Dyslexia, ADHD, or Both?

18th Annual State Dyslexia Summer Institute
July 31, 2013
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Dyslexia

• Specific learning disability
• Characterized by:
  • difficulties with accurate and/or fluent word recognition
  • poor decoding skills
  • poor spelling
  • Typically, due to a deficit in the phonological component of language that is unexpected

IDA, 2002

Dyslexia

• Definitions of dyslexia from other countries include other cognitive and linguistic factors such as:
  • rapid naming
  • processing speed
  • working memory
  • automaticity

Youman, M., & Mather, N. (2012). Dyslexia laws in the USA. Annals of Dyslexia, online (p. 3)
Dyslexia

• Researchers and scientists from around the world have reached consensus regarding:
  • dyslexia is a language-based disorder
  • primary symptoms involve inaccurate and/or slow printed word recognition and poor spelling
  • unexpected in relation to cognitive and other academic abilities


Dyslexia

“One practice that is becoming popular in some public schools is to rule out dyslexia if the child does not have a PA deficit. Clearly, such a practice is not supported by the current results.” (p. 12).


Dyslexia

“For many years, a single-deficit phonological theory of dyslexia was most prominent; however, mounting evidence shows that, although phonological deficits are standard in individuals with dyslexia, a single phonological deficit is probably not sufficient to cause the disorder.” (p. 270)

Dyslexia

Pennington et al. (2011), looked at single versus multiple deficit models of dyslexia.

- The study focused on four cognitive areas:
  - Phonological awareness
  - Language skill
  - Processing speed
  - Naming speed


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Four Cognitive Models of Dyslexia were hypothesized

I. Single phonological deficit – a deficit in PA is necessary and sufficient to cause dyslexia

II. Single deficit subtypes – other deficits besides PA, such as processing speed, naming speed, or language are sufficient to cause dyslexia

Pennington et al., 2011

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Four Cognitive Models of Dyslexia were hypothesized

III. Phonological core, multiple deficit – a single PA deficit is necessary but not sufficient to produce dyslexia; so there must be at least two deficits, one of which is PA

IV. Multiple deficit – a single deficit is not sufficient to cause dyslexia; at least two deficits are needed

Pennington et al., 2011
Dyslexia

• Results indicated a “hybrid model” for dyslexia deficit diagnosis fit best.
• There are multiple possible pathways to dyslexia, some involving single deficits and some involving multiple deficits.


Dyslexia

• “Our results reject a strict, single deficit version of the phonological hypothesis, but we did find that PA deficits were common in both dyslexic samples and had the highest sensitivity of any single cognitive deficit.” (p. 11)


Dyslexia

• “Clinical diagnoses of dyslexia....should be based on converging evidence from the child’s family and developmental history, qualitative observations of the child’s behavior in the evaluation, and test scores” (p. 12)

ADHD

• Attention-Deficit Hyperactivity Disorder has three subtypes:
  • Predominately inattentive
  • Predominately hyperactive-impulsive
  • Combined type

ADHD

• Primary symptoms:
  • difficulties with inhibition
  • inability to attend for an age-appropriate period of time
  • distractibility
  • Poor impulse control

ADHD – Inattentive Type

• Difficulty with focused and selective attention
• Speed of information processing impaired

• More strongly associated with reading disorders than the ADHD – Hyperactive/Impulsive subtype
Attention

- Attention is needed for any learning to take place
- Attention affects the input and/or output of information
- Attention is closely associated with executive functions

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Executive Function (EF)

- “Executive function is an umbrella term reflecting a collection of processes, described as the capacity to engage in independent, purposeful, goal-directed behavior.” (p. 107)

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The Executive Skills

The Metacognitive Strand
- Goal setting
- Planning/strategizing
- Sequencing
- Organization of materials
- Time management
- Task initiation
- Executive/goal-directed attention
- Task persistence
- Working memory
- Set shifting

The Social/Emotional Regulation Strand
- Response inhibition (also known as impulse control)
- Emotional control
- Adaptability

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Kaufman, C. (2010). Executive Function in the Classroom. (p. 4)
EF: Goal-directed attention

- Difficulties sustaining attention
- Easily distracted by internal stimuli (stray thoughts, daydreams, etc.)


