Chapter 5
Integrating Neurological, Neuroradiological, and Psychological Examinations in Neuropsychological Assessment

This chapter provides guidelines to help psychologists determine when to refer a child or adolescent for neuropsychological assessment, neurological examination, or other neurodiagnostic testing (e.g., CT scan or MRI). Children and adolescents often need neurological, neuroradiological, and/ or neuropsychological assessments. Although not every child seen for cognitive, academic, psychiatric, or behavioral problems requires further assessment apart from traditional psychoeducational evaluations, some disorders do need further attention by specialists to investigate the child's neurological or neuropsychological status. Clinical and school psychologists should be apprised of conditions that typically require further attention. The nature of neurologic, neuroradiologic, and neuropsychological assessment will be discussed, along with guidelines for making referrals. Further, aspects of psychological, psychosocial, and academic functioning are discussed, as these areas may be seriously compromised by brain-related disorders of childhood. Integration of these various evaluation findings are discussed.

The Neurological Examination

Neurological examinations are conducted by neurologists generally specializing in childhood and adolescent neurology. Because it is sometimes difficult to differentiate normal developmental variations from abnormal neurodevelopment in the first few years of life, it is important to access child neurologists when there is a question about chronic and serious neurodevelopmental delays. The neurologist will identify disease, injury, developmental, or genetic processes that interfere with CNS functioning. The neurological examination usually consists of the following: (1) an in-depth review of medical and developmental history; (2) an assessment of mental status; (3) an assessment of the functional capacity of the CNS, including the cranial nerves; (4) an evaluation of motor systems; (5) an assessment of sensory functions, and (6) an assessment of autonomic functions (Swaiman, Ashwal, & Ferriero, 2006). Each area is systematically evaluated through a series of activities designed to measure muscle tone, cranial nerves, and primitive and autonomic reflexes. Interpreting information from the neurological examination is complicated by the child's age and intellectual and functional capacity. A look inside the examination room with a neurologist and patient would show the physician initially conducting an in-depth developmental interview. Since the child is present during this procedure and the physician notes the child's participation, attention, and language. Moreover, the child's facial movements are noted with attention to head nodding, eye blinking, staring, tics, and movement disorders. In addition, the physician observes the child's behavior with regard to his or her impulsivity, dependence on the parent, and activity level. Additional observations of parent-child interaction are obtained. Swaiman et al. (2006) suggests that the physician consider the following questions: "Does the child respond positively to the parent's interaction? Does the child attempt to manipulate the parent? Is the response transient or persistent? Is the parent's attitude one of caring or hostility?'

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After age four, a motor screening examination is conducted. The neurologist has the child stand in front of him or her and demonstrate the required motor acts. The child is asked to hop on one foot and then the other, to walk forward and backward, to walk on tiptoes, and to walk on heels with toes pointed up. Additionally, the child is asked to rise from a squatting position, and to stand with feet together, eyes closed and arms and hands outstretched from the body and parallel with the floor. These maneuvers are designed to check for balance, extraneous unnecessary movement, and the Romberg sign. The Romberg sign is indicative by the child's inability to stand still when his or her eyes are closed (Swaiman et al., 2006). The child then is asked to touch his or her nose with the finger, both with eyes closed and with eyes open. Based on this initial screening, the neurologist will follow up on any abnormalities in motor coordination. The next portion of the examination involves testing reflexes. Both deep tendon reflexes (also known as muscle stretch reflexes) and reflexes appropriate at various ages are assessed. For the deep tendon reflexes, the neurologist elicits the reflex with a rubber reflex hammer while the child is seated quietly. Hyper reflexes (contraction of muscles that generally are not involved in the reflex) are a sign of corticospinal dysfunction. Hypo reflexes are most often associated with motor unit abnormalities of the spinal cord (Swaiman, 1994) or of the cerebellum. Cerebellar functions are assessed by asking the child to first touch his or her nose and then the examiner's finger at various positions. The child is also asked to run his or her heel down the shin of the opposite leg. Inability to complete these tasks smoothly may indicate cerebellum dysfunction.

Cranial nerves are evaluated next. Congenital anomalies as well as traumatic injury can produce observable neurological signs. See Table 5.1 for a review of some common anomalies that might be identified when conducting an examination of the cranial nerves.

The sensory system is assessed next. The ability to sense vibrations, position of limb, and joint sense is evaluated. To evaluate the child's ability to localize tactile information, the neurologist touches various places both unilaterally and bilaterally with the child's eyes closed. The inability to localize touch is associated with parietal lobe dysfunction (Swaiman et al., 2006). The child is also asked to recognize various objects which are placed in his or her hand (stereognosis) with eyes closed. Although these tasks are believed to provide information as to the integrity of the parietal lobes, attention to task can interfere with performance.

Muscle strength is also assessed. The child is asked to push against the examiner's hand with his or her hand or foot as hard as possible. He or she may also be requested to push his/her head against the neurologist's hand as hard as possible, or walk on his or her hands while the examiner holds the child's feet. Once the child's feet are placed on the floor, the child is asked to stand up. Inability to stand without aid is another measure of muscle strength. To evaluate gait, the child is asked to walk back and forth and to run. Running exacerbates problems with gait and can show additional signs of spasticity or jerking movements (Swaiman, 1994). This section was a brief overview of a typical neurological examination. The interested student may wish to observe a neurological examination in order to obtain a first-hand experience. You may wish to ask a parent if you can accompany him or her to such an examination.

