Advanced WISC-IV Interpretation and WISC-IV Integrated

Presented by Amy Dilworth Gabel, Ph.D.
Training and Client Consultation Director,
Pearson Clinical Assessment

Session Objectives- Participants will learn:

• how to use more advanced interpretation techniques for the WISC-IV and Integrated;
• how to define and describe the benefits of process-oriented assessment;
• how to use examples from the WISC-IV Integrated data to understand complex learning processes to establish a framework for interventions and teaching strategies.

WISC-IV Model
Full Scale IQ

- Stronger contributions of working memory and processing speed
  - Supported by contemporary research
- 30% each VCI and PRI
- 20% each PS and WM

Composite Scores

- Working Memory Index
  - Essential component of fluid reasoning and other higher order skills
  - Closely related to achievement and learning
  - See Fry & Hale, 1996; Parkin, Jitissa, & Moore, 1997; Swanson, 1996

Why is Working Memory Important?

- RTI calls for early assessment and intervention implementation
  - Identification of “Why” child is struggling
  - Evidence-based interventions available for WM
- WM deficits linked with SLD
- Strategies to support WM should be embedded within academic interventions
Composite Scores

- Processing Speed Index
  - Dynamically related to mental capacity, reading performance & development, and reasoning by conservation of resources (e.g., efficiency)
  - See Fry & Hale, 1996; Kail, 2000; Kail & Hall, 1994; Kail & Salthouse, 1994

Mediating Factors of:

- Processing Speed
- Working Memory

Conservation of cognitive resources

Statistical Significance of Index Score Differences

- A statistically significant difference between scores, for example between the VCI and the PRI scores, refers to the likelihood that obtaining such a difference by chance is very low (e.g., $p < .05$) if the true difference between the scores is 0 (Matarazzo & Herman, 1985).
- The level of significance reflects the level of confidence the examiner can have that the difference between the scores, called the difference score, is a true difference.
Interpreting Index Scores

1. Enter the various index standard scores on the Analysis page from the Summary page.
2. Calculate the difference between scores.
3. Use Table B.1 to identify Critical Value by age.
4. Use Table B.2 to identify the Base Rate.

<table>
<thead>
<tr>
<th>Composite Score Differences</th>
<th>Scaled Score 1</th>
<th>Scaled Score 2</th>
<th>Diff</th>
<th>Critical Value</th>
<th>Big Diff</th>
<th>Y/N</th>
<th>Base Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>VCI - PRI</td>
<td>132</td>
<td>50</td>
<td>82</td>
<td>11.38</td>
<td>Y</td>
<td>42%</td>
<td></td>
</tr>
<tr>
<td>VCI - PRI</td>
<td>132</td>
<td>50</td>
<td>82</td>
<td>11.38</td>
<td>Y</td>
<td>42%</td>
<td></td>
</tr>
<tr>
<td>VCI - PRI</td>
<td>132</td>
<td>50</td>
<td>82</td>
<td>11.38</td>
<td>Y</td>
<td>42%</td>
<td></td>
</tr>
<tr>
<td>VCI - PRI</td>
<td>132</td>
<td>50</td>
<td>82</td>
<td>11.38</td>
<td>Y</td>
<td>42%</td>
<td></td>
</tr>
<tr>
<td>WMI - PSI</td>
<td>102</td>
<td>65</td>
<td>37</td>
<td>9.45</td>
<td>N</td>
<td>26%</td>
<td></td>
</tr>
</tbody>
</table>

Base Rate Information

By Entire Sample or Ability

- Overall sample
  - VCI-PRI by 15 points = 14.5%
  - VCI-PRI by 15 points = 12%
  - WMI-PSI by 15 points = 19.8%
  - WMI-PSI by 15 points = 16.4%
- FSIQ ≤ 79
  - VCI-PRI by 15 points = 16.9%
  - VCI-PRI by 15 points = 15.5%
  - WMI-PSI by 15 points = 22.1%
  - WMI-PSI by 15 points = 15.5%

Use of the FSIQ – Perspectives

- Recent studies suggest that FSIQ may be an equally valid measure of general ability for individuals or groups having highly variable index scores as for those having consistent index scores (Daniel, 2007), and that there may be no difference in the predictive validity of FSIQ for low-scatter and high-scatter groups (Watkins et al., 2007).
GAI=General Ability Index

• The GAI is an optional index score for the WISC-IV and the WAIS-IV.
• The GAI is derived from the core Verbal Comprehension and Perceptual Reasoning subtests.
• The GAI provides an estimate of general intellectual ability, with reduced emphasis on working memory and processing speed relative to the FSIQ.
• Theoretically, the GAI represents an individual’s overall cognitive ability, if working memory and processing speed abilities were similar to verbal and non-verbal abilities.

