (3) the *functional profile stage.* This author has labeled current trends in neuropsychology as the *integrative and predictive stage.* These stages are reviewed in the next few sections of this chapter.

Single Test Approach Stage

Modern adult clinical neuropsychology has its origins in the mid-nineteenth century researchers (e.g., Broca, 1865, as cited in Von Bronin, 1960; Jackson, 1874, as cited in Taylor, 1932) who studied localization of brain functions. Despite the early emphasis on localization of brain functions, such as Broca's and Wernicke's areas, early adult clinical neuropsychology in the United States focused on global brain function and dysfunction.

CAUTION

The single test approach did not differentiate brain injured from non-brain injured children with sufficient validity.

The single test approach domi-

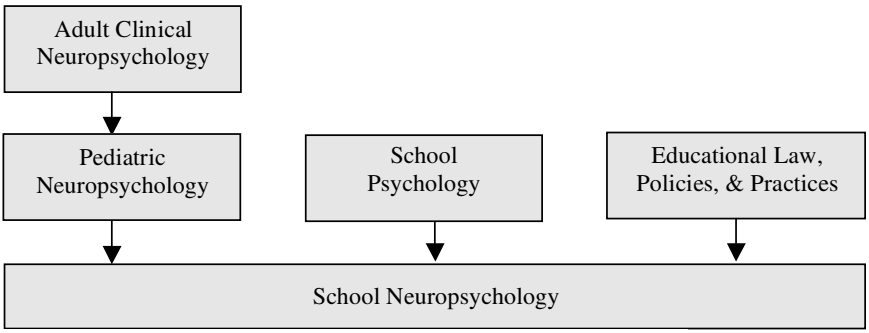

Figure 1.1 Historical influences on school neuropsychology

nated the practice of adult clinical neuropsychology during the 1900 to 1950s. One goal of practitioners during this period was to differentiate patients with brain damage from other groups using a single measure. Practitioners were taught to look for signs of overall "organicity" or brain dysfunction using single tests such as the Bender Visual-Motor Gestalt, Benton Visual Retention, or the Memory for Designs tests.

An analogy to the *single test approach* is the example of baking a cake. If your mother taught you how to bake a cake, she probably told you to stick a toothpick into the center of the cake to see if the cake was done. In other words, you generalized from a single sample to the rest of the cake. If the toothpick came out clean, then the rest of the cake was assumed to be done (see Figure 1.2). The "single sample" toothpick worked well in generalizing to the rest of the cake.

However, if we conceptualize the cake as being the construct of brain organicity (see Figure 1.2), a single test does not generalize well to the rest of the brain functions. For example, a child's poor performance on the Bender Visual-Motor Gestalt Test could be a result of multiple factors rather than an indicator of organicity. Poor performance on the Bender Gestalt could be a result of poor visual-motor coordination, motor awkwardness, poor visual-spatial skills, poor motivation, or poor fine motor coordination, and so on. In current school psychology practice, there are still some practitioners who refer to signs of "organicity" being observed in single samples of assessment; however, this approach has not differentiated brain-injured from nonbrain-injured children with sufficient validity (Rourke, 1982).

Test Battery/Lesion Specification Stage

As neuropsychological measurement increased in sophistication, clinicians and researchers determined that taking multiple samples of the same construct led to a better measurement of the construct of brain organicity or dysfunction. Therefore, in the "cake pan" analogy in which the cake is the construct of organicity,

Figure 1.2 Analogy of baking a cake

that construct would be better determined by taking samples from several locations measuring visual-spatial abilities, executive functions, attentional skills, memory and learning functions, and so on. Test batteries that measure a variety of neuropsychological constructs were developed to alleviate some of the concerns of using a single test to predict neuropsychological dysfunction.

In the 1940s, WWII played a major role in reshaping clinical neuropsychology. The war created a large number of soldiers who became patients with severe concussive and penetrating head injures (Hartlage et al., 1987). During this period, clinical psychology was also emerging as a profession, and a host of practitioners became available to evaluate patients with brain injuries. From the 1940s through the 1970s, several major neuropsychological test batteries were developed and widely used by clinicians. The principle role of the clinical neuropsychologist during this period was to administer neuropsychological batteries of tests to determine the source of possible brain dysfunction(s). The contributions of Ward Halstead, Ralph Reitan, Alexander Luria, Edith Kaplan, and colleagues will be reviewed in the next section.

Halstead-Reitan's Contributions to Clinical Neuropsychology

Ward Halstead was a prominent researcher and practitioner who published a monograph in 1947 that related the observations made on hundreds of patients with frontal lobe damage (see Halstead, 1952). Halstead's approach to assessment was largely atheoretical and designed to maximize the hit-rate in differentiating brain-injured patients from normal controls.

One of Halstead's students, Ralph Reitan, expanded the Halstead neuropsychological test battery and verified its use with lateralizing brain dysfunction (Reitan, 1955), lateralized motor deficits (Reed & Reitan, 1969), temporal lobe damage (Reitan, 1955), abstraction ability (Reitan, 1959), dysphasia (Reitan, 1960), and sensorimotor functions (Reitan, 1971). The *Halstead-Reitan Neuropsychological Test Battery* (HRNTB; Reitan, 1955; Reitan & Davidson, 1974; Reitan & Wolfson, 1993), as it became known, has been widely used in adult clinical neuropsychology practice.

The normative database for the adult version of the HRNTB has been updated in recent years (Heaton, Grant, & Matthews, 1991), which makes it still clinically useful with adults. While the Halstead-Reitan tests were assembled into a battery, the *single test approach stage* that dominated the early field is still somewhat evident. For example, on the Aphasia Screening Test, a Halstead-Reitan test, a child is labeled "dyslexic" if only one item is failed. As in the *single test approach stage,* this is a questionable practice because there are multiple ex-

planations for poor performance on a particular item rather than ascribing a neuropsychological condition.

Alexander Luria's Contributions to Clinical Neuropsychology

Alexander Luria was a Russian neuropsychologist who spent over 40 years evaluating the psychological and behavioral effects of brain-injured adults. Although Luria and Halstead were contemporaries, they took a very different approach to understanding brain-behavior relationships. Whereas, Halstead (and subsequently Reitan) used a *quantitative* approach to differentiating brain-injured from controls, Luria heavily emphasized the *qualitative* observations of the error patterns of patients. He summarized his theoretical and clinical observations in two influential books, *Higher Cortical Functions in Man* (Luria, 1966) and *The Working Brain* (Luria, 1973).

Luria's original method relied on detailed clinical insight and informal hypothesis testing. American clinicians were suspect of Luria's approach because it did not have the standardization of procedures and established psychometric properties that they were growing accustomed to with other instruments. Anne-Lise Christensen, an apprentice of Luria, originally standardized some of Luria's stimulus materials in the 1960s. In the 1970s, an English version of the test was standardized by Charles Golden, a Nebraska neuropsychologist, along with Thomas Hammeke and Arnold Purish. Golden and his colleagues administered the original Luria items to hundreds of neurologically impaired and control adults. They then used discriminant function analyses to determine which test items differentiated the normal controls from the brain-injured patients. Their research produced the first version of the *Luria-Nebraska Neuropsychological Battery* (LNNB; Golden, Hammeke, & Purish, 1978), which was later revised in 1986 (Golden, 1986).

