

Chapter One

THE EMERGING SPECIALIZATION OF SCHOOL NEUROPSYCHOLOGY

This first chapter reviews the major reasons why there is an interest in the emerging specialization of school neuropsychology, including the acknowledgment of the neurobiological bases of childhood learning and behavioral disorders, the increased number of children with chronic medical conditions that affect school performance, the increased use of medications with school-age children, the increase in the number of children with severe behavioral and emotional challenges, and the increased emphasis on the identification of processing disorders in children with specific learning disabilities. The chapter also reviews the need for providing neuropsychological assessment and consultation services within the schools. A definition of school neuropsychology is provided and the roles and functions of a school neuropsychologist are outlined. Finally, lists of the recent school neuropsychological publications and scholarly journals, that publish school neuropsychology research are presented.

REASONS WHY THERE IS A GROWING INTEREST IN SCHOOL NEUROPSYCHOLOGY

There are several reasons why there is a growing interest in school neuropsychology, including: (1) the wealth of research on the neurobiological bases of childhood learning and behavioral disorders; (2) the increased numbers of children in the schools with medical conditions that affect their school performance; (3) the increased use of medications prescribed to children; (4) the increase in the incidence rate of children who had serious educational and behavioral problems; and (5) the increased emphasis on the identification of processing disorders within children diagnosed with a specific learning disability. These reasons will be covered in more detail in this section of the chapter.

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

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.

of school psychologists. Some of the seasoned veterans or psychology historians 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. 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. Starting in the 1970s and continuing through today, the cognitive psychologists were 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.

It is important to acknowledge that the integration of neuropsychological principles into educational practice got off to a rough start. Practitioners who entered the field prior to the 1970s may remember Doman and Delcato’s perceptual-motor training (R. Doman, Spitz, Zucman, Delacato, & G. Doman, 1960) for children with “minimal brain dysfunction” or tests such as the *Illinois Test of Psycholinguistic Abilities* (S. Kirk, McCarthy, & W. Kirk, 1968). 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 in the past 30-plus years that supports the biological bases to the majority of childhood disorders.

After passage of Public Law 94-142 in the 1970s, researchers began to investigate the neurobiological bases of learning disabilities and behavioral disorders (Obrzut & Hynd, 1996). The past 40 years have yielded substantial evidence for the biological bases of behavior. There is strong neurobiological evidence for attention deficit hyperactivity disorders (see Hale et al., 2010, for a review), reading disorders (see Feifer, 2010, for a review), written language disorders (see Berninger, 2010, for a review), mathematics disorders (see Maricle, Psimas-Fraser, Muenke, & Miller, 2010, for a review), pervasive developmental disorders (see Bauman & Kemper, 2005; Dooley, 2010, for reviews), autism spectrum disorders (see Lang, 2010, for a review), and Asperger's disorder (see DeOrnellas, Hood, & Novales, 2010, for a review). See D. Miller (2010) for a comprehensive review of the neurobiological correlates to common childhood developmental disorders, academic disabilities, and processing disorders. School psychologists who want to translate this brain-behavior research into practice are increasingly interested in applying neuro-psychological principles into their professional practice.

CAUTION

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

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 hooked up 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 Colaluca & Ensign, 2010; Dooley, 2010, for reviews).

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. Although there has been no noticeable decrease in the number of low-birth-weight infants born each year, 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 early neurological insults. The premature birth rate in the United States rose by more than one third from the early 1980s through 2006; however, the upward trend has finally reversed based on 2007 and 2008 data (J. A. Martin, Osterman, & Sutton, 2010). Martin and colleagues reported that in 2008, 12.3% of all live births were preterm, or premature. In addition to prematurity and low-birth-weight, Rapid Reference 1.1 lists several other major medical influences on school neuropsychology.

Despite this high perinatal mortality rate (741 per 100,000; Miniño, 2011), there has been an improvement in the overall survival of low-birth-weight infants, most likely associated with advanced technology (Meadow, Lee, Lin, & Lantos, 2004). Interestingly, the actual cause of preterm birth remains somewhat elusive. While there are definite risk factors (e.g., African American ethnicity, low socioeconomic status, substance abuse, and poor maternal nutrition), there is essentially no one known identifiable cause (Slattery & Morrison, 2002). A review of the literature reveals that low-birth-weight infants are at risk for neurosensory, cognitive/neuropsychological, behavioral, and school/academic difficulties (Colaluca & Ensign, 2010; Dooley, 2010; Litt, Taylor, Klein, & Hack, 1995; Riccio, Sullivan, & Cohen, 2010).

