

wisc-IV
Integrated

insight.

Working Memory Domain Case Study

“Steven has been experiencing behavior problems at school and his teacher suspects that he may have underlying learning and emotional issues that are contributing to his difficulties.”



PEARSON

intervene.

Steven enjoys science and eagerly talks about research that he is conducting on various topics. He appears to enjoy one-on-one time with adults when he is allowed to discuss topics of interest to him. He is inquisitive and likes to figure out how things work.

Steven has been experiencing behavior problems at school, and his teacher suspects that he may have underlying learning and emotional issues that are contributing to his difficulties.



Meet Steven...a talkative and active 12-year-old boy. Steven is often impulsive, especially when he sees something that appeals to him. He is fascinated by clocks and likes to take them apart. He tends to engage in lengthy, one-sided conversations on his favorite subjects and is not easily redirected until he has exhausted all of his thoughts on a particular topic. He speaks at a normal rate, but in a monotone. The expressiveness of his speech is often inconsistent with its content. In general, he appears to have minimal pragmatic language skills. He has trouble following directions, and frequently requires them to be repeated.

According to Steven's school records, his problems at school include an inability to make and keep friends, disruptive behavior in class, a reading disorder, and a history of a mild articulation disorder in the first grade. His teacher reports that although Steven shows interest in other children, he exhibits very poor peer relationships and has severe problems functioning in groups. Steven frequently gets out of his seat, interrupts others with unrelated ideas, and disrupts the class by playing with objects around him.

Steven's teacher believes that he has an understanding of social rules, but has difficulty applying these skills in day-to-day relationships. He is frequently rejected as a work partner

because of his disruptive behavior. The teacher describes Steven as forgetful and says that he needs frequent reminders to stay on task in the classroom.

Steven is being assessed to determine if his difficulties with following directions and interpersonal interactions are because of his current cognitive functioning or emotional issues stemming from his early childhood. Another goal of the assessment is to determine if any of Steven's cognitive challenges are severe enough to require intervention in the classroom. As part of this assessment, Steven was administered the core and supplemental subtests of the WISC-IV Integrated.

Steven's efforts earned him the following scores:

WECHSLER INTELLIGENCE SCALE FOR CHILDREN[®]—FOURTH EDITION INTEGRATED (WISC[®]—IV INTEGRATED)

| | Composite Score | Percentile Rank |
|----------------------|-----------------|-----------------|
| FULL SCALE IQ | 115 | 84 |

INDEXES

| | | |
|----------------------|-----|----|
| Verbal Comprehension | 114 | 82 |
| Perceptual Reasoning | 125 | 95 |
| Working Memory | 80 | 9 |
| Processing Speed | 121 | 92 |

VERBAL COMPREHENSION SUBTESTS

| | Scaled Score | Percentile Rank |
|---------------|--------------|-----------------|
| Vocabulary | 10 | 50 |
| Similarities | 13 | 84 |
| Comprehension | 15 | 95 |

PERCEPTUAL REASONING SUBTESTS

| | | |
|------------------|----|----|
| Block Design | 11 | 63 |
| Picture Concepts | 14 | 91 |
| Matrix Reasoning | 17 | 99 |

WORKING MEMORY SUBTESTS

| | | |
|--------------------------|---|----|
| Digit Span | 6 | 9 |
| Letter-Number Sequencing | 7 | 16 |

PROCESSING SPEED SUBTESTS

| | | |
|---------------|----|----|
| Coding | 12 | 75 |
| Symbol Search | 15 | 95 |

During the test session, a number of observations were made regarding Steven's test performance. He responded verbosely on verbal tasks, which enabled him to achieve a high score on **Comprehension** (e.g., was able to identify more than one reason and get full points). He often spoiled his response on **Vocabulary**, achieving a lower score on this subtest. Steven also displayed a tendency to respond quickly to items and failed to check his work for accuracy. This resulted in lower scores on **Block Design** because his designs had small errors that lowered his overall score.

Steven's performance on the **Auditory Working Memory** task was inconsistent, missing some easy items, completing harder items. This seemed to occur for a couple of reasons. First, he made many perseverative errors. He would carry a number of letter sequences from one trial to the next. This suggests some difficulty in his ability to clear working memory of previously acquired information and created an interference effect on new recall. He also appeared to struggle with letters that were phonetically similar. Some mild auditory discrimination problems may exist.

