

**Advanced WISC-IV Interpretation  
and WISC-IV Integrated**

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**Session Agenda**

**Participants will be introduced to the following:**

- use of the WISC-IV and WISC-IV Integrated data to understand complex learning processes to establish a framework for interventions and teaching strategies;
- definition and interpretation of process-oriented assessment such as the WISC-IV Integrated.

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**WISC-IV Model**

The diagram illustrates the WISC-IV Model. At the center is a box labeled **FSIQ** (Full Scale IQ). Four arrows point towards this central box from four surrounding ovals. The top-left oval is labeled **VCI** (Verbal Comprehension Index) and lists subtests: Similarities, Vocabulary, Comprehension, Information, and Word Reasoning. The top-right oval is labeled **PRI** (Perceptual Reasoning Index) and lists subtests: Block Design, Picture Concepts, Matrix Reasoning, and Picture Completion. The bottom-left oval is labeled **WMI** (Working Memory Index) and lists subtests: Digit Span, Letter-Number Sequencing, and Arithmetic. The bottom-right oval is labeled **PSI** (Processing Speed Index) and lists subtests: Coding, Symbol Search, and Cancellation. A note at the bottom left states: "Note: Supplemental subtests are shown in italics".

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### 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 ).

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### Interpreting Index Scores

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

**Composite Score Differences**

Discrepancy Comparisons	Scaled Score 1	Scaled Score 2	Diff.	Critical Value	Sig. Diff. Y/N	Base Rate
VCI - PRI	112	92	20	11	Y	6.1%
VCI - WMI	112	102	10	11.38	N	22.9%
VCI - PSI	112	91	21	12.12	Y	9.7%
PRI - WMI	92	102	-10	11.38	N	24.5%
PRI - PSI	92	91	1	12.12	N	49.3%
WMI - PSI	102	91	11	12.46	N	24.1%

Base Rate by Overall Sample  
Statistical Significance (Critical Values) at the .05 level

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### Differences Between Subtest Scaled Scores

- Evaluation of variability helps practitioners identify strengths and weaknesses in cognitive functioning.
- As with differences between the index scores, the interpretation of a particular subtest score as especially high or low should take into account the statistical significance of the observed difference *and* estimates of population base rates.
  - Assess frequency of scatter using Table B.6 before assuming it to be unusual or important
  - Variability among subtest scores is common

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### When there is scatter- 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.

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### FSIQ=87/ GAI = 102

•Si = 11	•BD= 11
•VC = 10	•PCN = 11
•CO = 9	•MR = 10
•VCI = 99	•PRI = 104
•DSF= 7	
•DSB=4	•CD=3
•DS =6	•SS=7
•LNS=5	•PSI=73
•AR=6	
•WMI=74	

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### Common GAI Myths

- The GAI is FSIQ without working memory and processing speed
  - ◆ Fact: GAI taps working memory and processing speed, but to a lesser degree than FSIQ
  - ◆ Fact: Cognitive abilities are interrelated
  - ◆ Fact: Even measures of “pure” domains are not pure (e.g., Coding more than graphomotor processing speed)

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### Common GAI Myths

- The GAI can be used routinely as a substitute for the FSIQ
  - With rare exceptions (motor impairment, invalid FSIQ score), the GAI is not a substitute for the FSIQ
  - FSIQ more comprehensive; Working memory and processing speed are integral aspects of general intelligence
- The FSIQ is invalid if there are significant Index- Score differences, so use the GAI
  - FSIQ is invalid only if there are too few valid subtests to derive the score (even with substitution and proration)
  - Most of us (73.5% in WAIS-IV) have at least one Index Score that significantly differs from the mean of the Index Scores

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### Mediating Factors of:

- Processing Speed
- Working Memory

*Conservation of cognitive resources*

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### GAI Comparisons

- Whenever possible, 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

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**The Process Approach to Assessment  
Making the most of Cognitive Assessment  
in RTI**

- 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.

