Case Study Applications of the WISC-V in Cross-Battery Assessment and SLD Identification Using X-BASS

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*Yale Child Study Center, School of Medicine*

Outline for Today’s Presentation

- SLD identification using WISC-V, KTEA-3, KeyMath3
- Foundational sources of information necessary for making informed decisions about PSW method for SLD identification
- Brief Description of the Dual Discrepancy/Consistency (DD/C) operational definition of SLD – a PSW method
- Case Using the Cross-Battery Assessment Software System (X-BASS v2.0; PSW component)
- Diagnostic Impressions
Some Housekeeping

• Clarification of terms
  • XBA v. PSW

XBA ≠ PSW

• Flanagan and colleagues’ operational definition was often called by others “XBA,” rather than being conceived of as a method that was separate from yet compatible with XBA.

• To assist with clarification, Flanagan and colleagues (2013) gave it a name—the Dual Discrepancy/Consistency operational definition of SLD.
• XBA is a method for combining tests from different batteries and predates DD/C by several years (Flanagan & McGrew, 1997; Flanagan & Ortiz, 2001).

• The XBA approach is grounded mainly in Cattell-Horn-Carroll (CHC) theory and research (McGrew, 2005; 2009; Schneider & McGrew, 2012).

• Unlike other “flexible battery” practices, rigorous procedures and methods accompany XBA to insure that any assessment that expands beyond the confines of a single battery is both psychometrically and theoretically defensible.

• To assist in XBA and in interpretation of cross-battery data, X-BASS was developed (Ortiz, et al., 2015). X-BASS is an integration and substantial revision of the software programs that accompanied the second and third editions of Essentials of Cross-Battery Assessment (Flanagan et al., 2007, 2013).

• Although XBA can be used in the context of SLD identification, it has many other applications.
SLD Cannot be Diagnosed with a Formula

• Diagnosis of SLD can be made based on a systematic, theory- and research-based approach to examining results of a comprehensive evaluation

• A diagnosis of SLD is a clinical judgment that is made by a private independent psychologist or a multi-disciplinary team based on a convergence of data sources that appear to be consistent with the SLD construct.

• Due to federal statutory and regulatory requirements, a classification of SLD is made in the schools following one of three methods – methods that necessitate quantification for purposes of consistency in identification and accountability – The third option (i.e., PSW) is one such method

IDEIA – Federal Definition of SLD

“A disorder in one or more of the basic psychological processes involved in understanding or using language, spoken or written, which manifests itself in the imperfect ability to listen, think, speak, read, write, spell, or do mathematical calculations. Such terms include such conditions as perceptual disabilities, brain injury, minimal brain dysfunction, dyslexia, and developmental aphasia”
(34 CFR 300.311(a)(5)), (34 CFR 300.309(a)(2)(ii))

• **Ability-Achievement Discrepancy (AAD)**
  - May allow
  - Cannot mandate

• **Response-to-Intervention (RTI)**
  - Must allow
  - “as part of” a comprehensive evaluation

• **Alternative Research-based Approach (PSW)**

Third Option is PSW
Federal Regulations Permit the Use of a PSW Model
(34 CFR 300.311(a)(5)), (34 CFR 300.309(a)(2)(ii))

• Evaluation documentation must consider whether the student exhibits a pattern of strengths and weaknesses
  - In performance, achievement or both
  - Relative to age, State approved grade levels standards, *or intellectual development*
  - That is determined by the group to be relevant to the identification of SLD using appropriate instruments
Interpretation of PSW

- Requires an understanding of contemporary theory (viz., CHC theory)
- Requires an understanding of the theoretical constructs that are measured by cognitive batteries
- Requires understanding of cognitive processes and abilities related to achievement
- May require cross-battery assessment to assess all the abilities and processes considered important based on referral and to follow up on aberrant test performances
- Requires understanding of the SLD construct

D. P. Flanagan, 2017

Current and Expanded Cattell-Horn-Carroll (CHC) Model of Cognitive Abilities
(adapted from Schneider & McGrew, 2012) – Reviewed in Unit I

Sixteen broad and approximately 80 narrow abilities; approximately 9 broad and 35 narrow abilities represented on current batteries
WISC-V Primary Index Scales

Based on 5-factor hierarchical CFA of primary and secondary subtests

No Substitutions are Permitted

Based on construct validation literature; Extant factor analyses; CHC classifications

WISC-V Ancillary Index Scales

Composites New to the WISC-V

NEW WISC-V Complementary Index Scales

Ancillary and Complementary Index Scales are based on logical classifications as guided by research

New Glr Measures and Composites
10 New Clinical Composite Based on Actual Norms Calculated Automatically on the WISC-V Tab of X-BASS

Summary of the New Clinical Composites for the WISC-V

<table>
<thead>
<tr>
<th>Clinical Composite</th>
<th>Subtest Composition</th>
<th>Brief Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gc (Verbal Expression – Low)</td>
<td>Vocabulary +</td>
<td>These two subtests form a broad Gc ability and require less verbal expression compared to the other Gc subtests (e.g., one or two word responses as compared to multi-word responses or sentences). An alternative label for this composite is Retrieval from Remote Long-term Storage (RFLT-Remote), which provides an estimate of an individual’s ability to retrieve information from long-term storage that was encoded weeks, months, or years ago.</td>
</tr>
<tr>
<td>Gc-VE/L</td>
<td>Information</td>
<td></td>
</tr>
<tr>
<td>Gc (Verbal Expression – High)</td>
<td>Similarities +</td>
<td>These two subtests require greater verbal expression to earn maximum credit compared to the other Gc subtests and typically involve some degree of reasoning ability.</td>
</tr>
<tr>
<td>Gc-VE/H</td>
<td>Comprehension</td>
<td></td>
</tr>
<tr>
<td>Fluid-Crystallized Gf-Gc</td>
<td>Vocabulary +</td>
<td>Provides an alternative to the FSIQ and GAI. Balances Gf and Gc about equally. Contains only subtests with high g loadings. Because Gf and Gc are highly correlated with g and are considered to be the cornerstones of general intelligence, research supports use of a Gf-Gc composite as an estimate of general ability (e.g., McGrew, LaForte, &amp; Schrank, 2014).</td>
</tr>
<tr>
<td></td>
<td>Information +</td>
<td></td>
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<tr>
<td></td>
<td>Matrix Reasoning +</td>
<td></td>
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<td></td>
<td>Figure Weights</td>
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<tr>
<td>Working Memory (Alternative)</td>
<td>Digit Span</td>
<td>Provides an alternative to the Auditory Working Memory Index (AWMI) by eliminating Digit Span Forward (a test of memory span).</td>
</tr>
<tr>
<td>Gsm-MW (Alt)</td>
<td>Backwards +</td>
<td></td>
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<tr>
<td></td>
<td>Digit Span</td>
<td>Provides a balance of Memory Span and Working Memory and is consistent with the composition of the Digit Span subtest on the WISC-IV.</td>
</tr>
<tr>
<td></td>
<td>Sequencing +</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Letter-Number</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Sequencing</td>
<td></td>
</tr>
<tr>
<td>Working Memory</td>
<td>Digit Span</td>
<td>Provides an estimate of working memory with tests that are more cognitively complex than Digit Span. Arithmetic involves Gf (i.e., Quantitative Reasoning), Gc, and Gsm (Working Memory Capacity). Picture Span</td>
</tr>
<tr>
<td>(Cognitive Complexity – High)</td>
<td>Forward + Digit</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Span Backward</td>
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<tr>
<td></td>
<td>Arithmetic +</td>
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<tr>
<td></td>
<td>Picture Span</td>
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</tbody>
</table>
Summary of the New Clinical Composites for the WISC-V (Cont’d)

