What is the benefit of looking at a child through a neuropsychological lens?

1st Annual Gonzaga School of Education Assessment Conference

Daniel C. Miller, Ph.D., ABPP, ABSNP, NCSP, LSSP
Texas Woman’s University & KIDS, Inc.

Presentation Outline

• About the speaker
• Why the interest in neuropsychology?
• The continued integration of CHC theory with neuropsychological theories
• The Integrated School Neuropsychological / CHC Model
• Future trends in assessment

About the Speaker

• School psychologist and school neuropsychologist
• Professor and Department Chair - Texas Woman’s University
• Director of the KIDS, Inc. School Neuropsychology Post Graduate Certification Program
• Past President of the National Association of School Psychologists (2002-03)
• Author of several leading school neuropsychology publications.

Why the increased interest in school-neuropsychology?

• Interest in neuropsychological principles applied to the practice of school psychology is not new. Started in the early 1980s.
• Frustration of many current school psychologists over limitations to their professional practices.
• Over-reliance on special education diagnosis and classification taken the principles of psychology out of the practice of school psychology.

Recognition of the Neurobiological Bases of Childhood Learning and Behavioral Disorders

• Interest in the biological bases of human behavior is not new to our profession, but it is becoming more relevant to the current generation of school psychologists.
• The “nature vs. nurture” debate is as old as the psychology profession.
• The curriculum-based measurement/assessment approach touted by many practitioners today has its theoretical roots in behaviorism.
RTI Model: Questions Remain

- Some “experts” in the field of school psychology equate RTI with a strict behavioral or CBM approach to identifying children with disabilities.
- Progress monitoring will not ultimately answer the question why is the child not learning or behaving?
- Without accounting for individual differences, interventions become based on trial and error alone.

Intervening without assessment data is like a “fish and wish” approach – hoping that an intervention works by chance……..

Without accounting for individual differences, interventions become based on trial and error alone.

The Third Method of SLD Identification

- While using an RTI framework in a school can be beneficial to many students, RTI is not a diagnostic means in and of itself to assess SLD.
- However, the use of a third method of SLD identification is now an option.
- The third method includes any alternative, research-based procedure.
- Several alternative research-based approaches to SLD identification exist which are consistent with the third method, including:
  - the Operational Definition of SLD,
  - the Hypothesis Testing Cattell-Horn-Carroll Approach,
  - the Concordance-Discrepancy Model of SLD Determination
  - the Discrepancy/Consistency Model, and
  - the Response to the Right Intervention (RTRI) Model.
School Neuropsychological Assessment and SLD Identification

School Psychology:
- Reading Disabled
- Writing Disability
- Math Disability

School Neuropsychology:
- Reading Disabilities Subtypes:
  - Dysphonetic dyslexia
  - Surface dyslexia
  - Mixed dyslexia
- Writing Disability Subtypes
- Math Disability Subtypes

Feifer Assessment of Reading

- Age range: 4 to 21 years
- A comprehensive assessment of reading and related processes that will help you determine the examinee’s specific subtype of reading impairment and inform decisions about appropriate interventions.
- Based on the premise that treatments for reading disorders vary by dyslexic subtype, with four specific subtypes addressed: dysphonetic dyslexia, surface dyslexia, mixed dyslexia, and reading comprehension deficits.

School Neuropsychological Assessment and SLD Identification

- Rather than just identifying a SLD area based on a broad classification (e.g., reading disabled), school neuropsychologists try to drill down to the underlying cause of the reading disability.
- Knowing “why” a disability is occurring leads to more targeted interventions.

Summary of reasons why the increased interest in school-neuropsychology?

- Recognition of the Neurobiological Bases of Childhood Learning and Behavioral Disorders.
- Influences of Federal Education Laws and National Task Force Reports.
- Increased Number of Children with Medical Conditions that Affect School Performance.
- Increased Use of Medications with School-Aged Children.
- Increase in the Number of Challenging Educational and Behavioral Issues in the Schools.
- Lack of training opportunities in school neuropsychology.
- Increased emphasis on the identification of processing disorders in SLD children.

Integration of the SNP and CHC

- Miller (2007) introduced the school neuropsychological conceptual model and classified the major tests of cognitive abilities, achievement, and neuropsychological tests into that model.
- Flanagan and colleagues expanded their XBA approach (2nd ed.) and provided a software solution to XBA. They classified the major tests of cognitive abilities and achievement based on CHC theory.

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- Future trends in assessment
Integration of the SNP and CHC

- SNP Model Refined (Chapter) by Miller (2010) based on factor analytic studies and structural equation modeling.
- Flanagan, Alfonso, Ortiz, & Dynda (2010) wrote a groundbreaking chapter introducing an Integrated Framework which classified the major tests of cognitive abilities, achievement, and neuropsychological measures based on Lurian theory, Miller’s SNP Model, and CHC nomenclature.


- Set of tools that integrate XBA assessment with neuropsychological measures.

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- Future trends in assessment

Purpose of the SNP Model

The school neuropsychological conceptual model ("SNP Model") was created as a way of organizing school-age, cross-battery assessment data based upon the underlying principle neuropsychological constructs being measured.

Purposes of the SNP Model

- Facilitate clinical interpretation by providing an organizational framework for the assessment data;
- Strengthen the linkage between assessment and evidence-based interventions
- Provide a common frame of reference for evaluating the effects of neurodevelopmental disorders on neurocognitive processes


Theoretical Influences on the SNP Model

CHC Theory and School Neuropsychology

<table>
<thead>
<tr>
<th>CHC Theory</th>
<th>School Neuropsychology</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gf - Fluid Reasoning</td>
<td>Does not adequately address the constructs of:</td>
</tr>
<tr>
<td>Gc - Verbal Ability</td>
<td>Sensory Motor Functions</td>
</tr>
<tr>
<td>Gv - Visual-Spatial Thinking</td>
<td>Attention</td>
</tr>
<tr>
<td>Glr - Long-Term Retrieval</td>
<td>Learning and Memory</td>
</tr>
<tr>
<td>Ga - Auditory Processing</td>
<td>Executive Functions</td>
</tr>
<tr>
<td>Gsm - Short-Term Memory</td>
<td></td>
</tr>
<tr>
<td>Gs - Processing Speed</td>
<td></td>
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<tr>
<td>Gq - Quantitative Reasoning</td>
<td></td>
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</tbody>
</table>

Initial Development of the SNP Model

- Therefore, the SNP Model integrated additional neuropsychological theories such as Mirsky's theory of attention (Mirsky, 1996) and Baddeley and Hitch's (1974) theory of working memory (Baddeley, 2003).
- The SNP Model is also heavily influenced by Kaplan's process-oriented approach (Milberg et al., 2009), which resulted in the inclusion of qualitative, as well as, quantitative assessment data.
Lurian Approach to Assessment

Finally, the SNP Model follows a Lurian approach in which an individual’s neurocognitive strengths and weakness are systematically determined by varying the input, processing, and output demands across a variety of tasks.