FSIQ=87/ GAI = 102

• Si = 11
• VC = 10
• CO = 9
• VCI = 99
• DSI = 7
• DS = 6
• AR = 6
• WMI = 74
• BD = 11
• PCN = 11
• MR = 10
• PRI = 104
• CP = 3
• SS = 7
• PSI = 73

GAI Comparisons

• The GAI should be reported and interpreted in light of other scores: FSIQ, CPI, or Scores from other measures.
• FSIQ vs. GAI = comparison of two measures of general cognitive ability that differ in terms of emphasis on working memory and processing speed.
• GAI vs. CPI = comparison of a measure of current knowledge and reasoning ability to cognitive proficiency.
• GAI vs. Achievement or Memory scores = comparison of a measure of general cognitive ability to measures of achievement or memory.
CPI = Cognitive Proficiency Index

- The CPI is an optional index score for the WISC-IV and the WAIS-IV.
- The CPI is the counterpart to the GAI. It is derived from the core Working Memory and Processing Speed subtests.
- Theoretically, the CPI represents an individual’s proficiency at cognitive processing.
- Efficient cognitive processing frees-up cognitive resources for more complex or higher-level tasks.

Interpreting GAI and CPI

Analyses revealed:
- Only 2% of normal children obtained a large CPI GAI difference in combination with a large Achievement GAI difference.
- The frequency of these dual criteria was examined in the reading disorder, writing disorder, and combined reading and writing disorder samples, described in the WISC-IV Manual.
- The percentage of students receiving LD services that met both criteria ranged between 45% and 50% in the various reading and writing disorder samples.
- These findings suggest that these combined criteria may hold some promise in the identification of psychological processing disorders associated with some types of learning disabilities.

Summing it Up: FSIQ Interpretation Recommendations

- “…we continue to argue that the basis for understanding a child’s cognitive abilities and how this relates to their particular needs is best served, not by the full scale intelligence quotient (FSIQ) alone, but by the index scores tapping Verbal Comprehension (VCI), Perceptual Reasoning (PRI), Working Memory (WMI), and Processing Speed (PSI).”
- “While the FSIQ is especially useful in the assessment and classification of children who are intellectually gifted or cognitively impaired…”
- Lawrence G. Weiss, A. Lynne Beal, Donald H. Saklofske, Tracy Pickens-Alloway, and Aurelio Prifitera (2010)
The Process Approach to Assessment

• HOW a child performs tasks is as important, and often more important, than the score obtained at the subtest and above levels of aggregation.
• When these observations reflect
  • a pattern of behavior,
  • observed in multiple contexts,
  • (a preponderance of evidence)
• understanding performance on items, including the kinds of errors a child makes, provides rich clinical information that may be used in conjunction with knowledge of effective instruction.

WISC-IV Integrated

• Student 1
  • VC = 9
  • SI = 9
  • CO = 9
  • VCI = 95
  • BD = 10
  • PCn = 11
  • MR = 10
  • PRI = 100

• Student 2
  • VC = 10
  • SI = 6
  • CO = 12
  • VCI = 96
  • BD = 7
  • PCn = 12
  • MR = 11
  • PRI = 100

What is it?
WISC-IV Integrated Content
• Additional scoring procedures (i.e., search pattern for Cancellation, 30 second interval scoring for Coding)
• Alternate presentation format (i.e., Information Multiple Choice, Similarities Multiple Choice)
• Variations of Core and Supplemental tests with novel item content (Block Design MC, Visual Digit Span)
WISC-IV Integrated Content (What is it?)

- New subtests (Elithorn Mazes)
- Quantitative information regarding observations made during assessment

WISC-IV Integrated Content – Verbal Domain

- Core
  - Similarities, Vocabulary, Comprehension
- Optional Process
  - Similarities Multiple Choice, Vocabulary Multiple Choice, Picture Vocabulary Multiple Choice, Comprehension Multiple Choice, Information Multiple Choice
- Supplemental
  - Information, Word Reasoning

Task demands Associated with Verbal Comprehension Subtests?