Modern medical advances have also had an impact on the lives of children with other medical conditions such as cancer, AIDS, demyelinating diseases, traumatic brain injuries, and more rare medical diseases and conditions. The rate of chronic health conditions among children in the United States increased from 12.8% in 1994 to 26.6% in 2006 (Van Cleave, Gortmaker, & Perrin, 2010). Kline, Silver, and Russell (2001) reported that within the population of chronically ill children, 30% to 40% have school-related problems (see Colaluca & Ensign, 2010, for a review). The majority of these children would qualify

Rapid Reference 1.1

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.

under the Individuals With Disabilities Education Act (IDEA) category of *other health impaired* (OHI). 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 a few months, where cognitive rehabilitation took place (D. Miller, 2004). Today it is typical for a child to forego any formal cognitive rehabilitation and return to school soon after he or she is 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 traumatic brain injuries (TBIs). In defense of the managed health care industry, the literature on the effectiveness of cognitive rehabilitation with children has been sparse (Slomine & Locascio, 2009). Despite the fact that TBI and OHI have been disability classifications for decades, school personnel are not often 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 other special education classifications (see Morrison, 2010, for a review). 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 require only 3-year reevaluations, children with TBI need frequent monitoring for changes in academic, behavioral, adaptive, and social-emotional functioning

(Morrison, 2010). School neuropsychologists can play a major role in being the liaisons between the school and the medical community, developing transitional/reentry plans for school-age children returning to school after injury or insult, assisting with IEP development and monitoring, and general case management (see Prout, Cline, & Prout, 2010, for a review).

Increased Use of Medications with School-Age Children

There has been a dramatic increase in the number of school-age children taking psychotropic medications. Patel (2005) examined the prevalence rates of antipsychotic use in children and adolescents from 1996 to 2001 across three Medicaid 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 prescriptions. Medicaid Medical Directors Learning Network and Rutgers Center for Education and Research on Mental Health Therapeutics (2010) examined antipsychotic medication use in Medicaid children and adolescents across 16 states. The study found that in 2007, 1.7% of Medicaid children and adolescents received antipsychotic prescriptions, which represents a 10% increase from comparable data in 2004.

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. Constantine, Boaz, and Tandon (2010) reported similar finding based on trends between 2002 and 2007.

School neuropsychologists are not physicians, but they can provide information about how psychotropic medication used to treat common problems like depression, anxiety, and attentional processing disorders 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% of all children. Unfortunately, many children with diagnosable mental disorders do not receive services. The *Report of the Surgeon General on Children's Mental Health: A National Action Agenda* (U.S. Department of Health and Human Services, 2001) indicated that approximately 70% 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 all 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 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 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 et al. (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.

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 included in the schools are reviewed.

Increased Emphasis on the Identification of Processing Disorders in Specific Learning Disabled Children

In the most recent version of the Individuals with Disabilities Act of 2004 (U.S. Department of Education, 2004), the definition of a Specific Learning Disability (SLD) includes language that stated:

“[A] disorder in one or more of the basic psychological processes involved in the understanding or in using language, spoken or written, that may manifest itself in an imperfect ability to listen, think, speak, read, write, spell, or do mathematical calculations, including conditions such as perceptual disabilities, brain injury, minimal brain dysfunction, dyslexia, and developmental aphasia” but does not include “. . . learning problems that are primarily the result of visual, hearing, or motor disabilities, or intellectual disability, or emotional disturbance, or of environmental, cultural, or economic disadvantage.” (34 C.F.R. § 300.8(c)(10))

By requiring an assessment specialist to rule out exclusions such as intellectual disability or perceptual limitations as the causal factors for an SLD, the SLD definition encourages the assessment specialist to determine the reasons why there is a learning delay. The assessment specialist, who is a school neuropsychologist, brings a unique set of skills to bear on the need to identify the underlying neurological deficits that could explain the presence of an SLD. School neuropsychologists have a more sophisticated set of testing instruments that they are trained to use that will help address the neurocognitive strengths and weaknesses of an SLD child and increase the likelihood of academic improvement through targeted, evidence-based interventions.