CHT Model

- Cognitive Hypothesis Testing (CHT) Model.

Conducting Demand Analyses

1. Presenting problem
2. Intellectual/ cognitive problem
3. Administer/ score intelligence test
4. Interpret IQ or conduct demand analyses
5. Cognitive strengths/ weaknesses
6. Choose related construct test(s)
7. Administer/ score related construct test(s)
8. Interpret related tests/ compare results
9. Intervention consultation
10. Choose plausible intervention
11. Collect objective intervention data
12. Determine intervention efficacy
13. Continue/ terminate/ modify intervention

Integrated SNP/CHC Model (Miller, 2013)

- Cognitive Processes: Analyzing, Attention, Memory, Reasoning
- Acquired Knowledge: Academic Achievement, Language Abilities
- Basic Sensorimotor Capabilities: Fine Motor, Visual-Motor, Visual Spatial, Expressive Language
Report Organization: Organizing Evaluation Results

- Classroom Observations
- Basic Sensorimotor Functions
- Cognitive Processes: Visual/Spatial
- Cognitive Processes: Auditory/Phonological
- Cognitive Processes: Learning and Memory
- Cognitive Processes: Executive
- Facilitators/Inhibitors: Allocating and Maintaining Attention
- Facilitators/Inhibitors: Working Memory
- Facilitators/Inhibitors: Speed, Fluency, and Efficiency of Processing
- General Intellectual Functioning (Optional)
- Acquired Knowledge: Acculturation Knowledge
- Acquired Knowledge: Language Abilities
- Acquired Knowledge: Reading Achievement
- Acquired Knowledge: Written Language Achievement
- Acquired Knowledge: Mathematics Achievement
- Social-Emotional Functioning and Adaptive Behaviors

Sensorimotor Functions

The sensorimotor motor functions are the basic building blocks for higher-order cognitive processes and influence the acquisition of acquired knowledge.

Sensorimotor Functions

<table>
<thead>
<tr>
<th>Broad Classification</th>
<th>2nd Order Classification</th>
<th>3rd Order Classification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sensorimotor Functions</td>
<td>Lateral preference</td>
<td>Auditory and visual acuity</td>
</tr>
<tr>
<td>Sense functions</td>
<td>Tactile sensation and perception</td>
<td>Coordinated finger/hand movements</td>
</tr>
<tr>
<td>Fine motor functions</td>
<td>Visual-motor integration skills</td>
<td>Direct measures</td>
</tr>
<tr>
<td>Visual scanning</td>
<td>Coordination</td>
<td></td>
</tr>
<tr>
<td>Gross motor functions</td>
<td>Qualitative behaviors</td>
<td></td>
</tr>
</tbody>
</table>

Reporting Basic Sensorimotor Functions

- Presenting Concerns
- Current levels of functioning
  - Sensory Functions
  - Fine Motor Functions
  - Visual-Motor Integration Skills
  - Visual Scanning
  - Gross Motor Functions
- Summary of basic sensorimotor functions

When to Assess for Sensorimotor Functions

Sensory deficits have been associated with:
- Autism Spectrum Disorders
- AD-HD
- Learning Disabilities
- Dyslexia
- Nonverbal learning disabilities
- Genetic disorders (e.g., Down’s Syndrome)
- Non-genetic disorders (e.g., Fetal Alcohol Syndrome)
- Psychological disorders (e.g., obsessive-compulsive disorder).
Cognitive Processes

Essential cognitive processes influenced by both basic sensorimotor functions and facilitators/inhibitors.

Visuospatial Processes

<table>
<thead>
<tr>
<th>Broad Classification</th>
<th>2nd Order Classification</th>
<th>3rd Order Classification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Visuospatial processes</td>
<td>• Visuospatial perception</td>
<td>• Visual discrimination and spatial localization</td>
</tr>
<tr>
<td></td>
<td>• Visual-motor constructions</td>
<td>• Qualitative behaviors</td>
</tr>
<tr>
<td></td>
<td>• Visuospatial reasoning</td>
<td>• Recognizing spatial configurations</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Visual gestalt closure</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Visuospatial analyses with and without mental rotations</td>
</tr>
</tbody>
</table>

Why Assess Visuospatial Processes?

Visual perceptual skills play a major role in the development of:
- handwriting skills
- academic skills such as orthographic processing, visual-spatial aspects of math.
- academic fluency
- face recognition
- social skills

Auditory/Phonological Processes

<table>
<thead>
<tr>
<th>Broad Classification</th>
<th>2nd Order Classification</th>
<th>3rd Order Classification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Auditory/Phonological processes</td>
<td>• Sound discrimination</td>
<td>• Recognizing spatial configurations</td>
</tr>
<tr>
<td></td>
<td>• Auditory/phonological processing</td>
<td></td>
</tr>
</tbody>
</table>

Why Assess Auditory Processing?

- The basic building blocks of language are sound discrimination and auditory processing skills.
- Auditory processes affect:
  - Reading
  - Phonological aspects of writing
  - Oral expression

Tests of Auditory Processing

Auditory/Phonological Processing:
- CTOPP: Blending Words, Elision, & Sound Matching
- DAS-II: Phonological Processing
- Developmental Test of Auditory Perception (DTAP): Composite Auditory Perception Index
- KTEA-II: Phonological Awareness
- NEPSY-II: Phonological Processing
- PAL-II RW: Phonological Coding
- TAPS-3: Phonological Blending, Phonological Segmentation, & Word Discrimination
Learning and Memory Processes

<table>
<thead>
<tr>
<th>Broad Classification</th>
<th>1st Order Classification</th>
<th>2nd Order Classification</th>
<th>3rd Order Classification</th>
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<tbody>
<tr>
<td>Learning and Memory Processes</td>
<td>Rate of new learning</td>
<td>Verbal learning</td>
<td>Visual learning</td>
</tr>
<tr>
<td>Immediate verbal memory</td>
<td>Letter recall</td>
<td>Number recall</td>
<td>Word recall</td>
</tr>
<tr>
<td>Immediate visual memory</td>
<td>Abstract designs, spatial locations, or visual sequences with motor response (no contextual cues)</td>
<td>Faces, objects, or pictures with verbal or painting response (no contextual cues)</td>
<td>Visual Digit Span with verbal response (no contextual cues)</td>
</tr>
</tbody>
</table>