- Crystallized knowledge
- Verbal fluid reasoning
- Conceptualization
- Long-term memory
- Comprehension
The Importance of VCI

• Crystallized intelligence, as measured by the VCI, shows a strong and consistent relationship with the development of reading and math achievement.
• Contributions of crystallized intelligence to writing achievement are important primarily after age 7.
• Its contributions to reading, math, and writing achievement become increasingly important for reading and math achievement with age.
• (Flanagan & Mascolo, 2005)

Tanya

• 8th grade
• History of reading difficulties & behavioral outbursts in school, inconsistent attendance this year
• VC=7, IN=6
• CO=10, WR=9, SI=9

Vocabulary Multiple Choice Verbal Process Subtest

• Uses same items as VC and PV.
• Involves:
  - Auditory Discrimination and Comprehension
  - Verbal Knowledge Base
  - Recognition Retrieval from Long-Term (Recent or Remote) Storage
  - Reading skills or Working Memory
  - By-passes “On Demand” Retrieval Efficiency (Word-Finding Ability), Free Recall, and Expressive Language Demands
Picture Vocabulary
Verbal Process Subtest

• Uses the same stimulus words as VC and VC MC.
• Involves:
   Auditory Discrimination and Comprehension
   Verbal/Nonverbal Knowledge Bases
   Retrieval from Long-Term (Recent or Remote) Storage
   Visual Perception and Discrimination
   Association of Visual Stimuli with Language Store
   Possible influences include Phonological Memory and Working Memory
   By-passes expressive language, free recall reading and or working memory demands

Key Interpretive Questions with VCI Processes

• Was the knowledge ever acquired (exposure, encoding)?
• Is there difficulty retrieving/recalling previously acquired information?
• Is there difficulty expressing what has been retrieved?

Tanya

• VCMC=12, INMC=12
• COMC=12, SIMC=11
Vocabulary: Instructional Implications

- Does expressive/language formulation affect child’s performance?
  - Compare regular vocab performance with VC MC & PV
- Are there are large number of “no responses” on VC?
  - decrease language demands by allowing for alternative methods of response
  - provide extra time, or cue ahead to questions requiring oral response
- Compare scores with spontaneous language

WISC-IV INTEGRATED PROCESS PROCEDURES

PERCEPTUAL DOMAIN
WISC-IV Integrated Content – Perceptual Domain

• Core
  • Block Design, Matrix Reasoning, Picture Concepts
• Supplemental
  • Picture Completion

• Optional Process
  • Block Design without time bonus, Block Design Multiple Choice (w/ and w/o time bonus), Block Design Process Approach, Elithorn Mazes (Time and No time bonus)

How is PRI Related to Achievement?

• Strong relationship to math
  • recognizing concepts, identifying relations, perceiving relationships among patterns, drawing inferences, problem solving, extrapolating, and transforming information
• Moderate relationship with reading and written expression

PRI Weakness- Due to

Visual perceptual weaknesses?
Fluid reasoning weakness?
Visual Processing Difficulties Signaled by Problems With:

- Imagining/picturing something
- differentiating left and right.
- mentally manipulating and estimating the size of objects or visual patterns
- Seeing/making patterns into meaningful wholes.
- understanding math concepts in geometry, calculus, and other higher math.
- remembering letter formations and letter patterns.
- Recognizing and copying visual details.

Weakness with Visually Based Fluid Reasoning Signaled by Difficulties

- recognizing, forming, and understanding concepts
- drawing inferences from information that is presented.
- understanding the implications of an issue or an action.
- with complex problem solving, logic and concept formation.
- with quantitative reasoning needed for understanding and computing mathematics.
- transferring and generalizing information to new situations.

WISC-IV Integrated – Subj2

• BD = 7
• PCn = 12
• MR = 6
• PCm = 11

What explanations might account for this pattern?
Potentially Informative Comparisons

Picture Concepts – Picture Completion and Block Design – Matrix Reasoning

PCn and PCm involve the manipulation of concrete visual images to cue retrieval of stored information related to the pictured objects. Processing demand is distinct from the requirements of BD and many MR items where the geometric designs pictured have no inherent meaning as concrete objects, and are imaged and manipulated in ways different from those used to image and manipulate the concrete images of PCn and PCm.