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</thead>
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<tr>
<td>WM CCH</td>
<td>Involves Gc (Visual Memory), Memory Span, and Working Memory due to proactive interference.</td>
</tr>
<tr>
<td>Verbal (Expanded Crystalized) Index</td>
<td>Provides a robust estimate of Gc as compared to the Verbal Comprehension Index (VCI), spanning two narrow ability domains (VL – Lexical Knowledge and K0 – General Information). Requires reasoning with verbal information.</td>
</tr>
<tr>
<td>VECT*</td>
<td>Involves tests that have low to high demands for verbal expression.</td>
</tr>
<tr>
<td>Expanded Fluid Index</td>
<td>Provides a more robust estimate of Gf as compared to the Fluid Reasoning Index (FRI), spanning three narrow ability domains, including Induction (I), General Sequential Reasoning (RG), and Quantitative Reasoning (QG). Places more emphasis on quantitative reasoning as compared to FRI.</td>
</tr>
<tr>
<td>EFI*</td>
<td>Provides an alternative to the PSI, eliminating the memory and motor dexterity demands inherent mainly in the Coding subtest.</td>
</tr>
<tr>
<td>Perceptual Speed Gs**</td>
<td>Provides an estimate of an individual’s ability to retrieve recently encoded information from long-term storage.</td>
</tr>
<tr>
<td>Retrieval From Recent Long-Term Storage</td>
<td>Provides an estimate of an individual’s ability to retrieve recently encoded information from long-term storage.</td>
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A Comprehensive Evaluation for Suspected SLD Ought to Include Measurement of Cognitive Abilities and Processes Within At Least Seven CHC Domains

**Gf, Gc, Glr, Gsm, Gv, Ga, Gs**

There is Evidence of Significant Positive Relationships Between Cognitive Abilities and Processes and Specific Academic Skills

Cognitive Processing Weaknesses Manifest in Real-World Performances (e.g., reading, math, writing achievement in the classroom)
PWS Analysis Following the Dual Discrepancy/Consistency (DD/C) Model Using X-BASS

- Requires Estimates of Seven Cognitive Abilities and Processes
  - Gf
  - Gc
  - Glr
  - Gsm
  - Gv
  - Ga
  - Gs

- These 7 are necessary for the calculation of the g-value, FCC, and ICC

- Other areas that may be included in the PSW Analysis, but do not contribute to the g-value, ICC, or FCC
  - Executive Functions
  - Orthographic Processing
  - Speed of Lexical Access
  - Cognitive Efficiency

- Estimates Do Not Need to be Broad Cognitive Ability Estimates.
  - Broad CHC Estimate
    - Most likely in the areas of Gf, Gc, and Gv
    - WISC-V Gv is estimate of Vz only. Ok if no Gv difficulties are suspected and referral is reading
  - Narrow CHC Estimate
    - Likely in Ga (e.g., Phonetic Coding; Phonological Processing) and Gs (e.g., Perceptual Speed)
  - More than one CHC Estimate is ok
    - For example, in the area of Glr, one estimate of MA and one estimate of NA is ok

Conceptual Understanding of the Dual Discrepancy/Consistency (DD/C) Method

Flanagan, Ortiz, and Alfonso (2002 - 2017)
Essential Elements of PSW based on DD/C
Operational Definition of SLD
Flanagan, Ortiz, and Alfonso (2002-2017)

• **Level I: Academic weakness (SS < 90; more typically below 85)**
  • *Must also meet criteria for unexpected underachievement*
  • *Not all weaknesses are unexpected (to determine unexpected use X-BASS)*

• **Level II: Exclusionary factors must be ruled out as the primary cause of the academic skill weakness(es)**
  • It is not unusual to find one or more exclusionary factors that contribute to academic weaknesses
  • Use exclusionary factors form to ensure accountability

• **Level III: Cognitive weakness (SS < 90; more typically below 85)**
  • *Must also meet criteria for domain-specific weakness*
  • *Not all cognitive weaknesses are domain-specific (to determine domain-specific use X-BASS)*
  • Generally low average ability across most cognitive areas does not meet the criterion of a domain-specific cognitive weakness

  X-BASS (Flanagan, Ortiz, & Alfonso, 2015-2017) is necessary to conduct the DD/C PSW analysis

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Essential Elements of PSW based on DD/C
Operational Definition of SLD
Flanagan, Ortiz, and Alfonso (2002-2017)

• **Level IV: Data support a “dual discrepancy” and a “consistency” with at least average ability to think and reason**

  • **Discrepancy 1:** Difference between cognitive strengths and cognitive weaknesses is significant; difference between actual and predicted (from general ability or the Facilitating Cognitive Composite [FCC]) performance is unusual (base rate of about 10%) – *supports domain-specific cognitive weakness*

  • **Discrepancy 2:** Difference between cognitive strengths and academic weaknesses is significant; difference between actual and predicted (from general ability or FCC) performance is unusual (base rate of about 10%) – *supports unexpected underachievement*

  • **Consistency:** Empirical or ecologically valid relationship between cognitive and academic weaknesses

  X-BASS (Flanagan, Ortiz, & Alfonso, 2015-2017) is necessary to conduct the DD/C PSW analysis
Consistency – Don’t Assume a Perfect Prediction

Not all academic weaknesses have corresponding cognitive weaknesses.

Cognitive processing weaknesses do not guarantee that there will be academic weaknesses – they simply raise the risk (Flanagan & Schneider, 2016).

Relationship is probabilistic, not deterministic, as some have erroneously assumed (e.g., Kranzler et al., 2016).

What we Know about Holly

Age 9; Grade 5

- Retained in 1st grade
- Received tutoring in math
- Uses manipulatives
- Extra time on assessments and tests
- Failed STAAR math in grades 3, 4, and 5
- Math fluency is poor
- Progress monitoring shows mainly addition probes – slow performance; frequent errors
- Reading and writing are at grade level (based on STAAR; previous evaluations; teacher reports)
- DIBELS shows well below benchmark throughout grade 5 in Computation, despite intervention for two years
- KTEA-3 analysis shows unable to write equations used to derive answers; inconsistent performance on math computation; unable to complete subtraction problems involving borrowing; did not attempt multiplication, division, or fraction problems
- WISC-V circumscribed weaknesses; general average ability to think and reason
Math is Primary Area of Concern
Other data Related to Math

• Math fluency – “big concern”
  • Slow; last to finish
  • Progress monitoring data available mainly on addition (i.e., single-skill computation probes)
    • Holly used an inefficient strategy to solve problems
    • Only demonstrated a couple of instances of correct regrouping
Typical Battery

- WISC-V Five Primary Index Scales (10 Subtests)
- WIAT-III (13 Subtests to cover 8 areas of SLD)
- CTOPP-2 (3 subtests for Phonological Awareness)

- 26 Tests

- *What’s Missing (diagnostic math tests, Glr, EF) – 25 subtests administered to Holly and more information obtained*
Hypothesis?