Learning and Memory Processes

<table>
<thead>
<tr>
<th>Broad Classification</th>
<th>1st Order Classification</th>
<th>2nd Order Classification</th>
<th>3rd Order Classification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Learning and Memory Processes</td>
<td>Delayed verbal memory</td>
<td>Free recall without contextual cues</td>
<td>Free recall with contextual cues</td>
</tr>
<tr>
<td></td>
<td>Delayed visual memory</td>
<td>Free recall without contextual cues</td>
<td>Free recall with contextual cues</td>
</tr>
<tr>
<td></td>
<td>Verbal-visual associative learning and recall</td>
<td>Verbal-visual associative learning</td>
<td>verbal-visual associative delayed recall</td>
</tr>
</tbody>
</table>

Why Assessment Learning and Memory?

- Learning is what education is all about; yet school psychologists and educators do not often systematically assess for all aspects of learning.
- Memory is the recall of what is learned over time and is equally important to assess. How a child recalls what has been learned will provide insights into how the child encodes, stores, and retrieves information.

Stand Alone Tests of Memory and Learning

<table>
<thead>
<tr>
<th>Test</th>
<th>Age Range</th>
<th>Publisher</th>
</tr>
</thead>
<tbody>
<tr>
<td>California Verbal Learning Test – Children’s Version (CVLT-C)</td>
<td>5 to 16 years</td>
<td>Pearson</td>
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<tr>
<td>Children’s Auditory Verbal Learning Test – 2 (CAVLT-2)</td>
<td>7 to 17 years</td>
<td>PAR</td>
</tr>
<tr>
<td>Children’s Memory Scale (CMS)</td>
<td>5 to 16 years</td>
<td>Pearson</td>
</tr>
<tr>
<td>Test of Memory and Learning – Second Edition (TOMAL-2)</td>
<td>5 to 59 years</td>
<td>PRO-ED</td>
</tr>
<tr>
<td>Wechsler Memory Scale – Fourth Edition (WMS-IV)</td>
<td>5 to 90 years</td>
<td>Pearson</td>
</tr>
<tr>
<td>Wide Range Assessment of Memory and Learning – Second Edition (WRAML2)</td>
<td>5 to 90 years</td>
<td>PAR</td>
</tr>
</tbody>
</table>

Learning and Memory: Rate of New Learning

Verbal Learning Examples:
- NEPSY-II: List Memory Learning Effect
- WRAML2: Verbal Learning

Visual Learning Examples:
- CMS: Dot Locations Learning & Dot Locations Total

Learning and Memory: Immediate Memory

Verbal Immediate Memory:
- Letter Recall (No Contextual Cue)
- Number Recall (No Contextual Cue)
- Word Recall (No Contextual Cue)
- Sentence Recall (Contextual Cue)
- Story Recall (Contextual Cue)

Visual Immediate Memory:
- Abstract Designs with Motor Response (No Contextual Cue)
- Abstract Designs with Verbal Response (No Contextual Cue)
- Faces with Verbal or Painting Response (No Contextual Cue)
- Objects/Pictures with Verbal or Painting Response (No Contextual Cue)
- Spatial Locations with Motor Response (No Contextual Cue)
- Visual Digit Span with Verbal Response (No Contextual Cue)
- Visual Sequence with Motor Response (No Contextual Cue)
- Picture or Symbolic (With Contextual Cue)
Learning and Memory:
Delayed Memory: Free-Recall and Recognition

Delayed Verbal Memory:
- Delayed Verbal Recall without Contextual Cues
- Delayed Verbal Recall with Contextual Cues
- Delayed Verbal Recognition without Contextual Cues
- Delayed Verbal Recognition with Contextual Cues

Delayed Visual Memory:
- Delayed Visual Recall without Contextual Cues
- Delayed Visual Recall with Contextual Cues
- Delayed Visual Recognition without Contextual Cues
- Delayed Visual Recognition with Contextual Cues

What's New in Executive Functions?

Terms/Concepts/Processes Associated with Executive Functions

- Abstract reasoning
- Anticipation
- Attentional control
- Behavioral initiation/productivity
- Behavioral regulation
- Common sense
- Concept formation
- Creativity
- Estimation
- Fluency (verbal and nonverbal)
- Goal setting
- Hypothesis generation
- Inhibition of impulsiveness
- Mental flexibility
- Organization
- Planning problem solving
- Rule learning
- Self-control
- Self-monitoring
- Set formation and maintenance
- Set shifting
- Working memory

Adapted from Baron, 2004

New Resources on Executive Functions

Now available - Executive Functions: What They Are, How They Work, and Why They Evolved by Russell Barkley

2012 - Barkley Deficits in Executive Functioning Scale: Children and Adolescents (BdEFS-CA)

2012 - Essentials of Executive Function Assessment by George McCloskey and Lisa Perkins

Comparing Executive Function Constructs

<table>
<thead>
<tr>
<th>BRIEF</th>
<th>BRIEF-CA (Barkley)</th>
<th>CEFI (Naglieri &amp; Goldstein)</th>
<th>BDEFS-CA (Barkley)</th>
<th>Integrated QRPE/CHC Model (Miller)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Self-restraint</td>
<td>Self-Restraint</td>
<td>Sensitivity Control</td>
<td>Anticipation</td>
<td>Initiation</td>
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<td>Inhibit</td>
<td>Inhibit</td>
<td>Inhibit</td>
<td>Inhibit</td>
<td>Inhibit</td>
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<tr>
<td>Self-regulate emotions</td>
<td>Self-regulate emotions</td>
<td>Emotional Regulation</td>
<td>Compliance/Anger Management</td>
<td>Behavioral/Motivational Regulation</td>
</tr>
<tr>
<td>Echomotor control</td>
<td>Echomotor control</td>
<td>Echomotor control</td>
<td>Echomotor control</td>
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<td>Working memory</td>
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<td>Attention</td>
<td>Attention</td>
<td>Attention</td>
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<tr>
<td>Plan/organize</td>
<td>Plan/organize</td>
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<tr>
<td>Qualitative behaviors</td>
<td>Qualitative behaviors</td>
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<td>Qualitative behaviors</td>
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</tbody>
</table>

New Resources on Executive Functions

D-REF: Delis Rating of Executive Function (Fall, 2012)


Adapted from Baron, 2004
Measuring Executive Functions

- The conceptualization of executive functions is evolving.
- However, executive functions should ideally be measurable and operationalized for clinical practice.
- More research needs to be done to validate EF models.
- The Integrated SNP/CHC Model takes a neurocognitive approach to EF at this time.

