“Intelligent” intelligence testing with the WJ IV cognitive battery

- WJ IV published & new supplemental/clinical test groupings
- WJ IV assessment trees
  - Within-CHC domain assessment trees (“drilling down”)
  - Academic domain referral-focused assessment trees
- Miscellaneous topics and tidbits
- Conclusions and Q/A
History or learning problems in reading since starting school.

History of early ear infections and speech and language delays.

Classroom performance and tested reading shows problems in word recognition, reading fluency/speed, and spelling.

Has received significant non-SE tutoring since K in reading (Spalding-intense phonics method).

High SES and educated parents.

Problems in paying attention in class. Also difficulty staying in his seat.

Good in mathematics. But in low group. Says math is “too easy”

Avid chess player. Very social.

WJ IV example case study
(Patrick – 9 years 1 month old     Grade 3.6)

Case study provided
By Dr. Nancy Mather
To be included in Alan Kaufman’s new WISC-IV book
WJ IV Patrick case study: Select ACH clusters normative comparisons

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### Intra-ACH Variations Procedure (+-1.5 SD): Patrick case study

<table>
<thead>
<tr>
<th>VARIATIONS</th>
<th>STANDARD SCORES</th>
<th>DISCREPANCY</th>
<th>Interpretation at + or -1.50 SD (SEE)</th>
</tr>
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<tbody>
<tr>
<td></td>
<td>Actual</td>
<td>Predicted</td>
<td>Difference</td>
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<tr>
<td>Intra-Achievement [Extended] Variations</td>
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<tr>
<td>BASIC READING SKILLS</td>
<td>82</td>
<td>95</td>
<td>-13</td>
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<tr>
<td>READING COMPREHENSION</td>
<td>95</td>
<td>92</td>
<td>3</td>
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<tr>
<td>READING FLUENCY</td>
<td>77</td>
<td>96</td>
<td>-19</td>
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<tr>
<td>READING RATE</td>
<td>78</td>
<td>94</td>
<td>-16</td>
</tr>
<tr>
<td>MATH CALCULATION SKILLS</td>
<td>102</td>
<td>94</td>
<td>8</td>
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<tr>
<td>MATH PROBLEM SOLVING</td>
<td>106</td>
<td>93</td>
<td>13</td>
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<tr>
<td>BASIC WRITING SKILLS</td>
<td>89</td>
<td>94</td>
<td>-5</td>
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<tr>
<td>WRITTEN EXPRESSION</td>
<td>99</td>
<td>92</td>
<td>7</td>
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<tr>
<td>Letter-Word Identification</td>
<td>80</td>
<td>95</td>
<td>-15</td>
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<tr>
<td>Applied Problems</td>
<td>100</td>
<td>92</td>
<td>8</td>
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</table>

(Continued on next slide)
### Intra-ACH Variations Procedure (+-1.5 SD): Patrick case study

<table>
<thead>
<tr>
<th></th>
<th>Patrick</th>
<th>Baseline</th>
<th>SD</th>
<th>Z Score</th>
<th>Description</th>
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<tbody>
<tr>
<td>Spelling</td>
<td>89</td>
<td>94</td>
<td>-5</td>
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<td>Passage Comprehension</td>
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<td>93</td>
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<tr>
<td>Calculation</td>
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<td>94</td>
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<td>-0.50</td>
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<td>Writing Samples</td>
<td>105</td>
<td>93</td>
<td>12</td>
<td>+1.06</td>
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<tr>
<td>Word Attack</td>
<td>84</td>
<td>96</td>
<td>-12</td>
<td>-1.09</td>
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<tr>
<td>Oral Reading</td>
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<td>96</td>
<td>-9</td>
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<td><strong>Sentence Reading Fluency</strong></td>
<td>76</td>
<td>94</td>
<td>-18</td>
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<tr>
<td>Math Facts Fluency</td>
<td>112</td>
<td>95</td>
<td>17</td>
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<td>Sentence Writing Fluency</td>
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<td>92</td>
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<td>Reading Recall</td>
<td>97</td>
<td>95</td>
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<td>Number Matrices</td>
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<td>94</td>
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<td>Editing</td>
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<td>95</td>
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<tr>
<td>Spelling of Sounds</td>
<td>92</td>
<td>95</td>
<td>-3</td>
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</tbody>
</table>
Significant ACH strengths/weaknesses: Intra-ACH (Extended) variation procedure (+-1.5 SD) – Patrick case study

Test level weaknesses: Letter-Word Identification; Sentence Reading Fluency, Word Attack. Word Reading Fluency

Test level strengths: Math Facts Fluency, Writing Samples, Number Matrices

WJ IV Basic Reading Skills and Comprehension—Core GIA+ cluster

ach-domain tree

- Oral Vocab.
- Number Series
- Verbal Attention
- Story Recall
- Visualization
- Phon. Proc.
- Letter-Pattern Matching

Gf

Gwm

Glr

Gv

Ga

Gs

Vocabulary (VL)

Concept Formation

Numbers Reversed

Retrieval Fluency

Phon. Proc.

Speed of lexical access-Ext (LA-Ext)

Gc

Oral Comp.

List. Comp. (LS)

Under. Directions

Sentence Repetition

Rapid Pic. Nam.

Segmentation

Vocabulary (VL)

Picture Vocab.

General Info.

Oral Comp.

Nonword Repetition

Number- Pattern Matching

Perceptual Speed (P)

Strength of empirical relation (correlation) with BRS and RC clusters in norm data (ages 6 to 19)

High

Low

See within CHC domain assessment/interp. tree for in depth assessment in each domain

- BRS Scholastic Aptitude Cluster
- RC Scholastic Aptitude Cluster

GIA/BRS RC Scholastic Aptitude $r = .87$

Gs/Perceptual Speed $r = .85$

Gc/Vocabulary $r = .89$

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### Regression Results

<table>
<thead>
<tr>
<th>Effect</th>
<th>Coefficient</th>
<th>Standard Error</th>
<th>Std. Coefficient</th>
<th>Tolerance</th>
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<th>p-Value</th>
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<td>GA</td>
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<td>GLR</td>
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<td>SPDLEX</td>
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**Dependent Variable**

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<tr>
<td>N</td>
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<td>Multiple R</td>
</tr>
<tr>
<td>Squared Multiple R</td>
</tr>
<tr>
<td>Adjusted Squared Multiple R</td>
</tr>
<tr>
<td>Standard Error of Estimate</td>
</tr>
</tbody>
</table>

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Ages 6 to 19 – broad and narrow CHC clusters as predictors of Vocabulary cluster (no Gc due to Vocab being dep. Variable)
Hypothesized causal relations between vocabulary, speed of lexical access, and reading achievement – research in process

Ho: Effect of speed of lexical access (LA) on reading achievement is indirect (moderated via vocabulary-VL)

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The bandwidth-fidelity trade off or dilemma (Cronbach, 1960)
The primary action is at the narrow ability level

The bandwidth-fidelity dilemma or trade-off (Cronbach, 1960)
WJ IV CHC broad and narrow ability clusters