IDEIA: SLD in Math Calculation, Math Problem Solving?

SLD has neurobiological influences, is a brain-based disorder, and is defined by specific cognitive processing weaknesses.
<table>
<thead>
<tr>
<th>SLD Area</th>
<th>Skill</th>
<th>Etiology</th>
<th>Associated impairments / Cognitive correlates</th>
</tr>
</thead>
<tbody>
<tr>
<td>Math</td>
<td>Number sense</td>
<td>Research indicates that the basic processing of numerical information and processes involved in math calculation and problem solving are both executed and functionally distinct (Anastasi, 2010). The intraparietal sulcus (IPS) is involved in processing and representing numerical quantity, although there may be differences in activation in a function of age (Anastasi &amp; Delahaye, 2006; Anastasi, Garvin, Lucier, Hemeny, &amp; Delahaye, 2005; Delahaye et al., 2006; Kaufman et al., 2009; Kastin, von Aster, Lenzendorf, Dietrich, &amp; Martus, 2009; Price &amp; Anastasi, 2013; Musatov et al., 2010).</td>
<td>Number representation — math disorders are associated with weaknesses in fundamental number representation and processing, which manifest in difficulties with quantifying any without counting, using non-verbal processes to complete simple numerical operations, and estimating the relative magnitude of two numbers. (Geary, 2001; Geary et al., 2012; Geary et al., 2008; Geary et al., 2005; Halberda et al., 2008, 2008; Boaler &amp; Geary, 2014; Feigenspan, Delahaye, &amp; Spek, 2004; Magiati, Feigenspan, &amp; Halberda, 2011).</td>
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<td></td>
<td>Memorization of arithmetic facts</td>
<td>A left hemisphere network that includes the prefrontal cortex, inferior parietal cortex, and intraparietal sulcus is often implicated in math fact retrieval (Delahaye &amp; Cohen, 1992; Delahaye &amp; Cohen, 1997; Delahaye et al., 1999). Further, some researchers believe that once math facts are retrieved from verbal memory, then the right hemisphere is primarily involved in processing and comprehension of the numerical representations (Delahaye, 1992; Delahaye &amp; Cohen, 1995; Delahaye et al., 1999).</td>
<td>Long-term retrieval — weak or impaired long-term retrieval of facts and increased error rates in recall. (Geary, 1995; Magiati, Delahaye, &amp; McKeeney, 2003). Because fact retrieval mechanisms fail to develop adequately, fluency is impaired and those with dyscalculia continue to utilize procedural strategies rather than memory-based strategies (Geary, Bov-Thomas, &amp; Yan, 1992; Geary, Hamson, &amp; Wood, 2000; Jordan &amp; Hanich, 2000; Hamosh et al., 2001; Lanius, Bevacqua, &amp; Butterworth, 2003).</td>
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<tr>
<td></td>
<td>Accurate or fluent calculation</td>
<td>Regions of the left prefrontal cortex, including the intraparietal sulcus, angular gyrus, and supramarginal gyrus have been consistently associated with math calculation (Anastasi, 2000; De Smedt, Holloway, &amp; Anastasi, 2011; Delahaye, Malka, Cohen, &amp; Wilson, 2004; Delahaye et al., 2003). However, there is evidence to suggest that both hemispheres, including the right hemisphere, contribute to other skills, may be genetically distinct and may reflect variance above and beyond optimized calculation abilities (Kan, Perell, &amp; Thompson, 2010; Perell et al., 2012). The intraparietal sulcus has also been found to play a role in the process of mental rotation (De Smedt et al., 2009).</td>
<td>Long-term retrieval — weak or impaired long-term retrieval of facts and increased error rates in recall. (Geary, 1995; Magiati, De Smedt, &amp; McKeeney, 2003). Because fact retrieval mechanisms fail to develop adequately, fluency is impaired and those with dyscalculia continue to utilize procedural strategies rather than memory-based strategies (Geary, Bov-Thomas, &amp; Yan, 1992; Geary, Hamson, &amp; Wood, 2000; Jordan &amp; Hanich, 2000; Hamosh et al., 2001; Lanius, Bevacqua, &amp; Butterworth, 2003). Rapid naming — the rate of access to information in long-term storage is believed to affect calculation fluency (D’Anisto &amp; Passolunghi, 2009). Some studies have found that arithmetic disorders are associated with deficits in rate of access to numerical information (e.g., D’Anisto &amp; Guastella, 2005); while others have demonstrated that rate of access to both numerical and non-numerical information is impaired (e.g., Temple &amp; Butterworth, 2002). Processing speed — there is evidence to support the contribution of processing speed to math calculation fluency, however, the relationship remains unclear; as processing speed is highly related to working memory and general intelligence (Berg, 2009; Bull &amp; Johnston, 1993; Geary, 2011; Macrae &amp; Rushton, 2013; Wilcox et al., 2011).</td>
</tr>
</tbody>
</table>
Summary of Relations between CHC Abilities and Neuropsychological Processes and Math Achievement and the Etiology of Math Functions