Executive Functions

<table>
<thead>
<tr>
<th>Broad Classification</th>
<th>2nd Order Classification</th>
<th>3rd Order Classification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Executive Functions</td>
<td>Cognitive flexibility (set shifting)</td>
<td>Verbal set shifting</td>
</tr>
<tr>
<td></td>
<td>Concept formation</td>
<td>Concept recognition</td>
</tr>
<tr>
<td></td>
<td>Problem solving, planning, and reasoning</td>
<td>Planning</td>
</tr>
<tr>
<td></td>
<td>Response inhibition</td>
<td>Verbal response inhibition</td>
</tr>
<tr>
<td></td>
<td>Qualitative behaviors</td>
<td>Behavioral/ emotional regulation</td>
</tr>
</tbody>
</table>

Why Assess for Executive Functions?

- Executive functions serve as the operators to get other cognitive processes done.
- Executive functions include:
  - Cognitive flexibility
  - Ability to form and/or recognize concepts - divergent thinking
  - Problem solving, reasoning, and planning
  - Ability to inhibit extraneous or counterproductive responses during learning and behaving
  - Emotional and behavioral regulation

Executive Functions: Qualitative Behaviors

- Set-Loss Errors (Failure to Maintain the Directions)
- Repetition Errors (Close Together = perseveration, Far Apart = memory weakness)
- Corrected Errors (Good Self-Monitoring)
- Uncorrected Errors (Poor Self-Monitoring)
- Omission Errors
- Commission Errors
- Sequencing Errors
- Time-Discontinuation Errors
- Initiating Behaviors (Reflective or Impulsive):
  - Rule Violations During Task Performance (Impulsive Response Style or Oppositional Response Style):
  - Total Attempted Items
  - Percent Accuracy

So Where Did the Other “Cognitive Processes” of Attention, Working Memory, and Processing Speed Get Classified?

Many of the qualitative, process-oriented, behaviors measures by tests such as the NEPSY-II and D-KEFS are similar to some of the Self-Regulation Executive Function Capabilities in McCloskey’s theoretical model.
A New Concept for the Integrated SNP/CHC Model

**Facilitators**

- In the original SNP Model, attentional processes were designated as a separate broad classification, **when in fact**, attentional processes permeate almost every other process and function described in the SNP Model.
- This is often the case for the speed and efficiency of processing and to a lesser degree working memory.

**Inhibitors**

- All three of these: attention, processing speed, and working memory act as **facilitators** to enhance the performance of other cognitive functions. It can be argued that these three processes do not work in isolation per se, but are cognitive facilitators.
- One of the major changes to the SNP Model is the creation of a broad classification called facilitators/inhibitors.

Facilitators/Inhibitors

- The concept of facilitators/inhibitors used in this model is much broader than the types of facilitators/inhibitors described in Dean and Woodcock’s (1999) information-processing model.
- They included external factors such as sensory-motor deficits and internal factors as motivation, fatigue, and behavioral style as examples of facilitators and inhibitors.

Practical Example of Facilitators/Inhibitors

- Think of a student attempting to solve a story problem.
- Story problems are generally thought of as a mathematical reasoning task, but attempting to solve a story problem also requires a combination of facilitators and inhibitors to accomplish the task.
Practical Example of Facilitators/Inhibitors

• In order for the student to initially encode an auditorially presented story problem, the student must focus attentional resources on the task at hand (a facilitator).

• Depending upon the length of the story problem, the student may have to utilize sustained attention (a facilitator) to maintain focus.

• The student also has to not pay attention to the extraneous details in the story or to any other distractors in the environment or internal distractors (an inhibitor).

• In story problems, the student must figure out what elements to extract and then manipulate to solve the problem, which requires working memory and reasoning skills (a facilitator).

Facilitators/Inhibitors

- WISC-IV Block Design
- WISC-IV Block Design – No Time Bonus
- Visual-Spatial Perception
- Attention
- Processing Speed

Why Assess for Attention?

• Attention permeates all cognitive processes and academic achievement.

• Assessing attention is not synonymous with giving a BASC-2 or Conners.

• Attention is a multifaceted construct and must be measured accordingly to determine what subcomponent of attention if any is not working well.

Facilitators/Inhibitors

- WJIII ACH NU Writing Samples
- WISC-IV Arithmetic
- Attention
- Working Memory
- Processing Speed

Allocating and Maintaining Attention

- Attentional Capacity for Numbers or Letters with Verbal Response
- Attentional Capacity for Visual Sequential Patterns with Motor Response
- Attentional Capacity for Words and Sentences (Increased Meaning) with Verbal Response
- Attentional Capacity for Stories (Even more Contextual Meaning) with Verbal Response
Facilitators/Inhibitors

Cognitive Processes:
- Attention
- Auditory
- Learning and Memory
- Executive

Acquired Knowledge:
- Academic Knowledge
- Language Abilities
- Reading Achievement
- Written Language Achievement

Speed and Efficiency of Cognitive Processing

Facilitators/Inhibitors

Cognitive Processes:
- Attention
- Auditory
- Learning and Memory
- Executive

Acquired Knowledge:
- Academic Knowledge
- Language Abilities
- Reading Achievement
- Written Language Achievement

Speed and Efficiency of Cognitive Processing

Why Assess for Working Memory?
- Working memory helps facilitate (when it is working) or inhibits (when it is not working) all areas of academic achievement and many aspects of cognitive processing.

Why Assess for Speed and Efficiency of Cognitive Processing?
- Processing speed is the "glue" that holds together multiple cognitive processing and makes the learner efficient.
- Processing speed as a cognitive construct is not well defined.
- Processing speed deficits are implicated in many childhood genetic disorders.

Speed, Fluency, and Efficiency of Processing Facilitators/Inhibitors

- Based on the synthesis of multiple exploratory and confirmatory factor analytic studies, McGrew (2005) and McGrew and Evans (2004) concluded that processing speed (Gs) might be best represented as a set of hierarchically organized speed taxonomy.
- Schneider and McGrew (2012) modified the aforementioned hierarchically model of processing speed to include a hypothesized general g factor of speed and composed of broad factors of cognitive speed, decision speed, and psychomotor speed.
- These broad factors included constructs of perceptual speed, rate of test taking, reaction time, movement time, and retrieval fluency.