Kaplan and Colleague's Contributions to Clinical Neuropsychology

In the 1960s and 1970s, a group of clinicians and researchers (e.g., Norman Geschwind, Harold Goodglass, Nelson Butters, Heinz Warner; see Hebben & Milberg, 2002) in the Boston area investigated variations in cognitive processes across clinical populations, but did not use either the HRNTB or the LNNB. Instead, this group used a flexible test battery designed to answer the referral question. This approach was named the Boston Process Approach in 1986 (Milberg, Hebben, & Kaplan, 1996) and has been called the Boston Hypothesis Testing Approach (Teeter & Semrud-Clikeman, 1997). The basic tenet of this approach to neuropsychological assessment was the idea that how a person arrives

at an answer on a test is as important as the test score itself. This emphasis on qualitative behaviors and hypothesis testing has some similarities to the original Lurian clinical method, but the Boston Process Approach uses standardized tests. The principle of "testing the limits" by asking individuals questions beyond the ceiling levels or modifying the questions is a hallmark of this approach. Edith Kaplan was one of the principle advocates for this approach to assessment. Many of the "process oriented" approaches originally advocated by these clinicians and researchers have become part of current assessment techniques.

DON'T FORGET

Luria's conceptualization of "functional systems" within the brain has served as the theoretical foundation for several current tests (e.g., *Cognitive Assessment System:* Naglieri & Das, 1997; *Kaufman Assessment Battery for Children–Second Edition:* Kaufman & Kaufman, 2004; *NEPSY:* Korkman, Kirk, & Kemp, 1998).

Adult Clinical Neuropsychology Practitioner's Philosophical Orientations

By the 1980s, surveys of clinical neuropsychologists reported that 28 percent of respondents preferred the Halstead-Reitan tests, 13 percent preferred the Luria-Nebraska tests, 15 percent preferred neither of the fixed batteries, and 44 percent of the respondents were not trained to use either of the fixed batteries (Guilmette, Faust, Hart, & Arkes, 1990). Guilmette et al. (1990) also reported that, while the Halstead-Reitan tests battery was the most popular, only 27 percent of the survey respondents used the complete battery in their assessments. Most clinical neuropsychologists in the 1980s used portions of fixed batteries in their practices but not the entire battery.

In the late 1980s and early 1990s, the adult clinical neuropsychology profession began endorsing the use of a flexible battery in assessment rather than a fixed battery. By the early 1990s, 60 percent of practitioners preferred the flexible battery approach to the fixed battery approach (Sweet, Moberg, & Westergaard, 1996). By the end of the 1990s, approximately 70 percent of practitioners preferred the flexible battery approach to the fixed battery approach (Sweet, Moberg, & Suchy, 2000).

Early Neuropsychological Test Batteries for Children

While adult clinical neuropsychologists were moving away from fixed batteries of assessment to more flexible batteries of assessment by the end of the 1990s, pediatric neuropsychologists had few assessment tools from which to choose.

CAUTION

If the Halstead-Reitan tests are going to be used in clinical practice today, make sure to use the consolidated norms at a minimum (see Baron, 2004). Even these norms remain problematic because they do not represent a true national standardization sample. A better practice for practitioners would be to use the Dean-Woodcock Sensory-Motor Battery (Dean & Woodcock, 2003b), which includes many of the original Halstead-Reitan tests but are based on a recently broad-based, restandardized population.

This section will review the history of pediatric neuropsychology and its influence on school neuropsychology.

First Neuropsychological Test Battery for Children

In the 1960s, pediatric neuropsychology emerged as a subspecialization within the broader field of clinical neuropsychology. Initially, many of the early neuropsychological test batteries developed for children were downward extensions of adult test batteries. Ernhart, Graham, and Eichman (1963) were credited as being the first researchers to apply a battery of tests to assess developmental outcomes in children with brain injuries. They found that brain-damaged children manifested deficits on multiple verbal and conceptual measures, as well as on multiple perceptual measures. They reported that no single measure yielded a satisfactory discrimination of brain-damaged children; whereas, the use of the whole battery did. This was consistent with the idea that multiple measures are better discriminators of brain function/dysfunction than a single sample of behavior.

Halstead-Reitan Tests for Children

In the 1970s, a downward extension of the adult HRNTB was developed for children in the 9- to 14-year-old range called the Halstead-Reitan Neuropsychological Test Battery for Older Children (HRNTB-OC; Reitan & Davidson, 1974; Reitan & Wolfson, 1992). A version of the test was also developed for children ages 5 to 8 called the Reitan-Indiana Neuropsychological Test Battery (RINTB; Reitan & Wolfson, 1985). Rapid Reference 1.3 presents the tests that are included in the HRNTB-OC and the RINTB. See Reitan and Wolfson (1992) for an expanded description of the HRNTB and RINTB tests and see Teeter and Semrud-Clikeman (1997) for an extensive review of the HRNTB and RINTB clinical research studies. Teeter and Semrud-Clikeman (1997) pointed out that the Halstead-Reitan tests for children must be used with caution. Concerns about the HRNTB and RINTB tests include: insufficient norms (Leckliter & Forster, 1994), covariance with intelligence, inability to distinguish psychiatric from neurological conditions in children, and the inability of the tests to localize dysfunction or predict recovery after a brain insult or injury.

Rapid Reference 1.3

Subtests from the Halstead-Reitan Neuropsychological Test Battery for Older Children (HRNTB-OC) and the Reitan-Indiana Neuropsychological Test Battery (RINTB)

HRNTB-OC Children Ages 9–14	RINTB Children Ages 5–8
Category Test	Category Test
Tactual performance test	Tactual performance test
Fingertip tapping test	Fingertip tapping test
Speech sounds perception test	
Seashore rhythm test	
Trail-making test, Parts A & B	Marching test
Strength of grip test	Strength of grip test
Sensory perceptual exam	Sensory perceptual exam
Tactile finger localization test	Tactile finger localization test
Fingertip number writing test	Fingertip symbol writing test
Tactile form localization test	Tactile form recognition test
Aphasia screening test	Aphasia screening test
	Color form test (opt.)
	Progressive figures test (opt.)
	Matching pictures test (opt.)
	Target Test (opt.)
	Matching figures and matching V's test (opt.)
	Drawing of start and concentric squares (opt.)