<table>
<thead>
<tr>
<th>CHC Broad Ability</th>
<th>Math Achievement</th>
<th>Etiology of Math Functions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gr</td>
<td>Reasoning inductively (I) and deductively with numbers (RQ) is very important for math problem solving. Executive functions such as set shifting and cognitive inhibition are also important.</td>
<td>The intraparietal sulcus in both hemispheres is widely viewed as crucial in processing and representing numerical quantity (number sense), although there may be differences in activation as a function of age (Ansari &amp; Dhital, 2006; Ansari, Garcia, Lucas, Hamon, &amp; Dhital, 2005; Dehaene et al., 2004; Kaufmann et al., 2006; Kucian, van der Meer, Launer, Dettendorfer, &amp; Martin, 2008; Price &amp; Ansari, 2013; Masson et al., 2010). Regions of the left fronto-parietal cortex, including the intraparietal sulcus, angular gyrus, and supramarginal gyrus have been consistently associated with math calculation (Dehaene, 2000; De Smedt, Holloway, &amp; Ansari, 2011; Dehaene, Molko, Cohen, &amp; Wilson, 2004; Dehaene et al., 2004). The dorsolateral prefrontal cortex has also been found to show increased activation during calculation, implying that executive functioning and working memory may be playing a role in the process (Davis et al., 2009). A left hemisphere network that includes the precenral gyrus, inferior parietal cortex, and intraparietal sulcus, is often implicated in math fact retrieval (Dehaene &amp; Cohen, 1992). Math problem solving is highly relevant to math achievement and the etiology of math functions.</td>
</tr>
<tr>
<td>Gs</td>
<td>Language development (LD), lexical knowledge (KL), and working memory capacity (WM) are important for math problem solving.</td>
<td>The intraparietal sulcus in both hemispheres is widely viewed as crucial in processing and representing numerical quantity (number sense), although there may be differences in activation as a function of age (Ansari &amp; Dhital, 2006; Ansari, Garcia, Lucas, Hamon, &amp; Dhital, 2005; Dehaene et al., 2004; Kaufmann et al., 2006; Kucian, van der Meer, Launer, Dettendorfer, &amp; Martin, 2008; Price &amp; Ansari, 2013; Masson et al., 2010). Regions of the left fronto-parietal cortex, including the intraparietal sulcus, angular gyrus, and supramarginal gyrus have been consistently associated with math calculation (Dehaene, 2000; De Smedt, Holloway, &amp; Ansari, 2011; Dehaene, Molko, Cohen, &amp; Wilson, 2004; Dehaene et al., 2004). The dorsolateral prefrontal cortex has also been found to show increased activation during calculation, implying that executive functioning and working memory may be playing a role in the process (Davis et al., 2009). A left hemisphere network that includes the precenral gyrus, inferior parietal cortex, and intraparietal sulcus, is often implicated in math fact retrieval (Dehaene &amp; Cohen, 1992). Math problem solving is highly relevant to math achievement and the etiology of math functions.</td>
</tr>
<tr>
<td>Gm</td>
<td>Memory span (MS) and working memory capacity (WM) are important for math problem solving and overall success in math, including math calculation.</td>
<td>The intraparietal sulcus in both hemispheres is widely viewed as crucial in processing and representing numerical quantity (number sense), although there may be differences in activation as a function of age (Ansari &amp; Dhital, 2006; Ansari, Garcia, Lucas, Hamon, &amp; Dhital, 2005; Dehaene et al., 2004; Kaufmann et al., 2006; Kucian, van der Meer, Launer, Dettendorfer, &amp; Martin, 2008; Price &amp; Ansari, 2013; Masson et al., 2010). Regions of the left fronto-parietal cortex, including the intraparietal sulcus, angular gyrus, and supramarginal gyrus have been consistently associated with math calculation (Dehaene, 2000; De Smedt, Holloway, &amp; Ansari, 2011; Dehaene, Molko, Cohen, &amp; Wilson, 2004; Dehaene et al., 2004). The dorsolateral prefrontal cortex has also been found to show increased activation during calculation, implying that executive functioning and working memory may be playing a role in the process (Davis et al., 2009). A left hemisphere network that includes the precenral gyrus, inferior parietal cortex, and intraparietal sulcus, is often implicated in math fact retrieval (Dehaene &amp; Cohen, 1992). Math problem solving is highly relevant to math achievement and the etiology of math functions.</td>
</tr>
<tr>
<td>Qv</td>
<td>Visualization (V2), including mental rotation, is important primarily for higher level math (e.g., geometry, calculus) and math problem solving.</td>
<td>The intraparietal sulcus in both hemispheres is widely viewed as crucial in processing and representing numerical quantity (number sense), although there may be differences in activation as a function of age (Ansari &amp; Dhital, 2006; Ansari, Garcia, Lucas, Hamon, &amp; Dhital, 2005; Dehaene et al., 2004; Kaufmann et al., 2006; Kucian, van der Meer, Launer, Dettendorfer, &amp; Martin, 2008; Price &amp; Ansari, 2013; Masson et al., 2010). Regions of the left fronto-parietal cortex, including the intraparietal sulcus, angular gyrus, and supramarginal gyrus have been consistently associated with math calculation (Dehaene, 2000; De Smedt, Holloway, &amp; Ansari, 2011; Dehaene, Molko, Cohen, &amp; Wilson, 2004; Dehaene et al., 2004). The dorsolateral prefrontal cortex has also been found to show increased activation during calculation, implying that executive functioning and working memory may be playing a role in the process (Davis et al., 2009). A left hemisphere network that includes the precenral gyrus, inferior parietal cortex, and intraparietal sulcus, is often implicated in math fact retrieval (Dehaene &amp; Cohen, 1992). Math problem solving is highly relevant to math achievement and the etiology of math functions.</td>
</tr>
<tr>
<td>Qs</td>
<td>Naming facility (NA) and rapid retrieval of basic math facts are important for math achievement and the etiology of math functions.</td>
<td>The intraparietal sulcus in both hemispheres is widely viewed as crucial in processing and representing numerical quantity (number sense), although there may be differences in activation as a function of age (Ansari &amp; Dhital, 2006; Ansari, Garcia, Lucas, Hamon, &amp; Dhital, 2005; Dehaene et al., 2004; Kaufmann et al., 2006; Kucian, van der Meer, Launer, Dettendorfer, &amp; Martin, 2008; Price &amp; Ansari, 2013; Masson et al., 2010). Regions of the left fronto-parietal cortex, including the intraparietal sulcus, angular gyrus, and supramarginal gyrus have been consistently associated with math calculation (Dehaene, 2000; De Smedt, Holloway, &amp; Ansari, 2011; Dehaene, Molko, Cohen, &amp; Wilson, 2004; Dehaene et al., 2004). The dorsolateral prefrontal cortex has also been found to show increased activation during calculation, implying that executive functioning and working memory may be playing a role in the process (Davis et al., 2009). A left hemisphere network that includes the precenral gyrus, inferior parietal cortex, and intraparietal sulcus, is often implicated in math fact retrieval (Dehaene &amp; Cohen, 1992). Math problem solving is highly relevant to math achievement and the etiology of math functions.</td>
</tr>
<tr>
<td>Gs/Gr</td>
<td>Number representation (e.g., quantifying sets without counting, estimating relative magnitude of sets) and number comparisons are related to overall number sense.</td>
<td>The intraparietal sulcus in both hemispheres is widely viewed as crucial in processing and representing numerical quantity (number sense), although there may be differences in activation as a function of age (Ansari &amp; Dhital, 2006; Ansari, Garcia, Lucas, Hamon, &amp; Dhital, 2005; Dehaene et al., 2004; Kaufmann et al., 2006; Kucian, van der Meer, Launer, Dettendorfer, &amp; Martin, 2008; Price &amp; Ansari, 2013; Masson et al., 2010). Regions of the left fronto-parietal cortex, including the intraparietal sulcus, angular gyrus, and supramarginal gyrus have been consistently associated with math calculation (Dehaene, 2000; De Smedt, Holloway, &amp; Ansari, 2011; Dehaene, Molko, Cohen, &amp; Wilson, 2004; Dehaene et al., 2004). The dorsolateral prefrontal cortex has also been found to show increased activation during calculation, implying that executive functioning and working memory may be playing a role in the process (Davis et al., 2009). A left hemisphere network that includes the precenral gyrus, inferior parietal cortex, and intraparietal sulcus, is often implicated in math fact retrieval (Dehaene &amp; Cohen, 1992). Math problem solving is highly relevant to math achievement and the etiology of math functions.</td>
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McDonough, Flanagan, Sy, and Alfonso (2017)
Linking Literature on Math Disability/Dyscalculia to Performance