Speed, Fluency, and Efficiency of Processing Facilitators/Inhibitors

- Speed, Fluency, and Efficiency of Processing Facilitators/Inhibitors (Broad Classification)
  - Second Order Classifications:
    - Performance Fluency
    - Retrieval Fluency
    - Acquired Knowledge Fluency
    - Fluency and Accuracy
Performance fluency is the ability to quickly perform simple, repetitive tasks. Performance fluency tasks do not require any memory retrieval. The tasks in this area are all related to over-learned, automatic processing.

Psychomotor fluency tasks require rapid motor output.

In CHC nomenclature, psychomotor fluency is a measure of psychomotor speed ($G_{ps}$) and movement time ($MT$).

An example of this kind of task would be keeping a pencil line moving through a maze as quickly as possible.

Perceptual speed or fluency ($P$) is defined as the ability to quickly distinguish similar but different visual patterns and maintain attention under timed conditions (Horn & Blankson, 2012).

Rate of Test Taking ($R_9$) is a narrow ability within the CHC nomenclature and relates to the perform of tests that are relatively easy or those that require very simple decisions (Horn & Blankson, 2012).

Figural fluency refers to the ability to connect dots with unique line patterns while following discrete rules.

Naming fluency = rapid automatized naming (RAN)

Naming fluency tasks require the student to rapidly name common objects, colors, words, or letters as quickly as possible.

Naming fluency or RAN tests are frequently used for diagnosing reading disabilities in children.
Many of the tests that measure oral motor fluency require the student to repeat words that are not real words but require the application of phonological rules. Students with deficits in this area should be referred to a speech and language therapist for a thorough evaluation.

Speed and Efficiency: Performance Fluency: Oral Motor Fluency

Miller, 2012

Acquired knowledge fluency measures represent the automaticity of processing for rapid reading, writing, and solving math problems.

Speed and Efficiency: Acquired Knowledge Fluency: Reading Fluency

• With the revision of IDEA in 2004 (United States Department of Education, 2004), reading fluency was added as a type of specific learning disability. The major academic test publishers have included a variety of reading fluency measures
• Reading fluency measures:
  – Rapid phonological decoding (most common)
  – Rapid morphological decoding

Speed and Efficiency: Acquired Knowledge Fluency: Math Fluency

• Mathematics fluency is also not yet recognized as a specific learning disability in IDEA, yet it is also an important skill to be assessed.
• Mathematics fluency represents the automaticity of completing math problems quickly and efficiently. There are many reasons why mathematics fluency can be disrupted.
Assessing Fluency with Accuracy

- An important measure to consider in a school neuropsychological evaluation is the interaction between fluency and accuracy.
- Anytime a test requires the examiner to record completion time, processing speed is indirectly being measured.
- Typically, tests that measure completion time also provide a measure of performance accuracy.

Interpretation of the Completion Time – Accuracy Interaction

<table>
<thead>
<tr>
<th>Low # of Errors</th>
<th>High # of Errors</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fast Completion Time</td>
<td>Indicates that the child has excellent processing speed and accuracy.</td>
</tr>
<tr>
<td>Average Completion Time</td>
<td>Indicates a child with good inhibitory skills. The child is attempting to balance speed with control but lacks the inhibitory skills to keep his or her error rate within normal limits.</td>
</tr>
<tr>
<td>Slow Completion Time</td>
<td>Indicates that the child may have chosen to slow down to increase accuracy or may have slow processing speed. Indicates that despite the child slowing down accuracy did not improve; usually indicative of low ability in the tested area.</td>
</tr>
</tbody>
</table>

Acquired Knowledge

Acquired knowledge is just what the name implies and includes encyclopedic knowledge, language abilities and academic achievement.

Acquired Knowledge

Comprehension-Knowledge ($G_c$), Domain-Specific Knowledge ($G_{dn}$), Reading and Writing ($G_{rw}$), and Quantitative Knowledge ($G_q$) are all classified as acquired knowledge within CHC theory since “they all involve the acquisition of useful knowledge and understanding of important domains of human functioning” and all of “these factors represent information stored in long-term memory” (Schneider & McGrew, 2012, p. 122).
Acquired Knowledge (Acculturation Knowledge):

• The term "acculturation knowledge" was used by Horn and Blankson (2012) to describe $G_c$ and is synonymous with the label comprehension-knowledge.

• In the Integrated SNP/CHC Model, the label acculturation knowledge was used as a broad classification.

• The term semantic memory, first used by Miller (2007) in the original SNP Model, is a second order classification within acculturation knowledge.

Acquired Knowledge (Language Abilities):

Integrated SNP/CHC Model:

Acquired Knowledge: Language Abilities:
- Oral Expression (vocabulary knowledge)
- Receptive Language

Classification of Reading Achievement

<table>
<thead>
<tr>
<th>Broad Classifications</th>
<th>Second Order Classifications</th>
<th>Third Order Classifications</th>
</tr>
</thead>
</table>
| Acquired Knowledge: Reading Achievement | Basic reading skills | Phonological decoding
| | | Orthographic coding
| | | Morphological/syntactic coding
| | Reading comprehension skills |

Classification of Written Language Achievement

<table>
<thead>
<tr>
<th>Broad Classifications</th>
<th>Second Order Classifications</th>
<th>Third Order Classifications</th>
</tr>
</thead>
</table>
| Acquired Knowledge: Written Language Achievement | Written expression | Expository composition
| | | Orthographic spelling
| | | Handwriting skills
| | | Qualitative behaviors

Classification of Mathematics Achievement

<table>
<thead>
<tr>
<th>Broad Classifications</th>
<th>Second Order Classifications</th>
<th>Third Order Classifications</th>
</tr>
</thead>
</table>
| Acquired Knowledge: Mathematics Achievement | Oral counting | Fact retrieval
| | | Mathematical calculations
| | | Mathematical reasoning
| | | Qualitative behaviors

Presentation Outline

• About the speaker
• Why the interest in neuropsychology?
• The continued integration of CHC theory with neuropsychological theories
• The Integrated School Neuropsychological / CHC Model
• Future trends in assessment
How Do We Decide on An Assessment Battery?

- Fixed Battery Approach
- Cross Battery Approach
- Flexible Battery Approach
- Selective Assessment Approach

**Fixed Battery Approach**

- Not time efficient
- No one assessment tool will be sufficient for all referral questions
  - Choose the WISC-V for a 8 year old suspected of having a reading problem, but the WISC-V does not measure auditory processing (Ga)
  - Choose the WJ-IV for a 10 year old suspected of having ADHD, but the WJ-IV has limited measures of attention.
- If you are paying by the subtest for administration, it could get expensive.