Several researchers have compiled HRNTB and RINTB normative data sets for children since their initial publications (see Baron, 2004 for consolidated norms for most of the Halstead-Reitan tests for children). Rather than using the original Halstead-Reitan tests for children based on a synthesized collection of normative data that may be up to 35 years old, it is recommended that practitioners evaluate the Dean-Woodcock Sensory-Motor Battery (DWSMB; Dean & Woodcock, 2003b). The DWSMB incorporated many of the Halstead-Reitan tests when it restandardized the tests using a broad-based national sample. The DWSMB is also conormed with the Woodcock-Johnson III Tests of Cognitive

Ability (Woodcock, McGrew, & Mather, 2001a). The Dean-Woodcock will be discussed in a later section of this book.

Luria-Nebraska Neuropsychological Battery: Children's Revision

After the Luria-Nebraska Neuropsychological Battery for adults was introduced in 1978, Golden and his colleagues started working on a revision. In 1986, the revised Luria-Nebraska Neuropsychological Battery for adults was published along with a separate Luria-Nebraska Neuropsychological Battery: Children's Revision (LNNB-CR; Golden, 1986).

The LNNB-CR was designed to evaluate a wide range of skills aimed at assessing the neuropsychological processes of children ages 8 through 12. Rapid Reference 1.4 presents the LNNB-CR scales and the cognitive processes each scale measures. Golden (1997) reported that he and his colleagues spent nearly a decade, from the mid-1980s to the mid-1990s, working on the LNNB-III that would integrate the children and adult versions, but the test has never been published. Therefore, practitioners who use the LNNB-CR must rely on standardization sample norms that come from samples collected in the 1980s. Please refer to Golden (1997) for an expanded description of the LNNB-CR tests, and see Teeter and Semrud-Clikeman (1997) for an extensive review of the LNNB-CR clinical research studies. Some studies found the LNNB-CR was useful in discriminating LD from non-LD children, but little research has been done on the effectiveness of the test in discriminating neurologically impaired children from nonclinical groups.

Rapid Reference 1.5 presents the advantages and disadvantages of using the Halstead-Reitan or the Luria-Nebraska tests for children. A major concern about both the Halstead-Reitan and the Luria-Nebraska tests for children was that conceptually both instruments were downward extensions of adult models. These early fixed batteries treated children as miniature adults and did not take into consideration the developmental variations of childhood.

In summary, the focus of the *test battery / lesion specification stage* was to develop multiple neuropsychological measures within a test battery that when viewed together were useful predictors of brain dysfunction. The fixed-battery approach by its definition was restrictive. The tests served as gross indicators of brain function or dysfunction but were not very useful in localization or in developing prescriptive interventions. The need to move beyond assessment only for the sake of diagnosis, to a model of assessment that linked to prescriptive interventions laid the foundation for the next stage in clinical neuropsychology, called the *functional profile stage*.

Rapid Reference 1.4

The Luria-Nebraska Neuropsychological Battery–Children's Revision Scales

Scale	Cognitive Functions Assessed
Clinical Scales	
• Motor	• Bilateral motor speed, coordination, imitation, construction
• Rhythm	• Auditory discrimination, sequencing, memory, attention
• Tactile	• Finger and arm localization, two-point discrimination, shape discrimination, movement detection, attention
• Visual	• Visual recognition, visual memory, visual-spatial abilities
• Receptive Speech	• Receptive language, problem solving, flexibility, sequencing
• Expressive Speech	• Reading, expressive speech, sentence repetition, memory, object naming, grammar
• Writing	• Spelling, copying, sequencing, memory, spontaneous writing
• Reading	• Sound synthesis, letter recognition, reading, writing
• Arithmetic	• Number recognition, number writing, simple and complex arithmetic operations
• Memory	• Short-term verbal and nonverbal memory, and paired-associate learning
• Intelligence	• General intelligence (comprehension, language, problem solving)
Clinical Summary Scales	
• Pathognomonic	• Consists of items drawn from 10 of the ability scales. "Best indicator of brain integrity." Highly sensitive to presence of brain dysfunction or overall impairment.
• Left Hemisphere	• Measures integrity of left-hemisphere sensorimotor strip (sensory and motor functions).
• Right Hemisphere	• Measures integrity of right-hemisphere sensorimotor strip (sensory and motor functions).

Rapid Reference 1.5

Advantages and Disadvantages of the HRNTB-OC/RINTB and the LNNB-CR

Halstead-Reitan Tests	Luria-Nebraska Tests
Advantages	
• Empirically designed battery	• Empirically designed battery
• Well researched	• Strong theoretical basis
• Reliability and comparability across different clinical groups	• Relatively brief administration time and inexpensive
• Ability to be administered by a technician	• Rich qualitative component of the test
Disadvantages	
• Largely a downward extension of an adult model to children	• Largely a downward extension of an adult model to children
• Theoretically weak	• Not as well researched as the Halstead-Reitan tests
• Long administration times which requires a moderate amount of training	• Too much overlap with measures of achievement
• Costly set of materials	• Not a true reflection of the Lurian method
• Only one sample of behavior	• Not as popular as the Halstead-Reitan tests
• Samples of behavior not consistent with current theories	• Samples of behavior not consistent with current theories
• No contemporarily collected, broad-based normative data[a]	• No contemporarily collected, broad-based normative data

[a] Many of the Halstead-Reitan tests have been restandardized and included in the *Dean-Woodcock Sensory-Motor Battery* (Dean & Woodcock, 2003b).

Functional Profile Stage

Rourke (1982) referred to the first two stages in the history of clinical neuropsychology (*single test approach* and the *test battery/lesion specification*) as *static* stages. Starting in the late 1970s, three major factors influenced the evolution of neuropsychology: (1) pediatric neuropsychologists started to question the downward extension of adult models applied to children, (2) neuropsychologists in general started to question the validity of neuropsychological test batteries to localize brain lesions,

and (3) noninvasive neurodiagnostic methods (e.g., CAT, MRI, PET scans) began to replace neuropsychological tests for making inferences regarding brain lesions. With the evolution of neuroimaging techniques, neuropsychologists no longer used test batteries to determine localization of the sites of possible brain dysfunction. CAT and MRI scans provide detailed views of the structure of the brain, while early PET scans provided both structural and functional information about the brain. During this period, neuropsychologists shifted the focus of their reports away from brain localization issues to identifying a functional profile of an individual's strengths and weaknesses. The neuropsychologist's goal became to differentiate between spared and impaired abilities.

DON'T FORGET

With recent changes to federal education laws, school psychologists are uniquely poised to put the practice of "psychology" back into the practice of school psychology, more specifically integrating the principles of cognitive psychology and neuropsychology.

Rourke (1982) referred to this *functional profile stage* as the *cognitive stage*. Rourke's implication was that the *functional profile stage* put the principles of cognitive psychology back into the practice of neuropsychology. Rather than administer a fixed battery of tests and indicate the presence or absence of a suspected lesion, the neuropsychologists of the 1980s and beyond were asked to comprehensively assess the cognitive processes of the individual.