When to Refer for a Neurological Evaluation

A neurological examination should be considered under the following conditions:

1. Sudden, unexplained, and prolonged nausea accompanied by high fever, headache, and lethargy that might suggest meningitis or encephalitis
2. Rapid blinking eye movements, visual aura (auditory and sensory auras are not uncommon), blank stares, or head or muscle jerks/spasms that might suggest seizure activity
3. Visual or olfactory hallucinations
4. Sudden motor clumsiness or cerebellar ataxia
5. Prolonged viral infections producing symptoms listed under item 1
6. Head trauma producing nausea, blurred vision, loss of consciousness, or dilated pupils
7. Cranial nerve involvement producing unilateral or bilateral motor weaknesses (e.g., droopy mouth, eyes, or facial muscles, or tongue protrusion)

Table 5.1 Common anomalies revealed during examination of the cranial nerves

Number	Name and function	Anomalies	Contributing factors
I	Olfactory (smell)	Asnomia-loss of smell	Severe head trauma
			Frontal lobe gliomas
			Olfactory groove meningiomas
			Temporal lobe epilepsy
II	Optic (vision)	Uncoordinated movement	Congenital blindness
		Asymmetric nystagmus	Gliomas or craniopharyngiomas
		Exophthalmos	Congenital disorders
		Papilloedema	Increased cranial pressure
		Macula discoloration	Tay-Sachs, metachromatic dystrophy, Batten's disease
		Retinal bleeding	Intracranial pressure, bleeding, or leukemia
III	Oculomotor (eye movement)	Pupil dilation	
		Eyes downward	
IV	Trochlear	Depression of eye movement	
VI	Abducens	Eye turns medially	
		Restricted lateral eye movement	
V	Trigeminal (masticatory movement)	Hyperactive jaw	Cerebral trauma
			Pseudobulbar palsy
		Hypoactive jaw	Bulbar palsy
VII	Facial (facial movement)	Symmetry, upper and lower face	Lesions
		Odd auditory perceptions	Lesions
		Impaired taste and salivation	Bell's palsy
VIII	Auditory (hearing)	Vestibular dysfunction	
		Vertigo, nystagmus, ataxic gait	
		Audition	Medication
			Neuromas or skull factures
		Tinnitus (ear ringing)	Otosclerosis or toxins (streptomycin or aspirin)
IX	Glossopharyngeal (tongue and pharynx)	Taste buds	
X	Vagus (heart, blood vessels, viscera, larynx, and pharynx)	Swallowing	
		Language expression	
XI	Spinal accessory (movement, strength of neck and shoulder muscles)	Paralysis of head/neck muscles	Lesions
		Atrophy	
XII	Hypoglossal (tongue muscles)	Atrophy of tongue	Lesions
		Protrusion of tongue	
		Eating problems	
		Dysarthria	

Note: See Hynd and Willis (1988) for more details on cranial nerve damage.

8. Sudden, unexplained diminution of cognitive, language, speech, memory, or motor functions following normal development

A number of tumor processes, CNS leukemia, CNS infections (meningitis, encephalitis, and intracranial abscesses), neuromuscular diseases, and genetic disorders (e.g., neurofibromatosis, Sturge-Weber syndrome, and tuberous sclerosis) produce some of these symptoms (Hynd & Willis, 1988). These conditions typically require ongoing neurological examination and follow-up. Neurologic examination is usually part of the diagnostic and treatment protocol that follows when children display the symptoms described here. In some instances, neurologists will recommend further neuroradiological follow-up to ascertain the nature and range of CNS involvement. In other instances (head injury or suspected brain tumor or lesion), CAT scans and MRI studies may be warranted immediately. CT scans, MRI scans, and regional cerebral blood flow (rCBF) procedures were described in detail in Chapter 4.

Neuroradiological Evaluation

Despite their research potential, CT scans and MRI procedures are not necessarily part of the typical diagnostic process for identifying developmental disorders unless there are other accompanying neurologic signs (e.g., seizures, dysphasia). CT and MRI techniques are relatively expensive and for the most part are reserved for diagnosing and treating medical or neurological conditions affecting the CNS.

When to Refer for Neuroradiolgical Evaluation

A physician generally refers a child or adolescent for neuroradiological techniques under the following conditions:

1. Head trauma
2. CNS tumor processes
3. CNS disease processes involving white matter degeneration
4. Neurodevelopmental anomalies affecting the size or formation of brain structures, such as hydrocephaly or agenesis of the corpus callosum
5. Cerebrovascular diseases (e.g., sickle cell anemia)
6. Dyslexia or other neurodevelopmental disorders when there is a history of seizures, neurological signs, and/or significant language or speech delays

Positive signs on the neurological examination (see previous section) also may warrant further neuroradiologic evaluation. Children with neurodevelopmental disorders that affect brain size, tissue growth, cortical formations, and neural tube and fusion abnormalities usually require initial diagnostic and ongoing neuroradiological follow-up.

Finally, repeated neuroradiologic evaluations are routinely conducted on children with brain trauma to measure changes in neurologic status (Donders, 2007). Neuropsychological evaluations utilize measures and methods for determining the neurobehavioral status of children with various disorders. Guidelines for referral for neuropsychological evaluation will be explored next.