Math Disorders associated with weaknesses in fundamental number representation and processing, which manifest in difficulties with

• Quantifying sets without counting
• Using nonverbal processes to complete simple numerical operations
• Estimating the relative magnitude of sets

Math Disorders also associated with

• Difficulties with number comparisons
• Weak or impaired long-term retrieval of facts and increased error rates in recall
• Impaired fluency (b/c fact-retrieval mechanisms fail to develop adequately)
• Also, Dyscalculia often associated with utilization of procedural strategies rather than memory-based strategies

Area: Number Sense
Area: Memorization of Math Facts

See: McDonough, Flanagan, Sy, and Alfonso (2017) for citations (which also appear in earlier slides)

Linking Literature on Math Disability/Dyscalculia to Performance

Other associated impairments

• Weak or impaired long-term retrieval of facts and increased error rates in recall
• Impaired fluency (b/c fact-retrieval mechanisms fail to develop adequately)
• Also, Dyscalculia often associated with utilization of procedural strategies rather than memory-based strategies
• Rapid Naming: Poor rate of access to information (numerical and sometimes also non-numerical) in long-term storage affects calculation fluency – i.e., impaired rate of access
• Weakness in processing speed contributes to poor math calculation fluency

Area: Accurate and Fluent Calculation

See: McDonough, Flanagan, Sy, and Alfonso (2017) for citations (which also appear in earlier slides)
Linking Literature on Math Disability/Dyscalculia to Performance

Associated impairments in

- **Working memory** – leads to struggles with holding information in working memory, updating or revising the information, and tracking or monitoring the process, resulting in difficulties in sequencing, increased errors in counting, and other procedural errors.

- **Visual spatial ability** – weaknesses in visual perception, spatial reasoning, and mental rotation influence math performance adversely. These weaknesses may also manifest as difficulties with representing numbers and aligning numerals. Finally, visual spatial weaknesses affect geometry and fractions adversely.

- **Attention and executive functioning**: difficulties in math are often related to difficulties in set shifting and cognitive inhibition. Poor attentional control is also observed (i.e., difficulty ignoring irrelevant information and focusing on goal-relevant information).

See: McDonough, Flanagan, Sy, and Alfonso (2017) for citations (which also appear in earlier slides)

<table>
<thead>
<tr>
<th>Math Area</th>
<th>Skills and Processes Involved</th>
<th>Measurement of Processes</th>
<th>Manifestations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number Sense</td>
<td>Quantifying sets without counting (subitizing).</td>
<td>WISC-V Naming Speed Quantity</td>
<td>KTEA-3 Math Concepts &amp; Applications: “Number Concepts” error analysis category</td>
</tr>
<tr>
<td></td>
<td>Using nonverbal processes to complete simple numerical operations.</td>
<td>KeyMath3 Numeration and Algebra subtests (Basic Concepts)</td>
<td>Uses manipulatives; uses hash-marks to solve addition problems; difficulty using operational properties, order of operations and related symbolism to compute with whole and rational numbers</td>
</tr>
<tr>
<td></td>
<td>Estimating the relative magnitude of sets.</td>
<td>KeyMath3 Mental Computation and Estimation (Operations)</td>
<td>Observed having difficulty estimating which jars had more marbles in them during an in-class activity</td>
</tr>
<tr>
<td></td>
<td>Number comparisons</td>
<td>KeyMath3 Numeration</td>
<td>Teacher reported inconsistent ability to correctly identify the largest number among a set of numbers (seatwork activity; timed)</td>
</tr>
<tr>
<td>Memorization of Math Facts</td>
<td>Long-term retrieval of facts and increased error rates in recall.</td>
<td>WISC-V Immediate, Recognition, and Delayed Symbol Translation</td>
<td>KTEA-3 Math Concepts &amp; Applications: “Fact or Computation” error analysis category (Operations)</td>
</tr>
<tr>
<td></td>
<td>Impaired math fluency</td>
<td>WISC-V Immediate, Recognition, and Delayed Symbol Translation</td>
<td>Observed counting on fingers; difficulty remembering phrases associated with addition (e.g., add, sum, increases, together) and subtraction (e.g., decreased by, difference, minus); Teacher reported that student needs more error free repetitions than most students and information may still be “less.”</td>
</tr>
<tr>
<td></td>
<td>Using procedural strategies rather than memory-based strategies</td>
<td>KeyMath3 Mental Computation and Estimation</td>
<td>Observed the strategy “doubles plus 1” (benefits from strategy instruction)</td>
</tr>
<tr>
<td>Accurate and Fluent Calculation</td>
<td>Long-term retrieval of facts and increased error rates in recall.</td>
<td>WISC-V Immediate, Recognition, and Delayed Symbol Translation</td>
<td>KTEA-3 Math Concepts &amp; Applications: “Fact or Computation” error analysis category (Operations)</td>
</tr>
<tr>
<td></td>
<td>Rapid naming – poor rate of access to numerical information</td>
<td>WISC-V Naming Speed Quantity</td>
<td>Given extra time to complete math assignments</td>
</tr>
<tr>
<td></td>
<td>Processing speed</td>
<td>WISC-V PSI and Cancellation</td>
<td>Coding may have been low due to activation difficulty (i.e., lack of confidence or anxiety due to numbers and memory difficulties); Given extra time to complete math assignments</td>
</tr>
<tr>
<td>Math Problem Solving</td>
<td>Working Memory</td>
<td>WISC-V WMi and Arithmetic</td>
<td>KeyMath3 Foundations of Problem Solving and Applied Problem Solving subtests (Applications)</td>
</tr>
<tr>
<td></td>
<td>Visual-spatial Ability</td>
<td>WISC-V VS/VI</td>
<td>Observed difficulty holding information long enough to use it; needs visual supports when learning new math concepts/operations</td>
</tr>
<tr>
<td></td>
<td>Attention and EF</td>
<td>WISC-V PSI (sustained attention/focus)</td>
<td>Medication for diagnosed ADHD – Inattentive Type</td>
</tr>
<tr>
<td></td>
<td>D-KEFS (Verbal Fluency: Category Switching Test; Color-Word Interference: Inhibition/Switching)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### Holly’s WISC-V and Supplemental Data