**Broad CHC ability clusters (10)**

- Gf
- Gc
- Gwm
- Gs
- Ga
- Glr
- Gv
- Fld Reas (2)
- Cmp Knw(2)
- ST Work Mem (2)
- Cog Proc Speed(2)
- Aud Proc (2)
- LT Ret (2)
- Visual Proc (2)
- Qnt Reas RQ (2)
- Vocab VL (2)
- AMemSp MS (2)
- Perc Spd P (2)
- Phn Cod PC (2)
- SpLex Ac LA (2)
- List Cmp LS (2)
- Num Fac N (2)

**Narrow CHC ability clusters (8)**

Sometimes narrow is better than broad
High

Strength of empirical relation (correlation) with BRS and RC clusters in norm data (ages 6 to 19)

Low

See within CHC domain assessment/interp. tree for in depth assessment in each domain

* BRS Scholastic Aptitude Cluster
* RC Scholastic Aptitude Cluster
* GIA/BRS RC Scholastic Aptitude $r = .87$
* Gs/Perceptual Speed $r = .85$
* Gc/Vocabulary $r = .89$

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WJ IV Math Calculation Skills and Problem Solving – **GIA+cluster ach-domain** tree

- **Gc**
- **Gf**
- **Gwm**
- **Glr**
- **Gv**
- **Ga**
- **Gs**

**GIA (g)**
- Oral Vocab.
- Number Series
- Verbal Attention
- Story Recall
- Visual-ization
- Phon. Proc.
- Letter-Pattern Matching

**Gc**
- General Info.
  - **Gf**
    - Analysis-Synthesis
      - Concept Formation
      - Number Series
      - Objects
    - **Gwm**
      - Numbers Reversed
      - Retrieval Fluency
      - Other strong Gv tests from other batteries
  - **Gwm-Ext**
    - **Gf-Ext**
      - Numbers Reversed
      - Retrieval Fluency

**Gf**
- Quantitative Reasoning (RQ)
- GIA+cluster

**Gwm**
- Perceptual Speed (P)
  - **Gs**
    - Number-Pattern Matching
    - Pair Canc.

**Gv**
- Picture Recog.

See within CHC domain assessment/interp. tree for in depth assessment in each domain

- **MPS Scholastic Aptitude cluster**
- **MCS Scholastic Aptitude cluster**

GIA/MCS MPS Scholastic Aptitude $r = .87$
- **Gs**/Perceptual Speed $r = .85$
- **Gf**/Quant. Reasoning $r = .85$
- Number Series/Matrices $r = .65$

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See within CHC domain assessment/interp. tree for in depth assessment in each domain

MPS Scholastic Aptitude cluster
MCS Scholastic Aptitude cluster
GIA/MCS MPS Scholastic Aptitude $r = .87$
Gs/Perceptual Speed $r = .85$
Gf/Quant. Reasoning $r = .85$
Number Series/Matrices $r = .65$

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WJ IV Math Calculation Skills and Problem Solving – **GIA+cluster ach-domain** tree

- **Gf**
- **Gwm**
- **Glr**
- **Gv**
- **Ga**
- **Gs**

**GIA (g)**

- Oral Vocab.
- Number Series
- Verbal Attention
- Story Recall
- Visualization
- Phon. Proc.
- Letter-Pattern Matching

**Quantitative Reasoning (RQ)**

- Analysis-Synthesis
- Numbers Reversed

**Gwm**

**Gs**

- Numbers Reversed
- Pair Canc.

**Gf**

- .78
- .93 .63 H .80
- NumSer H (RQ) #
- .63 .73 .64

**Gwm**

- .93 .65 M .66
- ConFrm H (I)
- .44 .47 .35

**Gs**

- .92 .62 M .62
- AnISyn H (RG)
- .25 .43 .34

See within CHC domain assessment/interp. tree for in depth assessment in each domain.

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- MPS Scholastic Aptitude cluster
- MCS Scholastic Aptitude cluster

GIA/MCS Scholastic Aptitude $r = .87$

- $Gs$/Perceptual Speed $r = .85$
- $Gf$/ Quant. Reasoning $r = .85$

Number Series/Matrices $r = .65$
WJ IV Math Calculation Skills and Problem Solving – **GIA+cluster** \textit{ach-domain} tree

\begin{itemize}
  \item \textbf{Gc:} Oral Vocab.
  \item \textbf{Gf:} Number Series
  \item \textbf{Gwm:} Verbal Attention
  \item \textbf{Glr:} Story Recall
  \item \textbf{Gv:} Visual-\textit{ization}
  \item \textbf{Ga:} Phon. Proc.
  \item \textbf{Gs:} Letter-\textit{Pattern} Matching
\end{itemize}

\textbf{GIA (g)}

- Quantitative Reasoning (RQ)
  \begin{itemize}
    \item Analysis-Synthesis
    \item Numbers Reversed
  \end{itemize}

\textbf{Gwm}

- Other strong Gv tests from other batteries

\textbf{Gs}

- Perceptual Speed \( r = .85 \)
- Quantitative Reasoning \( r = .85 \)

\textbf{Gv}

- Visual \( H (Vz) \) \( .66 \)
- Visual \( H (MV) \) \( .71 .47 \)
- Pair Canc.

\textbf{PicRec}

- Visual \( H (Vz) \) \( .60 \)
- Verbal Attention \( .38 \)
- Numbers Reversed \( .36 \)

\textbf{GIA/MCS MPS Scholastic Aptitude} \( r = .87 \)

\textbf{Gs} Perceptual Speed \( r = .85 \)

\textbf{Gf/ Quant. Reasoning} \( r = .85 \)

\textbf{Number Series/Matrices} \( r = .65 \)

\textbf{See within CHC domain assessment/interp. tree for in depth assessment in each domain.}

\textbf{High}

- Strength of empirical relation (correlation) with BRS and RC clusters in norm data (ages 6 to 19)

\textbf{Low}
Reading primary concern

The following slides will illustrate the GIA+cluster (Core+) and within-CHC domain assessment trees
WJ IV Basic Reading Skills and Comprehension—Core GIA+ cluster ach-domain tree

See within CHC domain assessment/interp. tree for in depth assessment in each domain.

BRS Scholastic Aptitude Cluster
RC Scholastic Aptitude Cluster

GIA/BRS RC Scholastic Aptitude $r = .87$
Gs/Perceptual Speed $r = .85$
Gc/Vocabulary $r = .89$

Gc $= 94$
Gf $= 80/90$
Gwm $= .87$
Glr $= .85$
Gv $= .89$
Ga $= .87$
Gs $= .85$

Oral Vocab. $= 119 98/90$
Number Series $= 111 97/90$
Verbal Attention $= 89 71/90$
Story Recall $= 85 76/90$
Visualization $= 114 97/90$
Phon. Proc. $= 83 69/90$
Letter-Pattern Matching $= 75 9/90$

Quantitative Reasoning (RQ)

Concept Formation $= 108 97/90$

Perceptual Speed (P)

Number-Pattern Matching $= 80 8/90$

$Gc = +2.36$
$Gf = +1.35$
$Gwm = -0.76$
$Glr = -1.14$
$Gv = +1.45$
$Ga = -1.37$
$Gs = -1.92$

85 91
See within CHC domain assessment/interp. tree for in depth assessment in each domain

<table>
<thead>
<tr>
<th>Test</th>
<th>BRS Scholastic Aptitude Cluster</th>
<th>RC Scholastic Aptitude Cluster</th>
</tr>
</thead>
<tbody>
<tr>
<td>GIA/BRS RC Scholastic Aptitude</td>
<td>r = .87</td>
<td></td>
</tr>
<tr>
<td>Gs/Perceptual Speed</td>
<td>r = .85</td>
<td></td>
</tr>
<tr>
<td>Gc/Vocabulary</td>
<td>r = .89</td>
<td></td>
</tr>
</tbody>
</table>

85 (-9 from GIA)
91 (-3 from GIA)
See within CHC domain assessment/interp. tree for in depth assessment in each domain.