Neuropsychological Assessment

Neuropsychological assessment procedures are described in detail in Chapter 6. Neuropsychological tests are generally administered to investigate the brain-behavior relationship in children and adolescents and to determine whether cognitive, academic, and psychiatric disorders are related to abnormal brain function.

When to Refer for Neuropsychological Evaluation

Neuropsychological evaluations are generally recommended under the following conditions:

1. Conditions affecting the CNS that were previously described under neurological and neuroradiological referrals (e.g., head trauma, CNS diseases)

2. Chronic and severe learning disabilities that do not respond to traditional special education or remedial programming, particularly when there is evidence of a pattern of right or left hemisyndrome (lateralizing sensory-motor neurological signs)
3. Severe emotional or behavioral disturbances accompanied by significant learning, intellectual or developmental delays (e.g., motor, speech/language, perceptual) that are particularly resistant to traditional psychopharmacological, psychological, or behavioral interventions
4. Acute onset of memory, cognitive, academic, motor, speech/language, behavioral, and personality deficits that cannot be explained by other psychoeducational evaluations

Neuropsychological evaluations can be used to diagnose various neurodevelopmental disorders (e.g., LD), brain injuries, and CNS diseases, and for measuring treatment efficacy and recovery of function (Donders, 2007). See later chapters for methods of developing interventions for specific childhood disorders.

The Integration of Neurological, Neuroradiological, and Neuropsychological Data

Medical and university labs and clinics are exploring integrated research protocols including neuroradiological and neuropsychological data in an effort to more fully understand the nature of childhood disorders. Clinicians and researchers that are prominent in this effort include Castellanos et al. (2002), Giedd et al. (2004), Papanicolaou (2003), Gabrieli (2003), Semrud-Clikeman et al. (2006), and Shaywitz et al. (2004), to name a few. In these efforts, researchers are revealing evidence linking neurocognitive and neuropsychological deficits to functional brain regions or systems. In essence, these investigators are providing information to establish the bidirectional nature of the neuroanatomical/morphological neuropsychological-functional link. (This relationship is depicted in Fig. 1.1). While the link between anatomy and function has generally been downward, these efforts start at the functional and neuropsychological level and build upward, establishing a function-to-structure linkage that may lead to a better understanding of childhood disorders.

Researchers postulate neurobiological models of childhood disorders, such as dyslexia, and, in an effort to test these models empirically, information from divergent sources is analyzed. Typically theories about how the brain functions are tested by administering neuropsychological tests to carefully defined groups of children (e.g., dyslexic children with language-related deficiencies), and then by studying morphological variations in brain structures using neuroimaging techniques and, more recently, fMRI procedures. The degree to which specific neurolinguistic deficiencies are related to morphological abnormalities or functional differences in brain activation can thus be investigated. In doing so, researchers are beginning to answer questions such as these: Do children with language-related reading disorders have structures that are similar to those typically found in children in regions presumably mediating language processes? And, are the measured linguistic difficulties a function of these unique patterns of brain asymmetry? Shaywitz, Shaywitz, Pugh, Fulbright, and Skudlarski (2002) have discussed these morphological-functional relations for children with dyslexia in detail. The reader is also referred to Pliszka et al. (2006) for a better understanding of these brain/behavior interactions in children with ADHD.

The next logical and critical step in developing a neurobiological model of childhood disorders is to investigate the extent to which children with cognitive-processing and/or linguistic deficits respond to differential intervention programs. Efforts to identify cognitive correlates of reading deficits have been reviewed by Eden and Moats (2002). A meta-analysis of phonologically based approaches to remediation found that stressing phonological processing skills for poor readers improves reading performance (National Reading Panel, 2000). These interventions will be explored in more detail in Chapter 10.

In summary, efforts linking neuroradiological and neuropsychological findings are underway establishing the bidirectional nature of the relationship between brain structure and brain function. Integrated research paradigms are important in

this effort, and will advance our basic understanding of childhood disorders. In the clinical setting, children referred for neuropsychological evaluation do not necessarily receive neurological or neuroradiological testing unless there is accompanying brain damage or suspected CNS disease. Cognitive, academic, behavioral and psychosocial functioning are also of interest to the neuropsychologist because these factors may affect test performance on neuropsychological measures. Thus it is important to explore alternative hypotheses (e.g., attentional deficits, motivational variations, depression, anxiety, and/or oppositional defiance) before making inferences about brain pathology on the basis of neuropsychological test results. Tests of psychological functioning that are commonly incorporated into neuropsychological evaluations are reviewed next. Psychological factors that have a negative impact on the neuropsychological evaluation are also explored.

Psychological Assessment of Children with Neurodevelopmental, Neuropsychiatric, and Other CNS Disorders

Achenbach (1990, 2005) suggests that at least six microparadigms be incorporated in the study of childhood disorders: biomedical, behavioral, psychodynamic, sociological, family systems, and cognitive. By drawing from each of these diverse approaches, questions about childhood disorders can be framed into an integrated "macroparadigm." Achenbach describes a model of multiaxial assessment with specific suggestions for measuring child behavior:

- *Axis I*: Parent reports, Child Behavior Checklist (Achenbach, 1991)
- *Axis II*: Teacher reports, Child Behavior Checklist Teacher's Report Form
- *Axis III*: Cognitive assessment, WISC-IV or WAIS-III
- *Axis IV*: Physical assessment, height, weight, and neurologica/medica1 exam
- *Axis V*: Direct assessment, Semistructured Clinical Interview and Youth Self Report (Achenbach & Rescorla, 2001).

