

Laura's scores on the Visuospatial Processing domain subtests indicate that her visuoconstructional skills are intact, but that her visual perception and scanning ability are not as developed. On subtests that require good spatial relational ability along with motor coordination to complete the tasks, such as *Block Construction* (BC) and *Design Copying* (DC), she achieved scaled scores that were At Expected Level. However, on *Arrows* (AW), *Geometric Puzzles* (GP), and *Picture Puzzles* (PP) she obtained scaled scores of 7, 6, and 5 respectively. These subtests not only require perceptual skills, but also attention to detail, adequate impulse control and good working memory, all of which are suspected deficits for Laura.

The Social Perception domain is composed of two subtests, *Affect Recognition* (AR) and *Theory of Mind* (TM). Affect Recognition is designed to measure an individual's ability to identify and discriminate among various emotions. In general, Laura demonstrated good ability to discriminate between various emotions and facial expressions.

*Theory of Mind* (TM) measures the ability to understand other's perspectives and the relationship between emotion and social context.

Based on the Verbal Task of Theory of Mind, Laura has an understanding of other's emotions, perspectives, and beliefs consistent with her same age peers. Laura's performance on the Contextual task also indicates that she understands the nature of appropriate emotional interaction in contextual situations and is able to identify emotions associated with specific situations. Overall, Laura's performance on the Social Perception tasks was At Expected Level and is consistent with both her behavior during testing and her reported behavior when interacting with others her age.

The WISC-IV was administered to evaluate Laura's general intellectual ability and to provide additional information regarding Laura's working memory and processing speed. Her scores suggest relative weaknesses in both areas compared to her overall intellectual functioning, with statistically significant differences being observed between her *Working Memory Index* (WMI) score of 97 and both the *Verbal Comprehension Index* (VCI) score of 108 and *Perceptual Reasoning Index* (PRI) score of 104. Her *Processing Speed Index* (PSI) score of 80 was also highly discrepant from both her Verbal Comprehension and Perceptual Reasoning Index scores.



Theory of Mind (TM) measures the ability to understand other's perspectives and the relationship between emotion and social context.



### Summary

In evaluating Laura's performance on the NEPSY-II and WISC-IV, Laura demonstrated significant weaknesses in the areas of selective and sustained attention, cognitive flexibility, inhibition and impulse control, verbal working memory, and immediate and delayed auditory memory. Laura's skills in the domains of Language, Social Perception, and Visuospatial Processing are consistent with her general problem-solving abilities.

Despite the fact that Laura demonstrated significant impairment on some NEPSY-II subtests, her general intellectual functioning appears to fall within the average range. Therefore, it is important to isolate and detail Laura's specific problems. These are:

1. Difficulty in executive functioning which includes planning, organizing, and initiation;
2. Difficulty in executive control specific to cognitive flexibility, self-monitoring skills, and language control;
3. Difficulties maintaining selective and sustained attention; and
4. Decreased verbal working memory capacity, which likely affects specific types of learning.

It is likely that Laura's inability to recall the rules often associated with Mathematics and Science is due to her overall difficulties remembering verbal material, poor memorization strategies (e.g., rote), and impaired ability to access organized material.

The results of the assessment suggest probable Attention-Deficit/Hyperactivity Disorder, Predominantly Inattentive Type, executive dysfunction, and memory deficits, which are consistent with a history of prenatal crack cocaine exposure (Bendersky & Lewis, 1998; Mayes & Bornstein, 1997; Scher, Richardson, & Day, 2000).

Despite Laura's difficulties, she has some existing strengths on which to build. Laura seems to work more efficiently with designs and patterns; this may be a possible tool to consider during the intervention process. Because of Laura's limited working memory capacity, her ability to learn large amounts of information at one time is hindered. Presenting Laura with limited amounts of information at regular successive intervals may increase her ability to learn tasks such as Mathematics and Science. In addition, greater effort will be required by Laura to perform well in these classes, so they should be scheduled early in the day when she is rested and able to maintain effort. Because Laura's current school does not staff a school psychologist or special education teacher, it would be helpful for Laura's mother to pursue an educational institution that has professionals who understand Laura's difficulties and can help her to succeed.

Because this is the initial neuropsychological assessment, the data from this evaluation will be shared with Laura's teachers, mother, and counselor in an effort to help build a supportive, structured environment in which Laura can excel to her true cognitive potential.

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## Laura's Story

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Laura is a 12-year-old female enrolled in the 7th grade at a private middle school. Laura was referred for a neuropsychological evaluation due to her mother's concern over Laura's consistently poor grades in Mathematics and Science and her recent retention in the 7th grade. Laura received a failing grade in Mathematics and a D minus in Science at the conclusion of her 7th grade year.