**Cross-Battery Assessment Approach**

- Provides greater flexibility in assessment.
- Allows for customized test batteries designed to address referral concerns.
- X-BASS program is a wonderful addition to the field of school psychology.
- Requires a higher degree of expertise including knowledge of established aptitude-achievement relationships across age ranges.

**Flexible Battery Approach**

- Differs from XBA in that all of the tests can come from one battery.
- The combination of tests, within or cross-battery may vary based on each child.
- Requires the examiner to have broad assessment skills and know when to use them.

**Selective Assessment Approach**

- Assessment specialists are looking for empirical evidence to help target or narrow the focus of assessment to be more cost efficient and provide a solid linkage to evidence-based interventions.

What role does the normative samples of the tests we use play in differential diagnoses?

- Major tests of cognitive abilities and academic achievement generally have well defined standardization samples based on U.S. Census data.
- What is most often lacking in these tests is differential performance data for groups of individuals with clinical disorders.
Selective Assessment Approach

NEPSY-II Example:
- Includes validity studies for 7 clinical groups: students referred for suspected difficulties in:
  - Reading
  - Mathematics
  - Attention/Concentration
  - Behavior Management
  - Language Delays
  - Perceptual and/or Motor
  - School readiness

(Korkman, Kirk, & Kemp, 2007)

Example of Diagnostic Assessment for Learning Differences - Reading

- Attention and Executive Functioning
  - Aud. Attn & Resp. Set (5-16)
  - Inhibition (5-16)
  - Statue (3-6)

- Language
  - Comp. of Instr. (3-16)
  - Oromotor Sequences (3-12)
  - Phonological Process. (3-16)
  - Speeded Naming (3-16)

- Memory and Learning
  - Memory of Names/Delayed (5-16)
  - Word List Interference (7-16)

- Sensorimotor
  - Manual Motor Seqs (3-12)

- Social Perception (N/A)

- Visuospatial Processing
  - Design Copying (3-16)
  - Picture Puzzles (7-16)

Example of Diagnostic Assessment for Perceptual/Motor Delays/Disorders

- Attention and Executive Functioning
  - Aud. Attn & Resp. Set (5-16)
  - Clocks (7-16)

- Language
  - Oromotor Sequences (3-12)

- Memory and Learning
  - Memory for Designs/Delayed (3-16)

- Sensorimotor
  - Finger Tapping (5-16)
  - Imitating Hand Positions (3-12)

- Social Perception
  - Affect Recognition (Opt) (3-16)

- Visuospatial Processing
  - Block Construction (3-16)
  - Design Copying (3-16)

Woodcock-Johnson Clinical Database

- Clinical validity data for the WJIII tests (WJ III COG, DS, and WJIII ACH) using 21 different clinical groups.
- 6,081 clinical case data sets collected by the Woodcock-Muñoz Foundation.
- Data obtained from a variety of sources including initial publisher clinical validation samples, clinical practices, and research studies.

WJ III COG & ACH Clinical Group Data - Chapter 6

Initial goal for the data analysis:
- identify clinical groups based on age
- group them categorically based on the type of diagnoses
- look for patterns of performance in both the cognitive and acquired knowledge domains.


Initial findings at this website.

Table: WJ III Clinical Validity Groups

<table>
<thead>
<tr>
<th>Diagnosis</th>
<th>6-9 yrs</th>
<th>10-18 yrs</th>
<th>19-49 yrs</th>
<th>50+ yrs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reading Disorders</td>
<td>503</td>
<td>204</td>
<td>24</td>
<td>17</td>
</tr>
<tr>
<td>Writing Disorders</td>
<td>518</td>
<td>287</td>
<td>22</td>
<td>16</td>
</tr>
<tr>
<td>Mathematics Disorders</td>
<td>507</td>
<td>288</td>
<td>23</td>
<td>19</td>
</tr>
<tr>
<td>Executive Function</td>
<td>511</td>
<td>275</td>
<td>22</td>
<td>17</td>
</tr>
<tr>
<td>Language Disorders</td>
<td>507</td>
<td>289</td>
<td>23</td>
<td>19</td>
</tr>
<tr>
<td>Motor Fine Motor Skills</td>
<td>512</td>
<td>277</td>
<td>22</td>
<td>16</td>
</tr>
<tr>
<td>Motor Gross Motor Skills</td>
<td>506</td>
<td>281</td>
<td>22</td>
<td>16</td>
</tr>
<tr>
<td>General Learning Abilities</td>
<td>510</td>
<td>277</td>
<td>22</td>
<td>16</td>
</tr>
</tbody>
</table>


Mathematics Disorders Example

Tier 1 Weaknesses: The fewest tests providing the most information about potential weaknesses:

<table>
<thead>
<tr>
<th>6-9 Year Olds (n = 47)</th>
<th>10-18 Year Olds (n = 116)</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Letter-Word Identification</td>
<td>• Applied Problems</td>
</tr>
<tr>
<td>• Calculation</td>
<td>• Number Series</td>
</tr>
<tr>
<td>• Passage Comprehension</td>
<td>• Calculation</td>
</tr>
<tr>
<td>• Applied Problems</td>
<td>• Numbers Reversed</td>
</tr>
<tr>
<td>• Numbers Reversed</td>
<td>• Letter-Word Identification</td>
</tr>
<tr>
<td>• Writing Samples</td>
<td>• Spelling</td>
</tr>
<tr>
<td>• Handwriting</td>
<td>• Concept Formation</td>
</tr>
<tr>
<td>• Memory for Words</td>
<td>• Reading Vocabulary</td>
</tr>
<tr>
<td>• Analysis/Synthesis</td>
<td>• Handwriting</td>
</tr>
<tr>
<td>• Visual-Auditory Learning</td>
<td>• Verbal Comprehension</td>
</tr>
</tbody>
</table>

Math deficits obviously show up as major weaknesses in children identified with a math disability; however, math deficits alone do not tell the whole tale of the deficit patterns.

Tier 1 Weaknesses: The fewest tests providing the most information about potential weaknesses:

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<td>• Verbal Comprehension</td>
</tr>
</tbody>
</table>
Tier 1 Weaknesses: The fewest tests providing the most information about potential weaknesses.