Neuropsychological evaluations could be appropriately incorporated into Axis IV of this model. Various components and techniques recommended for use in a comprehensive psychological evaluation are discussed briefly. Information gathered from this evaluation informs the neuropsychologist and others about the child's overall cognitive-intellectual, psychosocial, and academic functioning. This information is helpful in describing the extent to which brain-related dysfunction affects these important functional areas of the child.

Impact of Psychological Functioning on Neuropsychological Results

A number of psychological conditions or factors can have an impact on neuropsychological evaluations that should be considered when evaluating children and adolescents. These factors may interact differentially depending on whether the child's condition is a result of acquired anomalies (e.g., traumatic brain injury) or developmental anomalies (e.g., learning or neuropsychiatric disorders). First, children sustaining traumatic brain injury may display symptoms of "psychic edema" that interfere with performance on neuropsychological tests. Inattention, distractibility, and motivational problems may be present soon after injury. Although these features frequently subside within weeks of injury, once the child has stabilized, initial or baseline neuropsychological evaluation may be contaminated by these short-term problems (Semrud-Clikeman, 2004). Furthermore, these psychological aspects may mask other deficits that could ultimately be long-lasting (e.g., impaired reasoning and planning). For example, tests of executive functioning (e.g., Wisconsin Card Sort or Category Test) may be sensitive to these psychological problems.

If a child is inattentive and distractible, then careful and thoughtful analysis is lacking. Impulsive responses may be inaccurate. Some children with TBI do continue to display ADD-like symptoms long after recovery, but the clinician is advised to consider the initial impact on test results if inattention and distractibility are observed, particularly when the child's history does not suggest that the

problems were present preinjury. Second, language and/or reading delays may make some neuropsychological items difficult. If a child does not understand the verbal directions of a test and responds inaccurately, this may indicate a language comprehension problem rather than a deficit in the underlying neuropsychological function of interest. For example, instructions on some psychological and neuropsychological measures tests (i.e., Trails B from the Halstead Reitan) may prove too complicated for a child with a receptive language delay. In this instance, it is imperative to determine whether low scores result from true reasoning or planning deficits, or from problems in comprehension. Testing the limits or simplifying instructions may be helpful in this determination. Further, cognitive delays also may produce poor performance on measures of global (e.g., reasoning, abstract formation, memory) versus specific brain functioning (e.g., motor speed).

Third, children with conduct-related or oppositional defiant disorders may show signs of passive aggressiveness and poor motivation. Refusal or poor effort should not be confused with neuropsychological deficits. It is also not uncommon for children with these psychiatric problems to have poor frustration tolerance. They may give up quickly and become easily frustrated when they begin to struggle on items that are difficult (e.g., reasoning tasks). Efforts to improve frustration tolerance may include using reinforcers (e.g., a soda, a candy bar) or shorter testing intervals. Fourth, children with ADHD also may make careless, impulsive errors. Testing on and off medication often gives the clinician a better picture of the child's underlying neuropsychological problems beyond the impulsivity and distractibility that may be paramount in ADHD. Breaking testing periods into shorter periods may also improve performance.

Finally, depression and/or anxiety may interfere with a child's ability to put forth sustained effort. Children may appear apathetic, withdrawn, or overly nervous. It is important to build rapport with the child and to create a supportive, reinforcing testing climate. Again, testing the child both on and off medication may be indicated, especially for children who take antidepressants. The neuropsychological report should reflect any special testing administration changes or modifications, and should describe the conditions under which the behaviors were elicited. It may be helpful to conduct a follow-up evaluation (three to six months later) if the clinician believes that psychological factors have rendered the interpretation of neuropsychological findings suspect or contaminated. An important part of the neuropsychological evaluation process is a comprehensive presentation of the information gathered on the child's behavior and method of interacting with the examiner.

Conclusion

With the advent of new examination methods for the neurological functioning of children, neurologists and neuropsychologists are better equipped to concentrate on areas of strength and weakness as well as remediation, instead of the previous emphasis on location of damage or diagnosis. Understanding when to refer a child for a neuropsychological examination is just as important as understanding the basic measures that are utilized. Neuropsychological reports should not only report testing results, but also provide interventions and understanding of the results. Many cases that are referred for a neuropsychological evaluation will often also have psychiatric overtones. A comprehensive examination provides information about the child's social and emotional functioning. For adolescents and adults the MMPI-A and MMPI-2 are instruments that are frequently utilized. For children self-report rating scales are generally useful. For some clients who are either unwilling or unable to describe their difficulties or who have poor insight, a projective measure will be helpful.

Thus, a comprehensive neuropsychological evaluation encompasses a good psychological assessment and adds knowledge about brain function as well as possible aspects of development that may negatively impact brain development and functioning. These issues are illustrated in the neuropsychological report provided in this chapter.

The following chapter briefly reviews basic domains of neuropsychological functioning. It also provides a brief discussion of the commonly utilized tests for these areas. Further discussion of set neuropsychological batteries is provided in Chapter 8.