One cannot help but draw a parallel between the shift from the *fixed battery/brain localization stage* to the *functional profile stage* in clinical neuropsychology and the current state of school-psychology specific learning disabilities identification practices. Rapid Reference 1.6 highlights these similarities. During the

Rapid Reference 1.6

Parallels Between the Shift in Neuropsychology from a Fixed-Battery Stage to a Functional Profile Stage and Present Day School Psychology Practice

Neuropsychology	School psychology
• "Repsychologizing" of the field through emphasis on cognitive strengths and weaknesses.	• De-emphasis on SLD discrepancy formulas and reemphasis on processing deficits.
• Few new tests in the 1980s that addressed the reconceptualization.	• Many new assessment measures and intervention techniques designed to address processing deficits.

fixed battery stage, the assessment tools themselves made clinical neuropsychologists become more like technicians rather than clinicians. The test results were clear-cut, indicating either the presence or the absence of brain dysfunction. Many aspects of school psychology practice between the 1980s and today have relied too heavily on using fixed methods (e.g., discrepancy formulas) to indicate the presence or absence of specific learning disabilities. When the field of neuropsychology made the shift to valuing a more functional assessment of the individual's strengths and weaknesses and linking that information to prescriptive interventions, neuropsychologists were at a disadvantage because there were no new testing instruments that addressed this reconceptualization.

School psychology is in a much more favorable position since the 1990s, as there has been a steady increase in assessment tools designed to address functional strengths and weaknesses and make prescriptive linkages. School psychologists are on the cusp of putting the practice of "psychology" back into the practice of school psychology, or more specifically of integrating the principles of cognitive psychology and neuropsychology.

So the *functional profile stage* of neuropsychology reemphasized the "repsychologizing" of neuropsychology by emphasizing the psychological aspects of neurological insults and anomalies and identifying the functional strengths and weaknesses of individuals. Although this stage of development represented a shift in the goals of neuropsychological assessment, there were no dramatic changes or innovations in the types of tests and measures being used. The "state of the art" of clinical neuropsychological assessments during this period was still the three major approaches: the Halstead-Reitan, the Lurian perspective, and the Boston Process Approach.

For the sake of continuity, let's return to the analogy of the cake pan. If we continue to use the analogy that the cake represents the construct of organicity or overall brain function, neuropsychologists in the *functional profile stage* would continue to advocate for taking multiple samples (or tests) of behavior. However, the emphasis would shift from prediction of "organicity" to an analysis of the relationships between the performances on the behavioral samples (i.e., did the "cake" samples show differences among the sampled sites?).

Integrative and Predictive Stage

The *integrative and predictive stage* is a term used by this author to describe the period of the early 1990s to present time. During this period, many multidisciplinary changes have influenced school neuropsychology. Many of these changes are related to advances in how the brain influences learning and behavior. The rapid

explosion of research related to brain-behavior relationships resulted in the U.S. Congress declaring the 1990s as the "Decade of the Brain."

School neuropsychologists are ultimately interested in how to assess neurocognitive functions reliably and validly. Accurate assessment is essential for accurate diagnoses and strengthening prescriptive interventions. The multidisciplinary advances since the 1990s that have influenced the practice of school psychology and the specialty of school neuropsychology include: development of tests specifically designed for children, advancement of neuroimaging techniques, theoretical advancement, influences of a cross-battery approach, influences of a process-assessment approach, and the professional focus on ecological validity and linking assessment data with evidence-based interventions.

Development of Tests Specifically Designed for School-Aged Children

Prior to the *integrative stage,* if a researcher wanted to develop a new test that measured visual short-term memory as an example, the courses of action were clear. The researcher would develop a set of items, administer them to a broad-based sample, validate the psychometric properties of the test, and then publish the test. A common method for establishing the validity of that new test would have been to correlate it with an existing test that reported to measure the same construct. If the two tests correlated, the researcher indicated that the new test was a valid measure of the construct being tested. Today, the test developer is faced with a new set of challenges. A new test must still adhere to psychometric rigor, but it is also important for the test to fit within a theoretical frame of reference, report both quantitative and qualitative samples of behavior, be ecologically valid, and have some linkages to evidence-based interventions. This push for integration of all of these attributes is also an important feature of the *integrative and predictive stage*.

One of the hallmark features of the *integrative and predictive stage* is that neuropsychological tests developed for children in this period are not downward extensions of adult models. The newer neuropsychological batteries for children and stand-alone tests of neuropsychological processes (reviewed in Chapters 4–12) are specifically designed for and standardized on children. The *Test of Memory and Learning* (TOMAL; Reynolds & Bigler, 1994) was one of the first examples of a neuropsychological test designed specifically for school-aged children. Test authors in the 1990s provided school neuropsychologists with a rich array of assessment tools that were developed for school-aged children. Some of these newer tests will be discussed in the next major section of the book.

Influences of Brain Imaging Studies on Learning and Behavior

The TOMAL was also one of the first measures that used CT scans to validate some of its construct validity. Increasingly, neuroimaging techniques such as functional MRI scans (fMRI) are being used to validate neuropsychological instruments that report to measure certain cognitive processes. In addition, functional imaging techniques are opening the "windows of the mind" to allow us to peek into the brains of children while they are performing basic cognitive functions. In a more recent and exciting application, researchers such as Shaywitz (2003) have started to use functional imaging techniques to evaluate the effects of specific reading interventions. Neuropsychological test development and validation of the future will include neuroimaging studies.

Expansion of Theoretical Frames of Reference

From the early 1900s through the mid-1980s, the theoretical frames of reference for classifying human cognitive abilities were limited to one (verbal) or two factor (verbal and visual-spatial) solutions. The theoretical models of intelligence increased dramatically just prior to the start of the *integrative stage* of neuropsychology in the 1990s. See Flanagan and Harrison (2005) for a comprehensive review of the contemporary theories of intelligence, including: Carroll's Three-Stratum Theory of Cognitive Abilities, Gardner's Theory of Multiple Intelligences, the Cattell-Horn Fluid-Crystallized (*Gf-Gc*) theory, and the Luria-Das Model of Information Processing.

The current state-of-the-art practice of school psychology and school neuropsychology demands that assessment of cognitive abilities have a strong theoretical foundation. The strong theoretical foundation also facilitates the interpretation of the test data within a theoretical frame of reference. For example, the advanced and integrated Cattell-Horn-Carroll theory served as the theoretical foundation for the Woodcock-Johnson Third Edition Tests of Cognitive Abilities (Woodcock, McGrew, & Mather, 2001a), while the Luria-Das Model of Information Processing served as the theoretical model of the Cognitive Assessment System (Naglieri & Das, 1997) and the Kaufman Assessment Battery for Children–Second Edition (Kaufman, & Kaufman, 2004).

DON'T FORGET

Current state-of-the-art practice demands that assessments have a theoretical foundation to aid in test interpretation.

