Why Some Students Can’t Read: A Look at Reading-Related Processes

Karen Apgar, MA/CAGS NCSP
Gloria Maccow, Ph.D.
Justin Potts, MS NCSP

Objectives

- Describe the reading-related processes and other cognitive abilities involved in reading.
- Illustrate how we use assessment data to
  - document under-achievement in reading,
  - determine which reading-related processes are linked to the under-achievement, and
  - identify appropriate interventions.
Developing Reading Skills

Reading

Reading is made up of two major parts:
- Pronouncing written words (decoding), and
- Comprehending words and text.

A major correlate of comprehension is vocabulary size.
Three Types of Struggling Readers

Deficient Decoding
- "Garden Variety" poor readers
- Specific Reading Disability (Dyslexia)

Adequate Comprehension
- Nonspecific Reading Disability (Hyperlexia)

Reading Skills and Reading-Related Processes
Reading Skills

<table>
<thead>
<tr>
<th>Grade</th>
<th>Skills</th>
</tr>
</thead>
<tbody>
<tr>
<td>K</td>
<td>Name letters accurately. &lt;br&gt;Identify and generate rhyming words. &lt;br&gt;Segment syllables and phonemes in spoken words.</td>
</tr>
<tr>
<td>1</td>
<td>Name real words accurately (without context clues). &lt;br&gt;Decode pseudowords accurately (without semantic cues).</td>
</tr>
<tr>
<td>2</td>
<td>Name real words accurately and quickly (without context clues). &lt;br&gt;Decode pseudowords accurately and quickly (w/o semantic cues).</td>
</tr>
<tr>
<td>3</td>
<td>Name real words accurately and quickly without context clues. &lt;br&gt;Decode pseudowords accurately and quickly w/o semantic cues. &lt;br&gt;Decode silently. &lt;br&gt;Read silently with fluency.</td>
</tr>
<tr>
<td>4 and above</td>
<td>Comprehend words. &lt;br&gt;Comprehend sentences. &lt;br&gt;Comprehend paragraphs.</td>
</tr>
</tbody>
</table>

Reading Requires:

- **Encoding** written words into temporary memory.

- **Segmenting in working memory** units of the written word — whole words, single letters, and/or letter clusters.

- **Phonological awareness** — of the syllables in multi-syllabic words and of the phonemes in spoken words.
Reading Requires:

- Use of the *grammar* information in suffixes to decide if a word fits a sentence context.
- Knowledge of *words* and concepts.
- Expressive language abilities.
- Verbal working memory.
- Inhibition, monitoring, shifting set.

Working Memory

Baddeley & Hitch, 1974; Baddeley, 2000.
Coding Word Forms in Verbal Working Memory (Berninger, 2007)

Figure 2: Creating interrelationships among the three word forms

Phonological Loop (Berninger, 2007)

Figure 3: The phonological loop
Executive Functions—Switching Set
(Beminger, 2007)

![Diagram](image1)

Figure 4  Switching attention or mental set

Executive Functions—Inhibition
(Beminger, 2007)

![Diagram](image2)

Figure 5  Inhibition in working memory
Executive Functions–Monitoring
(Berninger, 2007)

Self-Monitoring:
Review contents and/or processing in working memory

Updating and Revising:
Make changes in contents and/or processing in working memory (based on Review during Monitoring)

Written Language Problems Based on a Working Memory Architecture (Berninger, 2007)

Supports oral reading
Supports writing language and writing math
Case Example . . .

Introducing Aaron

(WISC-IV Integrated
Verbal Domain Case Study)

Background Information

Meet Aaron . . . a 10-year-old, African American boy with an engaging smile and a friendly, easygoing manner. After spending time with Aaron, it is easy to see that he enjoys the company of others and is equally comfortable around children and adults.
Background Information

Aaron likes sports and is a good athlete. Although somewhat quiet when playing with peers, it is apparent through observation that Aaron is well liked by both boys and girls in his class.

Background Information

- Aaron is in the 5th grade at Washington Elementary.
- He earned extremely low scores in reading and language arts on a standardized group achievement test administered in the early spring of his second grade year.
Background Information

- Since that time, he has been receiving educational support services through district remediation programs.
- Consistent with the regular classroom whole language instructional program, the remedial program emphasizes improvement of reading comprehension skills rather than a systematic approach to word decoding skill development.

