Using a Pattern of Strengths and Weaknesses (PSW) for Specific Learning Disability (SLD) Identification

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Outline for Today’s Workshop

• Brief overview of SLD identification
• Review of foundational sources of information necessary for making informed decisions about PSW method for SLD identification, with an introduction to the assessment – intervention connection
• Description of the PSW method and conceptual similarities among PSW methods; description of the Dual Discrepancy/Consistency (DD/C) operational definition of SLD – a PSW method; and
• The PSW-A Component of the Cross-Battery Assessment Software System (X-BASS)
• Summary and conclusions
OVERVIEW OF SLD IDENTIFICATION

The Cross-Battery Assessment Approach
U.S. (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)
(34 CFR 300.311(a)(5)), (34 CFR 300.309(a)(2(ii))

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- Alternative Research-based Approach (PSW)
All Methods of SLD Identification Are... WTF Methods
Ability-Achievement Discrepancy

WAIT TO FAIL
Response to Intervention

WATCH THEM FAIL
Pattern of Strengths and Weaknesses

WHY THEY FAIL
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
Psychologist to Parent:

- It's been six months and your son is still not as far along as we anticipated based on the interventions we've been trying. At this time, we have two options.

  - One, we can try another intervention that is supported by research and, therefore, is expected to work (like the other interventions we tried).
  - Or two, we can take a more comprehensive look at how your son approaches tasks, how he learns, how he is smart, and what difficulties he may have when faced with new problems. That means that we can do a comprehensive evaluation of your son and get a better understanding of his strengths and weaknesses in cognitive areas that are important for learning and achievement. We believe this additional information can help us understand why your son did not respond well to intervention and what we can do differently as we continue to plan and develop educational interventions for him.

RTI and Cognitive Assessment Data – Important for SLD Identification

Why Do Some Not Understand the Value of A Comprehensive Evaluation?
Psychologist to Parent:

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Source:
RTI and Cognitive Assessment are Not Mutually Exclusive

• There will undoubtedly be countless arguments on each side, but none will be strong enough to convince people that one approach is clearly better than the other.

• An increasingly widespread view will likely emerge that embraces each approach as different but *complementary* in the identification, diagnosis, and treatment of specific learning disability.

D. P. Flanagan, 2008
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

- 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 psychometrically and theoretically defensible.
XBA

• 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.

**Utility of KTEA-3 Error Analysis for the Diagnosis of Specific Learning Disabilities**

Dawn P. Flanagan¹, Jennifer T. Mascolo¹, and Vincent C. Alfonso²
Prior to Developing Quantitative Method (PSW-A)–Clinical Judgment (Flanagan and colleagues 2002-2006)

**KABC-II and KTEA-II Data**

| Name: ______________________ | Age: ___ | Grade: ___ |
| Examinee: ___________________ | Date: ______ |

**Grw** Broad/Narrow Cluster
Reading Composite (____)
Sound Symbol (____)
Reading Fluency (____)

**Ga** Broad/Narrow Cluster
Nonsense Wd Decod (____)
Phonol. Awareness (____)

**Glr/Gs** Broad/Narrow Cluster
Assoc. Fluency (____)
Naming Facility (____)

**Glr-MA** Broad/Narrow Cluster
Rebus (____)
Atlantis (____)

**Gsm** Broad/Narrow Cluster
Word Order (____)
Number Recall (____)

**Gf** Broad/Narrow Cluster
Story Comp. (____)
Pattern Reasoning (____)

**Gv** Broad/Narrow Cluster
Rover (____)
Triangles (____)

**Gc** Broad/Narrow Cluster
Expressive Vocab. (____)
Verbal Knowledge (____)

Pattern of empirically or logically related cognitive and academic deficits establishes basis for satisfying criterion of “below average aptitude-achievement consistency”

Pattern of generally average cognitive abilities and processes establishes basis for satisfying criterion of “an otherwise normal ability profile”

Historical Concept of Intra-Individual Discrepancies
What’s Next?

• Review of foundational sources of information necessary for making informed decisions about PSW method for SLD identification, with emphasis on the assessment – intervention connection
Interpretation of PSW

• Requires an understanding of contemporary 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

D. P. Flanagan, 2017
Interpretation of PSW

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Sixteen broad and approximately 80 narrow abilities; approximately 9 broad and 35 narrow abilities represented on current batteries
Over Two Decades of Revisions and Refinements to Gf-Gc/CHC Theory

Chapter by **McGrew**: First attempt at Integrating Cattell-Horn Gf-Gc Theory and John Carroll's Three-Stratum Theory

Chapter by **McGrew**: Documentation of how the integrated model presented in 1997 and again in 2000 became known as CHC theory

Chapter by **Schneider and McGrew**: Careful review of the literature led to some substantial modifications

Chapter by **Schneider and McGrew**: Most significant revisions to CHC theory to date and criteria for revisions to the CHC taxonomy
**Fluid Reasoning (Gf).** Gf refers to a type of thinking or reasoning that individuals use when faced with a relatively new or novel task that cannot be performed automatically. It requires the use of inductive, deductive, and quantitative reasoning when solving unfamiliar problems that are minimally dependent on prior knowledge.

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**Induction (I):** The ability to observe a phenomenon and discover the underlying principles or rules that determine its behavior. This ability is also known as rule inference.

**General Sequential Reasoning (RG):** The ability to reason logically using known premises and principles. This ability also is known as deductive reasoning or rule application.

**Quantitative reasoning (RQ):** The ability to reason with quantities, mathematical relations, and operators.
**Comprehension-Knowledge (Gc).** Gc refers to the breadth and depth of knowledge and skills (e.g., words, general information) that are acquired as a result of exposure to language, culture, general life experiences, and formal schooling. It represents the ability to comprehend and communicate culturally-valued knowledge.

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**Lexical Knowledge (VL):** The knowledge of the definitions of words and the concepts that underlie. Vocabulary knowledge.

**General (Verbal) Information (K0):** The breadth and depth of knowledge that one's culture deems essential, practical, and worthwhile for everyone to know.

**Listening Ability (LS):** The ability to understand speech. This ability starts with comprehending single words and increases to long complex verbal statements.

**Language Development (LD):** An intermediate stratum ability to comprehend and communicate using language. The general understanding of spoken language at the level of words, idioms, and sentences. Understanding words in context.
Working memory capacity

The ability to maintain and manipulate information in active attention. The mind’s mental “scratchpad” or “workbench.”

- A limited capacity system
- Mental scratch pad or workspace
- Loses information quickly through decay of memory traces, unless individual activates other cognitive resources to maintain the information in immediate awareness
**Working Memory Capacity (Gwm).** The ability to encode and maintain verbal or visual information in immediate awareness and then manipulate or transform it in some way within a few seconds, which is dependent in part on focus of attention. It also includes the ability to focus attention on task-relevant stimuli and ignore task irrelevant stimuli.

**Auditory short-term storage (Wa):** The ability to encode and maintain verbal information in primary memory.

**Visual-spatial short-term storage (Wv):** The ability to encode and maintain visual information in primary memory.

**Attentional Control (AC):** The ability to manipulate the spotlight of attention flexibly to focus on task-relevant stimuli and ignore task irrelevant stimuli. Sometimes referred to as spotlight or focal attention, focus, control of attention, executive controlled attention, or executive attention.
Long-term Storage and Retrieval Has Been Separated Because it has been Shown that it Encompasses Two Relatively Distinct Abilities

- **Gl**: Learning Efficiency
- **Gr**: Retrieval Fluency
Learning efficiency

The ability to learn, store, and consolidate new information over periods of time measured in minutes, hours, days, and years.
Learning efficiency

**Associative memory (MA):** The ability to form a link between two previously unrelated stimuli such that the subsequent presentation of one of the stimuli serves to activate the recall of the other stimuli.

**Meaningful memory (MM):** The ability to remember narratives and other forms of semantically related information.
Retrieval fluency
The rate and fluency at which individuals can access information stored in long-term memory.

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Speed of lexical access (LA): The ability to rapidly retrieve words from an individual’s lexicon. Verbal efficiency or automaticity of lexical access. An intermediate stratum level ability.

Naming facility (NA): The ability to rapidly call objects by their names.

Word fluency (FW): The ability to rapidly produce words that share a phonological (e.g., fluency of retrieval of words via a phonological cue) or semantic feature (e.g., fluency of retrieval of words via a meaning-based representation).

Ideational fluency (FI): The ability to rapidly produce a series of ideas, words, or phrases related to a specific condition or object.

Expression fluency (FE): The ability to rapidly think of different ways of expressing an idea.

The oral language composite made up of Rapid Picture Naming and Retrieval Fluency is called “Speed of Lexical Access” (LA) – It is broader than LA.
Speed of lexical access (LA): The ability to rapidly retrieve words from an individual’s lexicon. Verbal efficiency or automaticity of lexical access. An intermediate stratum level ability.

Figural fluency (FF): The ability to rapidly draw or sketch as many things (or elaborations) as possible when presented with a nonmeaningful visual stimulus (e.g., a set of unique visual elements).

Figural flexibility (FX): The ability to rapidly draw different solutions to figural problems.
Schneider and McGrew’s CHC-based Conceptualization of Gsm and Glr with WISC-V Subtests and Corresponding Memory Construct Highlighted

Digit Span Forward
Picture Span

- Auditory Span
- Spatial Span
- Meaningful Memory
- Associative Memory
- Free Recall
- Single-Trial and Immediate Recall

Digit Span Backward
Letter Number Seq.

- Complex Span
- Inhibit
- Shift
- Update

Symbol Translation
Subtests

Meaningful Memory
Associative Memory
Free Recall
Multiple-Trial and/or Delayed Recall

Naming Speed
Literacy

Gsm

Working Memory Capacity

Retrieval Fluency

Learning Efficiency

Figure 4.6. Conceptual map of memory-related abilities in CHC theory.
Schneider and McGrew’s CHC-based Conceptualization of Gsm and Glr
with WJ IV COG, OL, ACH Subtests and Corresponding Memory Construct Highlighted

- Numbers Reversed
- Memory for Words
- Verbal Attention
- Object-Number Sequencing
- Understanding Directions
- Auditory Span
- Spatial Span
- Meaningful Memory
- Associative Memory
- Free Recall
- Single-Trial and Immediate Recall
- Complex Span
- Inhibit
- Shift
- Update
- Memory Span
- Learning Efficiency
- Gsm
- Glr
- Working Memory Capacity
- Retrieval Fluency
- Meaningful Memory
- Associative Memory
- Free Recall
- Multiple-Trial and/or Delayed Recall
- Naming Facility
- Word Fluency
- Expressional Fluency
- Ideational Fluency
- Associational Fluency
- Solution Fluency
- Originality
- Figural Fluency
- Figural Flexibility
- Story Recall
- Reading Recall
- Visual-Auditory Learning
- Rapid Picture Naming
- Retrieval Fluency

Supplement WISC-V with Ga tests from another battery (e.g., CTOPP-2; FAR; WJ IV OL)

**Facets in Ga**

**Speech**
- **PC** (Phonetic coding): The ability to distinctly hear phonemes, blend sounds into words, and segment words into parts, sounds, or phonemes.
- **US** (Speech sound discrimination): The ability to detect and discriminate differences in speech sounds (other than phonemes) under conditions of little or no distraction or distortion.
- **UR** (Resistance to auditory stimulus distortion): The ability to hear words or extended speech passages correctly under conditions of distortion or background noise.

**Nonverbal**
- **U8** (Maintaining and judging rhythm): The ability to recognize and maintain a musical beat.
- **UM** (Memory for sound patterns): The ability to retain (on a short-term basis) auditory codes such as tones, tonal patterns, or speech sounds.

WJ IV measures both Phonetic Coding and Memory for Sound Patterns: Phonological Processing Test May be Influenced by Gr and Gwm

- **Test 5A. Phonological Processing – Word Access.**
  - Tell me a word that starts/middle/ends with the /b/ sound. /b/

- **Test 5B. Phonological Processing – Word Fluency.**
  - **Item 1:** words that begin with /m/ sound as in milk (in one minute)
  - **Item 2:** words that begin with /d/ sound as in dog (in one minute)

- **Test 5C. Phonological Processing – Word Substitution.**
  - If I say “Penny” and then change pen to sun, the new word would be...what?

**Ga:** Phonetic Coding (PC) – the ability to hear phonemes distinctly

**Gr:** Word Fluency (FW) – fluency of retrieval of words via a phonological cue

**Ga:** Phonetic Coding (PC) – the ability to segment words into parts (also requires working memory)
Areas of Processing Deficit and Their Link to Areas of Academic Achievement

Phonological Processing Model

Three Kind of Phonological Processing
Phonological Awareness: Phonological awareness refers to an individual’s awareness of and access to the sound structure of his/her oral language. This awareness proceeds from word length phonological units in compound words (e.g., cowboy), to syllables within words, to onset-rimes units within syllables to individual phonemes within rimes, and finally to individual phonemes within consonant clusters.

Phonological Memory: Phonological memory refers to coding information phonologically for temporary storage in working memory. A deficient phonological memory does not appear to impair either reading or listening to a noticeable extent, provided the words involved are already in the individual’s vocabulary. However, phonological memory impairments can constrain the ability to learn new written or spoken vocabulary.

Rapid Naming: Rapid naming of objects, colors, digits, or letters requires efficient retrieval of phonological information from long-term memory. The efficiency with which individuals are able to retrieve phonological codes associated with individual phonemes, word segments, or entire words should influence the degree to which phonological information is useful in decoding printed words. Measures of rapid naming require speed and processing of visual as well as phonological information. The skills involved
Storage of phonological information during reading involves creating a sound-based representation of written words in working memory. Deficits in storage of phonological information result in faulty representations in memory, which lead to inaccurate application of sound rules during reading tasks. A deficit in phonological memory does not inevitably lead to poor reading of familiar material, but is more likely to impair decoding of new words, particularly words that are long enough to decode bit by bit as a means of storing intermediate sounds. A deficit in phonological memory may impair reading comprehension for more complex sentences.
**Visual Processing (Gv).** Gv refers to the ability to generate visual images and perceive and analyze visual patterns and visual information. It also involves the ability to mentally simulate how complex visual patterns might look when transformed in some way (e.g., rotated).

**Visualization (Vz):** The ability to perceive complex visual patterns and mentally simulate how they might look when transformed (e.g., rotated, changed in size, partially obscured, and so forth).

**Imagery (IM):** The ability to voluntarily mentally produce very vivid images of objects, people or events that are not actually present.

**Visual memory (MV):** The ability to remember complex visual images over short periods of time (less than 30 seconds).

**Spatial scanning (SS):** The ability to quickly and accurately survey (visually explore) a wide or complicated spatial field or pattern with multiple obstacles and identify a target configuration or identify a path through the field to a target end point.

(Domain includes more narrow abilities not listed here)

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• The ability to control attention to automatically perform simple and repetitive clerical-type tasks quickly. It may be thought of as mental speed or the fluency with which simple, over-learned tasks are performed.
Perceptual speed (P): An intermediate stratum level ability that can be defined as the speed and fluency with which similarities or differences in visual stimuli (e.g., letters, numbers, patterns, etc.) can be searched and compared in an extended visual field.

Perceptual speed-search (Ps): The speed and fluency of searching or scanning an extended visual field to locate one or more simple visual patterns.

Perceptual speed-compare (Pc): The speed and fluency of looking up and comparing visual stimuli that are side-by-side or more widely separated in an extended visual field.

Number facility (N): The speed, fluency and accuracy in manipulating numbers, comparing number patterns, or completing basic arithmetic.

Reading speed (fluency) (RS): The speed and fluency of reading text with full comprehension. Also listed under Grw.

Writing speed (fluency) (WS): The speed and fluency of generating or copying words or sentences. Also listed under Grw and Gps.

Interpretation of PSW

- Requires an understanding of contemporary 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

D. P. Flanagan, 2017
CHC Factors on the WJ IV COG

WJ IV COG includes 18 Tests; 14 comprise seven CHC factors

Gf/Gc Composite

Gf

Gc

Gwm

Glr

Ga

Gv

Gs

VL

K0

RQ

I

MW

MW

MM

MA

PC

UM

Vz

MV

P

P

Oral Vocabulary

General Information

Number Series

Concept Formation

Verbal Attention

Numbers Reversed

Story Recall

Visual Auditory Learning

Phonological Processing

Nonword Repetition

Visualization

Picture Recognition

Letter-Pattern Matching

Pair Cancellation

Contribute to GIA
Number Facility (Gs:N) – The speed at which basic arithmetic operations are performed accurately

Cognitive Efficiency with Numbers

Number Facility (Gs:N) – The speed at which basic arithmetic operations are performed accurately

= Test from WJ IV OL
CHC Extended Factors on the WJ IV COG

Gc
- KO
- VL
- Picture Vocabulary
  - General Information
  - Oral Vocabulary
  - Picture Vocabulary

Gf
- I
- RG
- RQ
  - Concept Formation
  - Analysis-Synthesis
  - Number Series

Gwm
- WM
  - Verbal Attention
  - Object-Number Sequencing
  - Numbers Reversed

= Test from WJ IV OL
Composition of the WISC-V Full Scale IQ

WISC-IV FSIQ = 10 Subtests
WISC-V FSIQ = 7 Subtests

FSIQ

General
(Stratum III)

Gc

Gv

Gf

Gsm

Gs

Broad
(Stratum II)

Similarities
Vocabulary
Block Design
Matrix Reason.
Figure Weights
Digit Span
Coding

Allowable Substitutions for Core FSIQ Subtests (Only 1 Permitted)

<table>
<thead>
<tr>
<th>Information Comprehension</th>
<th>Visual Puzzles</th>
<th>Picture Concepts Arithmetic</th>
<th>Picture Span Letter-Number Sequencing</th>
<th>Symbol Search Cancellation</th>
</tr>
</thead>
</table>
**WISC-V Primary Index Scales**

- **VCI** (Verbal Comprehension Index)
  - Similarities
  - Vocabulary

- **VSI** (Visual-Spatial Index)
  - Block Design
  - Visual Puzzles

- **FRI** (Fluid Reasoning Index)
  - Matrix Reasoning
  - Figure Weights

- **WMI** (Working Memory Index)
  - Digit Span
  - Picture Span

- **PSI** (Processing Speed Index)
  - Coding
  - Symbol Search

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**No Substitutions are Permitted**

- **Gc** (General Cognitive Ability)
  - VL (Verbal Load)
  - K0 (Knowledge)

- **Gv** (General Verbal Ability)
  - VZ (Visual Load)
  - MV (Memory Vocational)

- **Gf** (Fluid Reasoning)
  - I (Integrative)
  - RG (Reasoning)

- **Gsm** (Spatial Memory)
  - MW (Motor Work)
  - MS (Motor Span)

- **Gs** (Speed of Processing)
  - R9 (Response Rate 9)
  - P (Processing)

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

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

No Substitutions are Permitted
Interpretation of PSW

- Requires an understanding of contemporary 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

D. P. Flanagan, 2017
## Summary of Relations between CHC Abilities and Neuropsychological Processes and Reading Achievement and the Etiology of Reading Functions

<table>
<thead>
<tr>
<th>CHC Broad Ability</th>
<th>Reading Achievement</th>
<th>Etiology of Reading Functions</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Gf</strong></td>
<td>Inductive (I) and general sequential reasoning (RG) abilities play a moderate role in <strong>reading comprehension</strong>. Executive functions such as planning, organization, and self-monitoring are also important.</td>
<td>Several cortical and subcortical structures are frequently implicated in <strong>basic reading skills</strong> and <strong>word reading accuracy</strong>. Recent work appears to identify dysfunction in a left hemispheric network that includes the occipitotemporal region, inferior frontal gyrus, and inferior parietal region of the brain (Silani et al., 2005; Shaywitz et al., 2000; Fletcher, Simos, Papanicolaou, &amp; Denton, 2004; Richlan et al., 2009; Richlan, 2012). Numerous imaging studies have also found that dysfunctional responses in the left inferior frontal and temporoparietal cortices play a significant role with regard to phonological deficits (Skeide et al., 2015). Similar brain regions are activated on tasks involving <strong>reading fluency</strong>, but additional activation is observed in areas involved in eye movement and attention (Jones, Ashby, &amp; Brani, 2013). Further, there is also evidence for increased activation in the left occipitotemporal region, in particular the occipitotemporal sulcus, which is important for rapid processing of letter patterns (Shaywitz et al., 2004; Dehaene &amp; Cohen, 2011).</td>
</tr>
<tr>
<td><strong>Gc</strong></td>
<td>Language development (LD), lexical knowledge (VL), and listening ability (LS) are important at all ages for <strong>reading acquisition and development</strong>. These abilities become increasingly important with age. Oral Language, Listening Comprehension, and EF (planning, organization, self-monitoring) also important for <strong>reading comprehension</strong>.</td>
<td></td>
</tr>
<tr>
<td><strong>Gwm</strong></td>
<td>Memory span (MS) and working memory capacity (WM) or attentional control are important for <strong>overall reading success</strong>. Phonological memory or WM for verbal and sound-based information may also be important. WM is important for <strong>reading comprehension</strong>, which involves holding words and sentences in awareness, while integrating prior knowledge with incoming information.</td>
<td></td>
</tr>
<tr>
<td><strong>Gv</strong></td>
<td>Orthographic processing (often measured by tests of perceptual speed that use orthographic units as stimuli) is related to <strong>reading rate and fluency</strong>. Orthographic processing involves the ability to process units of words based on visual long-term memory representations, which is critical for automatic word recognition.</td>
<td>Brain regions often associated with <strong>reading comprehension</strong> include the anterior temporal lobe, inferior temporal gyrus, inferior frontal gyrus, inferior frontal sulcus, and middle and superior frontal and temporal regions (Ferstl et al., 2008; Gernsbacher &amp; Kaschak, 2003). More recent research has revealed a relationship between listening and reading comprehension and activation along the left superior temporal sulcus, which has referred to by some as the “comprehension cortex” (Berl et al., 2010). However, broader pathways are also activated in reading.</td>
</tr>
<tr>
<td><strong>Ga</strong></td>
<td>Phonetic coding (PC) or phonological awareness/processing is very important during the elementary school years for the development of <strong>basic reading skills and word reading accuracy</strong>. Phonological memory or WM for verbal and sound-based information may also be important.</td>
<td></td>
</tr>
</tbody>
</table>
### Summary of Relations between CHC Abilities and Neuropsychological Processes and Reading Achievement and the Etiology of Reading Functions (Cont’d)

<table>
<thead>
<tr>
<th>Glr</th>
<th><strong>Naming facility (NA)</strong> or <strong>rapid automatic naming (RAN)</strong>; also called speed of lexical access is very important during the elementary school years for <strong>reading rate and fluency or word recognition skills</strong>. <strong>Associative memory (MA)</strong> is also important.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gs</td>
<td><strong>Perceptual speed (P)</strong> abilities are important throughout school, but particularly during the elementary school years.</td>
</tr>
</tbody>
</table>

Comprehension, reflecting increased cognitive demand compared to listening.