<table>
<thead>
<tr>
<th>Subtest</th>
<th>Score</th>
<th>Index</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Verbal Comprehension (Gc)</td>
<td>103</td>
<td>Naming Speed Index</td>
<td>76</td>
</tr>
<tr>
<td>Vocabulary</td>
<td>10</td>
<td>Naming Speed Literacy</td>
<td>80</td>
</tr>
<tr>
<td>Similarities</td>
<td>11</td>
<td>Naming Speed Quantity</td>
<td>75</td>
</tr>
<tr>
<td>Visual Spatial Index (Gv)</td>
<td>97</td>
<td>Symbol Translation Index</td>
<td>80</td>
</tr>
<tr>
<td>Block Design</td>
<td>9</td>
<td>Immediate Symbol Translation</td>
<td>80</td>
</tr>
<tr>
<td>Visual Puzzles</td>
<td>10</td>
<td>Delayed Symbol Translation</td>
<td>75</td>
</tr>
<tr>
<td>Fluid Reasoning Index (Gf)</td>
<td>94</td>
<td>Recognition Symbol Translation</td>
<td>88</td>
</tr>
<tr>
<td>Matrix Reasoning</td>
<td>10</td>
<td>Storage and Retrieval Index (Glr)</td>
<td>74</td>
</tr>
<tr>
<td>Figure Weights</td>
<td>8</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Working Memory Index (Gwm)</td>
<td>76</td>
<td></td>
<td></td>
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<tr>
<td>Digit Span</td>
<td>6</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Picture Span</td>
<td>6</td>
<td>XBA EF: Inhibition/Switching/Set Shifting</td>
<td>79</td>
</tr>
<tr>
<td>Processing Speed Index (Gs)</td>
<td>86</td>
<td>D-KEFS Verbal Fluency: Category Switching</td>
<td>7</td>
</tr>
<tr>
<td>Coding</td>
<td>6</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Symbol Search (Cancellation)</td>
<td>9</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>10</td>
<td></td>
<td></td>
</tr>
<tr>
<td>XBA Gs</td>
<td>97</td>
<td></td>
<td></td>
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<tr>
<td>FSIQ</td>
<td>81</td>
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<tr>
<td>GAI</td>
<td>100</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CPI</td>
<td>78</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Holly’s KTEA-3 and KeyMath3 Data

<table>
<thead>
<tr>
<th>KTEA-3</th>
<th>Score</th>
<th>KeyMath3</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Math Concepts &amp; Applications (MPS)</td>
<td>84</td>
<td>Numeration (MC)</td>
<td>7</td>
</tr>
<tr>
<td>Number Concepts Error Analysis</td>
<td></td>
<td>Algebra (MC)</td>
<td>7</td>
</tr>
<tr>
<td>Fact or Computation Error Analysis</td>
<td></td>
<td>Mental Computation and Estimation (MC)</td>
<td>6</td>
</tr>
<tr>
<td>Math Fluency (MC)</td>
<td>74</td>
<td>Foundations of Problem Solving (MPS)</td>
<td>6</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Applied Problem Solving (MPS)</td>
<td>5</td>
</tr>
</tbody>
</table>
What do we Know Based on All Data Sources?

### Quantitative

**Strengths**
- Gc – 103
- Gv:Vz – 97
- Gf:I, RG – 94
- Gs:P – 97
- Ga:PC – 96

**Weaknesses**
- Gsm – WMI of 76 (Arithmetic scaled score of 5)
- Glr:NA – NSI of 76
- Glr:MA – STI of 80
- EF: Inhibition/switching/set shifting – 79

**Manifestation** – Below Average to Well Below Average performance on Basic Concepts, Operations, and Applications on standardized math tests (i.e., selected subtests from KTEA-3 and KeyMath3)

### Qualitative

- Retained in 1st grade
- Received tutoring in math
- Uses manipulatives
- Extra time on assessments and tests
- Failed STAAR math in grades 3, 4, and 5
- Math fluency is poor
- Progress monitoring shows mainly addition probes – slow performance; frequent errors
- DIBELS shows well below benchmark throughout grade 5 in Computation

A Convergence of Indicators Supporting a Specific Learning Disability in Math

How Confident Are You Identifying Holly With a Specific Learning Disability in the Area of Math Calculation?

**Did you base your decision on**

- failure to RTI?
- Ability-achievement discrepancy?
- A specific Pattern of Strengths and Weaknesses?
- Work samples, behavioral observations, and other qualitative information?

There is no one right method. Experienced and knowledgeable practitioners consider multiple methods and multiple data sources to inform their decision.
Use **PSW Analysis** as a **Quantitative Check on Your Clinical Judgment**

(Also Important for Accountability and Consistency in Methodology in the Schools)
For Various reasons, the Coding Subtest Score is Likely Spurious

<table>
<thead>
<tr>
<th>Processing Speed Index (PSIG)</th>
<th>95</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coding (CT)</td>
<td>9</td>
</tr>
<tr>
<td>Symbol Search (P)</td>
<td>8</td>
</tr>
<tr>
<td>Cancellation (F)</td>
<td>75</td>
</tr>
</tbody>
</table>

*Additional points subtest scores can be generated for Span Design (see WJ-IV Technical Manual and WJ-IV Interpretive Manual). These additional scores are available in the WJ-IV EAP (Exam Data Entry Program) in the RASA applet.

**Because the difference between the scores on the PSIG is at least 15, and the difference in generalizability is at least 15, the PSIG is not considered necessary.**
Ga not measured by WISC-V

• Ample evidence that Holly can read at grade level and decode words that she does not recognize automatically

• Do I need to give Ga measures
  • Ga necessary for PSW analysis in X-BASS
  • A single subtest is sufficient if other data are available and converge in a manner that supports subtest performance
Supplement the WISC-V with tests from CTOPP-2 for Ga: Phonetic Coding

Top Row for all areas in XBA Analyzer Tab includes the names of Tests and Batteries that do not have their own separate tab in X-BASS. Use the drop down menu in the top row in the Ga domain to find the CTOPP-2.

Subtests
- Elision
- Blending Words
- Phoneme Awareness

Composite
- Phonological Awareness

CTOPP2 Manual does not include critical values for determining cohesion of composites.
Supplement the WISC-V with tests from CTOPP-2 for Ga: Phonetic Coding

Subtests
- Elision (ss = 8)
- Blending Words (ss = 9)
- Phoneme Awareness (ss = 9)

Composite
- Phonological Awareness (SS = 91)

CTOPP-2 Manual does not include critical values for determining cohesion of composites.

Enter the composite in the top row; select the subtests that make up the composite; and enter the scaled scores for each subtest and X-BASS will evaluate cohesion.
Supplement the WISC-V with tests from CTOPP-2 for Ga: Phonetic Coding

X-BASS Builds in the Guiding Principle: Use Actual Norms Whenever they are Available

CTOPP2 Manual does not include critical values for determining cohesion of composites. Enter the composite in the top row; select the subtests that make up the composite; and enter the scaled scores for each subtest and X-BASS will evaluate cohesion

Transfer Phonological Awareness Composite to Data Organizer Tab
Alternative When Other Data Sources Are Available

Cross-Battery Assessment Software System (X-BASS® v2.0)

Data Organizer and Score Summary

The purpose of this tab is to organize composite and subtests to assist in the selection of those to be used for evaluation of the pattern of strengths and weaknesses. In the PWI Analyzer, test names and scores cannot be entered into this tab directly. Rather, this tab provides a summary of scores and subtests that were transferred from other tabs because they were considered the best estimates of the abilities, academic areas, and selected neuropsychological domains. If you use the PWI Analyzer by clicking on the check box to the right of each item in any domain for which there are data, you may select up to two composite scores for each of the CWI broad ability groups (e.g., Global Ability) and neuropsychological domains and up to three scores for each of the academic areas. Note that you may also click on the “Data Organizer” tab to view and print the information on this tab. For more information on how to select the best scores for use in PWI analyses, click the tab to the right.