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**An example of why process assessment  
is important-**

- If you could see me, and I was standing here with my arms folded, what conclusions could you draw?
- Finding out WHY is important!

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**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)

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**WISC-IV Integrated Content (What is it?)**

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

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**WISC-IV Integrated Content – Verbal Domain**

<ul style="list-style-type: none"><li>• <b>Core</b><ul style="list-style-type: none"><li>◆ Similarities, Vocabulary, Comprehension</li></ul></li><li>• <b>Supplemental</b><ul style="list-style-type: none"><li>◆ Information, Word Reasoning</li></ul></li></ul>	<ul style="list-style-type: none"><li>• <b>Optional Process</b><ul style="list-style-type: none"><li>◆ Similarities Multiple Choice, Vocabulary Multiple Choice, Picture Vocabulary Multiple Choice, Comprehension Multiple Choice, Information Multiple Choice</li></ul></li></ul>
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**Task demands Associated with Verbal Comprehension Subtests?**

- Crystallized knowledge
- Verbal fluid reasoning
- Conceptualization
- Long-term memory
- Comprehension

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**Tanya**



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

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**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

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**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

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**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?

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**Tanya**



- VCMC=12, INMC=12
- COMC=12, SIMC=11

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**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

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### Verbal Fluency Strategy

- Structured paired task
  - ◆ 50 seconds to tell all that you know about a topic
    - SWITCH
  - ◆ 35 seconds for your partner to share what s/he knows about the topic, without repeating what the first person said
    - SWITCH
  - ◆ 20 seconds for the first person to share, SWITCH, and 20 seconds for the second to share
- Ideas may be recorded for sharing in larger group if desired

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### Strategies to Enhance Verbal Presentations



- Tape record lessons and analyze language and wait time
- Have a peer observe
- What teachers can expect with greater wait time
  - ◆ Increase in length of student responses
  - ◆ Increased participation
  - ◆ Greater task-oriented performance

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### WISC-IV INTEGRATED PROCESS PROCEDURES

#### PERCEPTUAL DOMAIN

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**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)

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**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

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**PRI Weakness- Due to**

**Visual perceptual weaknesses?**

**Fluid reasoning weakness?**

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**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.

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**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.

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**WISC-IV Integrated - Sandy**

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

•What explanations might account for this pattern?

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**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.

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**Similarities – Picture Concepts**

- When performance on these tasks is consistent, greater likelihood that child's ability to apply fluid reasoning abilities to establish new associations between objects or concepts is consistent across presentation formats (i.e., auditory presentation of verbal information, visual presentation of nonverbal images) and response demands (free response format for verbally presented questions versus recognition response format for visually presented object pictures).

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**Block Design Subtests**

- **WISC-IV Integrated Block Design- Task Demands**
  - ◆ Understand complex directions
  - ◆ Perceive visual stimuli accurately
  - ◆ Part-to-whole analysis
  - ◆ Active problem solving
  - ◆ Self-monitoring & correction
  - ◆ Visual motor coordination

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**WISC-IV Integrated Block Design Subtests**

- Block Design No Time Bonus
- Block Design Multiple Choice
- Block Design Multiple Choice No Time Bonus
- Block Design Process Approach

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**Block Design: Instructional Links**

- Compare data on breaks in configuration with other visual data to obtain ideas re:severity of weakness in this area.
  - ◆ May require further assessment
- Difficulties obtaining the “big picture” (part-to-whole)
  - use diagrams, charts, outlines to show relationships between details and “big ideas”
  - begin lecture with big idea, keep referring back
- Does the child’s performance improve with the aid of structure?
  - ◆ When tasks are highly analytical (geometry concepts, maps), child may benefit from additional structure such as translation into verbal information, for example.

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**What if the student does well on BD?**

- Might they benefit from demonstrations in class?
- Would an example of the finished product help them to see what needs to be accomplished?
- Would the use of graphic organizers like Venn diagrams help?