Family and genetic factors have long been identified as crucial in reading achievement, with some researchers suggesting that a child with a parent with a reading disability is eight times more likely to be dyslexic compared to the general population (Pennington & Olson, 2005).

Shared environmental factors include: language and literacy environment during childhood (Wadsworth et al., 2000), and quality of reading instruction.

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Note: Information in this table was culled from the following sources: Flanagan, Ortiz, Alfonso, & Mascolo, 2006; Flanagan, Ortiz, & Alfonso, 2013; McDonough, Flanagan, Sy, & Alfonso, 2017; McGrew & Wendling, 2010; McGrew et al., 2014)
## Summary of Relations between CHC Abilities and Neuropsychological Processes and Math Achievement and the Etiology of Math Functions

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<th>Etiology of Math Functions</th>
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<tr>
<td><strong>Gf</strong></td>
<td>Reasoning inductively (I) and deductively with numbers (RQ) is very important for <strong>math problem solving</strong>. 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 (<strong>number sense</strong>), 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, von Aster, Loenneker, Dietrich, &amp; Martin, 2008; Price &amp; Ansari, 2013; Mussolin et al., 2010). Regions of the left fronto-parietal cortex, including the intraparietal sulcus, angular gyrus, and supramarginal gyrus have been consistently associated with <strong>math calculation</strong> (Ansari, 2008; 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).</td>
</tr>
<tr>
<td><strong>Gc</strong></td>
<td>Language development (LD), lexical knowledge (VL), and listening ability (LS) are important at all ages for <strong>math problem solving</strong>. These abilities become increasingly important with age.</td>
<td></td>
</tr>
<tr>
<td><strong>Gwm</strong></td>
<td>Memory span (MS) and working memory capacity (WM) or attentional control are important for <strong>math problem solving</strong> and overall success in math. (Including <strong>math calculation</strong>)</td>
<td></td>
</tr>
<tr>
<td><strong>Gv</strong></td>
<td>Visualization (VZ), including mental rotation, is important primarily for higher level math (e.g., geometry, calculus) and <strong>math problem solving</strong>.</td>
<td>A left hemisphere network that includes the precentral gyrus, inferior parietal cortex, and intraparietal sulcus, is often implicated in <strong>math fact retrieval</strong> (Dehaene &amp; Cohen, 1992; Dehaene &amp; Cohen, 1997; Dehaene et al., 1999). Further, some researchers believe that rote math facts are retrieved from verbal memory, thereby requiring activation of the angular gyrus and other regions associated with linguistic processes (Dehaene, 1992; Dehaene &amp; Cohen, 1995; Dehaene et al., 1999). Prevalence of math disabilities is about 10 times higher in those with family members who had math disabilities (Shalev et al., 2001). Environmental factors including motivation, emotional functioning (e.g., math anxiety), and suboptimal or inadequate teaching may also contribute to math difficulties (Szucs &amp; Goswami, 2013; Vukovic et al., 2013). Further, math achievement may be associated with cultural or gender-based attitudes that may be transmitted in the family environment (e.g., Chiu &amp; Klassen, 2010; Gunderson et al., 2011).</td>
</tr>
<tr>
<td><strong>Ga</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Glr</strong></td>
<td>Naming facility (NA; also called speed of lexical access) and associative memory (MA) are important for memorization and rapid retrieval of <strong>basic math facts</strong> and for accurate and fluent <strong>calculation</strong>.</td>
<td></td>
</tr>
<tr>
<td><strong>Gs</strong></td>
<td>Perceptual speed (P) is important during all years, especially the elementary school years for <strong>math calculation fluency</strong>.</td>
<td></td>
</tr>
<tr>
<td><strong>Gr/Gs</strong></td>
<td>Number representation (e.g., quantifying sets without counting, estimating relative magnitude of sets) and number comparisons are related to overall <strong>number sense</strong>.</td>
<td></td>
</tr>
<tr>
<td>CHC Broad Ability</td>
<td>Writing Achievement</td>
<td>Etiology of Writing Functions</td>
</tr>
<tr>
<td>------------------</td>
<td>---------------------</td>
<td>-----------------------------</td>
</tr>
<tr>
<td>Gf</td>
<td>Inductive (I) and general sequential reasoning (RG) are consistently related to written expression at all ages. Executive functions such as attention, planning, and self-monitoring are also important.</td>
<td>Neural correlates of writing are less understood, but some studies have suggested that the cerebellum and parietal cortex, particularly the left superior parietal lobe, may be involved (Katanoda et al., 2001; Magrassi et al., 2010). In addition, the frontal lobes have also been implicated and are considered crucial in planning, brainstorming, organizing, and goal setting, which are important for written expression (Shah et al., 2013).</td>
</tr>
<tr>
<td>Gc</td>
<td>Language development (LD), lexical knowledge (VL), and general information (K0) are important primarily after 2nd grade and become increasingly important with age. Level of knowledge of syntax, morphology, semantics, and VL has a significant impact on clarity of written expression and text generation ability.</td>
<td>Functional neuroimaging studies have provided substantial evidence for the role of the ventral-temporal inferior frontal gyrus and the posterior inferior frontal gyrus in spelling (Rapp et al., 2015; van Hoorn et al., 2013). Other areas that have been identified include the left ventral cortex, bilateral lingual gyrus, bilateral fusiform gyrus (Planton et al., 2013; Purcell et al., 2014; Richards et al., 2005; Richards et al., 2006). However, many of these regions have also been associated with reading and are not distinct to spelling / writing disorders.</td>
</tr>
<tr>
<td>Gwm</td>
<td>Memory span (MS) is important to writing, especially spelling skills whereas working memory (WM) has shown relations with advanced writing skills (e.g., written expression; synthesizing multiple ideas, ongoing self-monitoring).</td>
<td>While there is a significant genetic component involved in the development of writing skills, this etiology is often shared with a broad variety of reading and language skills (Olson et al., 2013).</td>
</tr>
<tr>
<td>Gv</td>
<td>Orthographic processing (often measured by tests of perceptual speed that use orthographic units as stimuli) is particularly important for spelling.</td>
<td></td>
</tr>
<tr>
<td>Ga</td>
<td>Phonetic coding (PC) or phonological awareness / processing is very important during the elementary school years (primarily before 5th grade) for both basic writing skills and written expression.</td>
<td></td>
</tr>
<tr>
<td>Glr</td>
<td>Naming facility (NA; also called speed of lexical access) has demonstrated relations with writing fluency. Storing and retrieving commonly occurring letter patterns in visual and motor memory are needed for spelling.</td>
<td></td>
</tr>
<tr>
<td>Gs</td>
<td>Perceptual speed (P) is important during all school years for basic writing skills and is related to written expression at all ages.</td>
<td></td>
</tr>
</tbody>
</table>
General and Specific Manifestations of Broad Ability Weaknesses and

Recommendations That May Facilitate Learning and Aid in Bypassing or Minimizing the Effects of Broad Ability Weaknesses
### Rapid Reference 1.5 General and Specific Manifestations of Fluid Reasoning (Gf) Weaknesses

<table>
<thead>
<tr>
<th>CHC Broad Cognitive Abilities/Neuropsychological Functions</th>
<th>General Manifestations of Cognitive/Neuropsychological Weakness</th>
<th>Specific Manifestations of Cognitive/Neuropsychological Weakness</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Fluid Reasoning (Gf)</strong></td>
<td><strong>Difficulties with:</strong></td>
<td><strong>Reading Difficulties:</strong></td>
</tr>
<tr>
<td>Novel reasoning and problem solving; ability to solve problems that are unfamiliar.</td>
<td>Higher-level thinking and reasoning</td>
<td>Drawing inferences from text</td>
</tr>
<tr>
<td>Processes are minimally dependent on prior learning.</td>
<td>Transferring or generalizing learning</td>
<td>Abstracting main idea(s)</td>
</tr>
<tr>
<td>Involves manipulating rules, abstracting, generalizing, and identifying logical relationships.</td>
<td>Deriving solutions for novel problems</td>
<td>Math Difficulties:</td>
</tr>
<tr>
<td>Fluid reasoning is evident in inferential reasoning, concept formation, classification of unfamiliar stimuli, categorization, and extrapolation of reasonable estimates in ambiguous situations (Schneider &amp; McGrew, 2012).</td>
<td>Extending knowledge through critical thinking</td>
<td>Reasoning with quantitative information (word problems)</td>
</tr>
<tr>
<td>Narrow Gf abilities include Induction, General Sequential Reasoning (Deduction), and Quantitative Reasoning.</td>
<td>Perceiving and applying underlying rules or process(es) to solve problems</td>
<td>Internalizing procedures and processes used to solve problems</td>
</tr>
</tbody>
</table>

See Chapter 4 in *Essentials of Cross-Battery Assessment* (Flanagan, Ortiz, & Alfonso, 2013)
See Chapter 1 in *Essentials of Planning, Selecting, and Tailoring Interventions for Unique Learners* (Mascolo, Alfonso, & Flanagan, 2014)
### Rapid Reference 1.14 Recommendations That May Facilitate Learning and Aid in Bypassing or Minimizing the Effects of a Fluid Reasoning (Gf) Deficit

<table>
<thead>
<tr>
<th>Classroom Instruction</th>
<th>Instructional Materials</th>
<th>Environmental</th>
<th>Strategies</th>
</tr>
</thead>
<tbody>
<tr>
<td>Use demonstrations to externalize the reasoning process (think-alouds)</td>
<td>Expanded answer keys containing the “reason” for correct/incorrect choices</td>
<td>Problem-solving charts (hanging or taped to desk)</td>
<td>Use metacognitive strategies (mnemonics that are memorable and that accurately represent the learning task)</td>
</tr>
<tr>
<td>Gradually offer guided practice (e.g., guided questions list) to promote internalization of procedures or process(es)</td>
<td>Guided lists for implementing procedures, formulas</td>
<td>Procedural charts/lists (hanging or taped to desk)</td>
<td>Use tools that help them categorizes objects and concepts to assist in drawing conclusions (e.g., graphic organizers, concept maps)</td>
</tr>
<tr>
<td>Offer targeted, explicit feedback</td>
<td>Models/examples</td>
<td>Preferred seating arrangements that provide easy access to a peer model with strong reasoning skills (e.g., for cooperative learning activities)</td>
<td>Listen to and separate the steps in completing a problem from the actual content used in a problem</td>
</tr>
<tr>
<td>Offer opportunities for learning formats that allow for reasoning to be modeled for the student (e.g., cooperative learning, reciprocal teaching)</td>
<td>Text features (boldface, italics)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Compare new concepts to previously learned concepts (same vs. different)</td>
<td>Graphic organizers that allow for a visual depiction of relationships between and among concepts</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Use analogies, similes, metaphors, paired with concrete explanations, to support understanding when presenting tasks (e.g., “We are going to learn our math facts with lightning speed, that means we are going to learn them fast”)</td>
<td>Manipulatives to demonstrate relationships (e.g., part to whole relationships)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Rapid Reference 1.6 General and Specific Manifestations of Crystallized Intelligence (Gc) Weaknesses

<table>
<thead>
<tr>
<th>CHC Broad Cognitive Abilities/Neuropsychological Functions</th>
<th>Brief Definition</th>
<th>General Manifestations of Cognitive Neuropsychological Weakness</th>
<th>Specific Manifestations of Cognitive Neuropsychological Weakness</th>
</tr>
</thead>
</table>
| Crystallized Intelligence (Gc)                          | Breadth and depth of knowledge and skills that are valued by one’s culture. Developed through formal education as well as general learning experiences. Stores of information and declarative and procedural knowledge. Reflects the degree to which a person has learned practically useful knowledge and mastered valued skills (Schneider & McGrew, 2012). Narrow Gc abilities include General Verbal Information, Language Development, Lexical Knowledge, Listening Ability, Information about Culture, Communication Ability, and Grammatical Sensitivity. | **Difficulties with:**  
Vocabulary acquisition  
Knowledge acquisition  
Comprehending language or understanding what others are saying  
Fact-based/informational questions  
**Using prior knowledge to support learning** | **Reading Difficulties:**  
Decoding (e.g., word student is attempting to decode is not in his/her vocabulary)  
Comprehending (e.g., poor background knowledge about information contained in text)  
**Math Difficulties:**  
Understanding math concepts and the “vocabulary of math”  
**Writing Difficulties:**  
Grammar (syntax)  
Bland writing with limited descriptors  
Verbose writing with limited descriptors  
Inappropriate word usage  
**Language Difficulties:**  
Understanding class lessons  
Expressive language—“poverty of thought” |

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See Chapter 1 in *Essentials of Planning, Selecting, and Tailoring Interventions for Unique Learners* (Mascolo, Alfonso, & Flanagan, 2014)
### Rapid Reference 1.15 Factors That May Facilitate Learning and Aid in Bypassing or Minimizing the Effects of a Crystallized Intelligence (Gc) Deficit

<table>
<thead>
<tr>
<th>Classroom Instructional Factors</th>
<th>Instructional Materials</th>
<th>Environmental Factors</th>
<th>Strategies</th>
</tr>
</thead>
<tbody>
<tr>
<td>Provides an environment rich in language and experiences</td>
<td>Contains chapter Glossaries</td>
<td>Word-of-the-day calendar</td>
<td>Use KWL strategy to increase background knowledge</td>
</tr>
<tr>
<td>Incorporates frequent practice with and exposure to words</td>
<td>E-Glossaries available</td>
<td>Word walls</td>
<td>Use context when reading to ascertain meaning</td>
</tr>
<tr>
<td>Reads aloud to children</td>
<td>Provides vocabulary building activities (print or online)</td>
<td>Distraction-free seating</td>
<td>Capitalize on opportunities to practice new words (listening for their use in television shows and other media, purposely using them in conversation)</td>
</tr>
<tr>
<td>Varies reading purpose (leisure, information)</td>
<td>Contains tools for priming background knowledge (e.g., Harcourt)</td>
<td>Closed doors</td>
<td>Engage in activities such as word searches containing related terms (e.g., travel terms) and crosswords (note: puzzlemaker.com can create customized puzzles)</td>
</tr>
<tr>
<td>Works on vocabulary building</td>
<td>Includes story starters</td>
<td>Closed windows</td>
<td>Write a new word and its definition along with a drawing</td>
</tr>
<tr>
<td>Teaches morphology</td>
<td>Includes text features (boldface, italics)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Capitalizes on opportunities to define words within instruction (e.g., “the composition of igneous rock, that is, what it is made of, is . . .”)</td>
<td>Availability of video clips</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Rapid Reference 1.15 Factors That May Facilitate Learning and Aid in Bypassing or Minimizing the Effects of a Crystallized Intelligence (Gc) Deficit

<table>
<thead>
<tr>
<th>Includes supportive modalities (e.g., visuals, gestures) to increase understanding of language used</th>
<th>Audio glossaries</th>
</tr>
</thead>
<tbody>
<tr>
<td>Embeds instruction within a meaningful context (e.g., relating words to learner experiences, increasing listening ability through game-like format)</td>
<td>Dictionaries</td>
</tr>
<tr>
<td>Develops vocabulary through naturalistic extension of language (e.g., if a student asks, “Can I start my work,” the teacher might respond, “Yes, you can begin your work;” naturally building synonym knowledge)</td>
<td>Thesaurus</td>
</tr>
<tr>
<td>Uses extension and expansion strategies (Mather, Lynch, &amp; Richards, 2001)</td>
<td>Encyclopedias</td>
</tr>
<tr>
<td><strong>Exemplary Activities</strong></td>
<td></td>
</tr>
<tr>
<td>Use vocabulary cartoons (Burchers, 2000)</td>
<td></td>
</tr>
<tr>
<td>Use text talks</td>
<td></td>
</tr>
</tbody>
</table>
Most Intelligence and Cognitive Batteries do not Measure Ga
Assessing Phonological Processing Related to Reading

- Examples of assessments of phonological processing directly related to reading:
  - **PAL-II** Rhyming, Syllables, Phonemes, Rimes
  - **KTEA-II** Phonological Awareness Subtest
  - **NEPSY-II** Phonological Processing Subtest
  - **WJ IV** Phonological Processing Test
  - **DAS-II** Phonological Processing Subtest
  - **CTOPP-II** Blending and Segmenting Subtests
  - **FAR** – Feifer Assessment of Reading
### Rapid Reference 1.7 General and Specific Manifestations of Auditory Processing (Ga) Weaknesses

<table>
<thead>
<tr>
<th>CHC Broad Cognitive Abilities/Neuropsychological Functions</th>
<th>Brief Definition</th>
<th>General Manifestations of Cognitive/Neuropsychological Weakness</th>
<th>Specific Manifestations of Cognitive/Neuropsychological Weakness</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Auditory Processing (Ga)</strong></td>
<td>Ability to analyze and synthesize auditory information.</td>
<td><strong>Difficulties with:</strong></td>
<td><strong>Reading Difficulties:</strong></td>
</tr>
<tr>
<td></td>
<td>One narrow aspect of Ga is a precursor to oral language comprehension (i.e., parsing speech sounds or Phonetic Coding).</td>
<td>Hearing information presented orally, initially processing oral information</td>
<td><strong>Acquiring phonics skills</strong></td>
</tr>
<tr>
<td></td>
<td>In addition to Phonetic Coding, other narrow Ga abilities include Speech Sound Discrimination, Resistance to Auditory Stimulus Distortion, Memory for Sound Patterns (and others related to music).</td>
<td>Paying attention especially in the presence of background noise</td>
<td><strong>Sounding out words</strong></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Discerning the direction from which auditory information is coming</td>
<td><strong>Using phonetic strategies</strong></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Discriminating between simple sounds</td>
<td><strong>Math Difficulties:</strong></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Foreign-language acquisition</td>
<td><strong>Reading word problems</strong></td>
</tr>
</tbody>
</table>

- **Reading Difficulties:**
  - Acquiring phonics skills
  - Sounding out words
  - Using phonetic strategies

- **Math Difficulties:**
  - Reading word problems

- **Writing Difficulties:**
  - Spelling
  - Note-taking
  - Poor quality of writing
## Rapid Reference 1.16 Factors That May Facilitate Learning and Aid in Bypassing or Minimizing the Effects of an Auditory Processing (Ga) Deficit

<table>
<thead>
<tr>
<th>Classroom Instructional Factors</th>
<th>Instructional Materials</th>
<th>Environmental Factors</th>
<th>Strategies</th>
</tr>
</thead>
<tbody>
<tr>
<td>Enunciates sounds in words in an emphatic manner when teaching new words for reading or spelling</td>
<td>Video clips</td>
<td>Rules for talking and listening</td>
<td>Use comprehension monitoring (e.g., Does the word I heard/read make sense in context?)</td>
</tr>
<tr>
<td>Uses instructional techniques (e.g., work preview/text preview) to clarify unknown words</td>
<td>Read aloud texts/features</td>
<td>Spelling lists</td>
<td>Engage in self-advocacy (e.g., asking for information to be repeated and/or clarified in regard to the misheard part)</td>
</tr>
<tr>
<td>Provides instructional supports (e.g., guided notes) during note-taking activities</td>
<td>Audio glossaries</td>
<td>Closed doors</td>
<td>Physically positioning oneself toward/close to the speaker</td>
</tr>
<tr>
<td>Builds in time for clarification questions related to “missed” or “misheard” items during lecture</td>
<td>Supplement oral instructions with written instructions</td>
<td>Closed windows</td>
<td>Attending to speaker’s mouth and/or gestures, facial expressions, during the delivery of information</td>
</tr>
<tr>
<td>Shortens instructions</td>
<td>Phonemic awareness activities</td>
<td>Distraction-free seating</td>
<td>Recording notes via audio methods to allow a mechanism for being able to fill in notes for completeness</td>
</tr>
<tr>
<td>Makes an effort to minimize background noise via the use of instructional commands (e.g., work quietly, refrain from talking with your neighbor)</td>
<td>Electronic textbooks</td>
<td>Noise minimizers (carpet, noise-reducing headphones)</td>
<td>Following along with written directions/text during the provision of oral instruction</td>
</tr>
<tr>
<td>Repeats or rephrases questions asked by other students to ensure that all students “hear” the question that is associated with the teacher’s given response</td>
<td>Guided notes, graphic organizers</td>
<td>Preferential seating (close to teacher, away from heaters, fans)</td>
<td>Practicing spelling lists with visually based techniques</td>
</tr>
<tr>
<td>Emphasizes sight-word reading</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pauses when delivering oral instruction to allow time for student to process auditory information</td>
<td></td>
<td></td>
<td>Use visualization strategies to remember things</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Use written mediums (e.g., email, text) to preserve content/integrity of information communicated</td>
</tr>
</tbody>
</table>
### General and Specific Manifestations of Short-Term Memory (Gsm) Weaknesses