For your review, please click the “Mark Indicator” button to continue with additional steps for conducting PWI analyses.
Holly's Global Scores

Full Scale IQ

Note: Not included in standardization data.

WISC-V Percentile

General Ability Index (GAI)

Note: Not included in standardization data.

WISC-V Percentile

Capabilities Efficiency Index (CEI)

Note: Not included in standardization data.

WISC-V Percentile

Cross-Battery Assessment Software System (X-BASS® v2.0)

WISC-V Interpretive Summary Report

This tab provides a draft preview of the results from the analysis of WISC-V. Additional demographic information may be entered on the right side of the table below which will be included in the printout of the final report. The final interpretive summary report will closely match the layout presented below the table.

When you are ready to print the report, simply click the "Print WISC-V Report" button and X-BASS® will automatically format and print the final version.

START HERE: For WISC-V data, X-BASS® will conduct an analysis to determine which broad score is likely to represent the best estimate of general intellectual ability based on the WISC-V interpretive system as outlined by Flanagan & Allison (2013). Once all necessary data to perform the analysis are entered, X-BASS® will display the results automatically in the draft report preview below. To ensure the accuracy of the analysis, please review the questions below and indicate whether either of the two conditions apply in this case.

1. Is the individual suspected of having speech/language impairment, expressive language disorder, or any other disorder that may compromise expressive or receptive language? If yes, please check the box below, otherwise leave it blank.

2. Is the individual from a non-English language hearing impaired? If yes, please check the box below, otherwise leave it blank.

Enter optional information for inclusion in the WISC-V Interpretive Summary Report in the white spaces below.

Name: Holly

Date of Birth: 3/4/2006

Date of Evaluation: 2/17/2017

Grade: [Blank]

Evaluator: [Blank]

Date of Report:

School:

Ethnicity:

First Language:

Second Language:
Cross-Battery Assessment Software System (X-BASS®) WISC-V® Interpretable Summary Report

NAME: Holly  DATE OF REPORT:
DATE OF BIRTH: 3/4/2006  SCHOOL:
DAT OF EVALUATION: 7/17/2017  ETHNICITY:
GRADE:  FIRST LANGUAGE:
EVALUATOR:  SECOND LANGUAGE:

DESCRIPTION OF WISC-V GLOBAL ABILITY AND OTHER BROAD INDEX SCORES

In addition to the Normative Category for each global ability score or broad index, a determination regarding Coherence is provided along with additional analysis regarding whether the index or score is clinically meaningful or not. Note that when a score is deemed to be clinically meaningful, it is defined as having sufficient cohesion to accurately represent the ability it is intended to measure. Conversely, when a score is deemed not to be clinically meaningful, it indicates substantial subtest variability such that it may not be a good representation of the ability it is intended to measure.

<table>
<thead>
<tr>
<th>Index or Subtest</th>
<th>Score</th>
<th>PR</th>
<th>Normative Category</th>
<th>Coherence</th>
<th>Clinically Meaningful</th>
</tr>
</thead>
<tbody>
<tr>
<td>Full Scale IQ (FSIQ)</td>
<td>82</td>
<td>10</td>
<td>Below Average</td>
<td>Cohesive</td>
<td>No</td>
</tr>
<tr>
<td>General Ability Index (GAI)</td>
<td>80</td>
<td>-</td>
<td>Average</td>
<td>Cohesive</td>
<td>-</td>
</tr>
<tr>
<td>Nonverbal Index (NVI)</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Cognitive Processing Index (CPI)</td>
<td>78</td>
<td>7</td>
<td>Well Below Average</td>
<td>Cohesive</td>
<td>N/A</td>
</tr>
<tr>
<td>Storage and Retrieval Index (SRI/URI)</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

INTERPRETATION OF OVERALL INTELLUCTUAL ABILITY

The differences between the FSIQ and GAI and the CPI and GAI are unusual, occurring in about 10% of the general population, and the GAI is higher than the FSIQ and CPI. The variability in the scores that comprise the FSIQ and GAI may obscure information about the individual's strengths and weaknesses. However, the GAI may provide a better estimate of overall intellectual ability than the FSIQ because it contains only high g-loaded tests, whereas the FSIQ contains high g-loaded tests as well as moderate to low g-loaded tests (e.g., Coding). Although neither the FSIQ or GAI may be used as an estimate of overall intellectual ability for the individual, the GAI provides an estimate that is less reliant on working memory and processing speed than the FSIQ and may make difficulties with the individual's ability to process information more and efficiently. Therefore, when the GAI is considered the best estimate of ability. It should be reported along with the CPI or the WMI and PSI. Use index and subtest level analysis to explain the GAI > FSIQ difference. If a global ability score is needed in a formula or when diagnostic criteria include a cut score, then the GAI should be used unless clinical judgment suggests otherwise.

DESCRIPTION OF PRIMARY INDEX AND SUBTEST SCALED SCORES

In addition to the Normative Category for each Primary Index, a Personal Strength or Weakness is calculated using a critical value equal to a 95% confidence level of probability and a Base Rate value of 10% that is adjusted based on the magnitude/covariation of the FSIQ. Indexes that are both statistically significant Weaknesses, exceed Base Rate critical values, and are ≤ 85, are also designated as High Priority Concerns. Indexes that are both statistically significant Strengths, exceed the Base Rate critical value, and are ≥ 115, are also designated as Key Assets.