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**WISC-IV INTEGRATED PROCESS PROCEDURES**

MEMORY DOMAIN:  
Composed of  
Encoding/Registration  
Mental Manipulation

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**WISC-IV Integrated Content – Memory Domain**

- **Core**
  - ◆ Digit Span, Letter-Number Sequencing
- **Supplemental**
  - ◆ Arithmetic

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**WISC-IV Integrated Content – Memory Domain**

- **Optional Process**
  - ◆ Digit Span Forward/Backward, Visual Digit Span, Letter-Number Sequencing Process Assessment, Spatial Span Forward/Backward, Letter Span Rhyming/Nonrhyming, Arithmetic Process Assessment Parts A & B (Part A w/ and w/o time bonus), Written Arithmetic, {Coding Cued/Free Symbol Recall, Coding Cued Digit Recall}

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### 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).

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### Working Memory Deficits- A Significant Risk Factor

In a large longitudinal study-

- About two-thirds of the students performed poorly in the two key areas of learning assessed in the study, reading, and mathematics.
- In one-third of the sample the severity of their learning problems was reflected in formal recognition by their schools that they required additional classroom support.
  - ◆ *Alloway et al. (2007)*
- Consistent with other studies such as Swanson & Beebe-Frankenberger, 2004; Gathercole et al., 2006; Archibald & Gathercole, 2006

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### 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.

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**Letter-Number Sequencing – Digit Span Backward**

- LNS and DSB require working memory processes after initial encoding to manipulate the information before providing a response.
- When DSB and LNS cluster together and are significantly different from performance on DSF, this cluster is a better indication of working memory capacity for *basic* mental manipulations.

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**Arithmetic Subtests**

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

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**Memory Interventions: Consolidation**

- Encourage teachers to use consolidating strategies
  - ◆ “Take the time to think about it...” Thought starters-
    - A question I have is....
    - A way to use this idea is...
    - This is similar to what I know about...
    - The major points (big ideas) are...
    - I'm confused about....

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**WISC-IV INTEGRATED PROCESS PROCEDURES**

PROCESSING SPEED DOMAIN  
“Attentive speediness”

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**WISC-IV Integrated Content – Processing Speed Domain**

<ul style="list-style-type: none"><li>•<b>Core</b><ul style="list-style-type: none"><li>◆ Coding, Symbol Search</li></ul></li><li>•<b>Supplemental</b><ul style="list-style-type: none"><li>◆ Cancellation</li></ul></li></ul>	<ul style="list-style-type: none"><li>•<b>Optional Process</b><ul style="list-style-type: none"><li>◆ Coding-Copy, Cancellation Random/Structured, Search Strategy Cancellation, {Coding Cued/Free Symbol Recall, Coding Cued Digit Recall}</li></ul></li></ul>
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**Coding: Instructional Implications**

- If Symbol Copy is low (accuracy & speed), possible motor slowing, poor attention/effort, or graphomotor coordination issues
  - ◆ extra time for written tasks
  - ◆ refocus attention, breaks, specific work segments with self-checking
  - ◆ computer modifications
  - ◆ handwriting remediation, pencil grips,
  - ◆ May need to reduce motor demands.

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**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.

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**Dynamic Relationship-**

Kail (2000) concluded that:

- *Processing speed is not simply one of many different independent factors that contribute to intelligence; instead processing speed is thought to be linked causally to other elements of intelligence.*

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**The Cognitive Processing Index (CPI)**

- Summary score using WM and PS
- Proficient processing – through quick visual speed and good mental control – facilitates fluid reasoning and the acquisition of new material by reducing the cognitive demands of novel or higher-order tasks ( Weiss et al., 2006a, b ).

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**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.

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**Perspectives - Why Analyze Scores?  
Why go deeper?**

- Analysis of Index scores helps in identifying how student similar/dissimilar to some, many, or few others
- Particularly important because we see many FSIQ scores in 70-130 range
- *Understand conditions under which student performs well, and those under which s/he experiences difficulty-*
  - *And WHY?*

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