BRS Scholastic Aptitude Cluster
RC Scholastic Aptitude Cluster

GIA/BRS RC Scholastic Aptitude $r = .87$
Gs/Perceptual Speed $r = .85$
Gc/Vocabulary $r = .89$

85 (-9 from GIA)
91 (-3 from GIA)
Select WJ IV COG cluster/test score significance values (ages 6-19)*

* Rounded values calculated in WJ IV norm data (ages 6 to 19)

GIA (7 tests)

SAPT’s (4 tests) .87/≈12/≈13

Gf-Gc (4 tests) .86/≈12/≈13

BIA (2 tests) .94/≈8/≈9

Gc  Oral Vocabulary .71/≈18/≈20
  General Information .97/≈5/≈6
  Gc-Ext

Gf  Number Series .47/≈24/≈27
  Concept Formation .94/≈8/≈9
  Gf-Ext

Gwm  Verbal Attention .47/≈24/≈27
  Number Reversed .94/≈8/≈9
  Gwm-Ext

Glr  Story Recall .34/≈27/≈30
  Vis-Auditory Learning .94/≈8/≈9

Gv  Visualization .43/≈25/≈28
  Picture Recognition .37/≈27/≈29

Ga  Phonological Processing .60/≈21/≈24
  Nonword Repetition

Gs  Let-Pattern Matching

Correlation

SD(diff) 1.50 (≈ 13% base rate)
SD(diff) 1.65 (≈ 10% base rate)

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WJ IV Basic Reading Skills and Comprehension – **Core GIA+ cluster** ach-domain tree

- Oral Vocab.
- Number Series
- Verbal Attention
- Story Recall
- Visualization
- Phon. Proc.
- Letter-Pattern Matching
- Concept Formation
- Perceptual Speed (P)
- Number-Pattern Matching

**Oral Vocab.**

**Number Series**

**Verbal Attention**

**Story Recall**

**Visualization**

**Phon. Proc.**

**Letter-Pattern Matching**

**Concept Formation**

**Perceptual Speed (P)**

**Number-Pattern Matching**

**Core GIA+ cluster**

**GIA**

85 (-9 from GIA)

91 (-3 from GIA)

See **within CHC domain assessment/interp. tree** for in depth assessment in each domain.

- BRS Scholastic Aptitude Cluster
- RC Scholastic Aptitude Cluster

GIA/BRS RC Scholastic Aptitude $r = .87$

Gs/Perceptual Speed $r = .85$

Gc/Vocabulary $r = .89$
Within CHC-domain assessment trees: Drilling down into CHC domains

Key to the following slides

Gray shaded CHC domain – primary assessment domain

Dark lines with bold fonts = WJ IV published clusters

Dashed lines with regular fonts = clinical/supplemental test groupings

Dark outlined squares = COG/OL tests: Gray outlined squares = ACH tests

See document with all broad and narrow published and clinical groupings (www.iapsych.com/articles/wjivgroupings.pdf)

<table>
<thead>
<tr>
<th>CHC domain</th>
<th>Narrow CHC (or other) ability</th>
<th>WJ IV tests</th>
</tr>
</thead>
<tbody>
<tr>
<td>Verbal</td>
<td>Comprehension-Knowledge</td>
<td>Oral Vocabulary, General Information</td>
</tr>
<tr>
<td></td>
<td>Comprehension-Knowledge - Extended</td>
<td>Oral Vocabulary, General Information, Picture Vocabulary</td>
</tr>
<tr>
<td></td>
<td>General Knowledge (GK)</td>
<td>Oral Vocabulary, Picture Vocabulary</td>
</tr>
<tr>
<td></td>
<td>GK/Comprehension - Extended</td>
<td>Oral Vocabulary, Picture Vocabulary, Reading Vocabulary, Rapid Picture Naming?</td>
</tr>
<tr>
<td></td>
<td>The Listening Comprehension</td>
<td>Oral Comprehension, Understanding Directions</td>
</tr>
<tr>
<td></td>
<td>The Listening Comprehension - Extended</td>
<td>Oral Comprehension, Understanding Directions, Story Recall</td>
</tr>
<tr>
<td></td>
<td>General Information (GI)</td>
<td>General Information, Picture Vocabulary</td>
</tr>
<tr>
<td></td>
<td>General Knowledge (GK) - Extended</td>
<td>General Information, Picture Vocabulary, Science, Social Studies, Humanities</td>
</tr>
<tr>
<td></td>
<td>Knowledge of Nature (KN)</td>
<td>General Information, Picture Vocabulary, Humanities</td>
</tr>
<tr>
<td></td>
<td>Language Development (LD)</td>
<td>Oral Vocabulary, Oral Comprehension, Reading Vocabulary, Passage Comprehension</td>
</tr>
<tr>
<td></td>
<td>Receptive &amp; Expressive Language</td>
<td>Oral Comprehension, Story Recall, Understanding Directions, Memory for Sentences</td>
</tr>
<tr>
<td>Fluid Reasoning</td>
<td>Fluid Reasoning - Extended</td>
<td>Number Series, Concept Formation, Analysis Synthesis</td>
</tr>
<tr>
<td></td>
<td>Number reasoning (NR)</td>
<td>Number Series, Analysis Synthesis</td>
</tr>
<tr>
<td></td>
<td>Quantitative reasoning (QR)</td>
<td>Number Series, Analysis Synthesis, Number Matrices, Applied Problems</td>
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<td></td>
<td>Spatial reasoning (SP)</td>
<td>Concept Formation, Analysis Synthesis, Oral Vocabulary, Passage Comprehension</td>
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<tr>
<td></td>
<td>Inferences &amp; Inferences - Hybrid</td>
<td>Number Series, Concept Formation, Analysis Synthesis, Visualization</td>
</tr>
</tbody>
</table>

(WJ IV author provided supplement clinical groupings or clusters to consider © Institute for Applied Psychometrics, Kevin S. McGrew, 11-15-15 working draft)
Within CHC-domain assessment and interpretation trees: **Purpose/Uses**

- Select tests to investigate S/W hypotheses
- Post assessment—record results on trees to possibly identify S/W patterns

(PDF copies of the “WJ IV intelligent testing trees” available for printing @ www.iapsych.com/articles/wjivtrees1.pdf)
Within CHC domain assessment & interpretation tree - Gf
Within CHC domain assessment & interpretation tree - Gf

Quantitative Reasoning (RQ)
- 111 NmSeries (RQ) 97/90
  +1.35
  Gf
  +1.65
  Gf-Ext