IDEA 2004 allowed states to move away from the use of discrepancy models for the identification of an SLD. One of the approved approaches for SLD identification is the assessment of processing strengths and weaknesses to determine the underlying causes for an SLD. With this change in the federal law, many assessment specialist practitioners, including school psychologists, have the need to enhance their professional skills. School psychologists trained in how to integrate neuropsychological principles into their professional practice are uniquely qualified to assess processing strengths and weaknesses in SLD children.

THE NEED FOR NEUROPSYCHOLOGICAL ASSESSMENT IN THE SCHOOLS

This section of the chapter attempts to answer the question, why is there a need for neuropsychological assessment in the schools? The reasons for having access to more neuropsychological assessments accessible in the schools include: (1) the limited access to pediatric neuropsychological services in general; (2) the limited usefulness of some neuropsychological reports; and (3) the unique contributions of school neuropsychological assessments in making diagnoses and linking evidence-based interventions.

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-age 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-age children is often difficult.

DON'T FORGET

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.

Limited Usefulness of Some Neuropsychological Reports

Educators may have experienced sitting in an IEP meeting where a parent brings in a report from a neuropsychologist consultant. Too frequently, neuropsychological reports from outside consultants are filled with diagnostic conclusions and much test

DON'T FORGET

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

child's educational 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 not familiar with educational laws such as IDEA, NCLB, and Section 504 of the Rehabilitation Act or with the organization and operation of schools in general. Hurewitz and Kerr (2011) stated, "because neuropsychologists may provide reports for treatment, school programming, legal disputes, or any combination thereof, it is important that they are familiar with the school programming process and the unique litigation procedures available for children with disabilities in special education" (2011, p. 1058). 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 to 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). To best help the child, clinical neuropsychologists must learn which diagnoses and educational interventions are useful to school districts (Hurewitz & Kerr,

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.

data, but lack prescriptive recommendations that would be useful interventions in educational settings. Pelletier, Hiemenz, and Shapirio (2004) refer to this report as a "pin the tail on a lesion" type of report. In these cases, the expensive report that the parent brings to the school is frequently filed in the

2011). 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 documented 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, 2007, 2010) pointed out that many of the new cognitive abilities tests and tests of memory and learning that are 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 D. Miller (2004, 2007, 2010) 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.

The Unique Contribution of School Neuropsychological Assessments

In Chapter 6, the differences among psychoeducational, psychological, and school neuropsychological assessments are discussed. In general, neuropsychological assessments are the most comprehensive of the three types and often encompass both the psychoeducational and psychological components. What makes school neuropsychological assessments unique is the inclusion of more in-depth assessment of individual neurocognitive constructs such as sensory-motor functions, attentional processing, learning and memory, and executive functions.

School neuropsychological assessments are useful for:

- Identifying processing deficits in a child that could adversely affect educational attainment and developing remedial and/or compensatory strategies to maximize the child's learning potential.

12 ESSENTIALS OF SCHOOL NEUROPSYCHOLOGICAL ASSESSMENT

- Describing a profile of a child's neurocognitive strengths and weaknesses and relating that information to the child's learning and behavior in the school and home environments.
- Determining whether changes in learning or behavior are associated with neurological disease, psychological conditions, neurodevelopmental disorders, or non-neurological conditions.
- Monitoring educational progress over time in children, particularly in children with severe neuropsychological insults such as traumatic brain injury.
- Providing comprehensive assessment data that will increase the likelihood of success with evidence-based interventions.

Summary of the Need for School Neuropsychological Assessment in the Schools

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 difficult. Traditional reports written by clinical neuropsychologists are often not useful in the schools. These reports tend to be too long and cumbersome, often describe the tests more than the child, and often have recommendations not 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.

DEFINITION OF SCHOOL NEUROPSYCHOLOGY

Miller, along with two colleagues, 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. (D. Miller, DeFina, & Lang, 2004)

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.