Hospital: Developmental/Behavioral Program

Patient Name: **Sam**
Medical Record Number:
Date of Birth:
Date of Evaluation: **8/5, 8/12, 8/26/**
Chronological Age: **13–10**
Neuropsychologist:

Reason for Referral

Sam was referred for evaluation by Dr. K to evaluate his current level of intellectual and academic functioning. Dr. K evaluated Sam and diagnosed him with ADHD: combined type, Conduct disorder: adolescent onset, Anxiety disorder NOS with rule outs for Bipolar disorder, and learning disorders. Dr. R, child psychiatrist, is evaluating Sam concurrently with this evaluation. Sam is not currently prescribed any medications.

Background Information

The following information was obtained through review of medical records, discussion with Dr. K, and parent and child interviews. Additional information is available through Dr. K's report to the interested professional. The following is a summary of Sam's history. Sam has a long history of acting out behaviors and sadness/anxiety disorder. Significant deficits have been found in attention, social skills, and activity level. His family history is positive for incarceration and substance abuse and has been notably unstable. He has been at a juvenile detention center twice with the most recent stay in the past school year. He was at the juvenile detention center most recently due to significant behavioral difficulties at home, school refusal, and suicidal ideation. Sam's older brother has been reportedly arrested several times and is currently in prison for burglary. His mother also has a history of incarceration and substance abuse, but is currently working on turning her life around, and she reported she has been clean for 18 months.

The pregnancy was complicated by the use of heroin, caffeine, and nicotine during the first trimester, substances which were discontinued at that time. Pregnancy and delivery were reported as normal and delivery was by Cesarean Section. Sam was reported to be an active and fussy baby, but met all developmental milestones within normal limits. Sam's mother reports that he has significant difficulty sleeping and frequently doesn't sleep until early morning. Sam attends school at the ALC and has a history of suspensions and expulsions prior to his attendance at ALC. His achievement was reported to be in the average range. Sam has not had a psychological or neuropsychological evaluation. Dr. K's report indicates the presence of depression, anxiety, conduct problems, and peer problems. These findings were present on both home and school behavioral checklists and consistent with self-report measures completed by Sam.

Speech and Language assessment conducted at the hospital found Sam's language skills to be within normal limits for his age. An audiological evaluation through CHOA found an auditory processing deficit with recommendations for a repeat evaluation in one year.

Behavioral Observations

Sam was accompanied to the assessment by his mother. He was tested during two consecutive Thursday appointments for approximately three hours each. Sam was friendly throughout the evaluations and seemed to enjoy the tasks at hand. His language was age-appropriate and his speech was clear and unpressured. He reported that he had not slept well the nights before the assessments and was tired. Sam did appear to be lethargic during the testing which affected his attention at times. He responded well to redirection and worked on the tasks at hand. On tasks that were challenging for him Sam would give up easily and appeared to lack confidence in his abilities. He worked hard throughout the tests, but did not push himself if he didn't know the answer. He did not become unduly frustrated on tasks that were challenging for him. Given his high level of cooperation, the following results are felt to be a reliable and valid representation of his level of current functioning.

Tests Administered

Differential Abilities Scales (DAS), Wechsler Individual Achievement Test-II (WIAT-II), California Verbal Learning Test-Children's Version (CVLT-C), Stroop Color Word Test, Test of Variables of Attention, Wisconsin Card Sorting Test (WCST), Judgment of Line Orientation (JLO), Rey-Osterreith Complex Figure Test, Rorschach Inkblot Test, Behavior Assessment System for Children—parent form (BASC), Review of Medical Records, Clinical Interview

Test Interpretations

Cognitive Functioning

The Differential Abilities Scales (DAS) consists of core and diagnostic tests of general cognitive ability. The cognitive subtests assess the child's ability to understand and use language, complete puzzles and block designs, and interpret visual information. The diagnostic subtests evaluate the child's short- and long-term memory as well as his speed of information processing. Sam shows average overall functioning achieving a general cognitive index of 91 that places him at the 27th national percentile. There is a 90 percent assurance that his true ability lies between 86 and 95. There is a significant difference between his verbal and nonverbal skills; his verbal ability is in the strong average range and his nonverbal reasoning skills is below the average for his age. Sam's spatial abilities are in the average range. On the verbal subtests Sam shows age-appropriate ability to define words and use abstract language concepts. He also shows average perceptual skills. Weakness is present in Sam's nonverbal reasoning skills particularly in his ability to recognize patterns and complete sequencing tasks. The diagnostic tests indicate very good visual memory, both short- and long-term. His ability to process information quickly and his recall of auditory information are in the low average range for his age.

Academic Functioning

The Wechsler Individual Achievement Test is a measure of general academic functioning in the areas of reading, arithmetic and writing. On the reading subtests the child is asked to read single words and also to read a passage and answer questions about content. On the arithmetic subtests the child is asked to solve word problems as well as general calculation problems. The writing subtests require the child to spell words and then to write a story on a topic.