## Case Study 1

Laura's performance in these classes does not seem to improve with increased study time and she has become frustrated and unwilling to spend time preparing for tests and class assignments. Laura's grades in her other courses were mostly A's with a few B's and C's. Her mother and teachers believe that Laura's current problems are related to a lack of effort on Laura's part. Laura reports that she struggles with much of her Math and Science homework and reading assignments and is frustrated with her apparent inability to improve her performance. Laura claims that she has always struggled in these subjects, but says the content of the 7th grade classes is more difficult than previous years.

Laura's mother reports that Laura's biological mother abused crack cocaine during her pregnancy and Laura was born addicted to the drug. She was adopted as an infant and met most of her developmental milestones. Laura experienced chronic ear infections throughout infancy and early childhood and is diagnosed with chronic asthma, which requires the use of an inhaler. Her primary physician is concerned with her apparent attentional difficulties and recently referred Laura for evaluation for Attention-Deficit/Hyperactivity Disorder (ADHD). Laura received special education services for articulation and mild speech problems in the 5th grade.

During the assessment, Laura was pleasant and energetic. She was slow to warm up, but quickly became engaged in the process. She appeared open and honest in her responses to questions about her home life and school and was eager to talk about her involvement in the art, speech, and drama clubs, and debate team. Her conversational skills were somewhat awkward and she often demonstrated word finding difficulties, which resulted in minor difficulty with expressing herself. Laura frequently smiled and laughed during assessment sessions. Laura was socially appropriate and overall, she was pleasant and cooperative, while expressing frustration over her difficulties in school. When providing oral responses to test items, Laura had some difficulty finding the words to express herself, but nonetheless was able to effectively communicate her thoughts in a concise manner.

Because of the reported academic difficulties with Science and Math, Laura's assessment included an evaluation of attention and executive functioning, as well as her general cognitive abilities. The *NEPSY-II* (Korkman, Kirk, & Kemp, 2007) was administered to explore Laura's neuropsychological functioning, particularly for processing speed, impulse control, and working memory, all factors associated with ADHD. The *Wechsler Intelligence Scale for Children—Fourth Edition* (WISC-IV; Wechsler, 2003) was administered to assess Laura's general intellectual functioning. *The Vineland Adaptive Scales* (Sparrow, Cicchetti, & Balla, 2005) was administered to Laura's mother to assess Laura's adaptive functioning at home.

Laura achieved a General Ability Index score of 107 on the WISC-IV, indicating that her general cognitive functioning is in the average range. The results from the Vineland indicate that Laura is having significant difficulty with social and organizational skills and other daily activities in the home. However, these scores are not entirely consistent with Laura's demonstrated abilities in the school setting, and it is likely that the results on the Vineland reflect Laura's mother's frustration more than Laura's true adaptive functioning. To assess Laura's reported difficulty with attention and organizational tasks, subtests from the Attention and Executive Functioning domain of the *NEPSY-II* were administered. She completed the Animal Sorting, Auditory Attention and Response Set, Clocks, and Inhibition subtests. Overall, her performance on these subtests was poor. She had the greatest difficulty on tasks that require both sustained attention and good inhibitory control.

Laura performed At Expected Level on the *Auditory Attention* (AA) task, a measure of sustained auditory attention and vigilance. She obtained an AA Combined Scaled Score of 10, with both the AA Total Correct and AA Total Commission Errors scores also falling At Expected Level. These scores suggest that she has adequate sustained attention on a less complex task, however, her performance on the *Response Set* (RS) task revealed that she is likely to encounter more difficulty when the task requires working memory, cognitive flexibility, and the inhibition

of previously learned responses in addition to sustained attention. While Laura achieved an almost perfect score on RS Total Correct, she committed numerous Commission Errors, failing to inhibit incorrect responses for the task. As a result she achieved a RS Combined Scaled Score of 6, which falls in the Borderline range. Given her performance on the Auditory Attention task, the AA vs. RS Contrast Scaled Score of 5 indicates that her performance on the Response Set task is Below Expected Level. Laura may struggle when increased demands are placed on her working memory and inhibitory control.

Laura's performance on the Inhibition subtest was consistent with her scores on Auditory Attention and Response Set. On the *Naming* (INN) task, Laura obtained an INN Combined Scaled Score of 9, which is At Expected Level. The Naming task requires the child to name shapes or the direction of arrows as quickly as possible. Her scores indicate that she possesses the necessary language and processing speed required to complete the Inhibition subtest tasks. The *Inhibition* (INI) task requires the child to say the opposite shape name or arrow direction as quickly as possible. On this task, she obtained an INI Combined Scaled Score of 6, which fell in the Borderline range. Laura performed slightly poorer than expected on the Inhibition task compared to others with similar naming speed, producing an INN vs. INI Contrast Scaled Score of 6. On the *Switching* task, she obtained an INS Combined Scaled Score of 3, which falls Well Below Expected Level. The Switching (INS) task requires an additional demand of changing the response

based on the color of the shape or arrow. This additional task demand is designed to identify children with difficulties with working memory and poor cognitive flexibility. She performed poorer on the Switching task than expected given her performance on the Inhibition task, with an INI vs. INS Contrast Scaled Score of 4. Laura's performance remained relatively consistent across each task of Inhibition, with respect to pure speed, producing INN, INI, and INS Total Completion Time Scaled Scores in the Borderline range. However, as the task demands increased, the total number of errors also increased, lowering the Combined Scaled Score for each successive task. It should also be noted that Laura produced a relatively high number of self-corrected errors, which



suggests that she was engaged in some self-monitoring behavior while engaged in the tasks.