To better assess these phenomenon, the following WISC-IV Integrated subtests were administered: **Vocabulary Multiple Choice**, **Picture Vocabulary**, **Visual Digit Span**, **Block Design Multiple Choice**, **Elithorn Mazes**, **Spatial Span**, **Letter Span**, and **Letter-Number Sequencing Process Approach**. The vocabulary subtests were administered to test the hypothesis that Steven's excessive verbal production resulted in spoiled responses and his actual vocabulary scores under-represented his abilities. The **Block Design Multiple Choice** and **Elithorn Mazes** subtests were administered to determine if poor executive functioning (as indicated by poor planning, inattention, and impulsivity) affects his performance on speeded visual-perceptual tasks. The registration and working memory tasks were administered to determine in deficits in this domain are modality specific.

Wechsler Intelligence Scale for Children—Fourth Edition Integrated (WISC—IV Integrated)

| Subtest | Standard Score | Percentile Rank |
|------------------------------|----------------|-----------------|
| Vocabulary Multiple Choice | 9 | 37 |
| Picture Vocabulary | 11 | 63 |
| Block Design Multiple Choice | 14 | 91 |
| Elithorn Mazes | 8 | 25 |
| Digit Span Forward | 7 | 16 |
| Digit Span Backward | 6 | 9 |
| Visual Digit Span | 11 | 63 |
| Spatial Span Forward | 11 | 63 |
| Spatial Span Backward | 12 | 75 |
| Letter Span Non-Rhyming | 7 | 16 |
| Letter Span Rhyming | 3 | 1 |
| Letter-Number Sequencing PA | 8 | 25 |

Steven's performance on the **Vocabulary Multiple Choice** and **Picture Vocabulary** subtests did not significantly differ from his performance on the standard version of this test. Therefore, his verbose style did not negatively impact his performance on this subtest. Despite his relatively high score on

measures of verbal intellectual ability, his unusual use of language, poor pragmatics, and verbose style warrant further assessment of specific language abilities.

In the perceptual domain, Steven's performance on the **Block Design Multiple Choice** subtest was similar to his performance on **Picture Concepts** and **Matrix Reasoning**. His performance was better on the **Multiple Choice** version than the standard

Rhyming versus **Non-Rhyming**. This is consistent with the observed difficulties he appeared to be having discriminating between phonologically similar letters across trials on **Number-Letter Sequencing**. In the working memory domain, he did not appear to benefit from the reduced working memory demands of the embedded words; however, it was observed that he did better on his letter recall in this version and did not make as many cross item perseverative

consistent with previous psychoeducational assessments. Though Steven's current placement was primarily based on his behavioral issues, he received special education services for learning problems. As with previous providers of special education services, the teacher found working with Steven a challenge and felt that she was making little advancement in his academic skills.

On academic measures, Steven's performance



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version. The slightly lower performance on the standard **Block Design** task was likely due to his inattentiveness to detail and poor execution of his knowledge. On the **Elithorn Mazes** subtest, he performed in the average range, but significantly below his performance on the **Block Design Multiple Choice** subtest. His performance was notable for an impulsive approach to the test. He did not use motor planning, and his latency times were very short. This resulted in a greater-than-expected number of backward errors. Steven had to violate the rules of the task to overcome his lack of planning. To his credit, he did not make errors and was able to solve the maze on the second trial. In light of these findings, further assessment of executive functions is indicated.

In the registration/working memory domain, visual and spatial tasks were consistently performed better than auditory tasks. **Visual Digit Span** was significantly better than **Digit Span Forward** and **Spatial Span Backward** was significantly better than digit span backward. Among auditory registration measures, the only significant difference was lower scores on **Letter Span**

letter errors. He did, however, still exhibit difficulty with cross-item interference for numbers. Analysis of longest span data did not support the hypothesis that his inconsistency across trials resulted in a lower score than is his capacity. In general, longest span scores were consistent with his overall subtest performance.