EF: Goal-directed attention & reading

- Single-word decoding is not problematic
- Oral reading fluency characterized by:
  - numerous word deletions and changes;
  - the tendency to skip whole lines of text without noticing


EF: Planning, organizing, sequencing & reading

- Reading comprehension deficits appear associated with difficulties organizing/sequencing (remembers important details but disjointed and poorly sequenced)

EF: Self-monitoring & reading

- Oral reading characterized by:
  - insertions
  - deletions
  - changes
  - tendency to skip whole lines of text without noticing

- Written work contains spelling and other mechanical errors

  Kaufman, C. (2010). Executive Function in the Classroom. (p. 54)

EF: Impulse control & reading

- Oral reading characterized by the tendency to guess impulsively at words based on the first letter and the tendency to insert words that are not in text.


Memory

- **Short-term memory** – storage and retrieval of information within 20 seconds

- **Working memory**
  - allows a person to hold a piece of information in memory while working on something else

Working Memory

- Strongly related to attention
- Responsible for resisting interference and for shifting from one task to another, without losing relevant information
- More strongly related to symptoms of inattention than to symptoms of hyperactivity-impulsivity


EF: Working memory & reading

- Often forgets the details of reading while reading or soon after finishing
- Is able to answer factual/explicit questions
- Struggles with recalling more complex details, making predictions, and drawing inferences
- Spells words reasonable well in isolation, but makes spelling errors in narrative writing

Kaufman, C. (2010). Executive Function in the Classroom. (p. 54)

Memory

- Long-term memory – recall of learning information
  - has unlimited storage capacity
  - not affected by attention

ADHD

- Students with ADHD are weaker on:
  - measures of processing speed
  - response variability
  - executive functions – working memory, response inhibition, & planning

Boada et al., 2012

Comorbidity: co-occurrence of two or more diagnoses

Dyslexia & ADHD

- Hypotheses for co-occurring reading disability and ADHD:
  - phenocopy model (environmentally induced)
  - cognitive subtype
  - multiple deficit model

Dyslexia & ADHD

• “Single-deficit cognitive models of dyslexia or ADHD have not held up to scrutiny, partly because they cannot account for the observed level of comorbidity. The transition to multiple deficit models of these disorders at a neuropsychological level, on the contrary, provides a plausible mechanism by which we can get partial overlap of symptoms.” (p. 276)

Boada et al., 2012

Dyslexia & ADHD

• Phonological awareness and naming speed were specific predictors of single word reading
• Inhibition was a specific predictor of ADHD
• Processing speed was a shared predictor of both reading and inattention


Processing Speed

• Gs – Ability to perform simple, repetitive cognitive tasks quickly and fluently
Processing Speed

- Automaticity of word recognition and reading rate appear to be impacted by an individual’s cognitive processing speed.


Dyslexia & ADHD

Dyslexia is a language-based disorder;

ADHD is not


ASSESSMENT CONSIDERATIONS
Assessment Considerations

• “Anxiety and confusion about a case are important signals that more data are probably needed.” (p. 37)


Assessment Considerations

• Assessment is more than test scores
• Important to use all of the data available on the student – both qualitative and quantitative
• Use of:
  • information about the student’s developmental and academic history
  • parent and teacher reports
  • behavioral observations – during testing and in the classroom

Patterns of test results:

<table>
<thead>
<tr>
<th>Pennington, 2009</th>
<th>Reading Disability</th>
<th>ADHD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Crystalized intelligence</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>Fluid intelligence</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>Processing speed</td>
<td>—</td>
<td>—</td>
</tr>
</tbody>
</table>

**Reading:**
| Word recognition | — | + |
| Phonological processing | — | + |
| Fluency | — | + |
| Comprehension | +/- | +/- |
Patterns of test results:

<table>
<thead>
<tr>
<th></th>
<th>Reading Disability</th>
<th>ADHD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oral Language:</td>
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<td></td>
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<tr>
<td>Semantics</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>Syntax</td>
<td>+</td>
<td></td>
</tr>
<tr>
<td>Phonological awareness</td>
<td>—</td>
<td>+</td>
</tr>
<tr>
<td>Verbal working memory</td>
<td>—</td>
<td>+/-</td>
</tr>
</tbody>
</table>

Pennington, 2009

Patterns of test results:

<table>
<thead>
<tr>
<th></th>
<th>Reading Disability</th>
<th>ADHD</th>
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</thead>
<tbody>
<tr>
<td>Executive Functioning:</td>
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<tr>
<td>Inhibition</td>
<td>+</td>
<td>—</td>
</tr>
<tr>
<td>Generating</td>
<td>+</td>
<td>—</td>
</tr>
<tr>
<td>Set shifting</td>
<td>+</td>
<td>—</td>
</tr>
<tr>
<td>Sustained attention</td>
<td>+</td>
<td>—</td>
</tr>
<tr>
<td>Visual-spatial skills</td>
<td>+</td>
<td>—</td>
</tr>
<tr>
<td>Social &amp; communication skills</td>
<td>+</td>
<td>—</td>
</tr>
</tbody>
</table>

Pennington, 2009

Assessment Considerations

- **Reading:**
  Children with reading difficulties may lose their focus due to the added attention required to decode words – particularly when reading longer passages – and become frustrated and engage in off-task behavior.

- **ADHD – Inattentive Type:**
  Compare listening comprehension with reading comprehension
  - Students with weaknesses with attention will typically have more difficulty with listening comprehension tasks
  - Listening requires more sustained attention than reading
  - The speed of processing written material is under the reader’s control; the processing of information spoken by another is not under the listener’s control

Aaron & Ashi, 2002
Assessment Considerations

- ADHD-Inattentive Type:
  
  Compare reading comprehension measures (e.g., cloze passage and paragraph-reading)
  
  - tests of reading comprehension (depending on the type) are typically less demanding of attention
  
  - paragraph-length tests of reading comprehension require more sustained attention than sentence-length cloze tests

  Aaron et al., 2002

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Assessment considerations:

<table>
<thead>
<tr>
<th>Inconsistent Accuracy</th>
<th>Consistent Accuracy</th>
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</thead>
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<td>1 Correct</td>
</tr>
<tr>
<td>0 Incorrect</td>
<td>1 Correct</td>
</tr>
<tr>
<td>1 Correct</td>
<td>1 Correct</td>
</tr>
<tr>
<td>1 Correct</td>
<td>1 Correct</td>
</tr>
<tr>
<td>0 Incorrect</td>
<td>0 Incorrect</td>
</tr>
<tr>
<td>1 Correct</td>
<td>1 Correct</td>
</tr>
<tr>
<td>1 Correct</td>
<td>0 Incorrect</td>
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<tr>
<td>1 Correct</td>
<td>1 Correct</td>
</tr>
<tr>
<td>0 Incorrect</td>
<td>0 Incorrect</td>
</tr>
<tr>
<td>Total 7</td>
<td>Total 7</td>
</tr>
</tbody>
</table>


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Assessment considerations - Decoding

- If decoding is better in isolation than in context:
  
  - functions for adequate decoding are intact (phonology, automaticity, paired associate memory)
  
  - weak active working memory, self-monitoring, or chunk size capacity could be impacting word attack in context
  
  - weak receptive language impacting use of context clues

Assessment considerations - Decoding

• If decoding is better in context than in isolation:
  • Good receptive language allows for use of context clues to compensate for weak word attack/decoding skills

• If reading comprehension is stronger than reading decoding:
  • Good receptive language at the higher levels; weak phonology impacting phonics
  • Good higher-order cognition compensating for weak decoding


Assessment considerations - Decoding

• If reading decoding is stronger than reading comprehension:
  • Good phonology; weak receptive language at the higher levels (words, sentences, discourse)
  • Limited chunk size (student struggles with extended pieces of information)
  • Weak active working memory for extended text


Assessment considerations - Memory

• Repeat material
  • Students with weak processing depth may miss things the first time, but perform better on a second attempt (do this informally, not during a test that prohibits repeating information)
  • Students with weak memory, however, will exhibit difficulty across multiple trials

Assessment considerations - Memory

- **Active working memory:**
  - Ask the student to mentally juggle material already stored in long-term memory, such as reversing the months of the year or simultaneously counting by letters and numbers (A1, B2, C3, etc.)