<table>
<thead>
<tr>
<th>CHC Broad Cognitive Abilities/Neuropsychological Functions</th>
<th>Brief Definition</th>
<th>General Manifestations of Cognitive/Neuropsychological Weakness</th>
<th>Specific Manifestations of Cognitive/Neuropsychological Weakness</th>
</tr>
</thead>
</table>
| Short-Term Memory (Gsm)                                  | Ability to hold information in immediate awareness and use or transform it within a few seconds. | **Difficulties with:**  
- Following multistep oral and written instructions  
- Remembering information long enough to apply it  
- Remembering the sequence of information  
- Rote memorization  
- Maintaining one’s place in a math problem or train of thought while writing | **Reading Difficulties:**  
- Reading comprehension (i.e., understanding what is read)  
- Decoding multisyllabic words  
- Orally retelling or paraphrasing what one has read  
  **Math Difficulties:**  
- Rote memorization of facts  
- Remembering mathematical procedures  
- Multistep problems and regrouping  
- Extracting information to be used in word problems  
  **Writing Difficulties:**  
- Spelling multisyllabic words  
- Redundancy in writing (word and conceptual levels)  
- Identifying main idea of a story  
- Note-taking |

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<table>
<thead>
<tr>
<th>Classroom Instructional Factors</th>
<th>Instructional Materials</th>
<th>Environmental Factors</th>
<th>Strategies</th>
</tr>
</thead>
<tbody>
<tr>
<td>Offers repetition of information</td>
<td>Practice guides</td>
<td>Color-coded Information</td>
<td>Apply rote strategies (e.g., basic rehearsal, simple repetition) for information to be learned in the short-term</td>
</tr>
<tr>
<td>Reviews information and newly presented concepts often</td>
<td>Guided study</td>
<td>Math-facts tables (e.g., multiplication)</td>
<td>Encourage use of relational strategies (e.g., mnemonics)</td>
</tr>
<tr>
<td>Delivers information in manageable parts</td>
<td>Online review</td>
<td>Written schedules</td>
<td>Use elaborative rehearsal (associating new information with prior knowledge)</td>
</tr>
<tr>
<td>Evidences use of consistent instructional routines</td>
<td>Flash cards</td>
<td>Visual schedules (e.g., pictures)</td>
<td>Semantic rehearsal (creating a sentence using things to be remembered)</td>
</tr>
<tr>
<td>Uses meaningful stimuli to assist with encoding and allow for experiential learning (i.e., learning while doing)</td>
<td>Multisensory materials to facilitate encoding</td>
<td>Written reminders (homework)</td>
<td>Chunking</td>
</tr>
<tr>
<td>Provides opportunities for repeated practice and review</td>
<td></td>
<td></td>
<td>Paraphrasing</td>
</tr>
<tr>
<td>Provides supports (e.g., lecture notes, guided notes, study guides, written directions) to supplement oral instruction</td>
<td></td>
<td></td>
<td>Visual mnemonics (imagery, pegwords, loci, keyword method; Dehn)</td>
</tr>
</tbody>
</table>

### Rapid Reference 1.8 General and Specific Manifestations of Long-Term Retrieval (GLr) Weaknesses

<table>
<thead>
<tr>
<th>CHC Broad Cognitive Abilities/Neuropsychological Functions</th>
<th>Brief Definition</th>
<th>General Manifestations of Cognitive/Neuropsychological Weakness</th>
<th>Specific Manifestations of Cognitive/Neuropsychological Weakness</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Long-Term Retrieval (GLr)</strong></td>
<td>Ability to store information (e.g., concepts, words, facts), consolidate it, and fluently retrieve it at a later time (e.g., minutes, hours, days, and years) through association. In GLr tasks, information leaves immediate awareness long enough for the contents of primary memory to be displaced completely. In other words, GLr tasks (unlike Gsm tasks) do not allow for information to be maintained continuously in primary memory (Schneider &amp; McGrew, 2012). GLr abilities may be categorized as either ‘learning efficiency’ or ‘fluency.’ Learning efficiency narrow abilities include Associative Memory, Meaningful Memory, and Free Recall Memory; fluency narrow abilities involve either the production of ideas (e.g., Ideational Fluency, Associational Fluency), the recall of words (e.g., Naming Facility, Word Fluency), or the generation of figures (e.g., Figural Fluency, Figural Flexibility) (Schneider &amp; McGrew, 2012).</td>
<td><strong>Difficulties with:</strong>&lt;br&gt;Learning new concepts&lt;br&gt;Retrieving or recalling information by using association&lt;br&gt;Performing consistently across different task formats (e.g., recognition versus recall formats)&lt;br&gt;Rapid retrieval of information&lt;br&gt;Learning information quickly&lt;br&gt;Paired learning (visual-auditory)&lt;br&gt;Recalling specific information (words, facts)&lt;br&gt;Generating ideas rapidly</td>
<td><strong>Reading Difficulties:</strong>&lt;br&gt;Accessing background knowledge to support new learning while reading&lt;br&gt;Slow to access phonological representations during decoding&lt;br&gt;Retelling or paraphrasing what one has read&lt;br&gt;<strong>Math Difficulties:</strong>&lt;br&gt;Memorizing math facts&lt;br&gt;Recalling math facts and procedures&lt;br&gt;<strong>Writing Difficulties:</strong>&lt;br&gt;Accessing words to use during essay writing&lt;br&gt;Specific writing tasks (compare and contrast; persuasive writing)&lt;br&gt;Note-taking&lt;br&gt;Idea generation/production&lt;br&gt;<strong>Language Difficulties:</strong>&lt;br&gt;Expressive—circumlocutions, speech fillers, interrupted thought, pauses&lt;br&gt;Receptive—making connections throughout oral presentations (e.g., class lecture)</td>
</tr>
</tbody>
</table>

See Chapter 4 in *Essentials of Cross-Battery Assessment* (Flanagan, Ortiz, & Alfonso, 2013)
See Chapter 1 in *Essentials of Planning, Selecting, and Tailoring Interventions for Unique Learners* (Mascolo, Alfonso, & Flanagan, 2014)
### Rapid Reference 1.17 Factors That May Facilitate Learning and Aid in Bypassing or Minimizing the Effects of a Long-Term Retrieval (LTM) Deficit

<table>
<thead>
<tr>
<th>Classroom Instructional Factors</th>
<th>Instructional Materials</th>
<th>Environmental Factors</th>
<th>Strategies</th>
</tr>
</thead>
<tbody>
<tr>
<td>Use close-ended questions, yes/no, true/false</td>
<td>Guided lists for implementing procedures, formulas</td>
<td>Procedural charts</td>
<td>Organizes material to be learned using visual aids (e.g., diagrams, flowcharts), auditory aids (e.g., chunking), or other tangibles (e.g., flash cards)</td>
</tr>
<tr>
<td>Uses consistent instructional routines</td>
<td>Practice guides</td>
<td>Word walls</td>
<td>Makes connections by relating material to be learned to oneself</td>
</tr>
<tr>
<td>Offers repeated practice with and review of newly presented information</td>
<td>Online review</td>
<td>Desk organizers</td>
<td>Relates concepts to be learned to one another via tools such as a concept map</td>
</tr>
<tr>
<td>Teaches memory strategies and encourages their use (verbal rehearsal to support encoding, use of mnemonic devices; Dehn, 2010)</td>
<td>Glossaries (electronic, audio, printed)</td>
<td>External memory aids (lists, audible timers)</td>
<td>Creates a schedule for distributed practice of material to be learned</td>
</tr>
<tr>
<td>Uses multiple modalities when teaching new concepts (pair written or visual with verbal information) to support dual recoding (Dehn, 2010)</td>
<td>Study guides</td>
<td>Calendars with visual references to due dates</td>
<td>Plans for regular review of material</td>
</tr>
<tr>
<td>Limits the amount of new material to be learned; introduces new concepts gradually and with a lot of context</td>
<td>Review sheets</td>
<td>Visual reminders (Post-its, color-coded systems)</td>
<td>Rehearses material to be learned via recitation, repetition</td>
</tr>
</tbody>
</table>

(continued)
Relations between Gv Abilities and Reading Achievement

- **Gv** – Orthographic processing
Orthography (Wagner & Barker, 1994)

- The system of marks that make up the English language, including upper and lower case letters, numbers, and punctuation marks.
Assessing Visual Processing Related to Reading

- Visual processing must be assessed using **orthography** (letters, words and numbers) rather than abstract designs or familiar pictures
Assessing Orthographic Processing Related to Reading

- **Examples of assessments of orthographic processing directly related to reading:**
  - Test of Silent Word Reading Fluency-2 (TOSWRF-2)
  - Test of Irregular Word Reading Efficiency (TIWRE)
  - Test of Orthographic Competence (TOC)
  - Process Assessment of the Learner (PAL-II)
  - Early Reading Assessment (ERA)
  - Feifer Assessment of Reading (FAR)
### Rapid Reference 1.10 General and Specific Manifestations of Visual Processing (Gv) Weaknesses

<table>
<thead>
<tr>
<th>CHC Broad Cognitive Abilities/Neuropsychological Functions</th>
<th>General Manifestations of Cognitive/Neuropsychological Weakness</th>
<th>Specific Manifestations of Cognitive/Neuropsychological Weakness</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Visual Processing (Gv)</strong></td>
<td><strong>Difficulties with:</strong></td>
<td><strong>Reading Difficulties:</strong></td>
</tr>
<tr>
<td>- Ability to analyze and synthesize visual information.</td>
<td>- Recognizing patterns</td>
<td>- Orthographic coding (using visual features of letters to decode)</td>
</tr>
<tr>
<td>- The ability to make use of simulated mental imagery (often in conjunction with currently perceived images) to solve problems (Schneider &amp; McGrew, 2012).</td>
<td>- Reading maps, graphs, charts</td>
<td>- Sight-word acquisition</td>
</tr>
<tr>
<td>- There are many narrow Gv abilities, some of which include Visualization, Speeded Rotation, Closure Speed, Flexibility of Closure, Visual Memory, and Spatial Scanning.</td>
<td>- Attending to fine visual detail</td>
<td>- Using charts and graphs within a text in conjunction with reading</td>
</tr>
<tr>
<td>- Recalling visual information</td>
<td>- Appreciation of spatial characteristics of objects (e.g., size, length)</td>
<td>- Comprehension of text involving spatial concepts (e.g., social studies text describing physical boundaries, movement of troops along a specified route)</td>
</tr>
<tr>
<td>- Recognition of spatial orientation of objects</td>
<td></td>
<td>- Math Difficulties:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Number alignment during computations</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Reading and interpreting graphs, tables, and charts</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Writing Difficulties:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Spelling sight words</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Spatial planning during writing tasks (e.g., no attention to margins, words that overhang a line)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Inconsistent size, spacing, position, and slant of letters</td>
</tr>
</tbody>
</table>

See Chapter 4 in *Essentials of Cross-Battery Assessment* (Flanagan, Ortiz, & Alfonso, 2013)
See Chapter 1 in *Essentials of Planning, Selecting, and Tailoring Interventions for Unique Learners* (Mascolo, Alfonso, & Flanagan, 2014)
### Rapid Reference 1.19 Factors That May Facilitate Learning and Aid in Bypassing or Minimizing the Effects of a Visual Processing (Gv) Deficit

<table>
<thead>
<tr>
<th>Classroom Instructional Factors</th>
<th>Instructional Materials</th>
<th>Environmental Factors</th>
<th>Strategies</th>
</tr>
</thead>
<tbody>
<tr>
<td>Provide oral explanation for visual concepts</td>
<td>Video clips</td>
<td>Color-coded Information</td>
<td>Uses orthographic strategies for decoding (e.g., word length, shape of word); Uses &quot;cover-copy-compare&quot; technique—go to: <a href="http://www.amblesideprimary.com/ambleweb/lookcover/lookcover.html">http://www.amblesideprimary.com/ambleweb/lookcover/lookcover.html</a></td>
</tr>
<tr>
<td>Reviews spatial concept and supports comprehension through use of hands-on activities and manipulatives (e.g., using models to demonstrate the moon's orbital path).</td>
<td>Enlarged text (via online zoom feature or alternative print copy of textbook, worksheet)</td>
<td>Preferential seating aimed at allowing the student to access visual material (e.g., smart board) manipulatives, visual aids, and other materials to support learning</td>
<td>Capitalizes on intact or strong auditory skills during learning/studying (e.g., uses phonemic skills for decoding tasks)</td>
</tr>
<tr>
<td>Provides verbal label for visual representations (e.g., &quot;The shaded red bars represent women's votes, the green bars represent men's votes)</td>
<td>Highlights margins during writing tasks</td>
<td>Assigned note-taking buddy</td>
<td>Pairs visual information with verbal (mnemonics)</td>
</tr>
<tr>
<td>Provides written copies of oral instructions, lectures</td>
<td>Provides direct handwriting practice</td>
<td>Readers or scribes, where needed</td>
<td>Labels visual charts/graphs with verbal labels</td>
</tr>
<tr>
<td>Auditory cueing to supplement visual information/cues (e.g., &quot;Look at the bar graph for weekly sales&quot;)</td>
<td>Provides visual supports (graphic organizers, graph paper)</td>
<td>Reduce visual distraction</td>
<td>Highlights or color codes important information</td>
</tr>
</tbody>
</table>
**Rapid Reference 1.19  Factors That May Facilitate Learning and Aid in Bypassing or Minimizing the Effects of a Visual Processing (Gv) Deficit**

<table>
<thead>
<tr>
<th>Provides graph-paper to assist with number alignment</th>
<th>Alternative lighting (natural light, non-fluorescent lighting)</th>
<th>Uses aids to support visual tracking (finger, index card, ruler)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Books on tape</td>
<td></td>
<td>Spaces items on a page</td>
</tr>
<tr>
<td>Text-to-speech technology (screen and text readers)</td>
<td></td>
<td>Uses applications or supports that allow for enlargement of fonts</td>
</tr>
<tr>
<td>Reading/scanning pens</td>
<td></td>
<td>Uses note-taking strategies (e.g., Cornell, outlining)</td>
</tr>
</tbody>
</table>
### Rapid Reference 1.9 General and Specific Manifestations of Processing Speed (Gs) Weaknesses

<table>
<thead>
<tr>
<th>CHC Broad Cognitive Abilities/Neuropsychological Functions</th>
<th>Brief Definition</th>
<th>General Manifestations of Cognitive/Neuropsychological Weakness</th>
<th>Specific Manifestations of Cognitive/Neuropsychological Weakness</th>
</tr>
</thead>
<tbody>
<tr>
<td>Processing Speed (Gs)</td>
<td>Speed of processing, particularly when required to focus attention for 1–3 minutes. Usually measured by tasks that require the ability to perform simple repetitive cognitive tasks quickly and accurately. Narrow Gs abilities include Perceptual Speed, Rate-of-Test-Taking, Number Facility, Reading Speed, and Writing Speed (note that the latter two abilities are also listed under other broad CHC domains, including Gw).</td>
<td><strong>Difficulties with:</strong>&lt;br&gt;Efficient processing of information&lt;br&gt;Quickly perceiving relationships (similarities and differences between stimuli or information)&lt;br&gt;Working within time parameters&lt;br&gt;Completing simple, rote tasks quickly</td>
<td><strong>Reading Difficulties:</strong>&lt;br&gt;Slow reading speed, which interferes with comprehension&lt;br&gt;Need to reread for understanding</td>
</tr>
</tbody>
</table>
### Rapid Reference 1.18 Factors That May Facilitate Learning and Aid in Bypassing or Minimizing the Effects of a Processing Speed (Gs) Deficit

<table>
<thead>
<tr>
<th>Classroom Instructional Factors</th>
<th>Instructional Materials</th>
<th>Environmental Factors</th>
<th>Strategies</th>
</tr>
</thead>
<tbody>
<tr>
<td>Focuses on features of work products that are unrelated to time parameters (e.g., quality or accuracy of a response)</td>
<td>Practice guides</td>
<td>Clocks</td>
<td>Plan for long-term projects by using a realistic schedule that allows for consistent movement toward completion</td>
</tr>
<tr>
<td>Repeated practice</td>
<td>Online review</td>
<td>Written schedules</td>
<td>Preview important parts of text (end-of-chapter questions, title, subtitles, glossary of terms) to facilitate reading speed</td>
</tr>
<tr>
<td>Offers speed drills</td>
<td>Use computer activities that require quick, simple decisions</td>
<td>Desk organizers</td>
<td>Apply planning and time management strategies</td>
</tr>
<tr>
<td>Extended time</td>
<td>Books on tape</td>
<td></td>
<td>Use techniques such as skimming and scanning for reading activities</td>
</tr>
<tr>
<td>Reduces the quantity of work required (including homework)</td>
<td>Online activities/games (e.g., <a href="http://www.academicskillbuilders.com/games/">http://www.academicskillbuilders.com/games/</a>)</td>
<td></td>
<td>Use an outlining strategy for note-taking</td>
</tr>
<tr>
<td>Increases wait-times both after questions are asked and after responses are given</td>
<td>Choral repeated reading</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Note:** The online activities/games link is an example of how to facilitate learning and aid in bypassing or minimizing the effects of a processing speed (Gs) deficit.
General and Specific Manifestations of Cognitive Ability Weaknesses in SLD Identification

A specific learning disability (SLD) involves the presence of a cognitive processing weakness in one or more areas that is empirically or logically related to a documented academic weakness. While the primary form of data used to document cognitive ability weaknesses is standardized test scores, establishing ecological validity for a cognitive deficit involves the organization and analysis of additional data. For example, additional data that may be evaluated to support the presence of a cognitive ability weakness include information from behavior rating scales, parent and teacher interviews, classroom observations, prior evaluations, work sample analysis, and/or interviews with current or past teachers, counselors, and other paraprofessionals who have worked with the student. Below is a list of general and specific ways in which cognitive ability deficits manifest in real-world performance, specifically academic performance.

Directions: Complete the checklist below for any area identified as a cognitive ability weakness via standardized testing. Use the following codes next to a check-marked item to denote documentation source (P) = Parent; (T) = Teacher; (O) = Observations; (R) = Records review. More than one code may be used for a check-marked item.
Fluid Reasoning (Gf) (Check All that Apply):

Refers to a type of thinking that an individual may use when faced with a relatively new task that cannot be performed automatically. This type of thinking includes such things as forming and recognizing concepts (e.g., how are a dog, cat, and cow alike?), identifying and perceiving relationships (e.g., sun is to morning as moon is to night), drawing inferences (e.g., after reading a story, answering the question, “What will John do next?”), and reorganizing or transforming information (e.g., selecting one of several pictures to complete a puzzle). Overall, this ability can be thought of as a problem-solving type of intelligence. Problem-solving is important for reading comprehension (e.g., making inferences from text), math (e.g., figuring out how to set up a math problem by using information provided in a word problem), and writing (e.g., writing a persuasive essay).

General Manifestations

☐ Higher-level thinking and reasoning
☐ Deriving solutions for novel problems
☐ Transferring or generalizing learning
☐ Extending knowledge through critical thinking
☐ Perceiving and applying underlying rules and processes to solve problems

Specific Manifestations

Reading Difficulties

☐ Drawing inferences from text
☐ Abstracting main ideas
☐ Making predictions

Math Difficulties

☐ Reasoning with quantitative information (word problems)
☐ Internalizing procedures and processes used to solve problems
☐ Apprehending relationships between numbers

Writing Difficulties

☐ Essay writing and generalizing concepts
☐ Developing a theme
☐ Comparing and contrasting ideas

NOTES:
Crystallized Intelligence (Gc) (Check All that Apply):
Refers to an individual's knowledge base (or general fund of information) that has built up over time, beginning in infancy. It is like your own personal library or everything you know. Crystallized intelligence involves knowledge of one's culture (e.g., who is the President of the United States?) as well as verbal- or language-based knowledge that has been developed during general life experiences, and formal schooling (e.g., understanding words and their meaning; understanding street signs, knowledge of current events and the history of the United States). Having well developed or good Crystallized Intelligence means that one understands and uses language well, has an average or better vocabulary, has good listening skills, and is able to use language well via verbal expression.

General Manifestations

☐ Vocabulary acquisition
☐ Knowledge acquisition
☐ Finding the right words to use/say
☐ Using prior knowledge to support learning
☐ Fact-based/informational questions
☐ Comprehending language or understanding what others are saying

Specific Manifestations

Reading Difficulties

☐ Decoding (e.g., word student is attempting to decode is not in his/her vocabulary)
☐ Comprehending (e.g., poor background knowledge about information contained in text)

Math Difficulties

☐ Understanding math concepts and the "vocabulary of math"

Writing Difficulties

☐ Grammar (syntax)
☐ Bland writing with limited descriptors
☐ Verbose writing with limited descriptors
☐ Inappropriate word usage

Language Difficulties

☐ Understanding class lessons
☐ Expressive language - "poverty of thought"

NOTES:
Long-Term Storage and Retrieval (Glr) (Check All that Apply):

Refers to an individual’s ability to take in and store a variety of information (e.g., ideas, names, concepts) in one’s mind and then retrieve it quickly and easily at a later time by using association (e.g., remembering the names of one’s teachers and classmates). This ability does not represent what is stored in long-term memory or what you know. Rather, it represents the process of storing information, which is related to learning efficiency, as well as retrieving information. When someone says, “It’s on the tip of my tongue,” they are having a hard time retrieving something that they know. Sometimes children have difficulty “finding” information that they know and, therefore, cannot come up with a word or phrase that they learned.