Sam's reading skills are within expectations for his age and grade placement. He shows better abilities understanding what he has read and appears to use context clues in order to understand passages. His ability to sound out words is not as well developed and he would not attempt to sound out words that he did not know. Sam's mathematics abilities are his weakest area particularly in his ability to complete calculation tasks. He has not mastered fractions and shows poor understanding of decimals. Sam's spelling skills are in the below average range and his ability to write a paragraph is significantly below his age and ability measures. His story was marked by poor word usage, lack of punctuation and capitalization, run-on sentences, and limited word usage. Sam shows adequate development of his ideas. Compared to his ability, particularly compared to his verbal ability, Sam meets criteria for a learning disability in mathematics and written expression.

Learning and Memory

The California Verbal Learning Test-Children's Version (CVLT-C) was administered to assess Sam's ability to learn verbal material after several exposures. The task also provides measures of recall and recognition of previously learned material. Sam's scores on this measure are listed below. Sam shows average ability to encode and store auditory information. When asked to recall information after a short period of time, Sam's scores are significantly below average. Strategies for recalling information do not improve his score either in the short- or long-term.

The findings from the memory measures have important implications for Sam's school performance. He does not spontaneously generate efficient strategies for encoding, and may need to be taught more effective means of remembering new material. It also appears that new learning may be

taking place, but Sam is having difficulty with retrieval. Thus, he should be provided with a system of cueing himself to help him to remember information that he has just learned. Additionally, new learning should be rehearsed often to help render retrieval somewhat easier. These findings are consistent with the possibility of a central auditory processing disorder.

Executive Functioning

The Wisconsin Card Sorting Test is a measure of executive or frontal lobe functioning, including the ability to form concepts, generate an organizational strategy, and use examiner feedback to shift strategy to the changing demands of the task. Sam's performance is summarized below:

Sam shows excellent executive functioning skills. He is able to utilize examiner feedback to change his answers and to respond flexibly to a cognitive task. Sam did show difficulty in staying on the task and became distracted by additional stimuli. This finding indicates that he can be distracted from the task at hand and this hampers his ability to respond.

The Stroop Color Word Test was also administered to measure Sam's ability to inhibit responding. The Stroop has three parts: the first part requires him to read color words as quickly as possible, then colors, then words that are printed in opposing colors (the word red is printed in green ink and the child reads the color of the ink). Sam scored in the low average range in his ability to read color words quickly and for the colors. He scored in the below average range in his ability to inhibit his response when asked to complete the task where he reads the color, but not the word. He became increasingly frustrated at this task and this frustration also contributed to his very low score.

Attention

Sam was administered the Test of Variables of Attention (TOVA) to evaluate his abilities. He was administered the TOVA off of any medication, then on 10 mgs of methylphenidate. His scores without medication showed difficulties in all areas. With the medication his scores fell within average ranges.

These findings are consistent with observations during the evaluation as well as an interview with Sam and his mother. He endorsed eight symptoms of inattention, three of poor impulse control and four of high activity level. These findings are similar to those reported by Dr. K.

Perceptual-Motor Functioning

The Rey-Osterreith Complex Figure test requires the adolescent to copy a very detailed figure. Sam scored in the average range on this task showing good visual-motor skills, as well as good planning and organizational abilities.

Sam's basic visual-perceptual skills were assessed using the Judgment of Line Orientation test which requires the adolescent to determine the correct directional orientation of a line pattern. On this measure, Sam showed significant deficits in his ability to match patterns. This finding is consistent with his difficulty on the DAS nonverbal reasoning tasks. Sam achieved a score of 14 which places him 3.5 standard deviations below expectations for his age.

Sam also completed the Purdue Pegboard. The Purdue Pegboard requires him to place pegs in a pegboard as quickly as possible with each hand individually and then with both simultaneously. He scored in the average range with his ability to place pegs with his right (dominant) and left hands as well as with both hands together. He also completed the Finger Tapping Test, which requires him to tap on a tapper as quickly as possible with each hand for 10 seconds. Sam scored well within the average range on the measure. These findings indicate that Sam does not have significant motor task problems, but he does have difficulty with perception and with the integration of perception and motor, a task that is important for writing.

Emotional Functioning

Sam completed the Behavioral Assessment System for Children-Self-report (BASC), an integrated system designed to facilitate the differential diagnosis and classification of a variety of emotional and behavioral disorders of children and to aid in the design of treatment plans.His mother had

previously completed the BASC as well as his teacher during the evaluation with Dr. K. Findings indicated highly clinically significant difficulties present in learning, social functioning, activity level, and attention in school. At home significant problems were reported in attention, activity level, aggression, conduct, and self-esteem.

Sam's ratings indicate that he is feeling most stress in school and that his attitude toward school and teachers is problematic. He does not consider teachers as people who can help him, that they are unfair, and that they only look at the bad things you do. He also does not feel that school is a helpful place and that he really doesn't care about school and wants to get out as soon as possible. In addition, Sam indicates that he prefers excitement and will seek out such situations if they are not present. The risk for antisocial behavior is very high based on the BASC and he shows little anxiety about getting in trouble with authority figures. There are indications of concerns about his sense of worth and that he does not have the motivation to attempt tasks when they are more difficult. He reports adequate self-esteem and self-reliance, but problematic relationships with his parents.