  Gf-Ext 4 /Gf+Gv hybrid

  114 Visual. (Vz) 97/90
    +1.45

Verbal Reasoning (Gf-Verbal)
- 119 OralVoc (LD/VL) 98/90
  +2.36

Quantitative Reasoning-Ext (RQ)
- 107 AnlSyn (RG) 96/90
  +1.01

- 111 Number Matrices (Gq) 97/90
  +1.24

- 100 Applied Problems (Gq) 90/90
  +0.73

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Dr. Kevin McGrew 01-26-16
Within CHC domain assessment & interpretation tree - Gf

Quantitative Reasoning (RQ)
- NmSeries (RQ)
- ConFrm (I)
- AntiSyn (RG)

Quantitative Reasoning-Ext (RQ)
- Number Matrices (Gq)
- Applied Problems (Gq)

Gf
- Gf-Ext
- Gf-Ext 4 /Gf+Gv hybrid

Gf-Ext
- Visual. (Vz)

Verbal Reasoning (Gf-Verbal)
- OralVoc (LD/VL)

WISC-V
- FRI = 112
- MR = 11
- FW = 13

Passage Comp. (Grw)

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WJ IV Basic Reading Skills and Comprehension—Core GIA+ cluster ach-domain tree

See within CHC domain assessment/interp. tree for in depth assessment in each domain

BRS Scholastic Aptitude Cluster
RC Scholastic Aptitude Cluster

GIA/BRS RC Scholastic Aptitude $r = .87$
$Gs$/Perceptual Speed $r = .85$
$Gc$/Vocabulary $r = .89$

85 (-9 from GIA)
91 (-3 from GIA)
Within CHC domain assessment & interpretation tree -Gs

Perceptual Speed (P)

Orthographic Awareness

Number Facility (N)

Number Facility-Ext (N)

Math Facts Fluency (Gq)

Letter-Word Ident. (Grw)

Spelling (Grw)

Word Attack (Grw)

Spelling of Sounds (Grw)

Sent. Rdg. Fluency (Grw)

Rdg. Fluency (Grw)

Gwim

Glr

Gs

LetPtMat (P)

PairCan (P/AC)

NmPtMat (P)

RetFlu (FI)

RpdPchm (NA)

NumRev (WM/AC)

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Within CHC domain assessment & interpretation tree -Gs

Perceptual Speed (P)

Orthographic Awareness

Number Facility (N)

Number Facility-Ext (N)

Math Facts Fluency (Gq)

Letter-Word Ident. (Grw)

Spelling (Grw)

Word Attack (Grw)

Spelling of Sounds (Grw)

Sent. Rdg. Fluency (Grw)

Rdg. Fluency (Grw)

Gwim

Glr

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LetPtMat (P)

PairCan (P/AC)

NmPtMat (P)

RetFlu (FI)

RpdPchm (NA)

NumRev (WM/AC)

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Within CHC domain assessment & interpretation tree - Gs

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Perceptual Speed (P)

Gs

LetPtMat (P) 9/90 -1.80 76 14/90

PairCan (P/AC) 22/90 -1.34

NmPtMat (P) 8/90 -1.49

Orthographic Awareness

Number Facility (N)

Gs-Ext

NumRev (WM/AC)

Letter-Word Ident. (Grw) -1.88 80 14/90

Spelling (Grw) -0.60 89 59/90

Word Attack (Grw) -1.09 84 55/90

Spelling of Sounds (Grw) -0.28 92 80/90

Math Facts Fluency (Gq) +1.44 112 99/90

Gwm

NumFacility-Ext (N)

Glr

RetFlu (FI)

RpdPcNm (NA)

Broad cognitive fluency/speed $g_s$?

80 14/90

84 55/90

78 2/90

81 4/90

76 1/90

1.92

1.49

1.44

1.34

1.55

1.72

1.25

1.88

1.09

1.55

0.60

0.28

1.80

1.34

1.49

1.44

1.34

1.55

1.72

1.25
Within CHC domain assessment & interpretation tree - Gs

Perceptual Speed (P)

Orthographic Awareness

Number Facility (N)

Number Facility-Ext (N)

Gm

Gs

Glr

Gs

gs?

Orthographic Awareness

Math Facts Fluency (Gq)

Letter-Word Ident. (Grw)

Spelling (Grw)

Word Attack (Grw)

Spelling of Sounds (Grw)

Rdg. Rate

Sent. Rdg. Fluency (Grw)

Word Rdg. Fluency (Grw)

Letter-Word Identification (Grw)

Spelling (Grw)

Word Attack (Grw)

Spelling of Sounds (Grw)

Rdg. Rate

Math Facts Fluency (Gq)

Orthographic Awareness

Within CHC domain assessment & interpretation tree - Gs

Perceptual Speed (P)

Orthographic Awareness

Number Facility (N)

Number Facility-Ext (N)

Gm

Gs

Glr

Gs

gs?

Orthographic Awareness

Math Facts Fluency (Gq)

Letter-Word Ident. (Grw)

Spelling (Grw)

Word Attack (Grw)

Spelling of Sounds (Grw)

Rdg. Rate

Sent. Rdg. Fluency (Grw)

Word Rdg. Fluency (Grw)
**Within CHC domain assessment & interpretation tree - Gs**

**Orthographic Awareness**
- Orthographic Awareness
  - Math Facts Fluency (Gq)

**Number Facility (N)**
- Number Facility (N)
- Number Facility-Ext (N)
  - NumRev (WM/AC)

**GS-Ext**
- GS
  - PairCan (P/AC)
  - LetPlMat (P)
  - NmPlMat (P)

**Perceptual Speed (P)**
- Perceptual Speed (P)
  - Gs
  - Gs

**Broad cognitive fluency/speed**
- $g_s$?

**Within CHC domain assessment & interpretation tree - Gs**

- **WISC-V**
  - PSI = 78
  - CD = 6
  - SS = 5

- **WISC-V**
  - PSI = 78
  - CD = 6
  - SS = 5

- **Rdg. Rate**
  - Word Rdg. Fluency (Grw)

- **Sent. Rdg. Fluency (Grw)**

- **Spelling (Grw)**
  - Spelling
  - Word Attack (Grw)

- **WISC-V**
  - PSI = 78
  - CD = 6
  - SS = 5

- **Rdg. Rate**
  - Word Rdg. Fluency (Grw)

- **Spelling (Grw)**
  - Spelling
WJ IV Basic Reading Skills and Comprehension—Core GIA+ cluster ach-domain tree

See within CHC domain assessment/interp. tree for in depth assessment in each domain.