Background Information

- In spite of educational support, Aaron’s performance is poor in all academic areas.
- His teacher is wondering if Aaron might be intellectually disabled because of his lack of engagement during class lessons and his consistently low performance on standardized group achievement tests and classroom tests.
- His teacher refers Aaron for a psychoeducational evaluation.
Why is Aaron Struggling to Master Grade-Level Objectives in Reading?

### WISC-IV Scores

<table>
<thead>
<tr>
<th>Index/Subtest</th>
<th>Composite Score/Scaled Score</th>
<th>Index/Subtest</th>
<th>Composite Score/Scaled Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Verbal Comprehension</td>
<td>75</td>
<td>Perceptual Reasoning</td>
<td>100</td>
</tr>
<tr>
<td>Similarities</td>
<td>6</td>
<td>Block Design*</td>
<td>5 (W)</td>
</tr>
<tr>
<td>Vocabulary</td>
<td>5</td>
<td>Matrix Reasoning</td>
<td>11 (S)</td>
</tr>
<tr>
<td>Comprehension</td>
<td>6</td>
<td>Picture Concepts</td>
<td>9</td>
</tr>
<tr>
<td>(Information)</td>
<td>(7)</td>
<td>(Picture Completion)*</td>
<td>(10)</td>
</tr>
<tr>
<td>(Word Reasoning)</td>
<td>(10)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Working Memory</td>
<td>74</td>
<td>Processing Speed</td>
<td>85</td>
</tr>
<tr>
<td>Digit Span</td>
<td>6</td>
<td>Coding</td>
<td>5</td>
</tr>
<tr>
<td>Letter-Number Sequencing</td>
<td>5</td>
<td>Symbol Search</td>
<td>10</td>
</tr>
<tr>
<td>(Arithmetic)</td>
<td>(13)</td>
<td>(Cancellation)</td>
<td>(9)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Full Scale IQ = 80</td>
<td></td>
</tr>
</tbody>
</table>

Full Scale IQ = 80
WISC-IV Integrated Scores

<table>
<thead>
<tr>
<th>Verbal Domain Subtest</th>
<th>Scaled Score</th>
<th>Percentile Rank</th>
</tr>
</thead>
<tbody>
<tr>
<td>Similarities</td>
<td>6</td>
<td>9</td>
</tr>
<tr>
<td>Similarities Multiple Choice</td>
<td>12</td>
<td>75</td>
</tr>
<tr>
<td>Comprehension</td>
<td>6</td>
<td>9</td>
</tr>
<tr>
<td>Comprehension Multiple Choice</td>
<td>15</td>
<td>95</td>
</tr>
<tr>
<td>Vocabulary</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>Vocabulary Multiple Choice</td>
<td>10</td>
<td>50</td>
</tr>
<tr>
<td>Picture Vocabulary Multiple Choice</td>
<td>10</td>
<td>50</td>
</tr>
<tr>
<td>Information</td>
<td>7</td>
<td>16</td>
</tr>
<tr>
<td>Information Multiple Choice</td>
<td>7</td>
<td>16</td>
</tr>
</tbody>
</table>

Hypotheses

Cognitive Strengths

Cognitive Weaknesses
### Index-Level Discrepancy Comparisons

<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. Y / N</th>
<th>Base Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>VCI - PRI</td>
<td>75</td>
<td>100</td>
<td>-25</td>
<td>10.6</td>
<td>Y</td>
<td>3.7%</td>
</tr>
<tr>
<td>VCI - WMI</td>
<td>75</td>
<td>74</td>
<td>1</td>
<td>10.99</td>
<td>N</td>
<td>48.9%</td>
</tr>
<tr>
<td>VCI - PSI</td>
<td>75</td>
<td>85</td>
<td>-10</td>
<td>11.75</td>
<td>N</td>
<td>29.5%</td>
</tr>
<tr>
<td>PRI - WMI</td>
<td>100</td>
<td>74</td>
<td>26</td>
<td>11.38</td>
<td>Y</td>
<td>4.8%</td>
</tr>
<tr>
<td>PRI - PSI</td>
<td>100</td>
<td>85</td>
<td>15</td>
<td>12.12</td>
<td>Y</td>
<td>16.5%</td>
</tr>
<tr>
<td>WMI - PSI</td>
<td>74</td>
<td>85</td>
<td>-11</td>
<td>12.46</td>
<td>N</td>
<td>28.8%</td>
</tr>
</tbody>
</table>