Matrix Reasoning – Picture Concepts

• For some children, these tasks require significant working memory demands. When scores of these subtests are poor and consistent with scores on WR, AR, LNS, and DSB, working memory difficulties may be impacting negatively on task performance.
WISC-IV INTEGRATED PROCESS PROCEDURES

MEMORY DOMAIN:
Composed of
Encoding/Registration
Mental Manipulation

<table>
<thead>
<tr>
<th>Index Comparisons</th>
<th>Scaled Score 1</th>
<th>Scaled Score 2</th>
<th>Diff.</th>
<th>Critical Value</th>
<th>Sig. Diff.</th>
<th>Base Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>VCI - PRI</td>
<td>121</td>
<td>133</td>
<td>-12</td>
<td>11.38</td>
<td>Y</td>
<td>18.7%</td>
</tr>
<tr>
<td>VCI - WMI</td>
<td>121</td>
<td>107</td>
<td>14</td>
<td>12.12</td>
<td>Y</td>
<td>15.0%</td>
</tr>
<tr>
<td>VCI - PSI</td>
<td>121</td>
<td>112</td>
<td>9</td>
<td>13.15</td>
<td>N</td>
<td>28%</td>
</tr>
<tr>
<td>PRI - WMI</td>
<td>133</td>
<td>107</td>
<td>-26</td>
<td>11.76</td>
<td>Y</td>
<td>4.8%</td>
</tr>
<tr>
<td>PRI - PSI</td>
<td>133</td>
<td>112</td>
<td>21</td>
<td>12.02</td>
<td>Y</td>
<td>8%</td>
</tr>
<tr>
<td>WMI - PSI</td>
<td>107</td>
<td>112</td>
<td>-5</td>
<td>13.48</td>
<td>N</td>
<td>42.1%</td>
</tr>
</tbody>
</table>
WISC-IV Integrated Content – Memory Domain

• Core
  • Digit Span, Letter-Number Sequencing

• Supplemental
  • Arithmetic

WISC-IV Integrated Content – Memory Domain

• Optional Process

What Happens to Students with WM Difficulties?

Study involving a group of children with low working memory but typical scores in general ability measures

• Compared with classmates with typical working memory skills, the low working memory children frequently:
  • forgot instructions,
  • struggled to cope with tasks involving simultaneous processing and storage, and
  • lost track of their place in complex tasks.

• The most common consequence of these failures was that the children abandoned the activity without completing it. (Gathercole et al., 2006).
Classroom Implications

• A weakness in working memory may make the processing of complex information more time consuming, and tax the student’s mental energies more quickly compared to other children of the same age.
• This may contribute to more frequent errors on a variety of learning tasks, excessive fatigue, or difficulty tolerating frustration.
• Deficits in the executive function system of planning, organization, and the ability to shift cognitive sets should also be evaluated with these children.

Multiple failure points in the life of the working memory deprived

<table>
<thead>
<tr>
<th>Age</th>
<th>Problem</th>
<th>Psychology</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>Behavior problems</td>
<td>Failing behind</td>
</tr>
<tr>
<td>8</td>
<td>Staying focused</td>
<td>Time mgmt.</td>
</tr>
<tr>
<td>16</td>
<td>Getting into college</td>
<td>Promotion</td>
</tr>
<tr>
<td>20</td>
<td>Graduating</td>
<td>Achieving goals</td>
</tr>
<tr>
<td>25</td>
<td>Staying sharp</td>
<td>50</td>
</tr>
</tbody>
</table>