- BRS Scholastic Aptitude Cluster
- RC Scholastic Aptitude Cluster

GIA/BRS RC Scholastic Aptitude $r = .87$
Gs/Perceptual Speed $r = .85$
Gc/Vocabulary $r = .89$

$Gc$ 85 (-9 from GIA)
$Gs$ 91 (-3 from GIA)

High
94
80/90

Low

Strength of empirical relation (correlation) with BRS and RC clusters in norm data (ages 6 to 19)
Strength of empirical relation (correlation) with BRS and RC clusters in norm data (ages 6 to 19)

See within CHC domain assessment/interp. tree for in depth assessment in each domain

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Within CHC domain assessment & interpretation tree - Gc

Gc
- OralVoc (LD/VL)
- GenInfo (K0)
- PicVoc (VL)
- Listen. Comp. (LS)

Gwm
- Vocabulary-Ext (VL)

Glr
- RpdPcNm (NA)

Reading Vocab. (Grw)
- Know. of Culture (K2)
- Acad. Know. (Grw)
- Language Development (LD)

Gen. Info. (K0)
- 119 98/90
- 110 96/90
- 110 97/90
- 117 98/90

117 PicVoc (VL) 98/90

103 OralCmp (LS) 92/90
- Reading Vocab. (Grw)
- Passage Comp. (Grw)

Listen. Comp. (LS)
- UndPrt (WM)
- SenRep (MS/LS)

+2.29

+1.25

+0.74

- Gen. Info. Ext (K0)

- Acad. Know. (Grw)

114 97/90

Hum. (Gkn)
- Social Studies (Gkn)
- Science (Gkn)

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Within CHC domain assessment & interpretation tree - Gc

- **Gc**
  - OralVoc (LD/ VL)
  - GenInfo (K0)
  - PicVoc (VL)
  - Gc-Ext
  - Gen. Info. (K0)

- **Vocabulary (VL)**

- **Acad. Know.**
  - Hum. (Gkn)
  - Social Studies (Gkn)
  - Science (Gkn)

- **Listen. Comp.**
  - OralCmp (LS)
  - Reading Vocab. (Grw)
  - Passage Comp. (Grw)

- **Language Development (LD)**
  - UndDir (WM)

- **WISC-V**
  - VCI = 116
  - SIM = 13
  - VOC = 13

- **Gwm**
  - Vocabulary-Ext (VL)

- **Glr**
  - RpdPcNm (NA)

- **StryRec**
  - SenRep (MS/LS)

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**WJ IV Basic Reading Skills and Comprehension – Core GIA+ cluster Ach-domain tree**

- **Gc**
- **Gf**
- **Gwm**
- **Glr**
- **Gv**
- **Ga**
- **Gs**

**Overview**

- **Oral Vocab.**
- **Number Series**
- **Verbal Attention**
- **Story Recall**
- **Visualization**
- **Phon. Proc.**
- **Letter- Pattern Matching**

**Core Clusters**

- **Vocabulary (VL)**
  - **Picture Vocab.**
  - **Concept Formation**

- **Gf**

- **Gs**

**High**

- **Perceptual Speed (P)**
  - **Number- Pattern Matching**
  - **Pair Canc.**

**Low**

- **85 (-9 from GIA)**
- **91 (-3 from GIA)**

**Strength of empirical relation** (correlation) with BRS and RC clusters in norm data (ages 6 to 19)

- **GIA/BRS RC Scholastic Aptitude Cluster r = .87**
- **Gs/Perceptual Speed r = .85**
- **Gc/Vocabulary r = .89**

**See within CHC domain assessment/interp. tree for in depth assessment in each domain**

**Scores**

- **GIA**
  - **84**
  - **80/90**

**Visual Features**

- **BRS Scholastic Aptitude Cluster**
- **RC Scholastic Aptitude Cluster**

---

**Case Study**

- **85 (-9 from GIA)**
- **91 (-3 from GIA)**
WJ IV Basic Reading Skills and Comprehension – Core GIA+ cluster ach-domain tree

See within CHC domain assessment/interp. tree for in depth assessment in each domain

BRS Scholastic Aptitude Cluster
RC Scholastic Aptitude Cluster
GIA/BRS RC Scholastic Aptitude r = .87
Gs/Perceptual Speed r = .85
Gc/Vocabulary r = .89

85 (-9 from GIA)
91 (-3 from GIA)
Within CHC domain assessment & interpretation tree - Gv

Gv

Visual. (Vz)

PicRec (MV)

Visual Memory (MV)

Gv-Ext

VisAdLrg (MA)

RpdPcNm (NA)

Glr
**Within CHC domain assessment & interpretation tree - Gv**

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- **Gv**
  - Visual Memory (MV)
    - Visual (Vz)
      - 97/90
    - PicRec (MV)
      - 97/90
    - +1.45
  - +1.50
  - 114
  - 118
- **Glr**
  - Visual Memory (MV)
  - Gv-Ext
  - 97/90
  - 119
  - 104
  - +0.34
  - VisAdLrg (MA)
    - 92/90
  - +0.91
  - RpdPcNm (NA)
    - 76/90
  - 93
Within CHC domain assessment & interpretation tree - Gv

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WISC-V
VSI = 111
BD = 11
VP = 13

Gv

Glr

Visual. (Vz)
PicRec (MV)

Gv

Gv-Ext

Visual Memory (MV)

VisAdLrg (MA)
RpdPcNm (NA)
WJ IV and WISC-IV 2D MDS solutions (n=173)

- **H** = High
- **M** = Moderate
- **L** = Low
WJ IV and WISC-IV 2D MDS solutions (n=173)
WJ IV Basic Reading Skills and Comprehension—Core GIA+ cluster _ach-domain_ tree

See **within CHC domain assessment/interp. tree** for in depth assessment in each domain.

- **BRS Scholastic Aptitude Cluster**
- **RC Scholastic Aptitude Cluster**

<table>
<thead>
<tr>
<th>Skill</th>
<th>BRS Score</th>
<th>RC Score</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Vocabulary (VL)</strong></td>
<td>85 (-9 from GIA)</td>
<td>91 (-3 from GIA)</td>
</tr>
<tr>
<td><strong>Phon. Proc.</strong></td>
<td>Gc/Perceptual Speed</td>
<td>Gs/Perceptual Speed</td>
</tr>
<tr>
<td><strong>Visual-ization</strong></td>
<td>Visual-ization</td>
<td>Visual-ization</td>
</tr>
<tr>
<td><strong>Story Recall</strong></td>
<td>Story Recall</td>
<td>Story Recall</td>
</tr>
<tr>
<td><strong>Verbal Attention</strong></td>
<td>Verbal Attention</td>
<td>Verbal Attention</td>
</tr>
<tr>
<td><strong>Number Series</strong></td>
<td>Number Series</td>
<td>Number Series</td>
</tr>
<tr>
<td><strong>Concept Formation</strong></td>
<td>Concept Formation</td>
<td>Concept Formation</td>
</tr>
<tr>
<td><strong>Picture Vocab.</strong></td>
<td>Picture Vocab.</td>
<td>Picture Vocab.</td>
</tr>
</tbody>
</table>

_Strength of empirical relation (correlation) with BRS and RC clusters in norm data (ages 6 to 19)_

- **BRS Scholastic Aptitude Cluster**
  - **GIA/BRS RC Scholastic Aptitude**
    - **r = .87**
  - **Gs/Perceptual Speed**
    - **r = .85**
  - **Gc/Vocabulary**
    - **r = .89**
Segmentation

Phonetic Coding (PC)

Nonword Repetition

Ga

High

Strength of empirical relation (correlation) with BRS and RC clusters in norm data (ages 6 to 19)

Low

See within CHC domain assessment/interp. tree for in depth assessment in each domain

BRS Scholastic Aptitude Cluster
RC Scholastic Aptitude Cluster
GIA/BRS RC Scholastic Aptitude $r = .87$
Gs/Perceptual Speed $r = .85$
Gc/Vocabulary $r = .89$

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Within CHC domain assessment & interpretation tree - Ga

Ga

PhnProc (PC)

NonWrRp PC,UM/MS

Segment (PC)