<table>
<thead>
<tr>
<th>Index or Subtest</th>
<th>Score</th>
<th>PR</th>
<th>Normative Category</th>
<th>Strength or Weakness</th>
<th>Asset or Concern</th>
</tr>
</thead>
<tbody>
<tr>
<td>Verbal Comprehension Index (VCI)</td>
<td>109</td>
<td>58</td>
<td>Average</td>
<td>Uncommon Personal Strength</td>
<td>-</td>
</tr>
<tr>
<td>Vocabulary</td>
<td>11</td>
<td>67</td>
<td>Average</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Vocabulary</td>
<td>10</td>
<td>67</td>
<td>Average</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>FSIQ</td>
<td>109</td>
<td>58</td>
<td>Average</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Matrix Reasoning</td>
<td>15</td>
<td>53</td>
<td>Average</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Block Design</td>
<td>9</td>
<td>37</td>
<td>Average</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Visual Motor</td>
<td>15</td>
<td>53</td>
<td>Average</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Working Memory Index (WMI)</td>
<td>76</td>
<td>5</td>
<td>Well Below Average</td>
<td>High Priority Concern</td>
<td>-</td>
</tr>
<tr>
<td>Digit Span</td>
<td>6</td>
<td>9</td>
<td>Below Average</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Finger Span</td>
<td>6</td>
<td>9</td>
<td>Below Average</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Processing Speed Index (PSI)</td>
<td>88</td>
<td>38</td>
<td>Low Average</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Coding</td>
<td>6</td>
<td>9</td>
<td>Below Average</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Symbol Search</td>
<td>9</td>
<td>37</td>
<td>Average</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

INTERPRETATION AND FOLLOW UP RECOMMENDATIONS FOR PRIMARY INDEX SCORES

Depending on the classification of the scores, their coherency, and other factors, follow up may or may not be necessary. Follow up is usually considered necessary when the lower subtest score falls below average, suggesting a weakness or deficit and the higher subtest score is at least average. Note that follow up on the lower subtest score often leads to derivation of an alternative composite, which may then replace the index. Below is a detailed analysis of the coherency of each Primary index as well as the rationale regarding the recommendation for follow up.

Verbal Comp Index

Interpretaion: The VCI provides an estimate of Crystallized Intelligence (CI). CI refers to an individual's knowledge base or general fund of information that develops as a result of exposure to language, culture, general life experiences, and formal schooling. Word knowledge as measured by the Vocabulary subtest is Average, and the ability to reason with words as measured by the Similarities subtest was Average relative to same age peers. The difference between the scores that comprise the VCI is not significant and a difference of this size is considered common in the general population. This means that the VCI is a good summary of Crystallized Intelligence. The individual's VCI of 108 (99-117) is classified as Average and is ranked at the 99th percentile, indicating performance as good or better than 98% of same age peers from the general population. The difference between the VCI and the average of all five primary index scores is significant and so large that it is not commonly found in the general population. In this case, the VCI is Average relative to same age peers and is considered an uncommon personal strength. Overall, the individual's VCI performance suggests that Crystallized abilities may facilitate learning, particularly the abilities that are at least average.

Follow up: Because the difference between the scores that comprise the VCI is not substantial (less than 30) and both scores are at least average, follow up is not considered necessary.
XBA Analyzer Tab

Score configuration and interpretation:
The difference between the highest and lowest scores is less than 15, therefore, they form a composite that is considered cohesive and likely a good summary of the set of theoretically related abilities that comprise it. Interpret the composite as an adequate estimate of the ability that it is intended to measure.
**XBA Organizer Tab**

<table>
<thead>
<tr>
<th>MATH CALCULATION [MC]</th>
<th>MATH PROBLEM SOLVING [MPS]</th>
</tr>
</thead>
<tbody>
<tr>
<td>□ □ □ □ □ □ □ □ □ □</td>
<td>□ □ □ □ □ □ □ □ □ □</td>
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<td>□ □ □ □ □ □ □ □ □ □</td>
</tr>
</tbody>
</table>

**XBA Analyzer Tab**

**EXECUTIVE FUNCTIONS (EF)**
(choose these boxes to select score for integrated graph)

- D-KEFS Verbal Fluency Test: Category Switching (6) [F] 6
- D-KEFS Color-Word Interference: Inhibition/ Switching (6) [F] 7

<table>
<thead>
<tr>
<th>Composite</th>
<th>Score Analysis</th>
</tr>
</thead>
<tbody>
<tr>
<td>80</td>
<td>A</td>
</tr>
<tr>
<td>85</td>
<td>A</td>
</tr>
</tbody>
</table>

**COHESIVE Use 2-subtest XBA composite**

- SS: 79
- PR: 6

**Score configuration and interpretation:**

The difference between these scores is less than 15, and, therefore, they form a composite that is considered cohesive and likely a good summary of the set of theoretically related abilities that comprise it. Interpret the composite as an adequate estimate of the ability that it is intended to measure.
Selects All Cognitive, Achievement, and Special Purpose Scores for Inclusion in PSW Analysis

Cross-Battery Assessment Software System (X-BASS® v2.0)

Data Organizer and Score Summary

Guidelines for Selecting Best Composite Scores for SLD Evaluations

The purpose of this tab is to recognize composite and subtests to assist in the selection of those to be used for evaluation of the patterns of strengths and weaknesses, in the PSW analysis. Test scores and subscores cannot be entered into this task directly, rather, this tab provides a summary of test battery and subtests that can be transferred from other tabs because they were considered the best estimates of CVC abilities, academic areas, and selected neuropsychological elements. Use the tab to select the composite and subscores you would like to use in PSW analyses by clicking on the check box to the right of each one in any domain for which there are data. You may select up to five composites for each of the CVC broad ability (e.g., Cog, Sp, and Neuropsychological), e.g., executive function, cognitive processing domains and up to three scores for each of the academic areas. Note that you may also click on the “Data Organizer Graph” to view a print the information on this tab. For more information on how to select the best scores for use in PSW analyses, click the button to the right.

After you have made your selections, click the “Next” button to continue with additional steps for conducting PSW analysis.

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Strengths and Weaknesses Indicator

Determination of Strengths and Weaknesses

Indicate whether the CVC domain (highlighted in blue) and neuropsychological domains (highlighted in green) represent strengths or weaknesses for the individual. Determination of strengths and weaknesses is a judgment that is made by the evaluator based on what is known about the examinee’s strengths, weaknesses, and neuropsychological factors. Typically, the examinee is rated on the average category or higher likely to facilitate training and scores that fall below average in lower. Below initial morning, also, indicate whether the academic areas highlighted in yellow represent strengths or weaknesses for the individual. Achievement standard scores that are above 90 or higher are considered strengths and scores that fall below 80 are considered weaknesses.

After you have made your selections, click the “PSW Analysis Summary” button to continue with the PSW analysis.
ICC made up of Gsm and Glr
Diagnostic Impressions

- Holly has struggled in mathematics since early elementary school
- She made very little progress in math, despite increasingly intensive interventions in an RTI service delivery model for well over a year
- Holly has difficulty in many skills that are associated with a disorder or disability in math: Number Sense, Memorization of Math Facts, Accurate and Fluent Calculation, and Math Problem Solving
- She has weaknesses or deficits in the cognitive processes that underlie math skill acquisition and development: Naming Facility and Associative Memory, Working Memory (including Symbolic Working Memory), and Number Facility
- Difficulties with attentional control may also interfere with her math performance
- Anxiety may also interfere with her performance
- Holly’s history, along with her qualitative and quantitative data most closely align with Dyscalculia
- Holly meets criteria for SLD in Math Calculation and Math Problem Solving following the DD/C PSW model using X-BASS
- With a greater understanding of the underlying cognitive processing weaknesses that are contributing to Holly’s math difficulties, a systematic and tailored instructional and remedial program can be devised that will very likely lead to a more positive response compared to previous approaches.
Questions?