Influences of the Cross-Battery Approach

An outgrowth of the advances in our theoretical conceptualization of cognitive abilities is the cross-battery approach. In constructing a school-based neuropsychological assessment to answer a particular referral question, a school neuropsychologist may need to draw subtests from multiple test batteries. This is essentially a cross-battery approach. At the foundation of the cross-battery approach, (Carroll, 1983, 1993) and Horn (1988, 1994) conducted several factor-analytical studies across multiple measures of intelligence, which yielded a taxonomy of broad cognitive abilities. Woodcock (1990) was one of the first to suggest that pulling measures from one or more intellectual test batteries during a single assessment would provide a broader measure of cognitive abilities. The cross-battery approach was expanded as a means of bridging a gap between modern theories of the structure of intelligence and current practice of assessing those cognitive abilities (see Flanagan & McGrew, 1997; Flanagan & Ortiz, 2001).

Influences of the Process Assessment Approach

One of the legacies of the Boston Process Approach has been the inclusion of qualitative aspects of a child's performance within new tests. Practitioners and researchers have recognized the importance of both the quantitative and qualitative aspects of a child's performance. The emphasis on the qualitative behaviors is part of a broader *process assessment approach*. The process assessment approach assists school neuropsychologists in determining the strategies a child uses to solve a particular task. Test authors and their publishers have excelled in recent years in establishing base rates for common qualitative behaviors. For example, a test with such data included in the standardization will allow a practitioner to make statements such as "Asking for repetitions 10 times on the verbally presented material occurred with such frequency in only 3 to 10 percent of other 5 year olds in the standardization sample." The qualitative information can provide useful clues to interventions. See Rapid Reference 1.7 for a list of assessment instruments that have included qualitative components.

Emphasis on Ecologically Valid Assessment

As practitioners, we have attempted to administer standardized assessments to children in school closets or on gymnasium stages only to later question if those test results will mirror the child's actual level of abilities or achievement. This is an issue of ecological and predictive validity, which has been discussed in the literature

Rapid Reference 1.7

Tests with an Increased Emphasis on the Qualitative Aspects of Performance

- Luria-Nebraska Neuropsychological Battery–Children's Revision (Golden, 1986)
- Cognitive Assessment System (Naglieri & Das, 1997)
- NEPSY (Korkman, Kirk, & Kemp, 1998)
- Wechsler Intelligence Scale for Children–Third Edition as a Process Instrument (Kaplan, Fein, Kramer, Delis, & Morris, 1999)
- Wechsler Intelligence Scale for Children Fourth Edition Integrated (Wechsler, 2004a)

in recent years (Chaytor & Schmitter-Edgecombe, 2003; Sbordone, 1996). Improving the ecological validity of our assessment approaches was one of the goals of the Futures in School Psychology Conference in 2002 (Harrison et al., 2004).

In the *integrative and predictive stage* of neuropsychology, there has been, and is, an increased emphasis on relating assessment findings to an individual's everyday functioning. Sbordone (1996) defines ecological validity as "the functional and predictive relationship between the patient's performance on a set of neuropsychological tests and the patient's behavior in a variety of real-world settings" (p. 310). As in the functional stage of neuropsychology, the emphasis on assessment today is more on the prescriptive recommendations rather than the diagnostic conclusions within a report. In recent years, greater emphasis has been placed on the fields of clinical neuropsychology, school psychology, and the emerging specialty area of school neuropsychology to demonstrate predictive validity of assessment techniques. Parents and educators want to know how well the child will perform in the future based on current assessment data. This is especially true of using current assessment data to predict performance on high-stakes competency-based accountability testing for NCLB compliance. If we must continue to use high-stakes assessment, there will always be a percentage of the students who fail to reach the cut-off scores. School neuropsychologists can provide valuable assessment services to children who are failing competency-based tests by linking the assessment results to individualized remedial interventions.

Mandate to Link Assessment Results with Evidence-Based Interventions

In the grand scheme of things, the field of school psychology is relatively young. Within the past 100 years, the field has become better at developing and validat-

ing theoretical constructs and approaches to assessment. However, the field is lagging in the area of empirically validated interventions. School psychologists have many "cookbook" resources that provide recommendations based on common academic or behavioral problems. Review of the literature shows there is little solid evidence for many of the recommendations that are consistently made by practitioners. As a result of the recent legislative changes, there is an added emphasis in education on identifying methods that work.

Having stated the need for evidence-based interventions, where does the field proceed? Questions need to be answered, such as "What constitutes an evidenced-based intervention?" Kratochwill and Shernoff (2004) suggested that an intervention could be considered *evidence-based* if its application to practice was clearly specified and if it demonstrated efficacy when implemented into practice. Several joint task forces across professional organizations have been working on establishing guidelines for evidence-based practice research. This line of research is crucial to the credibility of school psychology and the school neuropsychology specialty. Gone are the days of assessing a child only for an educational classification. Clearly lawmakers, educators, teachers, and parents are demanding assessment that guides intervention.

There are challenges to conducting evidence-based research in the schools. Obtaining permission to conduct applied research in the schools has become increasingly difficult because administrators, teachers, and parents are concerned with "time on task" and maximizing the classroom time spent on preparing for high-stakes, competency-based exams. Evidence-based research may have the best chance of getting into the schools if the results can be shown to help improve test performance on statewide competency exams.

Let's return to the cake pan analogy one last time. If we consider the cake pan analogous to the concept of "organicity" or brain function/dysfunction, neuropsychologists in the current *integrative and predictive stage* would continue to advocate for taking multiple samples of behavior (i.e., multiple toothpick probes into the cake). However, in the past stages, all of the samples of behavior were based on behavioral test samples; that is what we would actually see on the toothpick after it is stuck in the cake. Today in clinical practice and research there is a cross-disciplinary approach to understanding brain functioning with integrated functional imaging techniques, advancements in test development, and inclusion of qualitative analyses of test performance. These multiple samples of any construct such as "organicity" must also strive to be ecologically valid and have good predictive validity; that is, we have to take the temperature of the cake probe (i.e., the toothpick) and analyze the contents adhering to the toothpick using technology and other tests that provide qualitative, chemical, physiological, and functional information. Future researchers will continue to advance

Rapid Reference 1.8

Historical Stages of Neuropsychological Assessment

Stage	Focus of Stage
• Single test approach (1900–1950)	• Emphasized using a single test (e.g., Bender Visual-Motor Gestalt) to predict brain dysfunction.
• Test battery/ lesion specification (1940–1980s)	• Emphasized using a battery of tests to predict brain dysfunction.
• Functional profile (1970–2000)	• Deemphasized localization of brain "lesions" and emphasized the identification of impaired and spared abilities.
• Integrative and predictive (1990–present)	• Current view of neuropsychology with an emphasis on cross-battery, multidimensional, and ecologically valid assessments.

the knowledge base in all disciplines such as education, psychology (including neuropsychology), school psychology, functional neuroanatomy, biochemistry, electrophysiology, genetics, and so on. The knowledge gleaned from these fields will reshape the ways in which we practice.