SndBlnd (PC)

SndAwr (PC)

Word Attack (Grw)

Spelling of Sounds (Grw)

Ga-Ext+

Phonetic Coding (PC)

Ga-Ext

Memory for Sound Patterns (UM)

SenRep (MS/LS)

Gwm

Ga/Gr?-Phono → Lexical Knowledge (access?)
**Within CHC domain assessment & interpretation tree - Ga**

- **Ga**
  - PhnProc (PC)
    - NonWrRp PC,UM/MS 89/90
    - 118
      - 98/90
      - +0.92
    - 111
      - Segment (PC)
        - 98/90
      - +1.51
    - 119
      - SndBlnd (PC)
        - 98/90
      - +1.48
  - Ga-Ext+
    - 84
      - Word Attack (Grw) 55/90
    - 92
      - Spelling Sounds (Grw) 80/90

- **Gwm**
  - SenRep (MS/LS) 81/90
  - 95

- **Ga/Gr?-Phono ➔ Lexical Knowledge (access?)**
Within CHC domain assessment & interpretation tree - Ga

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Ga

PhnProc (PC)

NonWrRp PC,UM/MS

Segment (PC)

SndBlnd (PC)

Phonetic Coding (PC)

Word Attack (Grw)

Spelling Sounds (Grw)

Ga-Ext+

Ga-Ext

Memory for Sound Patterns (UM)

SenRep (MS/LS)

Ga/Gr?-Phono→Lexical Knowledge (access?)
### Auditory Processing (Ga)

- **Phonological Processing (PC/Glr-LA)**
- **Sound Awareness (PC)**
- **Segmentation (PC)**
- **Nonword Repetition (PC/UM-MS)**
- **Sound Blending (PC)**

### Short Term Work Mem (Gwm)

- Retrieval (access) from store of phonological lexical knowledge structures/networks (off-line)

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Dyslexia: reconciling controversies within an integrative developmental perspective

Bart Boets¹,²

¹ Child and Adolescent Psychiatry, KU Leuven, Leuven, Belgium
² Department of Brain and Cognitive Sciences and McGovern Institute for Brain Research, Massachusetts Institute of Technology (MIT), Cambridge, MA USA

However, the leading phonological deficit hypothesis on dyslexia has recently been challenged by studies asserting that the phonological representations *per se* may be intact in individuals with dyslexia, but the ability to access them is impaired. Ramus and colleagues reached this conclusion based on a series of in-depth cognitive studies in adults from the growing evidence for a dysfunctional fronto-temporal connection in dyslexia, which has been interpreted as neural evidence for impaired access to phonological representations [4]. There is reason to believe that this particu-
Exploratory MDS of WJ IV norm subjects ages 6-19
Attention

Motor Power, Speed & Timing

Central Executive

Working Memory Capacity (WMC) = Efficiency of Attentional Control (AC)

Gs = Attentional Fluency

Learning (storage) efficiency (Glr)

Cognitive Processing Speed (Gs)

Focus of Attention

Short-Term Working Memory (Gwm)

Gt = Speed of Elem. Perc. Processing

Cognitive performance

Focus of Attention

Motors Control

Motor Power, Speed & Timing (Gp, Gps)

Motor performance

Beyond CHC Theory

Adapted from Schneider & McGrew (2012, 2013)

Central Executive

Gf = Complexity of Reasoning within Working Memory

Learning (storage) efficiency (Glr)

Retrieval fluency (Glr)

Attention

Environment Input

Sensory & Perceptual Systems

Visual (Gv)

Auditory (Ga)

Tactile (Gh)

Kinesthetic (Gk)

Olfactory (Go)

Gt = Speed of Elem. Perc. Processing

Cognitive Processing Speed (Gs)

Motor Control

Motor Sequences (what)

Motor Sequences (how)

Motor Sequences (what)

Motor Sequences (how)

Acquired Knowledge Systems (aka, long-term memory)

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http://www.iapsych.com/ipmodel.pdf

(Note: e.g., Gv, Ga, etc. are not simple visual perceptual or sensory processing but the complexity of visual processing that a person can handle)

Includes both tacit and explicit knowledge systems; declarative (what) and procedural (how) knowledge
Central Executive

Working Memory Capacity (WMC) = Efficiency of Attentional Control (AC)

Gs = Attentional Fluency

Focus of Attention

Gf = Complexity of Reasoning within Working Memory

Learning (storage) efficiency (Glr)

Retrieval fluency (Glr)

Motor Sequences (what)
Motor Sequences (how)
Etc. (what)
Etc. (how)

Nonverbal (e.g., motor)

Cognitive

Acquired Knowledge Systems (aka, long-term memory)

Acquired knowledge systems are organized as node-link networks.

Retrieval fluency (Glr) is efficiency of searching and retrieving from a specific knowledge network.
Semantic networks

- Lexical nodes
- Propositional nodes
Example of **network science** research: How the structure of a **phonological network** influences processing in the **psycholinguistic system**
Sample phonological network: "Speech" and phonological neighbors

Fig. 1. A sample of words from the phonological network analyzed in Vitevitch (2008). The word “speech” and its phonological neighbors (i.e., words that differ by the addition, deletion or substitution of a phoneme) are shown. The phonological neighbors of those neighbors (i.e., the 2-hop neighborhood of “speech”) are also shown.
Nonword Repetition (PC/UM-MS)

Phonological Processing (PC/Glr-LA)

Sound Awareness (PC)

Segmentation (PC)

Sound Blending (PC)

On-line processing

Retrieval (access) from store of phonological lexical knowledge structures/networks (off-line)

Most complex

Least complex

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Beyond CHC Theory
Adapted from Schneider & McGrew (2012, 2013)

Central Executive
Working Memory Capacity (WMC) = Efficiency of Attentional Control (AC)

Gs = Attentional Fluency

Gs = Attentional Fluency

Learning (storage) efficiency (Glr)

Retrieval fluency (Glr)

Focus of Attention

Gf = Complexity of Reasoning within Working Memory

Short-Term Working Memory (Gwm)

Environmental Input

Motor Control

Motor performance

Cognitive performance

Cognitive Processing Speed (Gs)

Motor Power, Speed & Timing (Gp, Gps)

(feedback loop)

(Sensory & Perceptual Systems)

Visual (Gv)

Auditory (Ga)

Tactile (Gh)

Kinesthetic (Gk)

Olfactory (Go)

Gt = Speed of Elem. Perc. Processing

(Note: e.g., Gv, Ga, etc. are not simple visual perceptual or sensory processing but the complexity of visual processing that a person can handle)

Semantic and phonological knowledge network
WJ IV Basic Reading Skills and Comprehension– Core GIA+ cluster ach-domain tree

See within CHC domain assessment/interp. tree for in depth assessment in each domain

BRS Scholastic Aptitude Cluster
RC Scholastic Aptitude Cluster
GIA/BRS RC Scholastic Aptitude r = .87
Gs/Perceptual Speed r = .85
Gc/Vocabulary r = .89

85 (-9 from GIA)
91 (-3 from GIA)

High

94
80/90

Low

Strength of empirical relation (correlation) with BRS and RC clusters in norm data (ages 6 to 19)