Assessment considerations - Memory

- **Other considerations:**
  - to remember something, you need to be able to attend to it – attention and memory work together and influence each other
  - remembering something you understand is easier than remembering something you do not understand
    - think about the student’s experiences and background knowledge
    - contextualized information (a story) may be easier to recall than decontextualized information (string of numbers)


Assessment Considerations – Processing Speed

- According to Mather & Wendling (2012), an informal approach for assessing processing speed is to create a page of randomly arranged upper- and lowercase letters. Give the student one-minute to quickly circle all of a specified letter (p. 95).

Assessment Considerations – Processing Speed

• According to Flanagan, Ortiz, & Alfonso (2013), the subtests Grapheme Matching and Letter Choice from the Test of Orthographic Competence are measures of the narrow ability - Perceptual Speed (P) under Processing Speed (Gs).


Assessment Considerations - RAN

• Rapid Automated Naming (RAN)
  • Requires the integration of phonological and orthographic knowledge with oral motor functioning
  • You can compare measure of RAN (Rapid Letter Naming, Rapid Digit Naming) with measures that require switching (Rapid Automatic Switching or RAS)
  • RAS tasks increase the need for executive functioning control of reading
  • Examples: PAL-II and RAN/RAS


Assessment Considerations - Fluency

• Oral Reading Fluency
  • Compare word reading untimed to timed word reading
  • Compare word reading fluency to sentence and passage level reading fluency

Assessment Considerations - Comprehension

- **Reading Comprehension**
  - compare different measures of reading comprehension
  - KTEA-III – less demanding because child has text for passage and questions to refer back to
  - WIAT-II – more demanding because questions are oral
  - WJ-III – most demanding (requires a single word that fits grammatically, syntactically, and meaningfully in the context)


Assessment considerations:

- If ADHD is suspected:
  - **Do not diagnose** (unless qualified to do so)

  - Work closely with other district professionals (i.e., counselor, LSSP, diagnostician)

Resources:

- **Attention-Deficit/Hyperactivity Disorder: A School-Based Evaluation Manual** by Jim Wright
  - www.jimwrightonline.com/pdfdocs/adhdManual.PDF

  - Screening tools

Brenda Taylor, M.Ed.
ESC 10 – July 31, 2013
CASE STUDIES

Joan – 8th Grade

• Referral concerns:
  - Difficulty keeping track of her assignments, turning in work, staying on task
• Family history of ADHD
• Concerns in early elementary
  - slow worker
  - daydreaming, doodling, staring out the window
  - reading skills weaker than her peers
  - received extra help in 3rd grade – structured phonics-based reading program; helped with accuracy, but continued difficulties with fluency
• Middle school
  - difficulties due to increased homework demands
  - spent more time on homework than peers and would forget to turn assignments in
  - slow reading speed
  - difficulty with writing assignments


Resources:
• The SWAN Rating Scale for ADHD (adapted version)

• Executive Functioning Semistructured Interview: Parent Version & Teacher Version in Executive Function in the Classroom by Chris Kaufman (Paul Brookes Publishing)
### Academic