General Manifestations

☐ Learning new concepts
☐ Paired learning (visual-auditory)
☐ Recalling specific information (words, facts)
☐ Performing consistently across different task formats (e.g., recognition versus recall formats)
☐ Rapid retrieval of information
☐ Learning information quickly
☐ Generating ideas rapidly
☐ Retrieving or recalling information by using association

See form for additional areas (i.e., Gsm, Gv, Ga, and Gs)

Specific Manifestations

Reading Difficulties

☐ Accessing background knowledge to support new learning while reading
☐ Slow to access phonological representations during decoding
☐ Retelling or paraphrasing what one has read

Math Difficulties

☐ Memorizing math facts
☐ Recalling math facts and procedures

Writing Difficulties

☐ Accessing words to use during essay writing
☐ Specific writing tasks (compare and contrast; persuasive writing)
☐ Note-taking
☐ Idea generation/production

Language Difficulties

☐ Expressive-circumlocutions speech fillers, “interrupted” thought, pauses
☐ Receptive – making connections throughout oral presentations (e.g., class lecture)

NOTES:
Manifestations Form

Determination of the severity of educational impact (Note: Decision is typically made by a multidisciplinary team).

- **Minimal.** Difficulty in one or two academic areas but the student *is able to function well* when provided with support services (e.g., accommodations).

- **Moderate.** Marked difficulties in one or more academic areas and the student is not likely to become proficient without some *intervals of specialized instruction* (e.g., *Tier II small group*) throughout schooling. *Support services may be needed* across settings in order for activities involving the academic skills to be performed effectively.

- **Substantial.** Deficits in one or more academic areas and the student is not likely to acquire and develop those skills without individualized and specialized instruction (e.g., *Tier III, special education*) throughout schooling. Even with support services, these students may not be able to perform academic skills effectively.

- **Assists in understanding how cognitive weaknesses interfere with learning and performance in the classroom**
- **Assists in obtaining ecological validity for test finds**
- **Assists in identifying targets for intervention**
- **Assists in determining severity of educational impact**

You are figuring out the “WHY”

When you know why, “HOW” is made easier
CHC QUIZ
The Person Who Made This Shirt Had Difficulty in What CHC Domain?
The Person Who Hung the Clock Had Difficulty in What CHC Domain?
The Person Who Placed Numbers on the Pole Had a Strength in What CHC Domain?
These Jobs/Careers Involve High Ability in What Primary CHC Domain?

- Librarian
- Short order cook
- Day Trader
- Receptionist, operator

Based on logical deductions given demands of the job
These Jobs/Careers Involve High Ability in What Primary CHC Domain?

- Teaching English, language arts, drama, and debate at k-12 or postsecondary institutions
- Professional writer; creative writer
- News correspondent

Based on logical deductions given demands of the job; see also McGrew and Flanagan (1998) for research support
These Jobs/Careers Involve High Ability in What Primary CHC Domain?

- Musician
- Conductor
- Music Teacher – fundamentals of pitch and rhythm
- Taking oral dictation

Based on logical deductions given demands of the job; see also McGrew and Flanagan (1998) for research support.
These Jobs/Careers Involve High Ability in What Primary CHC Domain?

- Air Traffic Controllers
- Detectives/FBI Agents
- Researchers

Based on logical deductions given demands of the job
These Jobs/Careers Involve High Ability in What Primary CHC Domain?

- Architecture and engineering
- Mathematician
- Auto mechanics and machine maintenance
- Welding and plumbing

Based on logical deductions given demands of the job; see also McGrew and Flanagan (1998) for research support.
The Person Who Created this Maze Had Difficulty in What CHC Domain?
Someone has difficulty with what CHC ability?
Interpretation of PSW

• Requires an understanding of contemporary 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
Cross-Battery Assessment

- Important for
  - Testing Hypotheses
  - Following up on aberrant score performance
  - Measuring constructs not found on the core battery but considered important based on referral information

<table>
<thead>
<tr>
<th>Visual Memory (MV)</th>
<th>Age Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>CAS-2</td>
<td>Figure Memory</td>
</tr>
<tr>
<td>DAS-II</td>
<td>Recall of Designs</td>
</tr>
<tr>
<td>DAS-II</td>
<td>Recognition of Pictures</td>
</tr>
<tr>
<td>KABC-II</td>
<td>Face Recognition</td>
</tr>
<tr>
<td>KBNA</td>
<td>Complex Figure 2</td>
</tr>
<tr>
<td>KSNA</td>
<td>Picture Recognition</td>
</tr>
<tr>
<td>KBNA</td>
<td>Spatial Location</td>
</tr>
<tr>
<td>NAB</td>
<td>Dots</td>
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<td>NAB</td>
<td>Driving Scenes</td>
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<td>NAB</td>
<td>Shape Learning</td>
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<td>NEPSY-II</td>
<td>Memory for Designs</td>
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<td>NEPSY-II</td>
<td>Memory for Faces</td>
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<td>RIAS</td>
<td>Nonverbal Memory</td>
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<td>Section A</td>
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<td>SIT</td>
<td>Section B</td>
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<td>Abstract Visual Memory</td>
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<tr>
<td>TOMAL-2</td>
<td>Facial Memory</td>
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<tr>
<td>TOMAL-2</td>
<td>Memory for Location</td>
</tr>
<tr>
<td>TVPS3</td>
<td>Visual Memory</td>
</tr>
<tr>
<td>WJ III NU COG</td>
<td>Picture Recognition</td>
</tr>
<tr>
<td>WJ IV COG</td>
<td>Picture Recognition</td>
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<tr>
<td>WMS-4</td>
<td>Designs I</td>
</tr>
<tr>
<td>WMS-4</td>
<td>Designs II Delayed Recall</td>
</tr>
<tr>
<td>WMS-4</td>
<td>Designs II Recognition</td>
</tr>
<tr>
<td>WMS-4</td>
<td>Spatial Addition</td>
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<td>WMS-4</td>
<td>Visual Reproduction I</td>
</tr>
<tr>
<td>WMS-4</td>
<td>Visual Reproduction II Delayed Recall</td>
</tr>
<tr>
<td>WMS-4</td>
<td>Visual Reproduction II Recognition</td>
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<tr>
<td>WNV</td>
<td>Recognition</td>
</tr>
<tr>
<td>WRAI-L2</td>
<td>Design Memory</td>
</tr>
<tr>
<td>WRAI-L2</td>
<td>Design Memory Recognition</td>
</tr>
<tr>
<td>WRAI-L2</td>
<td>Picture Memory</td>
</tr>
<tr>
<td>WRAI-L2</td>
<td>Picture Memory Recognition</td>
</tr>
</tbody>
</table>

X-BASS v2.0 (Flanagan, Ortiz, & Alfonso, 2017)
HISTORY AND DEFINITION

The Cross-Battery Assessment Approach
Findings of Woodcock’s (1990) Joint Factor Analysis of Cognitive Batteries

• The WJ-R measured eight broad $Gf-Gc$ cognitive abilities, while the other intelligence tests measured between three and five.

• When not using the WJ-R, it was suggested that clinicians “cross” batteries to obtain the information necessary for a particular evaluation.
The **Need** for Cross-Battery Assessment

A *WISC-III* detective strives to use ingenuity, clinical sense, a thorough grounding in psychological theory and research, and a willingness to **administer supplementary cognitive tests** to reveal the dynamics of a child’s scaled-score profile

(Kaufman, 1994)
<table>
<thead>
<tr>
<th>Test Battery</th>
<th>Gf</th>
<th>Gc</th>
<th>Gv</th>
<th>Gsm</th>
<th>Glr</th>
<th>Ga</th>
<th>Gs</th>
</tr>
</thead>
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The WJ-R provides additional tests to assist with adequate representation of Gc, Gsm, and Ga.
Definition of Cross-Battery Assessment

• A time-efficient method of organizing and interpreting cognitive and academic abilities and neuropsychological processes using more than one instrument in a manner that is psychometrically and theoretically defensible.

• Allows practitioners to measure reliably a wider (and/or more in-depth) range of cognitive, academic, and neuropsychological constructs than that represented by any given stand alone assessment battery.
XBA is used to systematically fill the holes in ability batteries to increase breadth and depth of measurement as may be required by the referral.

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## Construct Representation on the WISC

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<td>• $Gq, Gs, Gsm$ Underrepresented</td>
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<td>• $Gc, Gv, Gs, Gsm, Gf, Glr$ Adequate Representation</td>
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**Cross-Battery Assessment Enters the Field**

- **VIQ/PIQ:** Construct Irrelevant Variance
- **VIQ/PIQ Dropped**

---

### Cross-Battery Assessment

- *The Wechsler Test of Adult Intelligence* by Robert W. Wechsler
- *Cross-Battery Assessment of Intellectual Functioning* by Alan S. Kaufman and James C. Kaufman
Most Current Contributions of the XBA Approach to Psychological Evaluation

Refinements and Extensions to the Cross-Battery Approach

Significantly improved evidence base

Significantly improved and expanded software programs

- Data Management and Interpretive Assistant
- Pattern of Strengths and Weaknesses Analyzer
- Culture-Language Interpretive Matrix
Most Current Contributions of the XBA Approach to Psychological Evaluation

- Data Management and Interpretive Assistant
- Pattern of Strengths and Weaknesses Analyzer
- Culture-Language Interpretive Matrix

- All three programs have been integrated into one software system that substantially improves upon functionality and psychometrics
The Cross-Battery Assessment Approach

FOUNDATION: THEORY, CHC CLASSIFICATIONS OF TESTS, RELATIONS AMONG COGNITIVE ABILITIES, NEUROPSYCHOLOGICAL PROCESSES, AND ACADEMIC SKILLS
• The Cattell-Horn-Carroll (CHC) Theory as Defined by Schneider and McGrew (2012) with revisions and refinements underway based on their chapter in...

• Broad ability classifications of tests were necessary to guard against *construct irrelevant variance* in assessment

• Broad ability classifications were based on theory-driven cross-battery factor analyses

• Broad ability classifications also informed by factor analyses reported in current test manuals and expert consensus (Flanagan et al., 2013)
| Subtests in bold, uppercase type indicate that they were included in at least three cross-battery factor analyses that yielded consistent results. Thus, there is little doubt regarding the CHC broad abilities they measure. Subtests in bold, lowercase type indicate that they were included in two cross-battery factor analyses that yielded consistent results. Thus, it is likely that they are measures of the CHC broad abilities listed. Subtests in lowercase type indicate that they were included in only one cross-battery factor analysis or results of multiple analyses were inconsistent. Subtests in italics indicate that they were not included in any cross-battery factor analysis to date and thus, CHC broad ability classifications are based on expert consensus and within-battery factor analyses. |
• Narrow ability classifications of tests were necessary to guard against *construct underrepresentation* in assessment

• Narrow ability classifications were based largely on the results of content validity (expert consensus) studies
  – McGrew, 1997; Flanagan, Ortiz, & Alfonso, 2013; Flanagan, Ortiz, Alfonso, & Mascolo, 2006)
<table>
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See Appendix L in Essentials of Cross-Battery Assessment (3e) for Details of Expert Consensus Study.
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Neuropsychological domain classifications were intended to provide practitioners with more interpretive options and to facilitate the integration of psychometric and neuropsychological theories.
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</table>

*Note: A check mark (✓) indicates the authors’ classifications. A bullet (•) indicates the authors’ classification and Miller’s primary neuropsychological domain classification.*

Source: Appendix F in *Essentials of Cross-Battery Assessment*, third edition (Flanagan, Ortiz, & Alfonso, 2013)
SCHOOL NEUROPSYCHOLOGY CONSULTATION IN NEURODEVELOPMENTAL DISORDERS

SCOTT L. DECKER
Georgia State University

Additionally, the Cattell-Horn-Carroll (CHC) theory of intelligence and its operationalization in a Cross-Battery Assessment procedure may also improve school psychology assessment practice and facilitate the integration of neuropsychological methodology in school-based assessments. The CHC model benefits from more than a half-century of validity research on psychometric, developmental, heritability, academic outcome, and neurocognitive evidence (Flanagan & Harrison, 2005; Flanagan & Ortiz, 2005; McGrew, Keith, Flanagan, & Vanderwood, 1997). The CHC model is a multitiered model of intelligence, with tiers typically referred to as strata I, II, and III (Carroll, 1997). The broad abilities of stratum II are functionally similar to constructs measured in neuropsychology, although labels used to describe the measurements may differ (Dean et al., 2003). For example, neuropsychologists are familiar with constructs like executive functions, with such tests as the Wisconsin Card Sorting Test, Halstead’s Category Test, and the Trail Making Test, whereas school psychologists use equivalent concepts, like fluid intelligence. Psychometrically, these constructs are highly related but may differ in theoretical specifications (Decker, Hill, & Dean, 2007). The CHC and Cross-Battery Assessment approaches shift assessment practice from IQ composites to neurodevelopmental functions. This transition can be facilitated by training in contemporary psychometric models (Flanagan, Ortiz, & Alfonso, 2007). Furthermore, integrating Cross-Battery Assessment approaches within a global hypothesis-testing approach (Hale & Fiorello, 2004) may provide the best “alternative” method that meets federal requirements for a comprehensive evaluation.
• Important for informing diagnosis of specific learning disabilities

• Important for developing educational strategies, and selecting and tailoring interventions
<table>
<thead>
<tr>
<th>CHC Abilities</th>
<th>Reading Achievement</th>
<th>Math Achievement</th>
<th>Writing Achievement</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Gf</strong></td>
<td>Inductive (I) and general sequential reasoning (RG) abilities play a moderate role in <strong>reading comprehension</strong>. Executive functions, such as planning, organization, and self-monitoring are also important.</td>
<td>Reasoning inductively and deductively with numbers (RQ) is very important for <strong>math problem solving at all ages</strong>. Executive functions, such as set shifting and cognitive inhibition are also important.</td>
<td>Inductive (I) and general sequential reasoning abilities (RG) are consistently related to <strong>written expression</strong> at all ages. Executive functions, such as attention, planning, and self-monitoring are also important.</td>
</tr>
<tr>
<td><strong>Gc</strong></td>
<td>Language development (LD), lexical knowledge (VL), and listening ability (LS) are important at all ages for <strong>reading acquisition and development</strong>. These abilities become increasingly important with age. Oral Language, Listening Comprehension, and EF (planning, organization, self-monitoring) also important for <strong>reading comprehension</strong>.</td>
<td>Language development (LD), lexical knowledge (VL), and listening abilities (LS) are important at all ages. These abilities become increasingly important with age. Number representation (e.g., quantifying sets without counting, estimating relative magnitude of sets) and number comparisons related to overall <strong>Number Sense</strong>.</td>
<td>Language development (LD), lexical knowledge (VL), and general information (K0) are important primarily after about the 2&lt;sup&gt;nd&lt;/sup&gt; grade. These abilities become increasingly important with age. Level of knowledge of syntax, morphology, semantics, and VL has a significant impact on clarity of <strong>written expression</strong> and text generation ability.</td>
</tr>
<tr>
<td><strong>Gwm</strong></td>
<td>Memory span (MS) and <strong>working memory capacity (WM)</strong> or attentional control. <strong>Gwm important for overall reading success</strong>. Phonological memory or WM for verbal and sound-based information may also be important.</td>
<td>Memory span (MS) and <strong>working memory capacity (WM)</strong> or attentional control. <strong>Gwm important for math problem solving</strong> and overall success in math.</td>
<td>Memory span (MS) is important to writing, especially <strong>spelling</strong> skills whereas working memory has shown relations with advanced writing skills (e.g., <strong>written expression</strong>; synthesizing multiple ideas, ongoing self-monitoring). <strong>Gwm important for overall writing success</strong>.</td>
</tr>
<tr>
<td><strong>Gv</strong></td>
<td><strong>Orthographic Processing</strong> (often measured by tests of perceptual speed that use orthographic units as stimuli) – <strong>reading rate and fluency</strong>.</td>
<td>Visualization (VZ), including mental rotation, is important primarily for higher level (e.g., geometry, calculus) and <strong>math problem solving</strong>.</td>
<td><strong>Orthographic Processing</strong> (often measured by tests of perceptual speed that use orthographic units as stimuli) - <strong>spelling</strong></td>
</tr>
<tr>
<td><strong>Ga</strong></td>
<td><strong>Phonetic coding (PC)</strong> or “phonological awareness/processing” is very important during the elementary school years for the development of <strong>basic reading skills</strong>. Phonological memory or WM for verbal and sound-based information may also be important.</td>
<td><strong>Phonetic coding (PC)</strong> or “phonological awareness/processing” is very important during the elementary school years for both <strong>basic writing skills</strong> and <strong>written expression (primarily before about grade 5)</strong>.</td>
<td><strong>Phonetic coding (PC)</strong> or “phonological awareness/processing” is very important during the elementary school years for <strong>written expression (primarily before about grade 5)</strong>.</td>
</tr>
<tr>
<td><strong>Glr</strong></td>
<td><strong>Naming facility (NA)</strong> or “rapid automatic naming” (also called speed of lexical access) is very important during the elementary school years for <strong>reading rate and fluency</strong>. Associative memory (MA) is also important.</td>
<td><strong>Naming Facility (NA); or speed of lexical access); Associative Memory (MA) – memorization and rapid retrieval of basic math facts; accurate and fluent calculation.</strong></td>
<td>**Naming facility (NA) or “rapid automatic naming” (also called speed of lexical access) has demonstrated relations with written expression, primarily <strong>writing fluency</strong>. Storing and retrieving commonly occurring letter patterns in visual and motor memory are needed for <strong>spelling</strong>.</td>
</tr>
<tr>
<td><strong>Gs</strong></td>
<td><strong>Perceptual speed (P) abilities are important during all school years, particularly the elementary school years.</strong></td>
<td><strong>Perceptual speed (P) important during all years, especially the elementary school years for math calculation fluency.</strong></td>
<td><strong>Perceptual speed (P) abilities are important during all school years for basic writing and related to all ages for written expression.</strong></td>
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GUIDING PRINCIPLES – VERY BRIEF REVIEW

The Cross-Battery Assessment Approach
XBA Guiding Principles

I. Select a battery that best addresses the referral concerns and that is the best fit for the student
   – Consider co-normed tests first

II. Use clusters based on *actual norms* when they are available
   – Clusters yielded from the actual test battery rather than formulae based on subtest reliabilities and intercorrelations (although differences between actual norm-based clusters and those generated via formulae are *negligible*).
A Comparison of Two-Subtest Clusters Generated Three Different Ways

- M1: XBA Mean
- M2: WISC-IV Norms
- M3: Cluster Generator
EFI = Matrix Reasoning + Figure Weights + Picture Concepts + Arithmetic

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<th>Percentile Rank</th>
<th>90% Confidence Interval</th>
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### X-BASS

**Sum of Scaled Scores = 37**

#### Table 1: Verbal (Expanded Crystallized) Index Equivalents of Sums of Scaled Scores

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#### Crystallized Intelligence (Gc)

- WISC-V Similarities (Gc-VLg/f1)
- WISC-V Vocabulary (Gc-VL)
- WISC-V Information (Gc-KO)
- WISC-V Comprehension (Gc-KO)

**Composite Score Analysis:**

- SS: 95
- PR: 38

**Score configuration and interpretation:**

The difference between the highest and lowest scores is less than or equal to 1 and 1/3 SD 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.

---

### X-BASS

**Sum of Scaled Scores = 30**

#### Table 1: Verbal (Expanded Crystallized) Index Equivalents of Sums of Scaled Scores

<table>
<thead>
<tr>
<th>Sum of Scaled Scores</th>
<th>VECI</th>
<th>Percentile Rank</th>
<th>90% Confidence Interval</th>
<th>95% Confidence Interval</th>
</tr>
</thead>
<tbody>
<tr>
<td>30</td>
<td>85</td>
<td>16</td>
<td>81-91</td>
<td>80-92</td>
</tr>
<tr>
<td>31</td>
<td>87</td>
<td>19</td>
<td>82-93</td>
<td>81-94</td>
</tr>
<tr>
<td>32</td>
<td>88</td>
<td>21</td>
<td>83-94</td>
<td>82-95</td>
</tr>
<tr>
<td>33</td>
<td>89</td>
<td>23</td>
<td>84-95</td>
<td>83-96</td>
</tr>
<tr>
<td>34</td>
<td>91</td>
<td>27</td>
<td>86-97</td>
<td>85-98</td>
</tr>
<tr>
<td>35</td>
<td>93</td>
<td>32</td>
<td>88-99</td>
<td>87-100</td>
</tr>
<tr>
<td>36</td>
<td>95</td>
<td>37</td>
<td>90-100</td>
<td>89-101</td>
</tr>
<tr>
<td>37</td>
<td>96</td>
<td>39</td>
<td>91-101</td>
<td>90-102</td>
</tr>
<tr>
<td>38</td>
<td>98</td>
<td>45</td>
<td>93-103</td>
<td>92-104</td>
</tr>
<tr>
<td>39</td>
<td>99</td>
<td>47</td>
<td>94-104</td>
<td>93-105</td>
</tr>
<tr>
<td>40</td>
<td>100</td>
<td>50</td>
<td>95-105</td>
<td>94-106</td>
</tr>
</tbody>
</table>

#### Crystallized Intelligence (Gc)

- WISC-V Similarities (Gc-VLg/f1)
- WISC-V Vocabulary (Gc-VL)
- WISC-V Information (Gc-KO)
- WISC-V Comprehension (Gc-KO)

**Composite Score Analysis:**

- SS: 75
- PR: 43

**Score configuration and interpretation:**

Because the difference between the highest and lowest scores entered is greater than 1 and 1/3 SD, this set of scores is considered cohesive, indicating that a composite based on all four scores is unlikely to provide a good summary of the ability it is intended to represent. Instead, the two lowest scores form one cohesive composite (Comp A) that may be interpreted meaningfully and the two highest scores also form another cohesive composite (Comp B) that may be interpreted meaningfully.