- BRS Scholastic Aptitude Cluster
- RC Scholastic Aptitude Cluster
- GIA/BRS RC Scholastic Aptitude r = .87
- Gs/Perceptual Speed r = .85
- Gc/Vocabulary r = .89

85 (-9 from GIA)
91 (-3 from GIA)
WJ IV Basic Reading Skills and Comprehension—**Core GIA+ cluster ach-domain** tree

High

- Strength of empirical relation (correlation) with BRS and RC clusters in norm data (ages 6 to 19)

Low

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Within CHC domain assessment & interpretation tree - Gwm

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Verbal/linguistic working memory

Attentional control working memory

Working memory capacity

Verbal working memory (Dehn, 2015)
Two primary mechanisms of verbal working memory maintenance

- Tasks that make greater use of the articulatory rehearsal maintenance mechanism
  - A language production process mechanism
  - Phonological effects research
  - Covert/overt rehearsal

- Tasks that make greater use of the attentional refreshing maintenance mechanism
  - Reactivation memory trace mechanism across stimulus domains (lang, visual, spatial)
  - Increasing focus and inhibiting distractions
  - Controlling and directing focus of attention
Distances between tests intended to reflect relative hypothesized differences (not quantified) along two axes:


Hypothesized degree of linguistic or language-domain demand:

- Low
- High

Hypothesized degree of central-executive control network (cog. load; attentional control; degree of relational cognitive complexity):

- Low
- High

Gwm A - tasks that make greater use of the articulatory rehearsal maintenance mechanism (Camos, 2015):

- Sentence Repetition
- Understanding Directions
- Memory for Words
- Numbers Reversed

Gwm B - tasks that make greater use of the attentional refreshing maintenance mechanism (Camos, 2015):

- Verbal Attention
- Nonword Repetition
- Object-Number Sequencing
- Verbal/linguistic working memory

Attentional control working memory
Within CHC domain assessment & interpretation tree - Gwm

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Ga

Gwm

Glr

Gv

Gf

Verbal/linguistic working memory

Attentional control working memory

Working memory capacity

Verbal working memory (Dehn, 2015)

Visual working memory

Verbal working memory (Dehn, 2015)
**Visual working memory**

*WISC-V*
- WMI = 83
- DS = 6
- PS = 7

Addison XBA VWM tests?
WJ IV Basic Reading Skills and Comprehension– Core GIA+ cluster \textit{ach-domain} tree

- **Gc**
- **Gf**
- **Gwm**
- **Glr**
- **Gv**
- **Ga**
- **Gs**

**Vocabulary (VL)**
- Oral Vocab.
- Number Series
- Verbal Attention
- Story Recall
- Visual-ization
- Phon. Proc.
- Letter-Pattern Matching

**Perceptual Speed (P)**
- Nonword Repetition
- Number-Pattern Matching

**Ga**
- Numbers Reversed
- Sentence Repetition
- Phon. Coding (PC)
- Ortho. Aware.

**Gs**
- Segmentation
- Pair Canc.

**Gf**
- Concept Formation
- Numbers Reversed

**Gwm**
- Under. Directions
- Sentence Repetition

**XBA VWM testing?**

- **Phono \rightarrow lex. Knowledge?**
- **Phono \rightarrow lex. Knowledge?**

**Strength of empirical relation (correlation) with BRS and RC clusters in norm data (ages 6 to 19)**

- High
- Low

**94 80/90**
WJ IV Basic Reading Skills and Comprehension—Core GIA+ cluster_ach-domain tree

See within CHC domain assessment/interp. tree for in depth assessment in each domain.

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**Within CHC domain** assessment & interpretation tree - *Glr*

- **Glr**
  - Reading Recall (Grw) → Meaningful Memory (MM)
  - Glr (Gl) → Speed of Lexical Access (Gr-LA)
  - Glr (Gl)-Ext → New Learning Efficiency (Gl)

- **Ga**

- **Gf**
  - ConFrm (I) → AniSyn (RG)

- Speed of Lexical Access (Gr-LA)
  - RpdPcNm (NA)
  - PhnProc (PC)
Within CHC domain assessment & interpretation tree - Glr

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Conclusion

Although many of Patrick’s test scores were within the Average range, he demonstrated very limited to limited proficiency on all reading and spelling tests. What is of greatest concern is the fact that Patrick has made insufficient academic progress in reading even with substantial additional assistance from both home and school. Although he has received targeted reading instruction with the Spalding method since kindergarten, he continues to struggle using phonics, pronouncing multisyllabic words, and reading at an adequate rate. The persistence and relative severity of his reading difficulties, his slow processing speed, his limited response to systematic interventions, his slow word perception, and the types of reading and spelling errors he makes, all support the conclusion that Patrick has a severe reading disorder. In addition, his mild difficulties regulating attention also interfere with his listening and learning. School programming considerations and instructional goals and strategies are provided below to address Patrick’s weaknesses while building upon many of his well-developed skills.
WJ IV Basic Reading Skills and Comprehension—Core GIA+ cluster ach-domain tree

- **Gc**: Oral Vocab.
- **Gf**: Number Series
- **Gwm**: Verbal Attention
- **Glr**: Story Recall
- **Gv**: Visual-ization
- **Ga**: Phon. Proc.
- **Gs**: Letter-Pattern Matching

**GIA**

- **Vocabulary (VL)**
  - Picture Vocab.
  - Concept Formation

- **Gf**
  - Numbers Reversed

- **Gwm**
  - Under Directions
  - Sentence Repetition
  - Rapid Pic. Nam.

- **Ga**
  - Nonword Repetition
  - Number-Pattern Matching

- **Gs**
  - Segmentation
  - Pair Canc.

- **Glr**
  - Phonetic Coding (PC)
    - Sound Blending
  - Ortho. Aware.
    - Phono → lex Knowledge?

- **Gwm**
  - Vis. Aud. Lrn.

**High**

94
80/90

**Low**

Strength of empirical relation (correlation) with BRS and RC clusters in norm data (ages 6 to 19)
Figure 1. Pattern of Strengths and Weaknesses Conceptual Model.
Cognitive & achievement strengths

- Gc-Vocabulary
- Gf-Fluid Reasoning
- Gv(?)
- Ga-Phonetic coding (phon. proc.)
- Math achievement
- Reading comprehension
- Writing achievement

Is there internal cog/ach strength consistency?