<table>
<thead>
<tr>
<th>Joan – 8th</th>
<th>Charlie – 3rd</th>
<th>Chris – 5th</th>
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</thead>
<tbody>
<tr>
<td><strong>Phonological Awareness</strong></td>
<td><strong>Phonological Awareness</strong></td>
<td><strong>Phonological Awareness</strong></td>
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<tr>
<td>Elision</td>
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<td>7</td>
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<tr>
<td>Phoneme Reversal</td>
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<td>9</td>
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<tr>
<td><strong>Verbal Processing Speed</strong></td>
<td><strong>Verbal Processing Speed</strong></td>
<td><strong>Verbal Processing Speed</strong></td>
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<tr>
<td>Compound</td>
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<td>9</td>
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<td><strong>Verbal Memory</strong></td>
<td><strong>Verbal Memory</strong></td>
</tr>
<tr>
<td>Nonword Repetition</td>
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<td>9</td>
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<tr>
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<td><strong>Visuospatial</strong></td>
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<td>Verbal Comprehension</td>
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<tr>
<td>Perceptual Reasoning</td>
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<tr>
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<td>9</td>
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<tr>
<td>Processing Speed</td>
<td>83</td>
<td>9</td>
</tr>
</tbody>
</table>

**CTOPP**

| Elision | 7 | 7 | 11 |
| Blending Words | 7 | 7 | 9 |
| Memory for Digits | 15 | 10 | 8 |
| Nonword Repetition | 9 | 9 | 8 |
| Rapid Digit Naming | 9 | 9 | 10 |
| Rapid Letter Naming | 11 | 10 | 8 |
| **Phonological Awareness** | **Phonological Awareness** | **Phonological Awareness** |
| Phonological Memory | 82 | 82 | 100 |
| **GORT-4** | **GORT-4** | **GORT-4** |
| Rate | 10 | 7 | 6 |
| Accuracy | 6 | 7 | 6 |
| Comprehension | 7 | 7 | 7 |

**WORD**

| Word Reading | 91 | 93 | 90 |
| Pseudoword Reading | 88 | 86 | 84 |
| Spelling | 77 | 74 | 73 |
| Reading Comprehension | 95 | 94 | 93 |

**Listening Comprehension**

| 108 | 102 | 92 |

**CTOPP**

| Word Reading | 91 | 93 | 90 |
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| Spelling | 77 | 74 | 73 |
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**Listening Comprehension**

| 108 | 102 | 92 |

**Alphabet:** able to recite
- Letter names – UC 26/26
- Letter names – LC 26/26
- Consonant sounds – 18/21
- Short vowel sounds – 5/5

GUIDELINES FOR INSTRUCTION/INTERVENTION

ADHD & Decoding Difficulties

- Children with ADHD may be unable to sustain their attention with sufficient consistency to learn letter names and/or letter-sound correspondences, resulting in an incomplete or erratic knowledge of phonics.

- These children do not lack the phonological awareness skill needed to grasp and apply phoneme/grapheme linkages, but may lack instead the ability to focus sufficiently on the letter-sound associations and hold this information in memory adequately to use it for word reading.

  Kaufman, C. (2010). Executive Function in the Classroom. (p. 98)

ADHD & Decoding Difficulties

- Attention deficits can also impact students’ ability to fully recognize and process the visual elements of words.

- Impulsiveness may cause a student to guess at entire words.

- Sequencing difficulties may impact word reading by making it difficult to keep word sounds ordered in a consistent left-to-right manner.

Suggested Strategies for Students with Executive Dysfunction - Decoding

- Systematic, synthetic, and multisensory phonics instruction
- Emphasize common orthographic patterns
- Explicitly teach and have students practice left-to-right sound blending


ADHD/EF & Difficulties with Fluency

- Inattention while reading may result in the following types of errors:
  - omission of word parts (most often suffixes) and small words
  - disregard punctuation
  - may struggle to keep their place as they read; make skip lines of text

- Students with impulse control difficulties may add word parts, whole words, or ideas that are not on the page

Kaufman, C. (2010). Executive Function in the Classroom. (p. 100)

Suggested Strategies for Students with Executive Dysfunction - Fluency

- Provide frequent opportunities for guided oral reading practice
- Preview unfamiliar books and text passages
- Explicitly cue students before they read
- Use of fingers and other place markers

Dyslexia & ADHD: Educational Interventions

• Little research has been done on populations of students with both disorders
  • early intervention is important
  • children with both difficulties tend to show poor outcomes in both prevention programs and intervention programs