**XBA Guiding Principle:** Use Actual Norms Whenever They Are Available
When differences occur they are *negligible* (i.e., not significant). X-BASS composites are derived using the most psychometrically defensible procedures.
III. Select tests classified through an acceptable method

- Joint or Cross-Battery Factor Analyses and/or Expert Consensus
  - There is more agreement than disagreement in the field on the broad and narrow abilities that are measured by subtests on popular batteries

See XBA-CHC Test List on the INDEX tab in X-BASS v2.0
Cross-Battery Assessment Software System (X-BASS® v2.0)

Test Reference List - CHC, SLD & Neuropsych Classifications

Conceptualization by D.P. Flanagan, S.O. Ortiz, V.C. Alfonso; Programming by S.O. Ortiz and A.M. Dynda
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All subtests are classified in one of the broad CHC domains according to narrow ability (blue buttons). In addition to their CHC classifications, subtests that correspond to areas of achievement, as defined in the IDEA categories for Specific Learning Disability, are also listed for reference by academic domain (purple buttons). Likewise, subtests that correspond to areas of neuropsychological or other cognitive functions not included under CHC theory, are also listed for reference by specific domain (tan buttons). Click on any button to scroll directly to the listings for that domain.

**CHC Broad Domains**
- Gc
- Gf
- Glr
- Gsm
- Gv
- Ga
- Gs
- Gkn
- Grw-R
- Grw-W
- Gq

**IDEA SLD Categories**
- BRS
- RC
- RF
- WE
- MC
- MPS
- OE
- LC

**Neuropsychological and Other Cognitive Domains**
- EF
- OP
- LA
- CE

---

**Gc - Crystallized Intelligence**

**Communication Ability (CM)**

<table>
<thead>
<tr>
<th>Subtest</th>
<th>Age Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>CELF-4 Formulated Sentences (Gc:CM)</td>
<td>5-21</td>
</tr>
<tr>
<td>CELF-5 Formulated Sentences (Gc:CM)</td>
<td>5-21</td>
</tr>
<tr>
<td>DELV-NR Pragmatics (Gc:CM,LD)</td>
<td>4-9</td>
</tr>
<tr>
<td>KBNA Picture Description Oral (Gc:CM)</td>
<td>26-89</td>
</tr>
<tr>
<td>NAB Oral Production (GcCM)</td>
<td>18-97</td>
</tr>
<tr>
<td>PLAI 2 Expressive (GcCM,VLGf:RG)</td>
<td>3-5</td>
</tr>
<tr>
<td>SPELT-3 Structured Photographic Expressive Lang. Test (Gc:CM,LD)</td>
<td>4-9</td>
</tr>
<tr>
<td>TAL Oral Narration (Gc:CM,LD,Gl:MM)</td>
<td>5-11</td>
</tr>
</tbody>
</table>

**Lexical Knowledge (VL)**

<table>
<thead>
<tr>
<th>Subtest</th>
<th>Age Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>APAT Semantic Relationships (GcVL,Glf:Gl)</td>
<td>5-12</td>
</tr>
<tr>
<td>Bateria III COG Comprehension Verbal (Gc:VL,Gl)</td>
<td>2.90+</td>
</tr>
<tr>
<td>BBCS-3R Direction/Position (Gc:VL)</td>
<td>3-6</td>
</tr>
<tr>
<td>BBCS-3R Quantity (Gc:VL,Gl:KM)</td>
<td>3-6</td>
</tr>
<tr>
<td>BBCS-3R Self/Social Awareness (Gc:VL,Glkn:BC)</td>
<td>3-6</td>
</tr>
<tr>
<td>BBCS-3R Subtests 1-5 (SRC) (Gc:VL,LLD)</td>
<td>3-6</td>
</tr>
<tr>
<td>BBCS-3R Texture/Material (Gc:VL)</td>
<td>3-6</td>
</tr>
<tr>
<td>BBCS-3R Time/Sequence (Gc:VL)</td>
<td>3-6</td>
</tr>
<tr>
<td>BBCS-E Direction/Position (Gc:VL)</td>
<td>3-6</td>
</tr>
<tr>
<td>BBCS-E Quantity (Gc:VL,GQ:KM)</td>
<td>3-6</td>
</tr>
<tr>
<td>BBCS-E Self/Social Awareness (Gc:VL,Glkn:BC)</td>
<td>3-6</td>
</tr>
<tr>
<td>BBCS-E Subtests 1-5 (SRC) (Gc:VL,LLD)</td>
<td>3-6</td>
</tr>
<tr>
<td>BBCS-E Texture/Material (Gc:VL)</td>
<td>3-6</td>
</tr>
<tr>
<td>BBCS-E Time/Sequence (Gc:VL)</td>
<td>3-6</td>
</tr>
<tr>
<td>BSRA-3 Colors (Gc:VL)</td>
<td>3-6</td>
</tr>
<tr>
<td>BSRA-3 Size Comparisons (Gc:VL)</td>
<td>3-6</td>
</tr>
<tr>
<td>BVAT NU Oral Vocabulary (Gc:VL)</td>
<td>4.90+</td>
</tr>
<tr>
<td>BVAT NU Picture Vocabulary (Gc:VL)</td>
<td>4.90+</td>
</tr>
</tbody>
</table>

**General Verbal Information (K0)**

<table>
<thead>
<tr>
<th>Subtest</th>
<th>Age Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>APAT Sentence Absurdities (Gc:K0,Gf:RG)</td>
<td>5-12</td>
</tr>
<tr>
<td>Bateria III COG Informacion General (Gc:K0)</td>
<td>2-9.0+</td>
</tr>
<tr>
<td>BSRA-3 Letters (Gc:K0)</td>
<td>3-6</td>
</tr>
<tr>
<td>BSRA-3 Shapes (Gc:K0)</td>
<td>3-6</td>
</tr>
<tr>
<td>FAR Print Knowledge (Gc:K0)</td>
<td>4-21</td>
</tr>
<tr>
<td>KABC II Story Completion (5-6 years) (Gc:K0,Gf:RG)</td>
<td>5-6</td>
</tr>
<tr>
<td>KBNA Clocks (Gc:K0,Gv:Ku)</td>
<td>20-89</td>
</tr>
</tbody>
</table>

---

**Go to XBA Gc**

**Back to Top**
• Use two or more *qualitatively different* narrow ability indicators to represent each *broad* ability domain

• Use two or more *qualitatively similar* narrow ability indicators to represent each *narrow* ability domain

• *Is a single subtest ever enough?*
  • Only when converging data sources exist to support the score – ecological validity
  • Risky with low scores
  • Remember: *Single measures make for poor measurement*

*Every rule has an exception. There is no exception to this rule.*
XBA Guiding Principles

IV. When broad abilities are underrepresented, go out of battery

- Two qualitatively different indicators from another battery
- Or one qualitatively different indicator and use XBA Analyzer Tab to create a broad ability composite
XBA Guiding Principles

V. When crossing batteries use tests developed and normed within a few years of one another
   – Flynn effect
   – All tests in Cross-Battery book and X-BASS were normed within about 10-12 years of one another

VI. Select tests from the smallest number of batteries
   – to minimize error that may be the result of differences in norm sample characteristics

VII. Establish ecological validity for test findings – e.g., manifestation of weaknesses or deficits
**Manifestations Tables**

*Found in Mascolo, Flanagan, and Alfonso (2014). Chapter 1*

---

**Fluid Reasoning (Gf) (Check All that Apply):**

Refers to a type of thinking that an individual may use when faced with a relatively new task that cannot be performed automatically. This type of thinking includes such things as forming and recognizing concepts (e.g., how are a dog, cat, and cow alike?), identifying and perceiving relationships (e.g., sun is to morning as moon is to night), drawing inferences (e.g., after reading a story, answering the question, “What will John do next?”), and reorganizing or transforming information (e.g., selecting one of several pictures to complete a puzzle). Overall, this ability can be thought of as a *problem-solving* type of intelligence. Problem-solving is important for reading comprehension (e.g., making inferences from text), math (e.g., figuring out how to set up a math problem by using information provided in a word problem), and writing, (e.g., writing a persuasive essay).

**General Manifestations**

- Higher-level thinking and reasoning
- Transferring or generalizing learning
- Perceiving and applying underlying rules and processes to solve problems
- Deriving solutions for novel problems
- Extending knowledge through critical thinking

**Specific Manifestations**

**Reading Difficulties**

- Drawing inferences from text
- Abstracting main ideas
- Making predictions

**Math Difficulties**

- Reasoning with quantitative information (word problems)
- Internalizing procedures and processes used to solve problems
- Apprehending relationships between numbers

**Writing Difficulties**

- Essay writing and generalizing concepts
- Developing a theme
- Comparing and contrasting ideas

**NOTES:**
What’s Next?

Description of the PSW method and conceptual similarities among PSW methods; description of the Dual Discrepancy/Consistency (DD/C) operational definition of SLD – a PSW method; and understanding of the SLD construct
An Operational Definition of SLD
Flanagan, Ortiz, Alfonso, and Mascolo

• Definition first presented in 2002
• Revised and updated in 2006
• Updated in 2007
An Operational Definition of SLD

Revised and updated in 2011
Updated in Essentials of Cross-Battery Assessment, 3e (2013) and renamed:
Dual Discrepancy/Consistency (DD/C) Method
Operationalized in X-BASS (2017) – most sophisticated and psychometrically defensible PSW model to date
The Dual Discrepancy/Consistency (DD/C) Operational Definition of SLD

<table>
<thead>
<tr>
<th>Level</th>
<th>Nature of SLD</th>
<th>Focus of Evaluation</th>
<th>Examples of Evaluation Methods and Data Sources</th>
<th>Criteria for SLD</th>
<th>SLD Classification and Eligibility</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>Difficulties in one or more areas of academic achievement, including (but not limited to): Basic Reading Skill, Reading Comprehension, Reading Fluency, Oral Expression, Listening Comprehension, Written Expression, Math Calculation, Math Problem Solving.</td>
<td>Academic Achievement: Performance in specific academic skills [e.g., GR-O (reading decoding, reading fluency, reading comprehension), GR-W (spelling, written expression), Gc (math calculation, math problem solving), Gs (communication ability, listening ability)].</td>
<td>Response to quality instruction and intervention via progress monitoring, performance on norm-referenced, standardized achievement tests, evaluation of work samples, observations of academic performance, teacher/parent/student interview, history of academic performance, data from other members of Multidisciplinary Team (MDT) (e.g., speech-language pathologist, interventionist, reading specialist).</td>
<td>Performance in one or more academic areas is weak or deficient² (despite attempts at delivering quality instruction) as evidenced by converging data sources. Results from the WJ IV intra-achievement variation procedure may be used as one data source, especially when academic area(s) identified as a weakness has an associated standard score that is weak or deficient.</td>
<td>Necessary</td>
</tr>
<tr>
<td>II</td>
<td>SLD does not include a learning problem that is the result of visual, hearing, or motor disabilities; of intellectual disability; of social or emotional disturbance; or of environmental, educational, cultural, or economic disadvantage.</td>
<td>Exclusionary Factors: Identification of potential primary causes of academic skill weaknesses or deficits, including intellectual disability, cultural or linguistic difference, sensory impairment, insufficient instruction or opportunity to learn, organic or physical health factors, social/emotional or psychological disturbance.</td>
<td>Data from the methods and sources listed at Levels I and III. Behavior Rating Scales; medical records; prior evaluations; interviews with current or past counselors, psychiatrists, etc.</td>
<td>Performance is not primarily attributed to these exclusionary factors, although one or more of them may contribute to learning difficulties. [Consider using the Exclusionary Factors Form, which may be downloaded from <a href="http://www.crossbattery.com">www.crossbattery.com</a> under “resources.”]</td>
<td></td>
</tr>
<tr>
<td>III</td>
<td>A disorder in one or more of the basic psychological/neuropsychological processes involved in understanding or in using language, spoken or written; such disorders are presumed to originate from central nervous system dysfunction.</td>
<td>Cognitive Abilities &amp; Processes: Performance in cognitive abilities and processes (e.g., Gv, Ga, Gll, Gsm, Gc, specific neuropsychological processes (e.g., attention, executive functioning, orthographic processing; RAN: RAS) and learning efficiency (e.g., associative memory, free recall memory, meaningful memory).</td>
<td>Performance on norm-referenced tests, evaluation of work samples, observations of cognitive performance, task analysis, testing limits, teacher/parent/student interview, history of academic performance, records review.</td>
<td>Performance in one or more cognitive abilities and/or neuropsychological processes (related to academic skill deficiency) is weak or deficient² as evidenced by converging data sources.</td>
<td></td>
</tr>
</tbody>
</table>

| IV | Pattern of Strengths and Weaknesses (PSW) Marked by a Dual-Discrepancy/Consistency (DD/C) Determination of whether academic skill weaknesses or deficits are related to specific cognitive area(s) of weakness or deficit; pattern of data reflects a below average aptitude-achievement consistency with otherwise average or better ability to think and reason. | Data gathered at all previous levels as well as any additional data following a review of initial evaluation results (e.g., data gathered for the purpose of hypothesis testing; data gathered via demand analysis and limits testing). | Circumscribed below average aptitude-achievement consistency (i.e., related cognitive processes and academic skills are generally about 1SD below the mean or lower); circumscribed ability-achievement and ability-cognitive aptitude discrepancies, with cognitive areas of strength represented by standard scores that are generally ≥90 (include SEM around score); clinical judgment supports the impression that the student’s overall ability to think and reason will enable him or her to benefit from tailored or specialized instruction/intervention, compensatory strategies, and accommodations, such that has or her performance rate and level will likely approximate more typically achieving, non-disabled peers. Use the Cross-Battery Assessment Software System (X-BASS; Ortiz, Flanagan, & Alfonso, 2013) to conduct the PSW analysis. | | Sufficient For SLD Identification |

| V | Specific learning disability has an adverse impact on educational performance. | Special Education Eligibility\(^4\) Determination of Least Restrictive Environment (LRE) for delivery of instruction and educational resources. | Data from all previous levels and MDT meeting, including parents. | Student demonstrates significant difficulties in daily academic activities that cannot be remediated, accommodated, or otherwise compensated for without the assistance of individualized special education services. | Necessary for Special Education Eligibility |

---

\(^1\)This column includes concepts inherent in the federal definition (IDEA, 2004), Kavale, Spaulding, and Beam’s (2009) definition, Hamson and Holmes’ (2012) consensus definition, and other prominent definitions of SLD (see Sotelo-Dynega, Flanagan, & Alfonso, 2011 for a summary). Thus, all prominent SLD markers are included in this column.

\(^2\)Poor spelling with a dequate ability to express ideas in writing is often typical of dyslexia and/or dysgraphia. Even though IDEA 2004 includes only the broad category of written expression, poor spelling and handwriting are often symptomatic of a specific writing disability and should not be ignored (Wendling & Mather, 2009).

\(^3\)Weak performance is typically associated with standard scores in the 85–89 range, whereas deficient performance is often associated with standard scores that are around 1SD below the mean or lower. Interpretations of weak or deficient performance based on standard scores that fall in these ranges are bolstered when they have ecological validity (e.g., when there is evidence that the abilities or processes identified as weak or deficient manifest in everyday classroom activities that require these abilities and processes).

\(^4\)The major specific learning disability may be accompanied by secondary learning difficulties that also may be considered when planning the more intensive, individualized special education instruction directed at the primary problem. For information on linking assessment data to intervention, see Mascolo, Flanagan, and Alfonso (2014).
Alternative Research-Based Approaches to SLD Identification

- **PSW Methods:**
  - Flanagan, Ortiz, Alfonso, & Mascolo (2002-Present)
    - Dual-Discrepancy/Consistency (within the context of an Operational Definition of SLD and a broader approach to “best practices” in CHC-based assessment) – *automated in X-BASS*
    - Discrepancy/Consistency (PASS Model; CAS-2 battery) – *battery specific*
    - Concordance-discordance model (based on neuropsych theory within the context of an hypothesis testing approach) – *not automated*
  - Dehn & Szasz – Psychological Processing Analyzer-5
    - (remarkably similar to the PSW-A component of X-BASS, although not as comprehensive, or psychometrically sophisticated, or theoretically driven)
  - **WISC-V**
    - two discrepancy comparisons for PSW – *automated in WIAT-III, KTEA-III scoring programs*

D. P. Flanagan, 2017
The Focus Here is on the DD/C Model

**PSW Methods:**

- Flanagan, Ortiz, Alfonso, & Mascolo (2002-Present)
  - Dual-Discrepancy/Consistency (within the context of an Operational Definition of SLD and a broader approach to “best practices” in CHC-based assessment) – automated in X-BASS
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- WISC-V
  - two discrepancy comparisons for PSW – automated in WIAT-III, KTEA-III scoring programs
Conceptual Understanding of the Dual Discrepancy/Consistency (DD/C) Method

**COGNITIVE STRENGTHS**

*Aggregate of cognitive strengths suggest at least average general ability*

May be supported by typically developing academic skills

**ACADEMIC WEAKNESS/DEFICIT**

Actual academic area of weakness is significantly lower than expected based on estimated general cognitive ability

*Academic deficit(s) is unexpected because aggregate of cognitive strengths is at least average (i.e., 85 or higher) (and other factors were ruled out, such as inadequate instruction)*

**COGNITIVE WEAKNESS/DEFICIT**

Cognitive Ability and/or Processing Weaknesses

Actual cognitive area of weakness is significantly lower than expected based on estimated general cognitive ability

*Cognitive deficit(s) is specific, not general or pervasive, because aggregate of cognitive strengths suggests at least average general ability (i.e., 85 or higher)*

**ACADEMIC WEAKNESS/DEFICIT**

Academic Skills Weaknesses

Cognitive and academic weaknesses/deficits are approximately 1SD below the mean or lower (cognitive and academic areas of weakness are related empirically and relationship is ecologically valid)

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

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

• Involves more than just examining scores from standardized tests
  – A convergence of data sources is necessary
  – Data should be gathered via different methods
  – Exclusionary factors must be considered and examined systematically
Evaluation and Consideration of Exclusionary Factors for SLD Identification

An evaluation of specific learning disability (SLD) requires an evaluation and consideration of factors, other than a disorder in one or more basic psychological processes that may be the primary cause of a student’s academic skill weaknesses and learning difficulties. These factors include (but are not limited to), vision/hearing\(^1\), or motor disabilities, intellectual disability (ID), social/emotional or psychological disturbance, environmental or economic disadvantage, cultural and linguistic factors (e.g., limited English proficiency), insufficient instruction or opportunity to learn and physical/health factors. These factors may be evaluated via behavior rating scales, parent and teacher interviews, classroom observations, attendance records, social/developmental history, family history, vision/hearing exams\(^1\), medical records, prior evaluations, and interviews with current or past counselors, psychiatrists, and paraprofessionals who have worked with the student. Noteworthy is the fact that students with (and without) SLD often have one or more factors (listed below) that \textit{contribute} to academic and learning difficulties. However, the practitioner must rule out any of these factors as being the \textit{primary} cause of a student’s academic and learning difficulties to maintain SLD as a viable classification/diagnosis.