Summary of the Historical Influences of Clinical and Pediatric Neuropsychology on the School Neuropsychology Specialty

Rapid Reference 1.8 presents a review of the historical stages in clinical and pediatric neuropsychology and the major focus of each stage. The influences of clinical neuropsychology and pediatric neuropsychology on the emerging specialty of school neuropsychology have been reviewed. The next section will shift the focus to the history of school neuropsychology.

HOW DOES THE INTEGRATION OF NEUROPSYCHOLOGICAL PRINCIPLES FIT WITHIN THE BROADER FIELD OF SCHOOL PSYCHOLOGY?

The following questions are posed to the reader:

- *Is the integration of neuropsychological principles into the practice of school psychology an expansion of basic neuropsychological training received at the specialist level?*

- *Is school neuropsychology a specialty within the broader field of school psychology?*
- *Is school neuropsychology an emerging and unique specialization, separate from but related to school psychology and pediatric neuropsychology?*

These three questions represent different levels of classification of school neuropsychology based on current practice. The *first question* suggests that school neuropsychology may be a focused area of interest for some school psychology practitioners. Many practitioners attend, as often as they can, continuing education workshops that relate to neuropsychological topics. There is a tremendous interest in any topic related to school neuropsychology at each annual National Association of School Psychologists (NASP) and American Psychological Association (APA) conventions and annual state affiliate association conferences. This level of practice would be considered a baseline entry into school neuropsychology and only implies *interest* in the school neuropsychology field, not *competency* in school neuropsychology.

The *second question* suggests that school neuropsychology is a specialty area within the broader field of school psychology. Currently, NASP does not recognize specialties within the field of school psychology. Hynd and Reynolds (2005) emphatically stated in the recently published *Handbook of School Neuropsychology* that: "the time for development of specializations in school psychology has come" (p. 12). This author endorses that sentiment as well, recognizing that there is still controversy in the school psychology profession over this subject (see Pelletier et al., 2004).

The body of specialized school psychology knowledge has grown exponentially in recent years. We truly live in the information age. The training requirements for entry-level school psychology practitioners have increased dramatically since the early 1990s. Trainers of school psychologists do their best to train entry-level and advanced practitioners in a variety of roles and functions including: data-based problem solving, assessment, consultation, counseling, crisis intervention, and research. Most school psychology curriculums at the specialist level have a class that covers the biological bases of behavior; but there is no in-depth exposure to neuropsychology. School psychology trainers often feel that they only have enough time to introduce specialist-level students to the broad array of roles and functions available to them as practitioners. Increased specializations in areas such as school neuropsychology must occur either through organized, competency-

DON'T FORGET

School neuropsychology is quickly becoming a specialty within school psychology even though it has not been formally recognized by the school psychology professional organizations.

based post-graduate certification programs or through doctoral school psychology programs that offer specialization in school neuropsychology.

Many graduates of school psychology graduate programs (specialist or doctoral levels) report that they quickly choose an area of specialization once they graduate. Some graduates become "specialists" in autism assessment and interventions, others are "specialists" in early childhood assessment, adolescent psychopathology, curriculum-based measurement consultants, and so on. The point is that the field of school psychology has become so rich in knowledge that practitioners often seek a specialization. These specializations already taking place within our field are a result of both individual interest and the need for more in-depth knowledge and training in narrower areas of knowledge and practice.

Currently, the movement of integrating neuropsychological principles into school psychology practice is naturally evolving into a specialty within the broader field of school psychology. The question that arises with the specialization topic is: What constitutes specialization? Taking one course on how to administer a popular neuropsychological battery certainly does not constitute specialization; however, specializing in school neuropsychology does require minimal levels of training in identified competencies.

The *third statement* suggests that school neuropsychology is an emerging and unique specialization, separate from but related to school psychology and pediatric neuropsychology. This may be the long-range status of school neuropsychology, but school neuropsychology is probably best viewed as an area of interest for practicing school psychologists or, at best, as an emerging subspecialty area within the broader field of school psychology.

DEFINITION OF SCHOOL NEUROPSYCHOLOGY

In 2004, Miller [this author] along with two colleagues, DeFina (school/pediatric neuropsychologist) and Lang (pediatric neuropsychologist), wrote the following definition of school neuropsychology for a series of training workshops:

> School neuropsychology requires the integration of neuropsychological and educational principles to the assessment and intervention processes with infants, children, and adolescents to facilitate learning and behavior within the school and family systems. School neuropsychologists also play an important role in curriculum development, classroom design, and the integration of differentiated instruction that is based on brain-behavior principles in order to provide an optimal learning environment for every child.

In order to discuss some of the associated implications, this definition will be broken down into smaller components.

"*School neuropsychology requires the integration of neuropsychological and educational principles . . .*" The blend between educational and neuropsychological foundations is an essential knowledge base for school neuropsychologists.

"*. . . to the assessment and intervention processes with infants, children, and adolescents . . .*" School neuropsychology is not limited to assessment and diagnosis. Linking assessment with evidenced-based interventions is an important focus for school psychologists and school neuropsychologists. Also, school neuropsychologists are trained to work with infants and school-aged children.

"*. . . to facilitate learning and behavior within the school and family systems.*" School neuropsychologists are trained to work with children and adolescents within the context of their school and home environments. Learning and behavioral problems do not stop at the end of the school day. Family involvement is crucial in affecting positive behavioral and academic change in a child.

"*. . . School neuropsychologists also play an important role in curriculum development, classroom design, and the integration of differentiated instruction that is based on brain-behavior principles in order to provide an optimal learning environment for every child.*" School psychologists and school neuropsychologists are trained as consultants to the learning environment, linking instructional design, curriculum development, and differential assessment to research-based interventions. School neuropsychologists are uniquely trained to apply brain-based research principles to enhance the educational environment.

ROLES AND FUNCTIONS OF A SCHOOL NEUROPSYCHOLOGIST

George Hynd (1981) is credited as being the first school psychologist to advocate for doctoral school psychologists to be trained in clinical neuropsychology. Hynd suggested that a doctoral-level school psychologist with training in neuropsychology:

- interprets the results of neuropsychological assessment and develops strategies of intervention
- presents recommendations for remediation based on knowledge of scientifically validated interventions

- consults with curriculum specialists in designing approaches to instruction that more adequately reflect what is known about neuropsychological development
- acts as an organizational liaison with the medical community, coordinating and evaluating medically based interventions
- conducts in-service workshops for educational personnel, parents, and others on the neuropsychological basis of development and learning
- conducts both the basic and applied educational research investigating the efficacy of neuropsychologically based interventions and consultation in the schools

More recently, Crespi and Cooke (2003) posed that training in neuropsychology can:

- Facilitate teacher and parent education/consultation;
- Assist in developing neuropsychologically-informed special education decisions;
- Enhance referral use for neuropsychological services;
- Increase the ability to comprehend articles that have relied on neuropsychological concepts and methods in attempts to understand the etiology and behavioral or educational consequences of childhood developmental disorders;
- Protect against more simplistic and inaccurate habits (i.e., specific localization of brain functions or dysfunctions based on performance on a single psychological measure);
- Serve as a bridge between clinically-based neuropsychologists and school-based psychologists in providing an interpretative explanation of specific results and recommendations, and;
- Provide a theoretical framework that appreciates the value of multidimensional batteries and the inherent complexities and difficulties of making inferences about brain integrity (pp. 98–99).