“[T]o the assessment and intervention processes with infants, children, and adolescents . . .” School neuropsychology is not limited to assessment and diagnosis. Linking assessment with evidence-based interventions is an important focus for school psychologists and school neuropsychologists. Also, school neuropsychologists are trained to work with infants and school-age children.

“[T]o 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.

DON'T FORGET

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

- Acts as an organizational liaison with the medical community, coordinating and evaluating medically based interventions.
- Conducts inservice workshops for educational personnel, parents, and others on the neuropsychological basis of development and learning.
- Conducts both basic and applied educational research investigating the efficacy of neuropsychologically based interventions and consultation in the schools.

More recently, Crespi and Cooke (2003, pp. 98–99) 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.
- Provide a theoretical framework that appreciates the value of multidimensional batteries and the inherent complexities and difficulties of making inferences about brain integrity.

Rapid Reference 1.2 summarizes the various roles and functions of a school neuropsychologist.

LIST OF RECENT SCHOOL NEUROPSYCHOLOGY BOOKS

Rapid Reference 1.3 lists some of the major school neuropsychology books that have been published in recent years. The vast majority of the authors of the school

Rapid Reference 1.2

Roles and Functions of a School Neuropsychologist

- Provide neuropsychological assessment and intervention services to schools for students 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 inservice training for educators and parents about the neuropsychological factors that relate to common childhood disorders.
- Engage in evidence-based research to test for the efficacy of neuropsychologically based interventions.

neuropsychology resource books cited in Rapid Reference 1.3 are school psychologists.

LIST OF JOURNALS THAT PUBLISH SCHOOL NEUROPSYCHOLOGICAL RESEARCH

Rapid Reference 1.4 presents a list of journals most relevant to school neuropsychology. Rapid Reference 1.4 also presents a tabulation of the number of published articles related to pediatric/school neuropsychology in each of these journals from 1991 to 2012. These figures were derived by initially going to the online PsycInfo database and searching peer-reviewed journal articles that contained the word “neuropsychology” with age ranges including preschool through adolescence. The numbers of articles that match these criteria are presented in Rapid Reference 1.4. Despite the certain biological bases of all developmental disorders, school psychologists interested in reading original research on topics related to school neuropsychology must go beyond the traditional school psychology journals (e.g., *School Psychology Review*—The official journal of the National Association of School Psychologists, or the *School Psychology Quarterly*—the official

Rapid Reference 1.3

Major School Neuropsychology Publications (most recent to oldest)

- Barkley, R. A. (2012). *Executive functions: What are they, how they work, and why they evolved*. New York, NY: Guilford Press.
- Davis, A. S. (Ed.). (2011). *Handbook of pediatric neuropsychology*. New York, NY: Springer.
- Anderson, V., & Yeates, K. O. (Eds.). (2010). *Pediatric traumatic brain injury: New frontiers in clinical and translational research*. New York, NY: Cambridge University Press.
- Dawson, P., & Guare, R. (2010). *Executive skills in children and adolescents: A practical guide to assessment and intervention* (2nd ed.). New York, NY: Guilford Press.
- Dehn, M. J. (2010). *Long-term memory problems in children and adolescents: Assessment, intervention, and effective instruction*. Hoboken, NJ: Wiley.
- Goldstein, S., & Reynolds, C. R. (Eds.). (2010). *Handbook of neurodevelopmental and genetic disorders in children* (2nd ed.). New York, NY: Guilford Press.
- Kemp, S. L., & Korkman, M. (2010). *Essentials of the NEPSY-II assessment*. Hoboken, NJ: Wiley.
- Koziol, L. F., & Budding, D. E. (2010). *Subcortical structures and cognition: Implications for neuropsychological assessment*. New York, NY: Springer.
- Meltzer, L. (2010). *Promoting executive function in the classroom (what works for special-needs learners)*. New York, NY: Guilford Press.
- Miller, D. C. (Ed.). (2010). *Best practices in school neuropsychology: Guidelines for effective practice, assessment, and evidence-based intervention*. Hoboken, NJ: Wiley.
- Riccio, C. A., Sullivan, J. R., & Cohen, M. J. (2010). *Neuropsychological assessment and intervention for childhood and adolescent disorders*. Hoboken, NJ: Wiley.
- Christo, C., Davis, J., & Brock, S. E. (2009). *Identifying, assessing, and treating dyslexia at school*. New York, NY: Springer.
- McCloskey, G., Perkins, L. A., & Diviner, B. V. (2009). *Assessment and intervention for executive function difficulties*. Florence, KY: Routledge.
- Petersen, R. L., Yeates, K. O., Ris, M. D., Taylor, H. G., & Pennington, B. F. (2009). *Pediatric neuropsychology, Research, theory, and practice* (2nd ed.). New York, NY: Guilford Press.
- Semrud-Clikeman, M., & Teeter-Ellison, P. A. (2009). *Child neuropsychology: Assessment and interventions for neurodevelopmental disorders* (2nd ed.). New York, NY: Springer.
- Apps, J. N., Newby, R. F., & Roberts, L. W. (2008). *Pediatric neuropsychology case studies: From the exceptional to the commonplace*. New York, NY: Springer.