\(^1\)Vision/hearing: This refers to factors that may influence a student's ability to learn and succeed in school. It includes issues related to visual or hearing impairments.
Flanagan et al.’s DD/C Definition of SLD: Level II – Review of Exclusionary Factors

**Vision (Check All that Apply):**

- [ ] Vision test recent (within 1 year)
- [ ] Vision test outdated (> 1 year)
- [ ] Passed
- [ ] Failed
- [ ] Wears Glasses
- [ ] History of visual disorder/disturbance
- [ ] Diagnosed visual disorder/disturbance
- [ ] Vision difficulties suspected or observed
  (e.g., difficulty with far or near point copying, misaligned numbers in written math work, squinting or rubbing eyes during visual tasks such as reading, computers)

**Name of disorder:** ________________

**NOTES:** ____________________________________________
| __________________________________________________________ |
| __________________________________________________________ |
| __________________________________________________________ |
Flanagan et al.’s DD/C Definition of SLD: Level II – Review of Exclusionary Factors

<table>
<thead>
<tr>
<th>Hearing (Check All that Apply)²:</th>
<th>□ History of auditory disorder/disturbance</th>
</tr>
</thead>
<tbody>
<tr>
<td>□ Hearing test recent (within 1 year)</td>
<td>□ Diagnosed auditory disorder/disturbance</td>
</tr>
<tr>
<td>□ Hearing test outdated (&gt; 1 year)</td>
<td>□ Name of disorder: ______________________</td>
</tr>
<tr>
<td>□ Passed</td>
<td>□ Hearing difficulties suggested in the referral</td>
</tr>
<tr>
<td>□ Failed</td>
<td>(e.g., frequent requests for repetition of auditory information, misarticulated words, attempts to self-accommodate by moving closer to sound source, obvious attempts to speech read)</td>
</tr>
<tr>
<td>□ Uses Hearing Aids</td>
<td></td>
</tr>
</tbody>
</table>

NOTES:__________________________________________________________________________
__________________________________________________________________________
### Flanagan et al.’s DD/C Definition of SLD: Level II – Review of Exclusionary Factors

**Motor Functioning (Check All that Apply):**

- **☐** Fine Motor Delay/Difficulty
- **☐** Gross Motor Delay/Difficulty
- **☐** Improper pencil grip (Specify type: ____________)
- **☐** Assisting devices/aids used (e.g., weighted pens, pencil grip, slant board)
- **☐** History of motor disorder
- **☐** Diagnosed motor disorder
- **☐** Name of disorder: ______________
- **☐** Motor difficulties suggested in the referral (e.g., illegible writing; issues with letter or number formation, size, spacing; difficulty with fine motor tasks such as using scissors, folding paper)

**NOTES:**

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________
Flanagan et al.’s DD/C Definition of SLD: Level II – Review of Exclusionary Factors

Cognitive and Adaptive Functioning (Check All that Apply):

☐ Significantly “subaverage intellectual functioning” (e.g., IQ score of 75 or below)

☐ Pervasive cognitive deficits (e.g., weaknesses or deficits in many cognitive areas, including Gf and Gc)

☐ Deficits in adaptive functioning (e.g., social, communication, self-care)

Areas of significant adaptive skill weaknesses (check all that apply):

☐ Motor Skill ☐ Communication ☐ Socialization

☐ Daily Living Skills ☐ Behavior/Emotional Skills ☐ Other

NOTES: __________________________________________________
__________________________________________________________
__________________________________________________________
Social-Emotional/Psychological Factors (Check All that Apply):

☐ Diagnosed psychological disorder (Specify: ____________________________)

☐ Date of Diagnosis

☐ Family history significant for psychological difficulties

☐ Disorder presently treated - specify treatment modality (e.g., counseling, medication): ______________________

☐ Reported difficulties with social/emotional functioning (e.g., social phobia, anxiety, depression)

☐ Social-Emotional/Psychological issues suspected or suggested by referral

☐ Home-School Adjustment Difficulties

☐ Lack of Motivation

☐ Emotional Stress

☐ Autism

☐ Present Medications (type, dosage, frequency, duration) ________________________________

☐ Prior Medication Use (type, dosage, frequency, duration) ________________________________

☐ Hospitalization for psychological difficulties (date(s): ____________________________)

☐ Deficits in social, emotional, or behavioral [SEB] functioning (e.g., as assessed by standardized rating scales)

  Significant scores from SEB measures: _____________________________________________

NOTES: ___________________________________________________________________________

_________________________________________________________________________________
Flanagan et al.’s DD/C Definition of SLD: Level II – Review of Exclusionary Factors

Environmental/Economic Factors (Check All that Apply):

☐ Limited access to educational materials in the home
☐ History of educational neglect
☐ Caregivers unable to provide instructional support
☐ Frequent transitions (e.g., shared custody)
☐ Economic considerations precluded treatment of identified issues (e.g., filling a prescription, replacing broken glasses, tutoring)
☐ Environmental space issues (e.g., no space for studying, sleep disruptions due to shared sleeping space)
☐ Temporary Crisis Situation

NOTES:__________________________________________________________
__________________________________________________________
__________________________________________________________

Form downloadable on CD that accompanies Essentials of Cross-Battery Assessment, 3e (Flanagan, Oritz, & Alfonso, 2013)
Flanagan et al.’s DD/C Definition of SLD: Level II – Review of Exclusionary Factors

**Cultural/Linguistic Factors (Check All that Apply)**

- □ Limited Number of Years in U.S. (___)
- □ No History of Early or Developmental Problems in Primary Language
- □ Current Primary Language Proficiency:
  - (Dates: __________ Scores: ______________)
- □ Acculturative Knowledge Development
  - (Circle one: High – Moderate – Low)
- □ Language(s) Other than English Spoken in Home
- □ Lack of or Limited Instruction in Primary Language
  - (# of years _____)
- □ Current English Language Proficiency:
  - (Date: __________ Scores: ______________)
- □ Parental Educational and Socio-Economic Level
  - (Circle one: High – Moderate – Low)

**NOTES:**

____________________________________________________________________

____________________________________________________________________
### Physical/Health Factors (Check All that Apply):

- □ Limited access to healthcare  
- □ Minimal documentation of health history/status
- □ Chronic health condition (Specify: ____________________ )  
- □ Migraines
- □ Temporary health condition (Date/Duration: ________________ )  
- □ Hospitalization (Dates: ________ )
- □ History of Medical Condition (Date Diagnosed ____________ )
- □ Medical Treatments (Specify: ________________ )
- □ Repeated visits to the school nurse  
- □ Repeated visits to doctor
- □ Medication (type, dosage, frequency, duration: ____________________________ )

### NOTES:

________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
Flanagan et al.’s DD/C Definition of SLD: Level II – Review of Exclusionary Factors

**Instructional Factors (Check All that Apply):**

- [ ] Interrupted schooling (e.g., mid-year school move)  
  Specify why: ____________________________

- [ ] New teacher (past 6 months)  
  [ ] Retained or advanced a grade(s)

- [ ] Nontraditional curriculum (e.g., homeschooled)  
  [ ] Accelerated curriculum (e.g., AP classes)

- [ ] Days Absent ______

**NOTES:**

________________________________________________________________________
________________________________________________________________________
________________________________________________________________________

**Determination of Primary and Contributory Causes of Academic Weaknesses and Learning Difficulties (Check One):**

- [ ] Based on the available data, it is reasonable to conclude that one or more factors is *primarily* responsible for the student’s observed learning difficulties. Specify: ____________________________

- [ ] Based on the available data, it is reasonable to conclude that one or more factors *contributes* to the student’s observed learning difficulties. Specify: ____________________________

- [ ] No factors listed here appear to be the primary cause of the student’s academic weaknesses and learning difficulties

Form downloadable on CD that accompanies *Essentials of Cross-Battery Assessment, 3e* (Flanagan, Ortiz, & Alfonso, 2013)
Essential Elements of PSW based on DD/C Operational Definition of SLD
Flanagan, Ortiz, and Alfonso (2002-2017)

- **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

- **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).
Not All Definitions of SLD Assume at Least Average Overall Ability

The Dual Discrepancy/Consistency (DD/C) Operational Definition of SLD Requires at Least Average Overall Ability to Think and Reason Despite Some Cognitive Processing Deficits
Is At Least Average Overall Ability Consistent with the SLD Construct?
Individuals with SLD have At Least Average Overall Ability

- The children often have average or above intelligence and good memory in other respects
- Hinshelwood, 1902

“Historical Perspective” Information from Nancy Mather, NYASP 2011
Individuals with SLD have At Least Average Overall Ability

Many of the children have a high degree of intelligence

Orton, 1937

“Historical Perspective” Information from Nancy Mather, NYASP 2011
Individuals with SLD have At Least Average Overall Ability

"it seems probably that psychometric tests as ordinarily employed give an entirely erroneous and unfair estimate of the intellectual capacity of these children" (p. 582)

Orton, 1925

"Historical Perspective" Information from Nancy Mather, NYASP 2011
Individuals with SLD have At Least Average Overall Ability

- Remedial training must continue until reading is in harmony with the child’s other capacities and achievement
- Some children of superior intelligence struggle to learn to read
- Monroe, M. (1932)
Individuals with SLD have At Least Average Overall Ability

• “Sometimes children of good general intelligence show retardation in some of the specific skills which compose an intelligence test” (p. 22)

• Monroe and Backus (1937)
Individuals with SLD have At Least Average Overall Ability

• “…generalized integrity and deficiency in learning (p. 9)...there is a deficit in learning in the presence of basic integrity” (p. 25).


Cited in: Mather, N. (2016). Using the WJ IV to Diagnose Specific Reading Disabilities. Webinar – Houghton Mifflin Harcourt. bcove.me/g81r4scv
Individuals with SLD have At Least Average Overall Ability

“The clearest expression of a special disability is consistently low scores on a series of tests in a given subject conjoined with average or superior scores on tests in other subjects. Such scores can be arranged in an ‘educational profile.’ For example, in case of a reading disability, a child might obtain scores placing him in the ninth grade in arithmetic...and in the third grade in reading. Here we would have evidence of a striking reading disability.” (p. 43).

Individuals with SLD have At Least Average Overall Ability

All historical approaches to SLD emphasize the spared or intact abilities that stand in stark contrast to the deficient abilities

Kaufman, 2008, pp. 7-8
Individuals with SLD have At Least Average Overall Ability

“Weaknesses in word reading and spelling surrounded by a sea of strengths”
Individuals with SLD have At Least Average Overall Ability

- Learning Disabilities Association of Canada
- “Learning Disabilities refer to a number of disorders which may affect the acquisition, organization, retention, understanding or use of verbal or nonverbal information. These disorders affect learning in individuals who otherwise demonstrate at least average abilities essential for thinking and/or reasoning”
Individuals with SLD have At Least Average Overall Ability

By failing to differentially diagnose SLD from other conditions that impede learning, such as intellectual disability, pervasive developmental disorders, and overall below average ability to learn and achieve, the SLD construct loses its meaning and there is a tendency (albeit well intentioned) to accept anyone under the SLD rubric who has learning difficulties for reasons other than specific cognitive dysfunction...

What’s Next?

The PSW-A Component of X-BASS
Introduction and Functionality of the PSW-A Component of X-BASS

- Entering scores and interpreting output
- Guidance on selecting scores for inclusion in PSW Analysis
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

  Encompasses approximately 20 frequently measured cognitive abilities and processes

- 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
  - Orthographic Processing
  - Speed of Lexical Access
  - Cognitive Efficiency

- Estimates Do Not Need to be Broad Cognitive Ability Estimates. Examples:
  - 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
Cross-Battery Assessment Software System (X-BASS® v2.0)

Conceptualization by D.P. Flanagan, S.O. Ortiz, V.C. Alfonso; Programming by S.O. Ortiz and A.M. Dynda
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Essentials of Cross-Battery Assessment, 3rd Edition remains the reference document necessary for understanding Cross-Battery Assessment (XBA) and the principles upon which the X-BASS is based.

X-BASS is an automated Cross-Battery data management system with integrated, single-entry data management across all programs (XBA Analyzer, PSW Analyzer, and C-LIM Analyzer) that facilitates data analysis and enhances interpretation. In addition, X-BASS includes enhanced features for data entry and organization, program navigation, composite and subtest selection, and automatic and selective graphing of scores. Special provisions for determination of specific learning disability via interactive PSW analyses and assistance with understanding test score validity for English language learners are also included.

Beginner Mode:
If you are new to XBA or X-BASS, click the "Beginner Mode" button for step by step guidance and assistance in using X-BASS. This option is strongly recommended for first time users of X-BASS.

Quick Start:
New users should read the User Guide. Advanced users can set the User Mode and go directly to the Start or Index tab.

What's New:
Click here to find out more about the new features and changes to the current version of X-BASS.
PSW Component of X-BASS

• Transfer best estimates of CHC abilities and academic scores to XBA Organizer Tab
• From XBA Organizer tab, select estimates to be used in PSW analysis (use select all button)
• View output
• Select different cognitive and academic weaknesses for analysis if necessary
• Print interpretation of results
### Cross-Battery Assessment Software System (X-BASS® v2.0)

#### WISC-V® Data Analysis

**Age range = 6.0 - 16:11**

**Name:** Rebecca  
**Grade:** 4  
**Age:** 9 years 6 month(s)  
**Date:** 2/22/2017

<table>
<thead>
<tr>
<th>Index Name</th>
<th>Enter scores</th>
<th>PR</th>
<th>Transfer scores</th>
</tr>
</thead>
<tbody>
<tr>
<td>Verbal Comprehension Index (VCI/Gc)</td>
<td>92</td>
<td>30</td>
<td></td>
</tr>
<tr>
<td>Similarities (Gc;VL;Gf.I)</td>
<td>7</td>
<td>16</td>
<td></td>
</tr>
<tr>
<td>Vocabulary (VL)</td>
<td>10</td>
<td>50</td>
<td></td>
</tr>
<tr>
<td>Information (Kd)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Comprehension (Kd)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

#### Criteria for Cohesion: Is variability...  
- significant or substantial?  
- infrequent or uncommon?  

- Yes  
- No

#### CLINICAL JUDGMENT NEEDED

The VCI provides an estimate of Crystallized Intelligence (Gc). Gc 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 was Average, and the ability to reason with words as measured by the Similarities subtest was Low Average relative to same age peers. The difference between the scores that comprise the VCI is significant, however a difference of this size is considered common in the general population. This means that clinical judgment is necessary to determine whether the VCI is a good summary of Crystallized Intelligence. The individual's VCI of 92 (88-96) is classified as Average and is ranked at the 30th percentile, indicating performance as good as or better than 30% of same age peers from the general population.

#### Follow up Recommendations  
Do the results suggest a need for follow up?

- Yes, recommended for lowest score

**Gc: VL = 92**

Because the difference between the scores that comprise the VCI is at least 1SD, and the lower score is indicative of a weakness or deficit, follow up on the lower score is considered necessary to determine if it is an accurate and valid representation of ability and:

- Consider whether IN or CO would provide useful additional information
- If IN and CO are administered, consider the new clinical composite, Verbal (Expanded Crystallized) Index (VECI)
- Consider whether the Gc clinical composites (e.g., Gc-Verbal Expression Low; Gc – Verbal Expression High) would provide useful additional information
- Consider whether there is a difference between Retrieval from Remote Long-term Storage (Vocabulary + Information) and Retrieval from Recent Long-term Storage (Delayed Symbol Translation + Recognition Symbol Translation)
- Consider task characteristics and response demands
Additional Subtests were Administered
10 New Clinical Composite Based on Actual Norms Calculated Automatically on the WISC-V Tab

<table>
<thead>
<tr>
<th>Composite</th>
<th>Score</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Verbal-Expanded Cryst. Index (VECI)</td>
<td>88</td>
<td>21</td>
</tr>
<tr>
<td>Similarities (Gc:VL:GfI)</td>
<td>7</td>
<td>16</td>
</tr>
<tr>
<td>Vocabulary (VL)</td>
<td>10</td>
<td>50</td>
</tr>
<tr>
<td>Information (K0)</td>
<td>9</td>
<td>37</td>
</tr>
<tr>
<td>Comprehension (K0)</td>
<td>6</td>
<td>9</td>
</tr>
</tbody>
</table>

The composite score reported here is based on four or more subtests and cannot be fully or properly evaluated for follow up via this tab. If the composite has been determined to be cohesive, it is very likely that no follow up is necessary. If it was determined not to be cohesive or if cohesion could not be evaluated, the scores from the subtests that form the composite may be transferred over to the XBA Analyzer for additional analysis regarding the configuration and interpretation of the obtained scores.
# 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 + Information</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 (Verbal Expression – High)</td>
<td>Similarities + Comprehension</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>Fluid-Crystallized</td>
<td>Vocabulary + Information + Matrix Reasoning + Figure Weights</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>Working Memory (Alternative)</td>
<td>Digit Span Backwards + Digit Span Sequencing + Letter-Number Sequencing</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>Memory Span-Working Memory</td>
<td>Digit Span Forward + Digit Span Backward</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>
</tbody>
</table>
| Working Memory (Cognitive Complexity – High) | Arithmetic + Picture Span | 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...
Summary of the New Clinical Composites for the WISC-V (Cont’d)

<table>
<thead>
<tr>
<th>WM-CC/H</th>
<th>Involves Go (Visual Memory), Memory Span, and Working Memory due to proactive interference.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Verbal (Expanded Crystallized) 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. Involves tests that have low to high demands for verbal expression.</td>
</tr>
<tr>
<td>VECI*</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 (RQ). Places more emphasis on quantitative reasoning as compared to FRI.</td>
</tr>
<tr>
<td>Expanded Fluid Index</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>EFI*</td>
<td>Provides an estimate of an individual’s ability to retrieve recently encoded information from long-term storage.</td>
</tr>
<tr>
<td>Perceptual Speed</td>
<td>Delayed Symbol Translation + Recognition Symbol Translation</td>
</tr>
<tr>
<td>Gs-P**</td>
<td>Retrieval From Recent Long-Term Storage</td>
</tr>
<tr>
<td>RFLT-Recent</td>
<td>Essentials of WISC-V Assessment</td>
</tr>
</tbody>
</table>

* Complete coverage of administration, scoring, and interpretation
* Use of WISC-V in SLD Identification, Neuropsychological Assessment, and Evaluation of English Language Learners
* Comprehensive case reports and guidance on linking assessment findings to evidence-based interventions

Dawn P. Flanagan
Vincent C. Alfonso
Alan S. Kaufman & Nathan L. Kaufman, Series Editors
10 New Clinical Composite Based on Actual Norms Calculated Automatically on the WISC-V Tab

**Note:** The more scores that make up a composite, the larger the difference needs to be between highest minus lowest score for a noncohesive composite. Large differences are common in the general population. Nevertheless, when large differences are present, the composite may obscure important information about the individual’s strengths and weaknesses.
Check Boxes for Transfer to XBA Analyzer Tab for Analysis of Variability
XBA Analyzer Tab Provides the SAME Composite
No difference between Actual Norms and the Composite Generated by X-BASS

X-BASS composites based on the most psychometrically defensible means of calculating composites when actual norms are not available
What if I wanted to do something else? Can I Generate a Different Composite or Composites Based on my Clinical Judgment?
**X-BASS: “XBA Analyzer Tab”**

### Crystallized Intelligence (Gc)

<table>
<thead>
<tr>
<th>Subtest</th>
<th>Scores</th>
<th>Converted Standard Score</th>
<th>Composite Score Analyses</th>
</tr>
</thead>
<tbody>
<tr>
<td>WISC-V Similarities (Gc:VL;Gf:I)</td>
<td>7</td>
<td>85</td>
<td>A</td>
</tr>
<tr>
<td>WISC-V Vocabulary (Gc:VL)</td>
<td>10</td>
<td>100</td>
<td>A</td>
</tr>
<tr>
<td>WISC-V Information (Gc:K0)</td>
<td>9</td>
<td>95</td>
<td>A</td>
</tr>
<tr>
<td>WISC-V Comprehension (Gc:K0)</td>
<td>6</td>
<td>80</td>
<td>A</td>
</tr>
</tbody>
</table>

**Cohesive: Use 4-subtest XBA composite**

<table>
<thead>
<tr>
<th>SS</th>
<th>PR</th>
</tr>
</thead>
<tbody>
<tr>
<td>88</td>
<td>21</td>
</tr>
</tbody>
</table>

### Score configuration and interpretation:

The difference between the highest and lowest scores is less than or equal to 1 and 1/3 SD 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. If, however, there are reasons to consider an alternative configuration based on additional data, clinical significance, narrow abilities measured, etc., click the "Evaluate Score Configuration" button.

*Note: This version of X-BASS not yet released; available to X-BASS v2.0 users free in 4-6 weeks*
<table>
<thead>
<tr>
<th>CRYSTALLIZED INTELLIGENCE (Gc)</th>
<th>Enter scores</th>
<th>Converted Standard Score</th>
<th>Composite Score Analyses</th>
</tr>
</thead>
<tbody>
<tr>
<td>WISC-V Similarities (Gc:VL;Gf:I)</td>
<td>7</td>
<td></td>
<td></td>
</tr>
<tr>
<td>WISC-V Vocabulary (Gc:VL)</td>
<td>10</td>
<td></td>
<td></td>
</tr>
<tr>
<td>WISC-V Information (Gc:K0)</td>
<td>9</td>
<td></td>
<td></td>
</tr>
<tr>
<td>WISC-V Comprehension (Gc:K0)</td>
<td>6</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**COHESIVE: Use 4-subtest XBA composite**

**Score configuration and interpretation:**

The difference between the highest and lowest scores is less than or equal to 1 and 1/3, which form a composite that is considered cohesive and likely a good summary of the set of test abilities that comprise it. Interpret the composite as an adequate estimate of the ability to measure. If, however, there are reasons to consider an alternative configuration based on domain significance, narrow abilities measured, etc., click the "Evaluate Score Configuration" button.

---

**FLUID REASONING (Gf)**

(leave these boxes checked to select score for integrated graph)

<table>
<thead>
<tr>
<th>Converted Standard Score</th>
<th>Composite Score Analyses</th>
</tr>
</thead>
<tbody>
<tr>
<td>85</td>
<td></td>
</tr>
</tbody>
</table>

**Calculate 3-subtest/1-low divergent alternative composite?**

2.104 Using standard XBA rules, a cohesive 4-subtest XBA composite has been calculated and is likely the best representation of overall performance in this domain. However, if supported by additional data, score configuration, or narrow abilities measured, etc., one alternative would be to combine the three highest scores to form a clinically meaningful 3-subtest alternative composite with one lower divergent value. Would you like to calculate this type of composite? If you click 'Yes' the three highest scores will be used to form the composite and the lowest score will remain a divergent value. Otherwise click 'No' to continue with other options.

[Yes] [No]
## X-BASS: “XBA Analyzer Tab”

**CRystallized Intelligence (Gc)**

<table>
<thead>
<tr>
<th>Test</th>
<th>Scores</th>
<th>Converted Standard Score</th>
<th>Composite Score Analyses</th>
</tr>
</thead>
<tbody>
<tr>
<td>WISC-V Similarities (Gc:VL;Gf:I)</td>
<td>7</td>
<td>85</td>
<td>A</td>
</tr>
<tr>
<td>WISC-V Vocabulary (Gc:VL)</td>
<td>10</td>
<td></td>
<td></td>
</tr>
<tr>
<td>WISC-V Information (Gc:K0)</td>
<td>9</td>
<td></td>
<td></td>
</tr>
<tr>
<td>WISC-V Comprehension (Gc:K0)</td>
<td>6</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Fluid Reasoning (Gf)**

<table>
<thead>
<tr>
<th>Test</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>WNV Matrices (Gf:I)</td>
<td></td>
</tr>
</tbody>
</table>

**Cohesive:** Use 4-subtest XBA composite

- **Reset Score Configuration**
- **Evaluate Score Configuration**
- **Go to Gc Test List Classifications**
- **Transfer Comp(s) to Data Organizer**

**Score configuration and interpretation:**

The difference between the highest and lowest scores is less than or equal to 1 and 1/3 form a composite that is considered cohesive and likely a good summary of the set of these abilities that comprise it. Interpret the composite as an adequate estimate of the abilities measured. If, however, there are reasons to consider an alternative configuration based on significance, narrow abilities measured, etc., click the "Evaluate Score Configuration" button.