Rapid Reference 1.9 summarizes the various roles and functions of a school neuropsychologist.

DON'T FORGET

The roles and functions for school neuropsychologists suggested by Hynd in 1981 are still relevant today.

HISTORY OF THE SPECIALTY OF SCHOOL NEUROPSYCHOLOGY

The history of school neuropsychology is still emerging as a specialty

Rapid Reference 1.9

Roles and Functions of a School Neuropsychologist

- Provide neuropsychological assessment and interpretation services to schools for children with known or suspected neurological conditions.
- Assist in the interpretation of neuropsychological findings from outside consultants or medical records.
- Seek to integrate current brain research into educational practice.
- Provide educational interventions that have a basis in the neuropsychological or educational literature.
- Act as a liaison between the school and the medical community for transitional planning for TBI and other health-impaired children and adolescents.
- Consult with curriculum specialists in designing approaches to instruction that more adequately reflect what is known about brain-behavior relationships.
- Conduct in-service training for educators and parents about the neuropsychological factors that relate to common childhood disorders.
- Engage in evidenced-based research to test for the efficacy of neuropsychologically based interventions.

area. Rapid Reference 1.10 presents some of the highlights of the history of school neuropsychology.

The 1960s

As previously mentioned in the history of clinical neuropsychology, Ernhart, Graham, and Eichman published the first neuropsychological test battery for children in 1963.

The 1970s

The Halstead-Reitan Neuropsychological Test Battery for Older Children was published in 1974.

The 1980s

George Hynd (1981) was first to refer to neuropsychology as a specialty area in doctoral school psychology. A clinical and pediatric neuropsychology literature review places Hynd's first mention of this potential specialty within the *test*

Rapid Reference 1.10

Historical Events in School Neuropsychology

1963	Ernhart and Graham published the first neuropsychological test battery for children.
1974	Halstead-Reitan Neuropsychological Test Battery for Older Children test published.
1981	Neuropsychology as a specialty area in school psychology first appeared in publication in the *Journal of School Psychology*.
1981	*Neuropsychological Assessment of the School-Aged Child: Issues and Procedures* (Hynd & Obrzut, 1981) book published.
1983	*Child Neuropsychology: An Introduction to Theory, Research, and Clinical Practice* (Rourke, Bakker, Fisk, & Strang, 1983) book published.
1986	Luria-Nebraska Neuropsychological Battery: Children's Revision test published.
1986	*Child Neuropsychology: Volume 1–Theory and Research* (Obrzut & Hynd, 1986a) book published.
1986	*Child Neuropsychology: Volume 2–Clinical Practice* (Obrzut & Hynd, 1986b) book published.
1986	*Neuropsychological Assessment and Intervention with Children and Adolescents* (Hartlage & Telzrow, 1986) book published.
1988	*Pediatric Neuropsychology* (Hynd & Willis, 1988) book published.
1988	*Fundamentals of Clinical Child Neuropsychology* (Novick & Arnold, 1988) book published.
1988	*Assessment Issues in Clinical Neuropsychology* (Tramontana & Hooper, 1988) book published.
Late 1980s	Neuropsychology Special Interest Group formed in the National Association of School Psychologists.
1989	First edition of the *Handbook of Clinical Child Neuropsychology* (Reynolds & Fletcher-Janzen, 1989) book published.
1990	IDEA reauthorized and traumatic brain injury was included as a disability.
1990's	Several tests of memory and learning specifically designed for school-aged children were published (e.g., Wide Range Assessment of Memory and Learning: WRAML [Sheslow & Adams, 1990; 2003]; Test of Memory and Learning: TOMAL [Reynolds & Bigler, 1994]; and Children's Memory Scale: CMS [Cohen, 1997a]).
1992	*Advances in Child Neuropsychology–Volume 1* (Tramontana & Hooper, 1992) book published.
1995	*Child Neuropsychology* journal published first issue.
1996	*Pediatric Neuropsychology: Interfacing Assessment and Treatment for Rehabilitation* (Batchelor & Dean, 1996) book published.

1996	*Neuropsychological Foundations of Learning Disabilities: A Handbook of Issues, Methods, and Practice* (Obrzut & Hynd, 1996) book published.
1997	*Child Neuropsychology: Assessment and Interventions for Neurodevelopmental disorders* (Teeter & Semrud-Clikeman, 1997) book published.
1997	Second Edition of the *Handbook of Clinical Child Neuropsychology* (Reynolds & Fletcher-Janzen, 1997) book published.
1997	NEPSY test published (Korkman, Kirk, & Kemp, 1998).
1999	American Board of School Psychologists established.
2000	*Pediatric Neuropsychology: Research, Theory, and Practice* (Yeates, Ris, & Taylor, 2000) book published.
2000	*The Neuropsychology of Reading Disorders: Diagnosis and Intervention* (Feifer & DeFina, 2000) book published.
2002	*The Neuropsychology of Written Language Disorders: Diagnosis and Intervention* (Feifer & DeFina, 2002) book published.
2002	*Brain Literacy for Educators and Psychologists* (Berninger & Richards, 2002) published.
2003	*Overcoming Dyslexia: A New and Complete Science-Based Program for Reading Problems at Any Level* (Shaywitz, 2003) book published.
2004	*Neuropsychological Evaluation of the Child* (Baron, 2004) book published.
2004	*School Neuropsychology: A Practitioner's Handbook* (Hale & Fiorello, 2004) book published.
2004	The annual theme for the year and the NASP convention was "Mind Matters: All Children Can Learn."
2004	*Brainstorming: Using Neuropsychology in the Schools* (Jiron, 2004) resource book published
2005	*The Neuropsychology of Mathematics: Diagnosis and Intervention* (Feifer & DeFina, 2005) book published.
2005	*School Neuropsychology Handbook* (D'Amato, Fletcher-Janzen, & Reynolds, 2005) book published.
2005	IDEA reauthorized—discrepancy formula-based methods of identifying specific learning disabilities deemphasized—opens door to a more process assessment approach in identifying all children with special needs.
2006	First national conference for school neuropsychologists held in Dallas, Texas.

battery / lesion specification stage shortly after the publication of the Halstead-Reitan Neuropsychological Test Battery for Older Children.

The first textbook for practitioners was called the *Neuropsychological Assessment of the School-Aged Child: Issues and Procedures* (Hynd & Obrzut, 1981). In the 1981 book, Marion Selz, an early researcher of the Halstead-Reitan tests for children,

wrote a chapter on the test battery. Charles Golden also wrote a chapter on the early development of the Luria-Nebraska Neuropsychological Battery–Children's Revision that was later published in 1986.