- Castillo, C. L. (Ed.). (2008). *Children with complex medical issues in schools: Neuropsychological descriptions and interventions*. New York, NY: Springer.
- Dehn, M. J. (2008). *Working memory and academic learning: Assessment and intervention*. Hoboken, NJ: Wiley.
- Fletcher-Janzen, E., & Reynolds, C. R. (Eds.). (2008). *Neuropsychological perspectives on learning disabilities in the era of RTI: Recommendations for diagnosis and intervention*. Hoboken, NJ: Wiley.
- Mody, M., & Sullivan, E. R. (Eds.). (2008). *Brain, behavior, and learning in language and reading disorders*. New York, NY: Guilford Press.
- Reed, J., & Warner-Rigers, J. (Eds.). (2008). *Child neuropsychology: Concepts, theory, and practice*. New York, NY: Wiley-Blackwell.
- Reynolds, C. R., & Fletcher-Janzen, E. (Eds.). (2008). *Handbook of clinical child neuropsychology* (3rd ed.). New York, NY: Plenum Press.
- Feifer, S. G., & Della Toffalo, D. A. (2007). *Integrating RTI with cognitive neuropsychology: A scientific approach to reading*. Middletown, MD: School Neuropsych Press.
- Miller, D. C. (2007). *Essentials of school neuropsychological assessment*. Hoboken, NJ: Wiley.
- Dehn, M. J. (2006). *Essentials of processing assessment*. Hoboken, NJ: Wiley.
- Feifer, S. G., & DeFina, P. A. (2005). *The neuropsychology of mathematics: Diagnosis and intervention*. Middletown, MD: School Neuropsych Press.
- Baron, I. S. (2004). *Neuropsychological evaluation of the child*. New York, NY: Oxford University Press.
- Dewey, D., & Tupper, D. E. (2004). *Developmental motor disorders: A neuropsychological perspective*. New York, NY: Guilford Press.
- Hale, J. B., & Fiorello, C. A. (2004). *School neuropsychology: A practitioner's handbook*. New York, NY: Guilford Press.
- Shaywitz, S. (2003). *Overcoming dyslexia: A new and complete science-based program for reading problems at any level*. New York, NY: Knopf.
- Beminger, V. W., & Richards, T. L. (2002). *Brain literacy for educators and psychologists*. New York, NY: Academic Press.
- Eslinger, P. J. (Ed.). (2002). *Neuropsychological interventions*. New York, NY: Guilford Press.
- Feifer, S. G., & DeFina, P. A. (2002). *The neuropsychology of written language disorders: Diagnosis and intervention*. Middletown, MD: School Neuropsych Press.
- Semrud-Clikeman, M. (2001). *Traumatic brain injury in children and adolescents*. New York, NY: Guilford Press.
- Goldstein, S., & Reynolds, C. R. (Eds.). (1999). *Neurodevelopmental and genetic disorders in children*. New York, NY: Guilford Press.
- Siantz-Tyler, J., & Mira, M. P. (1999). *Traumatic brain injury in children and adolescents: A sourcebook for teachers and other school personnel*. Austin, TX: Pro-Ed.