The Rorschach Inkblot Test was also administered to attempt to uncover areas of emotional functioning that Sam did not appear free to discuss. Sam's protocol indicates that he directs his behavior through internal means and attempts to keep his feelings aside when in coping situations so that their influence on his decisions is, at best, modest. This coping style is very marked and not very flexible—in other words, he will persist in his behavior even in a situation in which an intuitive or trial-and-error style may be more appropriate. Sam is also showing significant signs of situational stress that appears to be interfering with his ability to direct his behavior in a more appropriate manner. He shows a conflict between possibly unmet dependency needs and his need to isolate himself—given his history he may feel that he needs to protect himself from opening up to anyone. He shows a tendency toward cognitive distortion that may make it more difficult for him to interpret interpersonal behavior appropriately. His protocol indicates the risk for antisocial behavior and he does not perceive that people work together toward a goal. Positively, Sam shows an interest in people, but may not process human relationships very well. He shows signs of dysthymia as well as some indications that he sees himself as damaged or inadequate.

Summary and Recommendations

Sam is a 13-year, 10-month-old male with a history of aggressive behavior, attendance at a juvenile detention center, and a problematic childhood. Cognitive assessment indicates average ability in verbal and spatial skills with below average nonverbal reasoning skills. Achievement testing indicates age-appropriate reading skills with deficits present in mathematics and written expression. He shows significant problems with attention which is improved with medication. Sam also has a history of social skills deficits as well as our finding of visual-spatial skill deficits. These findings are consistent with a diagnosis of a nonverbal learning disability. His difficulty in understanding appropriate social actions as well as containing his impulses make it difficult for him to participate in many social interactions. Instead Sam has developed behaviors that remove him from this difficulty through acting out. One cannot rule out that some of these behaviors may be related to his early development and his mother's probable substance abuse during pregnancy and after birth.

Sam shows good skills in utilizing feedback to change his behavior. However, he shows difficulty recalling information when presented orally—a finding consistent with his performance on the auditory processing test recently completed at the hospital. Emotionally Sam shows indications of being at high risk to develop antisocial behavior. He seeks out situations that are exciting for him and has a very low tolerance for boredom. There are indications of dysthymia in the projective testing as well as unmet needs for nurturance. Sam's difficulty in trusting adults in authority make it problematic for him to change his behavior and his defiance is his way of asserting control over a situation. These feelings are likely grounded in his early experience where his mother was unavailable to him and his needs were not met in a timely manner. The picture presented by Sam is of an adolescent who is torn between a need to be cared for and nurtured, and a

need to reject human contact. These concerns are complicated by his difficulty in perception that may frequently lead him to misinterpret people and their motives.

These findings are not consistent with a diagnosis of bipolar disorder, but are consistent with that of conduct disorder, ADHD, and a learning disability. It is believed that Sam is at a crossroads at this time and is at high risk to continue down his path of antisocial behavior. He requires intensive intervention assist him in preventing this possibility.

Given the above findings, the following recommendations are offered:

1. It is strongly recommended that his school convene a multidisciplinary team meeting to determine Sam's eligibility for special education services in the areas of OHI and LD.
2. A sleep study is recommended to determine the cause of Sam's history of sleep difficulty.
3. Individual cognitive-behavioral therapy is recommended and can be arranged through the hospital.
4. Continuation of parent training with Dr. K. is strongly recommended. Moreover, continuation of therapy with Dr. R is also strongly recommended as well as consideration for medication.
5. It is very important that auditory information which requires encoding be paired with visual cues to improve Sam's ability to remember what he has learned.
6. Additional memory strategies are provided as follows:

Strategies for Improved Memory Skills

Teaching Behaviors which are helpful:

1. Break tasks into small steps
2. Use extensive repetition
3. Teach strategies for memory, such as verbal rehearsal, clustering or chunking, imagery, associations, note taking, etc.
4. Use massed and distributed practice

Focus on the following:

A. Working Memory: Teach the child how to remember directions and keep it in mind long enough to complete the task. Younger children especially forget what they are supposed to do and start to "drift away." Use cues like "make yourself remember. . ." "This is important. . ." Do the first few items with the child, pointing out what is important.
B. Present information in short segments: Two sentences may be overwhelming. Monitor comprehension.
C. Get the child involved actively whenever possible. Use many visual aids, demonstrate, repeat, give many pages of the same idea. Your goal is comprehension, retention, and mastery.
D. The child needs memory strategies such as:
   - visualization (make a picture in your mind as you listen)
   - note taking (or buddy note taker)
   - repeating words in chunks
   - learning to associate related ideas
   - using "silly" cues such as, *Joe's Present* . *Joe* was born on *Sunday* , *July* 4th, in *Seattle* , *WA* , *USA* on *Book Street* . He got a *Ninja Turtle* from *Toys R' Us* . These sentences have all the rules for *capitalization* .
E. Only present the important information; leave out the frills and elaborations. Simplify, make it interesting, make it fun. Avoid long paragraphs or small print.