Discrepancy Comparisons

<table>
<thead>
<tr>
<th>Comparison</th>
<th>Scaled Score 1</th>
<th>Scaled Score 2</th>
<th>Diff.</th>
<th>Critical Value</th>
<th>Sig. Diff.</th>
<th>Base Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Digit Span - Letter-Number Sequencing</td>
<td>7</td>
<td>16</td>
<td>-9</td>
<td>2.83</td>
<td>Y</td>
<td>0.1%</td>
</tr>
<tr>
<td>Coding - Symbol Search</td>
<td>8</td>
<td>16</td>
<td>-8</td>
<td>3.55</td>
<td>Y</td>
<td>0.6%</td>
</tr>
<tr>
<td>Similarities - Picture Concepts</td>
<td>18</td>
<td>13</td>
<td>-5</td>
<td>3.36</td>
<td>Y</td>
<td>7.7%</td>
</tr>
<tr>
<td>Digit Span - Arithmetic</td>
<td>7</td>
<td>11</td>
<td>-4</td>
<td>2.94</td>
<td>Y</td>
<td>12.6%</td>
</tr>
<tr>
<td>Letter-Number Sequencing - Arithmetic</td>
<td>16</td>
<td>11</td>
<td>5</td>
<td>2.80</td>
<td>Y</td>
<td>4.4%</td>
</tr>
</tbody>
</table>
### Possible Memory Comparisons and Contrasts

#### Digit Span Forward – Digit Span Backward

- Most students earn similar scores on DSF and DSB.
- When performance is significantly different, the source of variability should be investigated.
  - may provide insight into how child uses, or fails to use, encoding and working memory resources.
• DSF > DSB: working memory inefficiencies should be explored.
• DSB > DSF: often related to poor engagement of the necessary processing resources required to do DSF (because the task is perceived as relatively simple.)

Note: differences should be evaluated using tables related to statistical and clinical significance

Arithmetic Subtests
• Regular WISC-IV Arithmetic
• Arithmetic with Time Bonus
• Arithmetic Process Assessment
  • Parts A and B, Part A Time Bonus
  • Written Arithmetic

Visual Span Tests
• WISC-IV standard subtests are presented in auditory modality only
  • This does not mean that the examinee will rely exclusively on auditory processing to keep information available for conscious manipulation – some likely visualize numbers and letters as a strategy
  • The integrated subtests present visual digits (not exact same items but same sequence of increasing number of digits)
WISC-IV INTEGRATED PROCESS PROCEDURES

PROCESSING SPEED DOMAIN
“Attentive speediness”

WISC-IV Integrated Content – Processing Speed Domain

• Core
  • Coding, Symbol Search
• Supplemental
  • Cancellation

• Optional Process
  • Coding-Copy, Cancellation
  • Random/Structured, Search Strategy
  • Cancellation, {Coding Cued/Free Symbol Recall, Coding Cued Digit Recall}

What is the importance of PSI?

• Performance on the PSI is an indication of the rapidity with which a student processes routine information without making errors.
• Many learning tasks involve a combination of routine information processing and complex information processing (such as reasoning).
  • Think reading
• A weakness in the speed of processing routine information may make the task of comprehending novel information more time-consuming and difficult.
• A weakness in simple visual scanning and tracking may leave a child less time and mental energy for the complex task of understanding new material.
### Subtests Raw Score Scaled Score Percentile Rank

<table>
<thead>
<tr>
<th>Subtests</th>
<th>Raw Score</th>
<th>Scaled Score</th>
<th>Percentile Rank</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coding</td>
<td>28</td>
<td>8</td>
<td>25</td>
</tr>
<tr>
<td>Symbol Search</td>
<td>28</td>
<td>16</td>
<td>98</td>
</tr>
</tbody>
</table>

---

### Conceptualization Structure

- **Core Input Requirements**
  - e.g., Hearing, Vision, Motor, etc…

- **Core Output Requirements**
  - Minimal verbal expression to maximal verbal expression required.
  - Minimal motor output required to maximal motor output required.
  - Maximal structure and organization provided to minimal amount of structure and organization required.
  - Maximal amount of contextual information provided to minimal amount of contextual information provided.

- **Characteristics of Response**
  - Correct, Efficient and Automatic
  - Incorrect, Efficient and Automatic
  - Correct, Inefficient and Effortful
  - Incorrect, Inefficient and Effortful
Key Take-Aways

• What is your purpose in testing?
  • Strengths and weaknesses in learning or processing information vs. general ability
  • A process approach to interpreting the WISC-IV provides rich

Customer Service
1-800-211-8378 (USA)
1-866-335-8418 (Canada)

Webinar-specific questions:
Amy Dilworth Gabel, Ph.D., NCSP
Director of Training and Client Consultation
Pearson Clinical Assessment
amy.gabel@pearson.com

www.psychcorp.com/trainingconsultation