### Hypotheses

**Academic Strengths**

_________________________________________

_________________________________________

_________________________________________

_________________________________________

_________________________________________

_________________________________________

**Academic Weaknesses**

_________________________________________

_________________________________________

_________________________________________

_________________________________________

_________________________________________

_________________________________________
## WIAT-III Composite Score Summary

<table>
<thead>
<tr>
<th>Composite</th>
<th>Standard Score</th>
<th>95% Conf. Interval</th>
<th>%ile Rank</th>
<th>Qualitative Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Reading</td>
<td>69</td>
<td>65–73</td>
<td>2</td>
<td>Low</td>
</tr>
<tr>
<td>Basic Reading</td>
<td>63</td>
<td>59–67</td>
<td>1</td>
<td>Low</td>
</tr>
<tr>
<td>Reading Comprehension and Fluency</td>
<td>75</td>
<td>68–82</td>
<td>5</td>
<td>Below Average</td>
</tr>
<tr>
<td>Mathematics</td>
<td>104</td>
<td>97–111</td>
<td>61</td>
<td>Average</td>
</tr>
<tr>
<td>Math Fluency</td>
<td>116</td>
<td>109–123</td>
<td>86</td>
<td>Above Average</td>
</tr>
</tbody>
</table>

## Subtest Score Summary

<table>
<thead>
<tr>
<th>Subtest</th>
<th>Raw Score</th>
<th>Standard Score</th>
<th>95% Conf. Interval</th>
<th>%ile Rank</th>
</tr>
</thead>
<tbody>
<tr>
<td>Listening Comprehension</td>
<td>—</td>
<td>96</td>
<td>85–107</td>
<td>39</td>
</tr>
<tr>
<td>Reading Comprehension</td>
<td>26**†</td>
<td>87</td>
<td>77–97</td>
<td>19</td>
</tr>
<tr>
<td>Oral Reading Fluency</td>
<td>37**†</td>
<td>70</td>
<td>62–78</td>
<td>2</td>
</tr>
<tr>
<td>Word Reading</td>
<td>6</td>
<td>60</td>
<td>55–65</td>
<td>0.4</td>
</tr>
<tr>
<td>Pseudoword Decoding</td>
<td>3</td>
<td>67</td>
<td>62–72</td>
<td>1</td>
</tr>
<tr>
<td>Spelling</td>
<td>7</td>
<td>59</td>
<td>52–66</td>
<td>0.3</td>
</tr>
<tr>
<td>Math Problem Solving</td>
<td>50</td>
<td>113</td>
<td>104–122</td>
<td>81</td>
</tr>
<tr>
<td>Numerical Operations</td>
<td>27</td>
<td>95</td>
<td>87–103</td>
<td>37</td>
</tr>
<tr>
<td>Math Fluency Addition</td>
<td>36</td>
<td>116</td>
<td>103–129</td>
<td>86</td>
</tr>
<tr>
<td>Math Fluency Subtraction</td>
<td>31</td>
<td>115</td>
<td>105–125</td>
<td>84</td>
</tr>
<tr>
<td>Math Fluency Multiplication</td>
<td>26</td>
<td>112</td>
<td>103–121</td>
<td>79</td>
</tr>
</tbody>
</table>

---

* Indicates a raw score that is converted to a weighted raw score (not shown).
† Indicates that a raw score is based on a below grade level item set.
ELIGIBILITY AND NEED FOR
DIRECT SPECIALIZED INSTRUCTION

Specific Learning Disability
IDEA 2004

... 3) May permit the use of other alternative research-based procedures for determining whether a child has a specific learning disability, as defined in 34 CFR 300.8(c)(10).

“. . . the child exhibits a pattern of strengths and weaknesses in performance, achievement, or both, relative to age, State-approved grade level standards or intellectual development . . . ” (300.309 (a) (2) (ii)).
The PSW model is intended to help practitioners generate hypotheses regarding clinical diagnoses. This analysis should always be used within a comprehensive evaluation that incorporates multiple sources of information.

### Pattern of Strengths and Weaknesses Analysis

<table>
<thead>
<tr>
<th>Comparison</th>
<th>Relative Strength Score</th>
<th>Relative Weakness Score</th>
<th>Diff.</th>
<th>Critical Value .05</th>
<th>Sign. Diff. Y / N</th>
<th>Supports SLD hypothesis? Yes / No</th>
</tr>
</thead>
<tbody>
<tr>
<td>A Processing Strength / Achievement Weakness</td>
<td>100</td>
<td>63</td>
<td>37</td>
<td>8.82</td>
<td>Y</td>
<td>Yes</td>
</tr>
<tr>
<td>B Processing Strength / Processing Weakness</td>
<td>100</td>
<td>75</td>
<td>25</td>
<td>10.60</td>
<td>Y</td>
<td>Yes</td>
</tr>
</tbody>
</table>
Pattern of Strengths and Weaknesses