Laura was also administered the *Animal Sorting* (AS) and *Clocks* (CL) subtests. On Animal Sorting, the child is asked to sort cards into two groups of four cards using self-initiated sorting criteria. Laura obtained an AS Combined Scaled Score of 8, which takes into account both the AS Total Correct Sorts and the AS Total Errors. The AS Total Errors includes both incorrect sorts and repeated sorts. Laura was able to formulate the basic concepts and produce a sufficient number of correct sorts, but produced two Repeated Sort Errors. This suggests poor monitoring for redundant information.



To assess Laura's reported difficulty with attention and organizational tasks, subtests from the Attention and Executive Functioning domain of the NEPSY-II were administered.

Similarly, when asked to complete the Clocks task, she demonstrated very little difficulty in planning, organization, and self-monitoring, obtaining a CL Scaled Score of 8. Her performance on the clocks task was not suggestive of any significant impairment in visuospatial and construction skills, knowledge of time principles and clock use, or graphomotor control. However, upon reviewing her responses to the clock reading items, she failed to provide correct responses to three of the four items. Based on her performance on the clock drawing items, her responses do not appear to be associated with an inability to tell time. In this case, her responses appear to be a direct result of poor attention to detail, in particular the lengths of the hands on the clock. For example, Laura provided a response of 3:30 to a clock face displaying the time of 6:15, perceiving the shorter hand as being the minute hand and the longer hand as being the hour hand. This also occurred on the other two missed items.

impairment, executive functioning affects performance on the Word Generation subtest; therefore, her poor performance reflects deficits in language productivity and control, rather than deficits in word knowledge. In addition, her language comprehension was average (*Comprehension of Instructions* = 8) although she frequently asked for repetition on a number of items. Laura may have difficulties attending to or remembering the instruction. *Repetition of Nonsense Word* (RN) assesses phonological decoding of sound patterns, as well as encoding and articulating complex and unfamiliar words. Laura performed Below Expected Level on this task, which may be related to her attentional problems, resulting in poor encoding, or reflects on-going subtle problems with articulation.

Given Laura's history of speech services, both her receptive and expressive language skills were assessed using the NEPSY-II Language subtests. Laura's performance on the majority of the Language domain subtests, including Oromotor Sequences, Phonological Processing, and Speeded Naming, was At Expected Level. Her scores indicate that she has age-appropriate linguistic and syntactical awareness, adequate phonological awareness and phoneme manipulative abilities, and normal automaticity of naming skills. The exception was her performance on the *Word Generation* subtest, on which she achieved a WG Semantic Scaled Score of 1 and a WG Initial Letter Scaled Score of 3, both of which fell Well Below Expected Level. In the absence of language



Although memory difficulties were not a primary referral complaint, memory functions may be affected by deficits in attention and executive functioning. The Memory and Learning domain subtests measure a variety of characteristics associated with verbal and nonverbal learning and memory. In general, Laura performed At Expected Level on tasks that involve nonverbal memory, achieving scaled scores of 13 on *Memory for Designs* (MD), 11 on *Memory for Designs Delayed* (MDD), 11 on *Memory for Faces* (MF), and 9 on *Memory for Faces Delayed* (MFD). However, on those subtests assessing auditory working and declarative memory, she struggled. *Word List Interference* (WI) measures verbal repetition and working memory ability. Laura's produced a WI Repetition Scaled Score of 9, which is At Expected Level, but obtained a WI Recall Scaled Score of 4. Given her ability to encode the information initially, Laura performed much poorer than expected on the interference task, obtaining a WI Repetition vs. Recall Contrast Scaled Score of 4. Laura is able to briefly hold information in verbal working memory but has difficulty recalling it when presented with interfering stimuli.

On *List Memory* (LM) and *List Memory Delayed* (LMD), subtests designed to assess the child's ability to learn verbal information through rote memorization, Laura obtained a LM and LMD Scaled Score of 6, which fell in the Borderline range. Her performance varied over the List Memory trials, producing a learning curve that reflected inconsistent performance and increased learning over successive trials. A similar pattern was demonstrated on the *Memory for Names* (MN) and *Memory for Names Delayed* (MND) subtests. The Memory for Names task assesses visual-verbal paired associative learning of verbal labels over three trials. Laura's performance on this task did not improve even with multiple learning trials. She obtained scaled scores that fell Well Below Expected Level on both Memory for Names and Memory for Names Delayed. *Narrative Memory* (NM) is designed to assess immediate verbal memory for information with an inherent structure. Laura's performance on the Free Recall and Free & Cued Recall both resulted in scores in the Borderline range.