**Mathematics Disorders Example**

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</thead>
<tbody>
<tr>
<td>Working memory deficits</td>
<td>Numbers Reversed</td>
<td>Numbers Reversed</td>
</tr>
<tr>
<td>Comprehension-Knowledge</td>
<td>Letter-Word Identification</td>
<td>Letter-Word Identification</td>
</tr>
<tr>
<td>Calculation</td>
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</tr>
<tr>
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<td>Visual-Auditory Learning</td>
<td>Visual-Auditory Learning</td>
</tr>
<tr>
<td>Memory for Words</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Analyses/Synthesis</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Visual-Auditory Learning</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Tier 2 Weaknesses: More tests providing the most information about potential weaknesses.

**Mathematics Disorders Example**

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<tbody>
<tr>
<td>Working memory deficits</td>
<td>Numbers Reversed</td>
<td>Numbers Reversed</td>
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<tr>
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<td>Letter-Word Identification</td>
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<tr>
<td>Spelling</td>
<td>Handwriting</td>
<td>Handwriting</td>
</tr>
<tr>
<td>Numbers Reversed</td>
<td>Memory for Words</td>
<td>Memory for Words</td>
</tr>
<tr>
<td>Writing Samples</td>
<td>Analysis/Synthesis</td>
<td>Analysis/Synthesis</td>
</tr>
<tr>
<td>Handwriting</td>
<td>Visual-Auditory Learning</td>
<td>Visual-Auditory Learning</td>
</tr>
<tr>
<td>Memory for Words</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Analyses/Synthesis</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Visual-Auditory Learning</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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<td>Letter-Word Identification</td>
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</tr>
<tr>
<td>Calculation</td>
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<td>Spelling</td>
</tr>
<tr>
<td>Passage Comprehension</td>
<td>Concept Formation</td>
<td>Concept Formation</td>
</tr>
<tr>
<td>Applied Problems</td>
<td>Reading Vocabulary</td>
<td>Reading Vocabulary</td>
</tr>
<tr>
<td>Spelling</td>
<td>Handwriting</td>
<td>Handwriting</td>
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<td>Visual-Auditory Learning</td>
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<tr>
<td>Memory for Words</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Analyses/Synthesis</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Visual-Auditory Learning</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Mathematics Disorders Example**

<table>
<thead>
<tr>
<th>Ages 6 to 9</th>
<th>Ages 10-18</th>
<th>Ages 19 to 29</th>
<th>Ages 30-90</th>
</tr>
</thead>
<tbody>
<tr>
<td>Of the 47 clinical cases in this sample 43 had a secondary diagnosis.</td>
<td>Of the 116 clinical cases in this sample, 31 had a secondary diagnosis.</td>
<td>Of the 174 clinical cases in this sample, only 2 had secondary diagnoses.</td>
<td>Of the 47 clinical cases in this sample only 2 had secondary diagnoses.</td>
</tr>
<tr>
<td>45% had reading disorders,</td>
<td>28% had written expression disorders</td>
<td>3 had a written expression disorder</td>
<td>1 adjustment disorder</td>
</tr>
<tr>
<td>19% had ADHD</td>
<td>19% had reading disorders</td>
<td>3 had ADHD.</td>
<td>1 Cognitive Disorder NOS.</td>
</tr>
<tr>
<td>17% had written expression disorders</td>
<td>16% had a Learning Disability NOS</td>
<td>All other secondary diagnoses were 2% or less.</td>
<td></td>
</tr>
<tr>
<td>11% had language disorders.</td>
<td>13% had a language disorder.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Mathematics Disorders Example
Comorbidity Disorders


Where is the Selective Assessment Research Heading?

- What are the fewest tests which provide the most details about potential weaknesses?
- What additional tests are available to provide more details about potential weaknesses?
- What are the fewest tests which provide the most details about potential strengths?
- Data available by age groups
- Co-morbidity data provided for each age group.

Comparison of Three Empirical Processing Strengths and Weaknesses Models for the Identification of Specific Learning Disabilities

Daniel C. Miller, Ph.D., ABPP
Denise E. Maricle
Principal Investigators
Alicia Jones
Research Assistant
Texas Woman's University
Grant Funded by the Learning Disabilities Foundation of America

Purpose of the Research Study

The goal of the project is to compare three processing strengths and weakness (PSW) models for the identification of specific learning disabilities (SLD) using a common set of clinical case examples.

Methodology

These three PSW approaches are:
2. Concordance-Discordance Model of SLD identification (Hale & Fiorello, 2004; Hale, Wycoff, & Fiorello, 2010) and,
3. Psychological Processing Analyzer (Dehn, 2015).

Phase I of the Project:
- Multiple mini case histories will be culled from an archival data set which are intended to reflect the presence or absence of SLD across one or more of the eight areas of SLD as defined by IDEA.
- The goal for this initial phase of the research study will be to obtain consensus across a group of practitioners for data sets of both cognitive processing and academic achievement scores which do and do not identify SLD.
**Methodology**

**Phase I of the Project:**
- In October, 2104 twenty professionals credentialed as a Diplomate in School Neuropsychology from the American Board of School Neuropsychology (ABSNP), LLC were sent email invitations to participate in the first phase of the study.
- Several reminders were sent out and by January, 2015, and ultimately 12 out of 20 people completed the data set review.
- Another twenty ABSNP, LLC professionals were recruited in Jan. 15 and another 6 people completed the data set review.

**Terminal Degrees of Participants:**
- Ph.D. n = 2
- PsyD n = 4
- Ed.D. n = 1
- Ed.S. n = 5
- MS/MA n = 6

**States were participants live/work:**
- CA n = 4
- CT n = 1
- FL n = 1
- GA n = 1
- IL n = 1
- MA n = 1
- NJ n = 2
- NV n = 1
- OH n = 2
- PA n = 1
- TX n = 3

**Case Study Scenarios**

- **Case Study #1:** Male Age 10-4 yrs. 4th Grader
  - SLD in math reasoning with a concurrent fluid reasoning deficit.
- **Case Study #2:** Female Age 8-3 yrs. 3rd Grader
  - SLD in reading decoding and listening comprehension with a concurrent auditory processing deficit.
- **Case Study #3:** Male Age 8-11 yrs. 3rd Grader
  - Gifted child with average achievement scores. No SLD.
- **Case Study #4:** Male Age 10-2 yrs. 4th Grader
  - SLD in reading decoding and math calculations with a concurrent long-term memory deficit.
- **Case Study #5:** Female Age 9-5 yrs. 4th Grader
  - SLD is reading fluency and oral expression with a concurrent processing speed deficit.
- **Case Study #6:** Male Age 9-4 yrs. 4th Grader
  - Low average cognitive abilities and achievement - No SLD.