**Calculate 3-subtest/1-high divergent alternative composite?**

- **Yes**
- **No**

2.106 Another option, if supported by additional data, score configuration, or narrow abilities measured, etc., would be to combine the three lowest scores to form a clinically meaningful 3-subtest alternative composite with one higher divergent value. Would you like to calculate this type of composite? If you click 'Yes' the three lowest scores will be used to form the composite and the highest score will remain a divergent value. Otherwise click 'No' to continue with other options.
**X-BASS: “XBA Analyzer Tab”**

### Crystallized Intelligence (Gc)

<table>
<thead>
<tr>
<th>Test</th>
<th>Click Box</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>WISC-V Similarities (Gc:VL;Gf:I)</td>
<td></td>
<td>7</td>
</tr>
<tr>
<td>WISC-V Vocabulary (Gc:VL)</td>
<td></td>
<td>10</td>
</tr>
<tr>
<td>WISC-V Information (Gc:K0)</td>
<td></td>
<td>9</td>
</tr>
<tr>
<td>WISC-V Comprehension (Gc:K0)</td>
<td></td>
<td>6</td>
</tr>
</tbody>
</table>

### Fluid Reasoning (Gf)

<table>
<thead>
<tr>
<th>Test</th>
<th>Click Box</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>WNV Matrices (Gf:I)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Cohesive: Use 4-subtest XBA composite**

- **Reset Score Configuration**
- **Evaluate Score Configuration**
- **Go to Gc Test List Classifications**
- **Transfer Comp(s) to Data Organizer**

**Score configuration and interpretation:**

The difference between the highest and lowest scores is less than or equal to 1 and 1/3. This form a composite that is considered cohesive and likely a good summary of the set of the abilities that comprise it. Interpret the composite as an adequate estimate of the abilities that are measured. However, there are reasons to consider an alternative configuration based on significance, narrow abilities measured, etc., click the "Evaluate Score Configuration" button.

**Calculate 2-subtest/2-subtest alternative composites?**

2.108 Another option, if supported by additional data, score configuration, or narrow abilities measured, etc., would be to combine the two highest scores to form one 2-subtest composite and combine the two lowest scores to form another 2-subtest composite. Would you like to calculate these types of composites? If you say 'Yes' the two lowest scores will form one composite and the two higher scores will form another composite. Otherwise click 'No' to continue with another option.

**Yes**  **No**
X-BASS: “XBA Analyzer Tab”

CRystallized Intelligence (Gc)

<table>
<thead>
<tr>
<th>Test Description</th>
<th>Enter Scores</th>
<th>Converted Standard Score</th>
<th>Composite Score Analyses</th>
</tr>
</thead>
<tbody>
<tr>
<td>WISC-V Similarities (Gc:VL;Gf:I)</td>
<td>7</td>
<td>85</td>
<td>A</td>
</tr>
<tr>
<td>WISC-V Vocabulary (Gc:VL)</td>
<td>10</td>
<td>100</td>
<td>B</td>
</tr>
<tr>
<td>WISC-V Information (Gc:K0)</td>
<td>9</td>
<td>95</td>
<td>A</td>
</tr>
<tr>
<td>WISC-V Comprehension (Gc:K0)</td>
<td>6</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Use Alternative Composite(s)**

- Reset Score Configuration
- Evaluate Score Configuration
- Go to Gc Test List Classifications
- Transfer Comp(s) to Data Organizer

Score configuration and interpretation:

At least one alternative composite has been formed using the scores entered into this application. A score between 80-89 inclusive that may have been used to form a composite, additional data exist to support inclusion in the composite as either a strength or a weakness.

Alternative composite calculated

2.109 The alternative composite has been calculated. If you wish to reconsider these options later, simply click the ‘Evaluate/Reset Score Configuration’ button again and follow the prompts.

OK
### X-BASS: “XBA Analyzer Tab”

<table>
<thead>
<tr>
<th>CRystallized Intelligence (Gc)</th>
<th>Clear Data</th>
<th>Enter scores</th>
<th>Converted Standard Score</th>
<th>Composite Score Analyses</th>
</tr>
</thead>
<tbody>
<tr>
<td>(check these boxes to select score for integrated graph)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>WISC-V Similarities (Gc:VL;Gf:I)</td>
<td></td>
<td>7</td>
<td>85</td>
<td>A</td>
</tr>
<tr>
<td>WISC-V Vocabulary (Gc:VL)</td>
<td></td>
<td>10</td>
<td>100</td>
<td>B</td>
</tr>
<tr>
<td>WISC-V Information (Gc:K0)</td>
<td></td>
<td>9</td>
<td>95</td>
<td>B</td>
</tr>
<tr>
<td>WISC-V Comprehension (Gc:K0)</td>
<td></td>
<td>6</td>
<td>80</td>
<td>A</td>
</tr>
</tbody>
</table>

**Score configuration and interpretation:**
At least one alternative composite has been formed using the scores entered into this domain. For any scores between 80-89 inclusive that may have been used to form a composite, additional data and information should exist to support inclusion in the composite as either a strength or a weakness.
Cross-Battery Assessment Software System (X-BASS® v2.1)

Data Organizer and Score Summary

Conceptualization by D.P. Flanagan, S.O. Ortiz, V.C. Alfonso; Programming by S.O. Ortiz and A.M. Dynda
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Name: Johnny Jones
Age: 14 years 0 month(s)
Grade: 2
Date: 1/7/2015

Guidelines for Selecting Best Composite Scores for SLD Evaluation

The purpose of this tab is to organize composites and subtests to assist in the selection of those to be used for evaluation of the pattern of strengths and weaknesses in the PSW Analyzer. Test names and scores can not be entered into this tab directly. Rather, this tab provides a summary of test battery and XBA composites that were transferred from other tabs because they were considered the best estimates of CHC abilities, academic areas, and selected neuropsychological domains. Use this tab to select the composites and subtest scores 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 two composites for each of the CHC broad ability (e.g., Gc, Gf, Gsm) and neuropsychological (e.g., Executive Functions, Orthographic 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 or 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 "S&W Indicator" button to continue with additional steps for conducting PSW analyses.

<table>
<thead>
<tr>
<th>CRystallized Intelligence (Gc)</th>
<th>FLuid Reasoning (GF)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Crystallized Intelligence (Gc)</td>
<td>80</td>
</tr>
<tr>
<td>Crystallized Intelligence (Gc)</td>
<td>97</td>
</tr>
<tr>
<td></td>
<td>0</td>
</tr>
</tbody>
</table>
X-BASS: WISC-V Tab and Gf Subtest Scaled Scores Transferred to XBA Analyzer Tab

Gf Section of XBA Analyzer Tab
This is a situation where some have claimed that XBA leads to “over-testing.” [The apparent “need” to follow up with another Gf subtest – in this case Gf:RG – is to get a cohesive composite. However, this may or may not be necessary, depending on available data sources.]

Note that over-testing only happens when the practitioner does not understand his or her data.

The question in this situation is: **How do I represent the “average” part of Gf in my PSW analysis without “over-testing” in “average” areas?**

---

<table>
<thead>
<tr>
<th>FLUID REASONING (Gf)</th>
<th>Enter scores</th>
<th>Converted Standard Score</th>
<th>Composite Score Analysis</th>
</tr>
</thead>
<tbody>
<tr>
<td>WISC-V Matrix Reasoning (Gf:I)</td>
<td>□</td>
<td>6</td>
<td>80</td>
</tr>
<tr>
<td>WISC-V Figure Weights (Gf:RG)</td>
<td>□</td>
<td>9</td>
<td>95</td>
</tr>
<tr>
<td>CTQNI-2 Geometric Analogies (Gf:I)</td>
<td>□</td>
<td>5</td>
<td>75</td>
</tr>
</tbody>
</table>

**Score configuration and interpretation:**
Because the difference between the highest and lowest scores entered is greater than or equal to 1SD, this set of scores is not cohesive, indicating that a composite based on all three scores is unlikely to provide a good summary of the ability it is intended to represent. Instead the two lowest scores form a cohesive composite that may be interpreted meaningfully and the highest value is a divergent score.
Is administration of Pictorial Sequences “chasing” the high score? No, not unless there is solid ecological validity for the initial Gf:RG performance. If ecological validity is available, then consider the following....
Evidence from multiple data sources indicates that Gf:RG (and reasoning with numbers) is not posing any problems for the student at this time.

**Multiple data sources include:** Teacher report, multiple work samples, math problem solving, grades in math
Use “Other Data Entry Tab”

Type the name of your “composite”; enter score; transfer to Data Organizer tab
Cross-Battery Assessment Software System (X-BASS® v2.0)

Data Organizer and Score Summary

Conceptualization by D.P. Flanagan, S.O. Ortiz, V.C. Alfonso; Programming by S.O. Ortiz and A.M. Dynda
Copyright © 2017 Samuel O. Ortiz, Dawn P. Flanagan & Vincent C. Alfonso. All Rights Reserved

Name: Rebecca
Age: 9 years 6 month(s)
Grade: 4
Date: 2/22/2017

Guidelines for Selecting Best Composite Scores for SLD Evaluation

The purpose of this tab is to organize composites and subtests to assist in the selection of those to be used for evaluation of the pattern of strengths and weaknesses in the PSW Analyzer. Test names and scores cannot be entered into this tab directly. Rather, this tab provides a summary of test battery and XBA composites that were transferred from other tabs because they were considered the best estimates of CHC abilities, academic areas, and selected neuropsychological domains. Use this tab to select the composites and subtest scores 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 two composites for each of the CHC broad ability (e.g., Gc, Gf, Gsm) and neuropsychological (e.g., Executive Functions, Orthographic 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 or 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 “S&W Indicator” button to continue with additional steps for conducting PSW analyses.

CRYSTALLIZED INTELLIGENCE (Gc)

Indicate which composite(s) you wish to use for PSW analyses. No more than two scores can be selected for this domain.

<table>
<thead>
<tr>
<th>Test</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>WISC-V Gc (V.O. IN) - No Reasoning</td>
<td>97</td>
</tr>
<tr>
<td>Crystallized Intelligence - XBA Gc</td>
<td>80</td>
</tr>
</tbody>
</table>

FLUID REASONING (Gf)

Indicate which composite(s) you wish to use for PSW analyses. No more than two scores can be selected for this domain.

<table>
<thead>
<tr>
<th>Test</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>WISC-V Fw (Plus converging data sources)</td>
<td>95</td>
</tr>
<tr>
<td>Fluid Reasoning - XBA Gf</td>
<td>74</td>
</tr>
</tbody>
</table>

LONG-TERM STORAGE AND RETRIEVAL (Glr)

SHORT-TERM MEMORY (Gsm)
### X-BASS: WISC-V Tab and Gsm Subtest Scaled Scores Transferred to XBA Analyzer Tab

#### Visual Spatial Index (VSI/Gv)
- Block Design: 84, 7
- Visual Puzzles: 7

*Additional process scaled scores can be generated for Block Design (see WISC-V Administration and Scoring Manual Supplement). These subtest processes are available in the XBA Analyzer Gsm drop down menu.

#### Working Memory Index (WMI/Gsm)

<table>
<thead>
<tr>
<th>Subtest</th>
<th>Score (WMI)</th>
<th>Score (Gsm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Digit Span* (MW, MS)</td>
<td>8</td>
<td>8</td>
</tr>
<tr>
<td>Picture Span (MS, MW)</td>
<td>6</td>
<td>6</td>
</tr>
<tr>
<td>Letter-Number Sequencing (MW)</td>
<td>7</td>
<td>7</td>
</tr>
</tbody>
</table>

*Additional process scaled scores can be generated for Digit Span (see WISC-V Administration and Scoring Manual Supplement). These subtest processes are available in the XBA Analyzer Gsm drop down menu.

#### Cohesive Scale

The WSI provides an estimate of Visual Processing (Gv). Gv refers to an individual’s ability to generate visual images and perceive and analyze visual patterns and visual information. The ability to understand visual-spatial relationships to construct geometric designs form a model as measured by the Block Design subtest was Low Average and the ability to generate visual images in the mind’s eye as measured by the Visual Puzzles subtest was Low Average relative to same age peers. The difference between the scores that comprise the VSI is not significant and a difference of this size is considered common in the general population. This means that the VSI is a good summary of Visual Processing. The VSI of 84 (80-88) is classified as Below Average and is ranked at the 14th percentile, indicating performance as good as or better than 14% of same age peers from the general population.

Gsm = 82

**COHESIVE**

The difference between the scores that comprise the WMI is considered substantial (i.e., at least 50 points), therefore, to gain a better understanding of the individual’s performance in this ability domain, it may be helpful to follow up on the lower scoring subtest:
- If DS is PS and suggestive of a weakness or deficit, consider administering LNS. If LNS is administered, evaluate AWMI for cohesion.
- If DS < PS, consider differences among process scores.
- If PS < DS, consider administering another test of visual working memory to explore hypotheses about verbal-visual differences in working memory capacity.

**SHORT-TERM MEMORY (Gsm)**

(check these boxes to select score for integrated graph)

<table>
<thead>
<tr>
<th>Score</th>
<th>Converted Standard Score</th>
<th>Composite Score Analyses</th>
</tr>
</thead>
<tbody>
<tr>
<td>8</td>
<td>90</td>
<td>A</td>
</tr>
<tr>
<td>80</td>
<td>80</td>
<td>A</td>
</tr>
<tr>
<td>85</td>
<td>85</td>
<td>A</td>
</tr>
</tbody>
</table>

**Transfer Test Comp to Data Organizer**

<table>
<thead>
<tr>
<th>Score</th>
<th>Converted Standard Score</th>
<th>Composite Score Analyses</th>
</tr>
</thead>
<tbody>
<tr>
<td>7</td>
<td>81</td>
<td>A</td>
</tr>
</tbody>
</table>

**Transfer XBA Comp(s) to Data Organizer**

**Calculate XBA Alternative Composite(s)**

**Go to Gsm Test List Classifications**

**PR:** 10
<table>
<thead>
<tr>
<th>Subtest</th>
<th>Raw Score</th>
<th>Percentile</th>
<th>Interpretation</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Processing Speed Index (PSI/Gs)</strong></td>
<td>100</td>
<td>50</td>
<td><strong>COHESIVE</strong></td>
</tr>
<tr>
<td>Coding (RG)</td>
<td>10</td>
<td>50</td>
<td>No, not considered necessary</td>
</tr>
<tr>
<td>Symbol Search (P)</td>
<td>10</td>
<td>50</td>
<td>No</td>
</tr>
<tr>
<td>Cancellation* (P)</td>
<td></td>
<td></td>
<td><strong>COHESIVE</strong></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>No, not considered necessary</td>
</tr>
<tr>
<td><strong>Naming Speed Index (NSI/Gir:NA)</strong></td>
<td>101</td>
<td>53</td>
<td><strong>COHESIVE</strong></td>
</tr>
<tr>
<td>Naming Speed Literacy (Gir:NA)</td>
<td>100</td>
<td>50</td>
<td>No, not considered necessary</td>
</tr>
<tr>
<td>Naming Speed Quantity* (Gir:NA/Gs:N)</td>
<td>102</td>
<td>55</td>
<td>No</td>
</tr>
<tr>
<td><strong>Symbol Translation Index (STI/Gir:MA)</strong></td>
<td>103</td>
<td>58</td>
<td><strong>COHESIVE</strong></td>
</tr>
<tr>
<td>Immediate Symbol Translation (MA)</td>
<td>104</td>
<td>61</td>
<td>No, not considered necessary</td>
</tr>
<tr>
<td>Delayed Symbol Translation (MA)</td>
<td>102</td>
<td>55</td>
<td>No</td>
</tr>
<tr>
<td>Recognition Symbol Translation (MA)</td>
<td>103</td>
<td>58</td>
<td>No</td>
</tr>
<tr>
<td><strong>Storage and Retrieval Index (SRI/Gir)</strong></td>
<td>102</td>
<td>55</td>
<td><strong>COHESIVE</strong></td>
</tr>
<tr>
<td>Note: The SRI is comprised of the three STI subtests (Immediate Symbol Translation, Delayed Symbol Translation, Recognition Symbol Translation) and the two NSI subtests (Naming Speed Literacy and Naming Speed Quantity).</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Transfer to Data Organizer**

WISC-V Report

Because the difference between the scores that comprise the PSI is not substantial (less than 5 SD) and both scores are at least average, follow up is not considered necessary.

Because the difference between the scores that comprise the composite is not substantial (less than 2/3 SD) and both scores are at least average, follow up is not considered necessary.

Because all scores in the composite are either not substantially different from one another or fall within the average or better range of ability, follow up assessment is not considered necessary.

It has been determined that the SRI is cohesive, which means that it may represent a good estimate of the individual's overall intellectual ability and usually indicates that follow up is not considered necessary. However, despite being cohesive, it is still possible that important variability exists among the subtests that comprise the SRI which may affect proper interpretation. Therefore, it may be helpful to review any additional information regarding interpretation of the SRI contained in the first section of the WISC-V Summary report before making a final determination regarding its meaning or the need for follow up.
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.
Supplement the WISC-V with tests from CTOPP-2 for Ga: Phonetic Coding

**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)

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

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*
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**
Supplement the WISC-V with tests from CTOPP-2 for Ga: Phonetic Coding

<table>
<thead>
<tr>
<th>Auditory Processing (Ga)</th>
<th>Converted Standard Score</th>
<th>Composite Score Analyses</th>
</tr>
</thead>
<tbody>
<tr>
<td>CTOPP-2 Blending Words (Ga:PC)</td>
<td>9</td>
<td>A</td>
</tr>
<tr>
<td>CTOPP-2 Elision (Ga:PC)</td>
<td>8</td>
<td>90</td>
</tr>
<tr>
<td>CTOPP-2 Phoneme Isolation (Ga:PC)</td>
<td>9</td>
<td>95</td>
</tr>
</tbody>
</table>

Transfer Phonological Awareness Composite to Data Organizer Tab

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

Score configuration and interpretation:
The difference between the highest and lowest scores that comprise the test composite is less than 1SD and, therefore, is considered cohesive and is likely a good summary of the set of theoretically related abilities that comprise it. Interpret the test composite as an adequate estimate of the ability that it is intended to measure.
### WIAT-III Tab

<table>
<thead>
<tr>
<th>Subtest</th>
<th>Raw Score</th>
<th>Standard Score</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Reading Comprehension (RC)</strong></td>
<td>82</td>
<td>12</td>
</tr>
<tr>
<td><strong>Oral Reading Fluency (RF)</strong></td>
<td>88</td>
<td>21</td>
</tr>
<tr>
<td><strong>Written Expression (Grw-W)</strong></td>
<td>97</td>
<td>42</td>
</tr>
<tr>
<td><strong>Spelling (WE)</strong></td>
<td>100</td>
<td>50</td>
</tr>
<tr>
<td><strong>Alphabet Writing Fluency (WE)</strong></td>
<td>98</td>
<td></td>
</tr>
<tr>
<td><strong>Sentence Composition (WE)</strong></td>
<td>95</td>
<td></td>
</tr>
<tr>
<td><strong>Essay Composition (WE)</strong></td>
<td>37</td>
<td></td>
</tr>
</tbody>
</table>

**COHESIVE**

Because the difference between the scores that comprise the composite is not substantial (less than 2/3 SD) and both scores are at least average, follow up is not considered necessary.

**RC or RF = 82**

Because the difference between the scores that comprise the composite is not substantial (i.e., less than 2/3 SD), indicating similar subtest performances, follow up is not considered necessary.

**WE = 97**

Because all scores in the composite are either not substantially different from one another or fall within the average or better range of ability, follow up assessment is not considered necessary.
<table>
<thead>
<tr>
<th>Subtest</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Basic Reading (Grw-R)</td>
<td>102</td>
</tr>
<tr>
<td>Word Reading (BRS)</td>
<td>101</td>
</tr>
<tr>
<td>Pseudoword Decoding (BRS)</td>
<td>103</td>
</tr>
<tr>
<td>Reading Compr. and Fluency (Grw-R)</td>
<td>82</td>
</tr>
<tr>
<td>Reading Comprehension (RC)</td>
<td>80</td>
</tr>
<tr>
<td>Oral Reading Fluency (RF)</td>
<td>88</td>
</tr>
<tr>
<td>Early Reading Skills (BRS:Ga:PC)</td>
<td></td>
</tr>
<tr>
<td>Written Expression (Grw-W)</td>
<td>97</td>
</tr>
<tr>
<td>Spelling (WE)</td>
<td>100</td>
</tr>
<tr>
<td>Alphabet Writing Fluency (WE)</td>
<td></td>
</tr>
<tr>
<td>Sentence Composition (WE)</td>
<td>98</td>
</tr>
<tr>
<td>Essay Composition (WE)</td>
<td>95</td>
</tr>
</tbody>
</table>

**COHESIVE**

The difference between the scores that comprise the composite is not significant and a difference of this size occurs in more than 10% of the general population which makes it relatively common. The composite is, therefore, cohesive and should be interpreted because it provides a good summary of the theoretically related abilities it was intended to represent.