Rapid Reference 1.4

Journals Relevant to School Neuropsychology¹

Journal	Number of Articles (1991–2012) Related to School/Pediatric Neuropsychology Issues
<i>Developmental Neuropsychology</i>	502
<i>Child Neuropsychology</i> ²	407
<i>Journal of Clinical and Experimental Neuropsychology</i>	277
<i>Archives of Clinical Neuropsychology</i>	214
<i>Neuropsychology</i>	194
<i>Applied Neuropsychology</i>	91
<i>Journal of the International Neuropsychological Society</i>	57
<i>Cognitive and Behavioral Neurology</i>	55
<i>Journal of Child Psychology and Psychiatry</i>	38
<i>Aging, Neuropsychology, and Cognition</i>	36
<i>Journal of Cognitive Neuroscience</i>	32
<i>Clinical Neuropsychologist</i>	27
<i>Neuropsychology Review</i>	14
<i>Journal of Intellectual Disability Research</i>	12
<i>Developmental Psychology</i>	10
<i>Brain Impairment</i>	5
<i>International Journal of Developmental Neuroscience</i>	5
<i>Mind, Brain, and Education</i> ³	4
<i>Journal of Psychoeducational Assessment</i>	4
<i>Psychology in the Schools</i>	4
<i>Psychological Assessment</i>	3
<i>School Psychology Review</i>	1
<i>School Psychology Quarterly</i>	0

¹ Through May 11, 2012.

² The *Child Neuropsychology* journal was introduced in 1995.

³ *Mind, Brain, and Education* was introduced in 2007.

journal of the American Psychological Association's Division 16—School Psychology). These two school psychology journals have published only one original school/pediatric neuropsychology article in the past 21 years, compared to 1,594 original peer-reviewed journal articles published in the top five journals associated with neuropsychology. School neuropsychology professional practice issues and research are currently published across a broad spectrum of journals, with the majority in neuropsychology journals.

CHAPTER SUMMARY

The understanding and respect for the biological bases of behavior has been a part of the field of psychology since its 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.
- Advances in understanding the neurocognitive effects of traumatic brain injury, common neurodevelopmental disorders, and chronic illness.

There continues to be interest in school neuropsychology because school psychologists work every day with children who have known or suspected neurodevelopmental disorders. 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 linkage as quickly as possible. School psychologists and educators need to know the documented neuropsychological correlates to common neurodevelopmental disorders 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, their families, and educators. 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 research that validates the linkage between assessment data and the prescriptive interventions that have been shown to be the most effective.

20 ESSENTIALS OF SCHOOL NEUROPSYCHOLOGICAL ASSESSMENT

School neuropsychology has its roots firmly planted in the historical foundations of clinical neuropsychology and school psychology. These historical influences on the emerging specialization of school neuropsychology are the focus of Chapter 2.

**TEST YOURSELF**

- 1. The 1970s catalyst for researchers to investigate the neurobiological bases of learning disabilities and behavioral disorders was:**
 - a. Passage of *No Child Left Behind* legislation
 - b. Doman Delcato's perceptual-motor training
 - c. Passage of P.L. 94-142
 - d. The *Illinois Test of Psycholinguistic Abilities*
- 2. True or False? More children are surviving birth traumas and medical illnesses with known correlates to later academic and behavioral concerns.**
- 3. What term is associated with children who are taking multiple medications, without full consideration of the potential drug interaction side effects?**
 - a. Polypharmacy
 - b. Substance abuse
 - c. Combined drug treatment
 - d. Multipharmacy
- 4. In what year did traumatic brain injury become part of IDEA?**
 - a. 1976
 - b. 1990
 - c. 1997
 - d. 2004
- 5. Who is credited as being the first school psychologist to advocate for doctoral school psychologists to be trained in clinical neuropsychology?**
 - a. Alfred Binet
 - b. Cecil Reynolds
 - c. David Wechsler
 - d. George Hynd
- 6. True or False? A major role of a school neuropsychologist is to identify processing deficits in children that could adversely affect educational attainment and develop remedial and/or compensatory strategies to maximize the children's learning potential.**
- 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.

EMERGING SPECIALIZATION OF SCHOOL NEUROPSYCHOLOGY 21

- 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. true; 3. a; 4. b; 5. d; 6. true; 7. b