7. Techniques to help students with attentional problems in the classroom

Physical Arrangement of Room

1. Have student seated near teacher
2. Move student's desk away from hallway, outside windows, etc.
3. Use desk dividers or study carrels if possible
4. Seat appropriate models next to students with attentional problems
5. Stand near student when giving directions or presenting lesson. Use the student's worksheet as an example
6. Use rows for seating arrangement. Avoid tables with groups of students, if possible

Lesson Presentation

1. Provide an outline, key concepts, or vocabulary prior to lesson presentation

2. Include a variety of activities during each lesson
3. Make lessons brief
4. Actively involve the student during the lesson presentation:
   - Use cooperative learning activities
   - Develop learning stations
   - Provide self-correcting materials
   - Enable the student to make frequent responses
   - Interact frequently (verbally and physically) with the student
5. Use the student's name during your presentation
6. Pair students to check work
7. Arrange for peer tutoring to help students review concepts
8. Use colored chalk during presentations when using chalk board

Worksheets and Tests

1. Use larger type
2. Keep page format simple:
   - Don't include extraneous pictures
   - Provide only one or two activities per page
   - Have white spaces on each page
3. Write clear, simple directions
4. Underline key direction words, vocabulary words, etc.
5. Draw borders around parts of page you want emphasized
6. Add reminders on worksheets to check work, etc.
7. Give frequent short quizzes and avoid longer tests
8. If necessary, allow student to take tests orally
9. Provide practice tests
10. Shorten assignments

Behavior

1. Implement a classroom behavior management system
2. Implement an individual behavior program and consistently chart progress (earn points for on-task time)
3. Use kitchen timer to help students stay on task
4. Use visual and auditory cues as behavioral reminders
5. Develop contracts/ behavior management systems in conjunction with parents to reinforce specific behaviors at home and at school
6. Implement a social skills curriculum
7. Give students choices ("You may work on your report or finish your math sheet")
8. Praise *specific* behaviors ("I like how you remembered to check your work before turning it in to me")
9. Define and review class rules each day
   Post rules where students can see them
10. Be as consistent as possible in following through on classroom and individual behavior programs
11. Set hourly, daily, weekly, or monthly goals with the student and provide frequent feedback on student's progress

Thank you for the opportunity to work with this young man and his family. If you have any questions about this report, please do not hesitate to contact me at the XXX-XXXX.

Dr. X. Ph.D.
Licensed Psychologist
cc: Dr. K
Dr. R

Psychometric Summary

Differential Abilities Scale-2

Average standard scores for the general cognitive index are between 85 and 115 with average T-scores for the individual subtests being between 40 and 60.

	Standard Score	Percentile
Verbal Cluster	105	63
Nonverbal Reasoning	81	10
Spatial	91	27
General Conceptual Ability	91	27

Core Subtests	**T-Score**	**Percentile**
Verbal Subtests		
Word Definitions	54	66
Similarities	53	62
Spatial Subtests		
Recall of Designs	45	31
Pattern Construction	45	31

Nonverbal Reasoning Subtests		
Matrices	38	14
Sequential and Quantitative Reasoning	40	16
Diagnostic Subtests		
Recall of Digits	45	31
Recall of Objects—Immediate	57	76
Recall of Objects—Delayed	54	66
Speed of Information Processing	47	38

Wechsler Individual Achievement Test-II

Average standard scores are between 85 and 115. Sam's scores are as follows:

	Standard Score	Percentile
Basic Reading	86	18
Word Attack	73	3
Reading Comprehension	101	53
Reading Composite	**90**	**25**
Mathematics Reasoning	83	13
Numerical Operations	73	4
Mathematics Composite	**74**	**4**
Spelling	82	12
Written Expression	75	5
Writing Composite	**77**	**6**

California Verbal Learning Test-Children's Version

Scores have a mean of 0, with standard scores of -1.0 to +1.0 indicating performance within the broad average range.

	Raw Score	Standard Score
List A, Trial 1	7	0.0
List A, Trial 5	12	0.0
Trials 1–5	45	42
List B Free Recall	6	−0.5
List A Short Delay Free Recall	6	−2.0
List A Short Delay Cued Recall	7	−2.0
List A Long Delay Free Recall	8	−1.0
List A Long Delay Cued Recall	7	−2.0
Correct Recognition Hits	7	−3.5
Discriminability	66.67%	−5.0
Learning Slope	1.2	−0.5

Wisconsin Card Sorting Test

Categories Achieved:	6	Normal range = 5–6
Failure to Maintain Set	4	Normal range = 0–1

	Raw Score	Standard Score (100 + 15)
Total Errors	15	116
Perseverative Responses:	11	108
Perseverative Errors:	0	109
Non-perseverative Errors:	5	118
Percent Conceptual Level Responses	82%	118

Test of Variables of Attention-Visual

Average scores run between 85 and 115

	Off Ritalin	On 10 mg
Omissions	65	103
Commissions	66	105
Response Time	77	110
Variability	55	95

Stroop Color Word Test

Average scores range between 40 and 60

Words	47
Colors	45
Color/Words	32

Behavior Assessment Scale for Children—Self-Report

Domain	**T-Score**	**Percentile**
Attitude to School	74*	99
Attitude to Teachers	74*	99
Sensation Seeking	70	97
School Maladjustment	*78**	*98*
Atypicality	69+	94
Depression	49	64
Somatization	65+	91
Anxiety	49	64
Sense of Inadequacy	62+	86

Social Stress	54	69
Clinical Maladjustment	57	75
Personal Adjustment	*39+*	*14*
Emotional Symptoms Index	*55*	*73*
For the following scales, higher scores are desirable		
Relations with Parents	30*	7
Interpersonal Relations	41	15
Self-Esteem	50	37
Self-Reliance	46	26

+at risk
*high scores indicate problem behaviors

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