Cog. proc. weaknesses

- Gwm
- Gs-Perceptual speed
- Ga-Phonology→lex. know. (access)
- Orthographic awareness

No difference (consistency)

Academic weaknesses

- Basic reading skills
- Reading fluency
- Reading rate

Significant difference

Significant difference

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Appendix B

Score Report

Name: Jackson, Brayden
Date of Birth: 05/15/2006
Age: 9-1
Sex: Male
Date of Testing: 06/02/2015

School:
Teacher:
Grade:
ID:
Examiner:

Tests Administered:
Woodcock-Johnson IV Tests of Cognitive Abilities (Norms based on age 9-1)
Woodcock-Johnson IV Tests of Oral Language (Norms based on age 9-1)
Woodcock-Johnson IV Tests of Achievement Form A and Extended (Norms based on age 9-1)

Table of Scores:
Woodcock-Johnson IV Tests of Cognitive Abilities (Norms based on age 9-1)
### WJ IV Dyslexia Profile of Scores

<table>
<thead>
<tr>
<th>Area Tested</th>
<th>Battery</th>
<th>Test Date</th>
<th>Cluster/Test</th>
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**Figure 1.**

Scores in Primary Reading and Writing Difficulties.
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WJ IV Basic Reading Skills and Comprehension – Core GIA+ cluster _ach-domain_ tree

- **Gc**: Oral Vocab.
- **Gf**: Number Series
- **Gwm**: Verbal Attention
- **Glr**: Story Recall
- **Gv**: Visual-ization
- **Ga**: Phon. Proc.
- **Gs**: Letter- Pattern Matching

**GIA**

- **Gf**: 94 80/90

**Strength of empirical relation** (correlation) with BRS and RC clusters in norm data (ages 6 to 19)

- **High**
- **Low**

**Vocabulary (VL)**
- Picture Vocab.
- Concept Formation

**Phonetic Coding (PC)**
- Sound Blending

**Ortho. Aware.**

**Phono ➔ lex Knowledge?**

**XBA VWM testing?**

**Under. Directions**

**Sentence Repetition**

**Rapid Pic. Nam.**

**Nonword Repetition**

**Pair Canc.**

**Phon. Proc.**

**Segmen- tation**

**Pair Canc.**
Cognitive & achievement strengths

- **Gc-Vocabulary**
- **Gf-Fluid Reasoning**
- **Gv(?)**
- **Ga-Phonetic coding (phon. proc.)**
- **Math achievement**
- **Reading comprehension**
- **Writing achievement**

Cog. proc. weaknesses

- **Gwm**
- **Gs-Perceptual speed**
- **Ga-Phono→lex. know. (access)**
- **Orthographic awareness**

Significant difference

No difference (consistency)

Academic weaknesses

- **Basic reading skills**
- **Reading fluency**
- **Reading rate**

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Assessment Service Bulletin Number 3

The WJ IV™ Gf-Gc Composite and Its Use in the Identification of Specific Learning Disabilities

Fredrich A. Schrank, PhD, ABPP
Kevin S. McGrew, PhD
Nancy Mathey, PhD

The authors of the Woodcock-Johnson IV (WJ IV; Schrank, McGrew, & Mathey, 2014a) discuss the WJ IV Tests of Cognitive Abilities (WJ IV COG; Schrank, McGrew, & Mathey, 2014b) Gf-Gc Composite, contrast its composition with that of the WJ IV COG General Intellectual Ability (GIA) score, and synthesize important information that supports its use as a reliable and valid measure of intellectual development or intellectual level. The authors also suggest that the associated WJ IV COG Gf-Gc Composite/Other Ability comparison procedure can yield information that is relevant to the identification of a specific learning disability (SLD) in any model that is allowed under the 2004 reauthorization of the federal Individuals with Disabilities Education Improvement Act (IDEA).
Significant broad, narrow & clinical COG/ACH strengths/weaknesses:

Gf-Gc Composite procedure (+-1.5 SD) – Patrick case study

- Short-term Working Mem (Gwm-Ext)
- Cognitive Processing Speed (Gs)
- Auditory Processing (Ga)
- Long-term Retrieval (Glr)
- Visual-spatial Processing (Gv)
- Perceptual Speed (P)
- Phonetic Coding (PC)
- Auditory Memory Span (MS)
- Number Facility (N)
- Cognitive Efficiency (Gsm+Gs-Ext)
- Basic Reading Skills
- Reading Comprehension
- Reading Fluency
- Reading Rate
- Math Calculation Skills
- Math Problem Solving
- Basic Writing Skills
- Written Expression
- Phoneme-Grapheme Knowledge
Cognitive & achievement strengths

• Gf-Gc
• Gv?
• Ga-Phonetic Coding?

Cog. proc. weaknesses

- Gwm (Ext)
- Gs
- Gs-Perceptual speed
- Glr?
- Number Facility
- Cog. Efficiency (Ext)

Academic weaknesses

- Basic Reading Skills
- Reading Comprehension
- Reading Fluency
- Reading Rate
- Basic Writing Skills
- Phoneme-Grapheme Know.

Significant difference

Significant difference

No difference (consistency)

If full-blown assessment

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Composition of WJ IV reading and math **scholastic aptitude** clusters

- **Rdg Apt A**
  - Verbal Attention
  - Concept Formation
  - Number Series

- **Rdg Apt B**
  - Oral Vocab.
  - Phonological Processing
  - Pair Cancellation

- **Math Apt A**
  - Visual-ization
  - Numbers Reversed

- **Math Apt B**
  - Analysis Synthesis
  - Number- Pattern Matching

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WJ IV Patrick case study:
Reading scholastic aptitude/achievement comparisons (+/-1.5 SD):

- Discrepancy PR = 26  SD = -0.64
- Discrepancy PR = 55  SD = +0.12
- Discrepancy PR = 58  SD = +0.19
- Discrepancy PR = 6   SD = -1.59
- Discrepancy PR = 5   SD = -1.61
WJ IV Patrick case study:
Math scholastic aptitude/achievement comparisons (+-1.5 SD):

Actual Math Calculation Skills
Predicted Math Calculation Skills
Discrepancy PR = 55  SD = +0.14

Actual Math Problem Solving
Predicted Math Problem Solving
Discrepancy PR = 62  SD = +0.31
Within CHC-domain assessment and interpretation trees: “Drilling down” in the CHC domain

Psychometrically-detailed within CHC-domain assessment and interpretation trees
Within CHC domain assessment tree - Gc

Gc
- Reading Vocab. (Grw)
- Vocabulary (VL)
  - Gen. Info. (K0)
  - Know. of Culture (K2)
- Gc-Ext
  - Language Development (LD)
  - Gen. Info.-Ext (K0)
  - Acad. Know.
- Listen. Comp. (LS)
  - OralComp
  - PicVoc
  - OralVoc
- Gwm
  - Vocabulary-Ext (VL)
- Glr
  - StryRec
  - RpdPrf
  - RpdPrfH

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Dr. Kevin McGrew  12-28-15
### Pearson Correlation Matrix

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<th>SOC</th>
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Within CHC domain assessment tree - Ga

Pearson Correlation Matrix

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Within CHC domain assessment tree - Gv

Pearson Correlation Matrix

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Within CHC domain assessment tree - Gwm

Verbal/linguistic working memory

Attentional control working memory

Working memory capacity

Verbal working memory (Dehn, 2015)

Auditory Memory Span (MS)

NonWrRp PC,UM/MS .90 .58 M .18

Gf

Gwm

Glr

Gv

Ga

VerbAttn H (WM/AC) .86 .62 M .36

NumRev H (WM/AC) .86 .66 M .64

ObNmSq H (WM) .89 .70 M .74

UndDir H (WM) .86 .66 M .64

MemWrd H (MS) .82 .63 M .58

SenRep H (MS/LS) .83 .60 M .48

Gwm-Ext

Vrtn Attn

H (WM/AC)

.90 .58 M .18

MemWrd

.82 .63 M .58

Verbal working memory (Dehn, 2015)

Visual working memory

Attentional control working memory

Working memory capacity

Verbal/linguistic working memory

Visual working memory

Reading Recall (Grw)

Within CHC domain assessment tree - Gwm

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Within CHC domain assessment tree - Gwm

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