Several school neuropsychology textbooks published in the mid-to-late 1980s were used for a number of years in many graduate neuropsychology classes (Hartlage & Telzrow, 1986; Novick & Arnold, 1988; Obrzut & Hynd, 1986a, 1986b; Reynolds & Fletcher-Janzen, 1989; Rourke et al., 1983; Tramontana & Hooper, 1988). In the late 1980s, neuropsychology had gained such a following within the school psychology community that a special interest group was formed within NASP.

The 1990s

The federal *IDEA* legislation was reauthorized in 1990 and included traumatic brain injury as a handicapping condition for the first time. The 1990s were the decade that test authors and test publishers provided school neuropsychology practitioners with a set of new assessment tools specifically designed for the assessment of memory and learning in school-aged children (e.g., WRAML, TOMAL, CMS), or for complete cognitive or neuropsychological test batteries (e.g., CAS, NEPSY, WISC-III PI).

In the 1990s and through the year 2000, several books were published by school psychologists related to school neuropsychology (see Obrzut & Hynd, 1996; Reynolds & Fletcher-Janzen, 1997; Teeter & Semrud-Clikeman, 1997), and several books were published related to pediatric neuropsychology (see Batchelor & Dean, 1996; Tramontana & Hooper, 1992; Yeates, Ris, & Taylor, 2000).

In 1995, the *Child Neuropsychology* journal published its first issue. This journal, still published, has become an important outlet for research related to school neuropsychology and pediatric neuropsychology.

In 1999, the American Board of School Neuropsychology (ABSNP) was established. The ABSNP started issuing Diplomate certificates in school neuropsychology based on peer-review case studies and objective written examinations.

The 2000s

In 2000, 2002, and 2005, Steven Feifer and Philip DeFina, two school neuropsychologists, published three informative books: *The Neuropsychology of Reading Disorders: Diagnosis and Intervention, The Neuropsychology of Written Language Disor-*

ders: Diagnosis and Intervention, and *The Neuropsychology of Mathematics: Diagnosis and Intervention,* respectively.

In 2002, Virginia Berninger, a trainer of school psychologists, and Todd Richards, a neuroscientist, wrote a book designed to bridge the gap between brain-behavior research and education called *Brain Literacy for Educators and Psychologists.*

In 2003, Sally Shaywitz, a physician, published an influential book called *Overcoming Dyslexia*. She was the keynote speaker at the 2004 NASP Convention in Dallas, Texas.

In 2004, three school-neuropsychology books were published: Ida Sue Baron, a clinical neuropsychologist, wrote *Neuropsychological Evaluation of the Child;* two school psychologists, James B. Hale and Catherine A. Fiorello, wrote *School Neuropsychology: A Practitioner's Handbook;* and Colleen Jiron, a school psychologist and pediatric neuropsychologist, wrote *Brainstorming: Using Neuropsychology in the Schools.*

In 2005, Rick D'Amato, Elaine Fletcher-Janzen, and Cecil Reynolds served as editors for the first publication of the *School Neuropsychology Handbook.*

In 2006, the first national school neuropsychology conference was held in Dallas, Texas.

In summary, the understanding and respect for the biological bases of behavior has been a part of psychology since it's inception. The increased interest in applying neuropsychological principles into the practice of school psychology and educational settings has been a direct result of many factors including:

- the growth in pediatric/child neuropsychological research,
- advances in neuropsychological theories applied to assessment,
- advances in functional and structural brain imaging techniques,
- limitations of clinical applications in school settings,
- increased use of medications by children and youth and their potential side effects on cognitive processing, and
- advances in understanding the neurocognitive effects of traumatic brain injury, common neurodevelopmental disorders, and chronic illness.

There will be continued interest in school neuropsychology because school psychologists work with children who have known or suspected neurodevelopmental disorders every day. With the increased emphasis on implementing and monitoring the effectiveness of evidence-based interventions, school psychologists are under pressure to provide the best assessment-intervention link-

age as quickly as possible. School psychologists and educators need to know the documented neuropsychological correlates to common neurodevelopmental disorders in order to prescribe and monitor the most effective interventions. The past two decades, in particular, have been an exciting time for school psychologists interested in learning more about neuropsychology and how to apply that knowledge base to helping children, educators, and their families. School psychologists have more assessment tools today that are psychometrically sound and theoretically based than ever before. The challenge for all of education, school psychology as a discipline, and school neuropsychology as an emerging specialization, is to increase our research that validates the linkage with assessment data to prescriptive interventions that have been shown to be the most effective.

The interest in school neuropsychology is strong but the emerging specialty area still needs to crystallize entry-level training standards. In Chapter 2, training and credentialing issues for school neuropsychology will be discussed, along with a proposed set of training standards, a model program of study, and resources for school neuropsychologists (e.g., books, journals, web sites).

TEST YOURSELF

1. **Using the Bender Visual-Motor Gestalt test to predict overall brain dysfunction would be an example of what stage in the history of clinical neuropsychology?**
   (a) the integrative and predictive stage
   (b) the functional profile stage
   (c) the single test approach stage
   (d) the test battery/lesion specification stage
2. **According to the author, what is the principal reason why the Halstead-Reitan tests for children and the Luria-Nebraska Neuropsychological Battery–Children's Revision are not suitable for current clinical use?**
   (a) Neither test has been shown to differentiate brain-injured from normal controls.
   (b) Neither test has contemporarily collected broad-based normative data.
   (c) Neither test has a strong theoretical basis.
   (d) Neither test is empirically designed.
3. **George Hynd was the first person to refer to neuropsychology as a specialty area in doctoral school psychology.** True or False?

4. **Luria's conceptualization of "functional systems" within the brain has served as the theoretical foundation for several current tests including all of the following except one, which one?**
   (a) Cognitive Assessment System (Naglieri & Das, 1997)
   (b) Kaufman Assessment Battery the Children–Second Edition (Kaufman & Kaufman, 2004)
   (c) NEPSY (Korkman, Kirk, & Kemp, 1998).
   (d) Test of Memory and Learning (Reynolds & Bigler, 1994)
5. **Current state-of-the-art practice demands that assessments have a theoretical foundation to aid in test interpretation.** True or False?
6. **What stage in the history of clinical neuropsychology deemphasized localization of brain "lesions" and emphasized the identification of impaired and spared abilities?**
   (a) the integrative and predictive stage
   (b) the functional profile stage
   (c) the single test approach stage
   (d) the test battery/lesion specification stage
7. **All of the following could be a typical role of a school neuropsychologist except one; which one?**
   (a) Seek to integrate current brain research into educational practice.
   (b) Administer CBM measures exclusively without regard to individual differences.
   (c) Provide educational interventions that have a basis in the neuropsychological or educational literature.
   (d) Act as a liaison between the school and the medical community for transitional planning for TBI and other health-impaired children and adolescents.

Answers: 1. c; 2. b; 3. true; 4. d; 5. true; 6. b; 7. b