Academic Achievement
Wechsler Individual Achievement Test® - Second Edition (WIAT®-II)

| Subtest/Composite | Standard Score | Percentile Rank |
|--------------------------|----------------|-----------------|
| Word Reading | 84 | 14 |
| Reading Comprehension | 90 | 25 |
| Psuedoword Decoding | 81 | 10 |
| Reading Composite | 82 | 12 |
| Numerical Operations | 79 | 8 |
| Math Reasoning | 91 | 27 |
| Math Composite | 83 | 13 |
| Spelling | 80 | 9 |
| Written Expression | 82 | 12 |
| Written Composite | 80 | 9 |

Steven displayed significantly lower academic skills compared to his intellectual ability,

on the **Word Reading** subtest was notable for his relatively good sight reading ability for words he knew well. For words, he did not know, he would often guess as to pronunciation of the word based on the first two or three letters. As his low **Psuedoword Decoding** score would indicate, he has weak phonological processing skills. When reading, he tends to rely on visual cues to help him decode unfamiliar words. This helps his performance to some degree. His reading comprehension, though not significantly better than his word reading was notable for his relatively good ability to figure out the general point of the story but he had difficulties with recalling specific details. His reading of words in a sentence was somewhat better than his ability to read words in isolation.

His math skills were notable for problems attending to details such as signs changing from one problem to another and for minor mistakes with simple adding and subtracting. He did not recheck his work for accuracy. His performance on **Math Reasoning** indicated that though he understands general math concepts he still makes

simple errors in addition and subtraction, which lowered his total score.

Steven's spelling performance was notable for problems with words that violate standard spelling conventions. He would try to spell these words phonetically, but because his phonetic skills were weak, he often misspelled the phonetic representation of the word. He did do well on words he clearly knew and had memorized. His writing was notable for the quantity he produced, which is consistent with his excessive verbal productivity, underscoring a pattern of high rates of effort, but poor control. Though he wrote a lot and the content was generally on target, his grammar, sentence construction, and use of words outside of his ability range was very poor. He did not punctuate and capitalize sentences appropriately. The writing lacked transitions between paragraphs. He derived paragraphs by counting the number of sentences, rather than using content as the deciding factor. In fact, each paragraph consisted of five sentences. The numerous run-on sentences made the text difficult to read.

Interpretation of Cognitive Testing*

Steven's abilities are above average in many domains of complex problem solving. Though verbal intellectual skills are above average, he does display a weakness in his auditory working memory skills. This weakness may at least in part be due to poor auditory discrimination that is not attributable to impairments in hearing acuity. Steven may have a central auditory processing disorder that affects his working memory and academic development. His verbal intellectual abilities are better than his ability to use language accurately, consistent with his low academic abilities. Poor working memory, auditory processing problems, and executive functioning impairments often contribute to problems with accurate language use.

In terms of attention, Steven did not display any obvious problems with sustained

attention. He is distractible in that he may get over focused on an idea or have difficulty resisting the temptation to reach for an object that catches his attention. These problems reflect deficits in executive control of attention and in general problems with self-regulation of behavior. On cognitive tests, he displayed significant problems with shifting cognitive sets even in the presence of corrective feedback. He has limited capacity to monitor his own behavior for adherence to task rules despite being able to state what those rules are. He shows a

very high rate of cognitive productivity but as testing revealed, he has very poor control of this process and is prone to sloppy, error filled work. His poor executive functioning contributes to academic and behavioral problems.

In other cognitive domains, Steven's verbal memory was in the low-average range for initial acquisition of information and in the average range for long-delay recall. Initial working memory difficulties may impact

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his immediate verbal memory, but his delayed rote recall is less affected. Among measures of face processing, he showed rather good recognition memory for newly learned faces and his discrimination was within normal limits. He did extremely poorly on a measure of facial affect recognition. The combination of limited capacity to read emotional expressions with poor language pragmatics, weak auditory processing and working memory and poor behavioral control makes interpersonal interactions a challenge for Steven.

Steven has difficulty following multi-step commands due to information loss in working memory. His teachers and foster parents are now aware of the importance of determining if he knows what he is supposed to do before assuming that he is being noncompliant. They understand that he will benefit from short, clear instructions.

Steven has the intellectual capacity to function well in school despite his learning disabilities. His primary impairment relates to his social functioning. The social problems stem from a number of cognitive weaknesses, including his difficulties in reading facial expressions, poor working memory to register and retain language in everyday situations, and his inability to quickly switch topics of conversation.

**Steven has the intellectual capacity
to function well in school
despite his learning disabilities.**

Given the complexity of his cognitive weaknesses and limited social functioning, it should not be expected that these deficits will be remediated in the context of a mainstream classroom without more intensive intervention. It is recommended that Steven be enrolled in a special education program for part of the day where he can receive more one-on-one attention and receive help tailored to his social and behavioral issues.

*Note: Interpretation based on a full battery of tests including many more measures than were reported in the body of the text.



Case Study No. 3