**BRS or RF = 82**

Because the difference between the scores that comprise the composite is not substantial (less than 2/3 SD) and both scores are at least average, follow up is not considered necessary.

**WE = 97**

Because all scores in the composite are either not substantially different from one another or fall within the average or better range of ability, follow up assessment is not considered necessary.

**Transfer Subtests to XBA Analyzer**

The check boxes in this column serve two functions: 1) transfer of selected subtests to the XBA Analyzer tab for follow up evaluation and analyses; or 2) transfer of selected subtests to the Composites Organizer tab for PSW analyses. Once subtests have been selected, click the gray or green button to the left to complete the desired transfer or the gray button to the right to clear all checkboxes.

**Transfer Subtests to Data Organizer**
**WIAT-III Tab**

<table>
<thead>
<tr>
<th>Mathematics (Gq)</th>
<th>Score</th>
<th>Cohesive</th>
</tr>
</thead>
<tbody>
<tr>
<td>Math Problem-Solving (MPS, Gf:RQ)</td>
<td>94</td>
<td>Yes</td>
</tr>
<tr>
<td>Numerical Operations (MC)</td>
<td>100</td>
<td>Yes</td>
</tr>
</tbody>
</table>

- The difference between the scores that comprise the composite is not significant and a difference of this size occurs in more than 10% of the general population which makes it relatively common. The composite is, therefore, cohesive and should be interpreted because it provides a good summary of the theoretically related abilities it was intended to represent.

<table>
<thead>
<tr>
<th>Math Fluency (Gq)</th>
<th>Score</th>
<th>Cohesive</th>
</tr>
</thead>
<tbody>
<tr>
<td>Math Fluency - Addition (MC, Gs:N)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Math Fluency - Subtraction (MC, Gs:N)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Math Fluency - Multiplication* (MC, Gs:N)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*For ages 8:0-18:11, the multiplication subtest is not included in cohesiveness analyses. If a value is entered in the cell, it will be included in follow up evaluation as a 3-subtest composite but cohesion will not be evaluated.

<table>
<thead>
<tr>
<th>Oral Language (Gc)</th>
<th>Score</th>
<th>Cohesive</th>
</tr>
</thead>
<tbody>
<tr>
<td>Listening Comprehension (LC, Gc, VL, LS)</td>
<td>105</td>
<td>Yes</td>
</tr>
<tr>
<td>Oral Expression (OE, Gc, VL, Glr, FI)</td>
<td>100</td>
<td>Yes</td>
</tr>
</tbody>
</table>

- The difference between the scores that comprise the composite is not significant and a difference of this size occurs in more than 10% of the general population which makes it relatively common. The composite is, therefore, cohesive and should be interpreted because it provides a good summary of the theoretically related abilities it was intended to represent.

Transfer Subtests to Data Organizer:

The check boxes in this column serve two functions: 1) transfer of selected subtests to the XBA Analyzer tab for follow up evaluation and analyses; or 2) transfer of selected subtests to the Composites Organizer tab for PSW analyses. Once subtests have been selected, click the gray or green button to the left to complete the desired transfer or the gray button to the right to clear all checkboxes.
Cross-Battery Assessment Software System (X-BASS® v2.0)

Data Organizer and Score Summary

Conceptualization by D.P. Flanagan, S.O. Ortiz, V.C. Alfonso; Programming by S.O. Ortiz and A.M. Dyno
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Name: Rebecca
Age: 9 years 6 month(s)
Grade: 4
Date: 2/22/2017

Guidelines for Selecting Best Composite Scores for SLD Evaluation

The purpose of this tab is to organize composites and subtests to assist in the selection of those to be used for evaluation of the pattern of strengths and weaknesses in the PSW Analyzer. Test names and scores cannot be entered into this tab directly. Rather, this tab provides a summary of test battery and XBA composites that were transferred from other tabs because they were considered the best estimates of CHC abilities, academic areas, and selected neuropsychological domains. Use this tab to select the composites and subtest scores 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 two composites for each of the CHC broad ability (e.g., Gc, Gf, Gsm) and neuropsychological (e.g., Executive Functions, Orthographic 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 or 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 “S&W indicator” button to continue with additional steps for conducting PSW analyses.

<table>
<thead>
<tr>
<th>CRystallized InTEllIGENCE (Gc)</th>
<th>FLUID REASONING (Gf)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Indicate which composite(s) you wish to use for PSW analyses. No more than two scores can be selected for this domain.</td>
<td>Indicate which composite(s) you wish to use for PSW analyses. No more than two scores can be selected for this domain.</td>
</tr>
<tr>
<td>Crystallized intelligence (Gc)</td>
<td>WISC-V FW (Plus converging data sources)</td>
</tr>
<tr>
<td>80</td>
<td>95</td>
</tr>
<tr>
<td>□ Alt.Comp 1</td>
<td>□ Test Comp</td>
</tr>
<tr>
<td>Clear Score 1</td>
<td>Clear XBA Comp(s)</td>
</tr>
<tr>
<td>97</td>
<td>74</td>
</tr>
<tr>
<td>□ Alt.Comp 2</td>
<td>□ Comp</td>
</tr>
<tr>
<td>Clear Score 2</td>
<td>Clear XBA Comp(s)</td>
</tr>
<tr>
<td>□</td>
<td></td>
</tr>
<tr>
<td>Clear Score 3</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>LONG-TERM STORAGE AND RETRIEVAL (Glr)</th>
<th>SHORT-TERM MEMORY (Gsm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Indicate which composite(s) you wish to use for PSW analyses. No more than two scores can be selected for this domain.</td>
<td>Indicate which composite(s) you wish to use for PSW analyses. No more than two scores can be selected for this domain.</td>
</tr>
<tr>
<td>WISC-V Storage and Retrieval Index (Glr)</td>
<td>Short-Term Memory - XBA Gsm</td>
</tr>
<tr>
<td>102</td>
<td>81</td>
</tr>
<tr>
<td>□ Test Comp</td>
<td>Comp</td>
</tr>
<tr>
<td>Clear Glr Test Comp</td>
<td>Clear XBA Comp(s)</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>VISUAL PROCESSING (Gv)</th>
<th>AUDITORY PROCESSING (Ga)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Indicate which composite(s) you wish to use for PSW analyses. No more than two scores can be selected for this domain.</td>
<td>Indicate which composite(s) you wish to use for PSW analyses. No more than two scores can be selected for this domain.</td>
</tr>
<tr>
<td>WISC-V Visual Spatial Index (Gv2)</td>
<td>Comprehensive Test of Phonological Processing-2 (Ga)</td>
</tr>
<tr>
<td>84</td>
<td>91</td>
</tr>
<tr>
<td>□ Test Comp</td>
<td>□ Test Comp</td>
</tr>
<tr>
<td>Clear Gv Test Comp</td>
<td>Clear Gs Test Comp</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>PROCESSING SPEED (Gs)</th>
<th>DOMAIN SPECIFIC KNOWLEDGE (Gkn)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Indicate which composite(s) you wish to use for PSW analyses. No more than two scores can be selected for this domain.</td>
<td>Indicate which composite(s) you wish to use for PSW analyses. No more than two scores can be selected for this domain.</td>
</tr>
<tr>
<td>WISC-V Processing Speed Index (Gs)</td>
<td></td>
</tr>
<tr>
<td>100</td>
<td></td>
</tr>
<tr>
<td>□ Test Comp</td>
<td></td>
</tr>
<tr>
<td>Clear Gs Test Comp</td>
<td>Clear XBA Comp(s)</td>
</tr>
<tr>
<td></td>
<td></td>
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<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

7 CHC Estimates Have Been Transferred to the Data Organizer Tab
There is no requirement that all 8 areas of SLD (listed in IDEIA) be evaluated for the purpose of conducting a PSW analysis.
All Cognitive Areas Assessed Should Contribute to PSW Analysis
When determining cognitive areas of strength and weakness, consider whether an ability or process likely *facilitates or inhibits* overall learning and specific academic skill acquisition and development.
Cross-Battery Assessment Software System (X-BASS® v2.0)

PSW-A Data Summary

Conceptualization by D.P. Flanagan, S.O. Ortiz, V.C. Alfonso; Programming by S.O. Ortiz and A.M. Dynda
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Name: Rebecca
Grade: 4
Date: 2/22/2017
Age: 9 years 6 month(s)

### CHC ABILITY DOMAINS

<table>
<thead>
<tr>
<th>Domain</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>WISC-V Gc (VQ, IN) - No Reasoning Test Comp</td>
<td>97</td>
</tr>
<tr>
<td>Crystallized Intelligence - XBA Gc Comp</td>
<td>80</td>
</tr>
<tr>
<td>WISC-V FW (Plus converging data sources) Test Comp</td>
<td>95</td>
</tr>
<tr>
<td>Fluid Reasoning - XBA Gf Comp</td>
<td>74</td>
</tr>
<tr>
<td>WISC-V Storage and Retrieval Index (Gf) Test Comp</td>
<td>102</td>
</tr>
<tr>
<td>Short-Term Memory - XBA Gsm Comp</td>
<td>81</td>
</tr>
<tr>
<td>WISC-V Visual Spatial Index (Gv:Vz) Test Comp</td>
<td>84</td>
</tr>
<tr>
<td>Auditory Processing - XBA Ga Comp</td>
<td>91</td>
</tr>
<tr>
<td>WISC-V Processing Speed Index (Gs) Test Comp</td>
<td>100</td>
</tr>
</tbody>
</table>

### Areas of strength below form the Facilitating Cognitive Composite (FCC)
- Gc
- WISC-V FW
- WISC-V Storage and Retrieval Index (Gf)
- WISC-V Visual Spatial Index (Gv:Vz)
- Auditory Processing

### Areas of weakness below form the Inhibiting Cognitive Composite (ICC)
- Gf
- Gs

CCH Composites designated as strengths are used for computation of the g-Value and FCC (top oval in the DD/C model) and those designated as weaknesses are used for computation of the ICC (bottom left oval in the DD/C model). When a domain contains a strength and a weakness, the strength is used in calculation of the g-value/FCC and the weakness is used in the calculation of the ICC.

#### 1. g-Value:
- Criterion for average ability met: LIKELY ($g = 0.78$)

PSW analysis indicates that the individual appears to possess at least average overall ability. In this case, the g-Value is > 0.50 and the FCC/ACC is > 84. Consequently, the individual likely meets the criterion of at least average overall ability as operationalized in the DD/C model. The individual may be identified as SLD if the results from PSW analysis indicate that all other criteria for SLD identification have also been met and if supported by other data sources and information.

#### 3. Inhibiting Cognitive Composite (ICC)
- Represents an aggregate of an individual's overall weaknesses and is used to evaluate consistency and the relationship between cognitive and academic weaknesses. If there is only one cognitive weakness, the ICC is not calculated.

#### 4. Rarity/Frequency of Difference - FCC/ACC to Cognitive Weakness
- Select base rate level for determining if the size of a difference occurs rarely or infrequently. The default value is 10%. A more conservative or liberal value may be selected. If multiple comparisons are made, a stricter value may be appropriate.
**Note:** You may have a strength **and** a weakness within a broad ability domain (Gf and Gc in this example) – the score representing a strength contributes to the FCC and the score representing a weakness contributes to the ICC.
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PSW-A g-Value Summary
Conceptualization by D.P. Flanagan, S.O. Ortiz, V.C. Alfonso; Programming by S.O. Ortiz and A.M. Dynda
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Name: Rebecca
Grade: 4
Age: 9 years 6 month(s)
Date: 2/22/2017

Analysis and Interpretation of g-Value

Based on data entered in prior tabs, a g-Value is computed and displayed here. Users are advised to refer to the PSW-A Notes tab in X-BASS and to the relevant text in Essentials of Cross-Battery Assessment, Third Edition for a detailed discussion regarding the full meaning and proper use and interpretation of the g-Value.

The g-Value reflects overall cognitive ability based on the broad CHC abilities judged by the evaluator to be strengths for the individual using the following scale:

\[ \frac{1}{2} \leq .50 = \text{average overall ability is unlikely}; \quad .51 \leq .59 = \text{more information needed}; \quad > .60 = \text{average overall ability is very likely} \]

How likely is it that the individual’s pattern of strengths indicates at least average overall cognitive ability?

Despite the presence of weaknesses in one or more cognitive domains, the evaluator indicated that the individual possesses average or better functioning in cognitive domains considered important for acquiring the academic skills typical for this grade level. In this case, the individual’s overall ability ought to enable learning and achievement, particularly if the FCC/ACC is greater than or equal to 90 and when specific cognitive weaknesses are minimized through compensatory efforts, accommodations, and the like. If the FCC/ACC is between 85 and 89 inclusive, the criterion for at least average overall ability within the DD/C model should be supported by additional data and information.

The Cognitive Strengths graph indicates the abilities used for the purpose of calculating the g-Value and FCC which collectively represent general ability within the DD/C model. The g-Value is interpreted according to the likelihood that an individual possesses at least average overall cognitive ability.

FCC = 99

The Cognitive Weaknesses graph indicates the abilities used for the purpose of calculating the ICC. The ICC is the default value used to represent the area(s) of cognitive weakness in the DD/C model. It is compared to the FCC and evaluated for consistency with specific areas of academic weakness.

*Indicates a CHC domain that is comprised of both a strength and weakness.
ICC: Reasoning with Verbal Information; Inductive Reasoning; Working Memory; Visualization
Cross-Battery Assessment Software System (X-BASS® v2.0)

Dual-Discrepancy/Consistency Model: PSW Analyses for SLD

Conceptualization by D.P. Flanagan, S.O. Ortiz, V.C. Alfonso; Programming by S.O. Ortiz and A.M. Dynda
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Name: Rebecca
Age: 9 years 6 month(s)
Grade: 4
Date: 2/22/2017

**Cognitive Strengths**

The value here is either the Facilitating Cognitive Composite (FCC) or a user entered Alternative Cognitive Composite (ICC) or both. The **FCC** is the Facilitating Cognitive Composite that normalizes for the individual's performance across multiple tests.

**FCC = 99**

**WIAT-III Basic Reading Skills (BRS) Test Comp - 102**

**Supporting Academic Weaknesses**

Areas listed in the drop down menu are identified as academic strengths.

**Is the difference statistically significant?**

* p < .05

**Based on the data selected for use in the PSW Analyzer, specific criteria for establishing a PSW consistent with SLD have been met. However, this pattern of results does not automatically confirm the presence of SLD. This pattern must be considered within the context of the entire case history of the individual. In addition, other data gathered through multiple methods need to be considered (e.g., information regarding exclusionary factors) when identifying or diagnosing SLD (see chapter 4 in Essentials of Cross-Battery Assessment, 3rd Ed.).**

**OK**

**Academic Weakness**

The first weakness in the list is selected by default. You may select a different area of academic weakness from the drop down menu for analysis.

**Actual**

**Predicted by**

**Strength of Relationship**

**HIGH**

**Is there a BELOW AVERAGE aptitude-achieve consistency?**

**YES, CONSISTENT**
**Dual-Discrepancy/Consistency Model: Summary of PSW Analyses for SLD**

Name: Rebecca  
Age: 9 years 6 month(s)  
Grade: 4  
Date: 2/22/2017

Did the individual’s observed cognitive and academic performances meet criteria within the DD/C model consistent with PSW-based SLD identification?

YES. Based on the data selected for use in the PSW Analyzer, specific criteria for establishing a PSW consistent with SLD have been met. However, this pattern of results does not automatically confirm the presence of SLD. This pattern must be considered within the context of the entire case history of the individual. In addition, other data gathered through multiple methods need to be considered (e.g., information regarding exclusionary factors) when identifying or diagnosing SLD (see chapter 4 in Essentials of Cross-Battery Assessment, 3rd Ed.).

1. Is there evidence of domain specific weaknesses in cognitive functioning?

YES. The difference between the individual’s estimate of intact cognitive abilities (FCC=99) and the score representing the area of specific cognitive weakness (ICC=74) is statistically significant. This finding means that there is likely a true or real difference between the estimate of overall cognitive strengths and the identified area of specific cognitive weakness for the individual. In addition, there is an unusually large difference between actual performance in the specific cognitive area (SS=74) and expected performance (SS=99) as predicted by overall cognitive strengths. That is, based on the individual’s estimate of cognitive strengths, it was predicted that the individual would perform much better in the specific cognitive area. In fact, the size of the difference between the individual’s actual and predicted performance in the specific cognitive area occurs very infrequently. The results of these analyses suggest that the individual’s PSW consists of a domain-specific cognitive weakness (particularly when the actual SS < 90), an inclusionary criterion for SLD.

2. Is there evidence of unexpected underachievement?

YES. The difference between the individual’s estimate of intact cognitive abilities (FCC=99) and the score representing the area of specific academic weakness (RC=82) is statistically significant. This finding means that there is likely a true or real difference between the estimate of overall cognitive strengths and the identified area of specific academic weakness for the individual. In addition, there is an unusually large difference between actual performance in the specific academic area (SS=82) and expected performance (SS=99) as predicted by overall cognitive strengths. That is, based on the individual’s estimate of cognitive strengths, it was predicted that the individual would perform much better in the specific academic area. In fact, the size of the difference between the individual’s actual and predicted performance in the specific academic area occurs very infrequently. The results of these analyses suggest that the individual’s PSW is marked by unexpected underachievement (particularly when the actual SS < 90), an inclusionary criterion for SLD.
3. Is there evidence of a below-average aptitude-achievement consistency?

YES. The specific cognitive (SS=74 for ICC) and academic (SS=82 for RC) scores are indicative of normative weaknesses or deficits compared to same age peers (SS<85). There is research that supports a high relationship between the Inhibiting Cognitive Composite and Reading Comprehension which indicates that the ICC is comprised of two or more areas that are strongly related to Reading Comprehension. Therefore, this combination of scores provides evidence that assists in explaining the nature of the individual's observed learning difficulties. Based on all of these considerations, these findings appear to indicate overall support for the criterion regarding below average aptitude-achievement consistency.
Summary and Conclusions
PSW Model Provides Information About Important Markers for SLD

- **Overall cognitive ability is at least average** despite specific cognitive processing weaknesses – FCC (top oval)
- Specific cognitive processing weaknesses – ICC or individual weaknesses as reported in bottom left oval
  - Weaknesses relative to most people (< 90)
  - Weaknesses because they are significantly lower than FCC
  - Weaknesses because difference between actual and predicted performance is unusual in the general population
  - SLD is *specific, not general*
- **Academic weaknesses** – as reported in bottom right oval
  - Weaknesses relative to most people (< 90)
  - Weaknesses because they are significantly lower than FCC
  - Weaknesses because difference between actual and predicted performance is unusual in the general population
  - Unexpected underachievement
- **May have academic areas of strength** (reported in top oval as they are expected to be consistent with the FCC)
- **Consistency between** cognitive processing weakness (or weaknesses; e.g., ICC) and academic area of weakness (bottom two ovals)
  - Specific learning disabilities are caused by underlying cognitive processing weaknesses
  - “Disorder in one or more of the basic psychological processes” - IDEIA
PSW Models: The Controversy

- Given its increasing popularity, research on the PSW approach is emerging.
- One emerging body of research indicates that there is a \textit{lack of agreement among PSW models}.
  - This research also suggests that PSW models are effective at determining who \textit{is not SLD}, but they are not as effective at determining who \textit{is SLD}.
  - Valid points are made about \textit{potential weaknesses of PSW} models in this literature (e.g., Stuebing, Fletcher, Branum-Martin, & Francis, 2012).
- Another emerging body of research provides support for a neuropsychological/cognitive processing PSW approach (Hale et al., 2010 White Paper).
  - This research shows the relevance of PSW methods for differential diagnosis of learning disability in
    - \textbf{reading} (e.g., Feifer, Gerhardstein, Flanagan, Fitzer, & Hichs, 2014),
    - \textbf{math} (e.g., Kubas, Drefs, Poole, Schmid, Holland, & Fiorello, 2014), and
    - \textbf{written expression} (e.g., Fenwick, Kubas, Witzke, Fitzer, Miller, Maricle, & Hale, 2015).
  - Valid points are made about the \textit{potential strengths of PSW} models in this literature.
- While valid points are made for and against the use of PSW models, the results of the studies that have been published to date are impacted by methodological preferences used to analyze the data as well as the accuracy/inaccuracy of the assumptions made about each PSW model.
PSW Models: The Controversy

• There will be arguments for and against PSW over the next several years.

• All methods have limitations; PSW is no exception. Nevertheless, it most certainly can be used effectively \textit{to inform SLD diagnosis}.

• Until the critics produce a \textit{better method}, PSW will predominate and the battles will focus on which PSW method should be used in the schools.
Bottom Line

• *There is no SLD litmus test*; the more well-versed you are in different approaches and methods, the more information you will gain about the student (including how to best help him or her)
Identification of SLD

• Involves more than just examining scores from standardized tests or progress monitoring data
  – A convergence of data sources is necessary
  – Data should be gathered via different methods
  – Exclusionary factors must be considered and examined systematically
Three Important Tasks for All School Personnel

• Work to ensure that RTI is up and running well, most especially in the early grades
• Work closely with teachers to create a supportive environment for students where they can access the curriculum at their instructional level
Three Important Tasks for All School Personnel

• Conduct comprehensive assessments of students who do not respond as expected to quality instruction and intervention
  – Include cognitive/neuropsychological tests
  – Connect assessment findings to instructional strategies and interventions
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Complete program information on online registration can be found at: http://www.schoolneuropsych.com/xba/index.php?id=920

Discounts available for school districts

www.schoolneuropsych.com
Questions?
Special thanks to Drs. Dawn Flanagan and Sam Ortiz for sharing their slides based on the work of Flanagan, Ortiz, and Alfonso (2013, 2017).

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