**Case Study Scenarios**

- **Case Study #7:** Male Age 8-11 yrs. 3rd Grader
  - SLD in math calculations with a concurrent visual processing deficit.
- **Case Study #8:** Female Age 10-8 yrs. 5th Grader
  - SLD in math reasoning and written expression with a concurrent short-term memory deficit.
- **Case Study #9:** Female Age 11-1 yrs. 5th Grader
  - Intellectually disabled - No SLD.
- **Case Study #10:** Male Age 9-5 yrs. 4th Grader
  - SLD in reading comprehension and listening comprehension with a concurrent attention deficit.
- **Case Study #11:** Female Age 11-2 yrs. 5th Grader
  - SLD is written expression with a concurrent executive functions deficit.

**Phase I Results**

<table>
<thead>
<tr>
<th>Case</th>
<th>Correctly Identified Achievement Deficit Area(s)</th>
<th>Correctly Identified Processing Deficit</th>
<th>SLD?</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Math Reasoning (100%)</td>
<td>Fluid Reasoning (88.9%)</td>
<td>Yes: 88.9%</td>
</tr>
<tr>
<td>2</td>
<td>Reading Decoding (94.4%)</td>
<td>Auditory Processing (100%)</td>
<td>Yes: 72.3%</td>
</tr>
<tr>
<td></td>
<td>Giffted with average achievement</td>
<td></td>
<td>No: 88.9%</td>
</tr>
<tr>
<td>3</td>
<td>Reading Decoding (72.2%)</td>
<td>Long-Term Memory (83.3%)</td>
<td>Yes: 88.9%</td>
</tr>
<tr>
<td>4</td>
<td>Reading Decoding (72.2%) Math Calculations (83.3%)</td>
<td>Processing Speed (94.4%)</td>
<td>Yes: 72.2%</td>
</tr>
<tr>
<td>5</td>
<td>Reading Fluency (88.8%)</td>
<td>Oral Expression (88.8%)</td>
<td>Yes: 88.9%</td>
</tr>
<tr>
<td>6</td>
<td>Low average cognitive abilities and academic achievement</td>
<td></td>
<td>No: 94.4%</td>
</tr>
<tr>
<td>7</td>
<td>Math Calculations (94.4%)</td>
<td>Visual-Spatial Processing (94.1%)</td>
<td>Yes: 72.2%</td>
</tr>
<tr>
<td>8</td>
<td>Math Reasoning (88.8%) Written Expression (88.8%)</td>
<td>Short-term Memory (99.8%)</td>
<td>Yes: 88.8%</td>
</tr>
</tbody>
</table>

**Phase I Results**

<table>
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<tr>
<th>Case</th>
<th>Correctly Identified Achievement Deficit Area(s)</th>
<th>Correctly Identified Processing Deficit</th>
<th>SLD?</th>
</tr>
</thead>
<tbody>
<tr>
<td>9</td>
<td>Intellectually Disabled - No SLD</td>
<td></td>
<td>No: 88.9%</td>
</tr>
<tr>
<td>10</td>
<td>Reading Comprehension (100%)</td>
<td>Attention Problems (100%)</td>
<td>Yes: 61.1%</td>
</tr>
<tr>
<td>11</td>
<td>Written Expression (94.4%)</td>
<td>Executive Functions (100%)</td>
<td>Yes: 77.7%</td>
</tr>
</tbody>
</table>

Case Study #10 was removed from any further analyses due to the low agreement rate of the presence of a SLD. Probably thought the student had ADHD not SLD.
**Phase II Research Study**

- Three case study examples of a single achievement deficit along with a single cognitive processing deficit (SLD present).
- Four case study examples of dual achievement deficits along with a single cognitive processing deficit (SLD present).
- Three case study examples where there is no SLD (Control Cases).

**Overall Results**

- The X-BASS (Flanagan et al., 2015) approach had a 100% agreement with the expert panel in the identification of SLD and the identification of non-SLD.
- The X-BASS requires some level of training and expertise to make sure it is being used properly, but it is conceptualized and operationalized well and yields the best results of the three approaches.

**Overall Results**

- The Concordance-Discordance Model (C-DM) was more conservative in the identification of SLD.
  - This model only identified 54% of the expert-identified SLD cases.
  - The differences had to do with the calculations of cognitive strengths and weaknesses and academic weakness comparisons. Differences were due to the lower reliability of some of the measures used for the cognitive weaknesses.

**Psychological Processing Analyzer 3.1 (Dehn, 2015):**

- In Dehn’s (2014) PSW model any process score in the average range (a standard score of 90 or above) can be considered a strength for PSW diagnostic purposes.
- As seen in Hale et al.’s C-DM Model, cognitive strengths as defined by standard scores in the low 90's, may not be strong enough to warrant a statistical significant difference between that score and a cognitive weakness.

**The Difference Lies Under the Hood**

- The PPA does not analyze the cognitive strength – academic weakness discrepancy.
- The PPA relies on composite scores only.
- The PPA is more inclusive of what constitutes a cognitive process.

**The Difference Lies Under the Hood**

- The C-DM allows the user to enter any score, but relies on the expertise of the examiner to know the neurocognitive literature – usually a big assumption.
- The most conservative approach to SLD identification.
The Difference Lies Under the Hood

- The X-BASS is the most reliable 3rd method of SLD diagnosis and the most sophisticated.
- X-BASS users will require some advanced training to ensure that the program is being used appropriately.

Directions for Future Assessment

- Neuropsychological principles will continue to be integrated into mainstream school psychological assessment.
- Some neuropsychological constructs are still ill-defined and need to be further validated (e.g., processing speed).
- fMRI and DTI imaging studies need to be conducted to validate some of the neuropsychological constructs.

Directions for Future Assessment (cont.)

- Software like the X-BASS program are welcome additions to the program but require moderate advances in clinical skills and acquired knowledge.
- Further validation of selective assessment and XBA needs to happen over time.
- Theoretical models still need to be tested with different clinical populations.
- The future is very bright for school neuropsychology and XBA.

Introductory School Neuropsychology Books

[Images of book covers]
References


Contact Information

Dr. Daniel C. Miller
Texas Woman’s University
Department of Psychology and Philosophy
P.O. Box 425470
Denton, TX 76204
(940) 898-2251 phone
dmiller@twu.edu

Dr. Daniel C. Miller
KIDS, Inc.
130 Cottontail Cove
Holly Lake Ranch, TX 75765
(800) 594-4649 phone
dcmiller@kidsinc.com
www.schoolneuropsych.com