In Conclusion:

• Attention and Executive Functions are required for all learning
  • Dyslexia and ADHD co-occur more frequently than expected by chance
  • Current research supports a “hybrid model” for dyslexia identification (multiple possible pathways – some involving a single deficit, some involving multiple deficits)
In Conclusion:

• Processing speed has been identified as a shared predictor for both reading and attentional difficulties

• Assessment is more than test scores!
  It is important to use ALL data – formal & informal, quantitative & qualitative

• There should be a preponderance of evidence or a clear picture for disability identification & diagnosis

In Conclusion:

• Early intervention is important

• Students with difficulty in both reading and ADHD and/or executive functioning:
  • need to be treated for both disorders
  • may show slower progress
Student has difficulty Reading

“Can the student understand when listening?”

- YES
- Intact or strong receptive language

“Can the student decode nonsense words?”

- YES
- Intact or strong phonology
- Consider orthographic memory

- NO
- Weak phonics

“Can the student manipulate word sounds?”

- YES
- Intact or strong phonology
- Consider paired associate memory*

- NO
- Weak phonology

“Does repetition help?”

- YES
- Weak attention Processing Controls

- NO
- Weak receptive language

Consider levels of language: word, sentence, and discourse

*Paired associate memory is needed to link graphemes with phonemes.

Directions: *When I say begin, circle as many of the lower case e’s as you can* (time for one minute).
Dyslexia, ADHD and Executive Function: Assessment considerations

Decoding:
• Single word reading is better in isolation than in context:
  o functions for adequate decoding are intact
  o could possibly be due to weak:
    ▪ working memory;
    ▪ self-monitoring;
    ▪ chunk size capacity (compare word reading fluency to sentence and passage level reading fluency); and/or
    ▪ receptive language for using context clues

• Decoding is stronger than comprehension:
  o difficulties could be due to:
    ▪ weak higher level language skills;
    ▪ limited chunk size; and/or
    ▪ weak working memory

• Untimed single word reading stronger than timed word reading:
  o could be due to slow processing speed;
  o check to see if decoding was previously a concern and whether the student has received reading intervention; previous tutoring/intervention may have assisted with accuracy, but fluency continues to be slow (research has shown that this occurs)

Oral Reading of connected text:
• Reading of text contains word deletions and changes
  o could be due to difficulties with goal-directed attention (executive functioning) and/or
  o could be due to lack of self-monitoring
• Skips lines of text without noticing
  o could be due to difficulties with goal-directed attention (executive functioning) and/or
  o could be due to lack of self-monitoring
• Guesses impulsively based on first letter and inserts words not in text
  o could be due to lack of impulse control
• Decoding of words is stronger than in isolation
  o if receptive language is adequate could be using context clues to assist

listening comprehension:
• look to see if LC score is consistent with teacher and parent information regarding receptive language processing
• to decipher between possible memory vs. attention difficulties, after completing the testing, try repeating some of the items missed (do not change scores – this is diagnostic information only). If repetition increases
the LC score, the difficulties are more likely related to attention than memory.

**Reading comprehension:**
- Compare decoding to RC
  - If RC is stronger, good receptive language at higher levels
  - If decoding is stronger (see considerations for decoding)
- Compare listening comprehension to reading comprehension
  - If LC stronger, good receptive language at higher levels
  - If RC stronger, attention or memory issues could be interfering
- Compare different measures of reading comprehension
  - Paragraph-length test of RC require more sustained attention than sentence-length cloze tests;
  - Student able to look back at passage vs. having to recall information read from memory
- **Difficulties with working memory:**
  - May forget details while reading or soon after finishing
  - Able to answer factual/explicit questions better than questions that require recall of more complex details, making predictions, and drawing inferences
- Difficulties with executive functioning (planning, organizing, sequencing):
  - May be able to remember important details, but disjointed and poorly sequenced

**Spelling:**
- If stronger in isolation than in narrative text, weaknesses may be due to difficulties in:
  - Working memory;
  - Self-monitoring; and/or
  - Chunk size capacity

**Resources:**