Processing Strength
WISC–IV Perceptual Reasoning Index
SS = 100

A. Discrepant?
Yes

Achievement Weakness
WIAT–III Basic Reading
SS = 63

B. Discrepant?
Yes

Processing Weakness
WISC–IV Verbal Comprehension
Index SS = 75

Vocabulary

<table>
<thead>
<tr>
<th>Verbal Domain Subtest</th>
<th>Scaled Score/Standard Score</th>
<th>Percentile Rank</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vocabulary</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>Vocabulary Multiple Choice</td>
<td>10</td>
<td>50</td>
</tr>
<tr>
<td>Picture Vocabulary Multiple Choice</td>
<td>10</td>
<td>50</td>
</tr>
<tr>
<td>Receptive Vocabulary</td>
<td>104</td>
<td>61</td>
</tr>
</tbody>
</table>

(WISC-IV Integrated; WIAT-III)
Questions

- Does Aaron have adequate general ability?
- Is there an academic, language, or fine-motor skill deficit?
- Is the skill deficit, in part, in reading, spelling, language arts?

Consider possible diagnoses.

Reading-Related Cognitive processes

<table>
<thead>
<tr>
<th>Coding</th>
<th>Orthographic</th>
<th>Phonological</th>
<th>Morphological</th>
<th>Vocabulary</th>
<th>Working Memory</th>
<th>Executive Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>Basic Reading</td>
<td></td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Reading Comprehension</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

At a fundamental level, Aaron has difficulty mapping the orthographic and phonological word forms. This contributes to problems with accuracy of word decoding and spelling.
Summary of Findings

- Aaron’s achievement in reading is a weakness relative to his fluid reasoning abilities.
- His reading comprehension is adversely affected by impaired decoding skills.
- His knowledge of words is within the average range, but he struggles to express his knowledge verbally.
Summary of Findings

• He is able to perform complex mental processing, but his performance is affected adversely by impaired verbal expressive abilities and impaired visual-motor integrative abilities.

• Aaron’s language was evaluated and he was diagnosed with a severe expressive language disorder.

Summary of Findings

• The Individualized Education Program Team classified Aaron with a Specific Learning Disability in Basic Reading and Written Expression.

• Due to his expressive language disorder, Aaron also received Speech/Language as a related service.
INTERVENTION
Integrating Orthographic, Phonological, and Morphological Awareness for Word Reading With Text Reading
(Berninger, 2003)

Subword Level

- Phonological Awareness
- Orthographic Awareness
- Alphabetic Principle
- Structural Analysis
Phonological Awareness

Teacher says word. Child repeats word, then says word again, but without the small sound the teacher indicates.

- proud /d/
- bird /d/
- for /f/
- garden /en/
- first /t/
- contest /s/
- afraid /r/
- always /al/
- burn /b/

Orthographic Awareness

- The child looks carefully at the word. With the pointing finger, s/he sweep under the word from left to right, paying attention to each letter.
- Then, s/he covers the word with a 3”x5” index card. When the teacher says “Now,” the child spells out loud (or in writing) the word s/he sees in the mind’s.

- proud
- contest
- deeply
- garden
- always
- breathed
- stinker
- first
- feared
Alphabetic Principle

- Teach strategies for changing printed words into spoken words.
- For example, use Talking Letters to teach spelling-sound correspondences.
- The child can use these correspondences to help sound out words in the story you will read later.
- Focus on naming the letter(s), the picture, and then the sound.

Structural Analysis

For each word
- Identify number of syllables.
- Count number of phonemes in each syllable in the spoken word.
- Classify each syllable in the word.
Structural Analysis

Word Level

Phonological Decoding of Words from Text
Student sounds out the words for the lesson.
Silent Reading for Meaning
- Story: “Five Stink Bugs Have a Contest” in Corrective Reading B2.
- Child reads the story silently “to find out how the smallest stink bug tricks the others.”
- Child reads story aloud, summarizes, then reads aloud again.
- Finally, teacher guides the student(s) in reflective discussion.

Interventions for Comprehension
- Monitoring comprehension
- Using graphic and semantic organizers
- Answering questions
- Generating questions
- Recognizing story structure
- Summarizing

(National Reading Panel, June 2003)
Interventions for Vocabulary

National Reading Panel recommends
- using vocabulary words from content-learning materials.
- providing explicit instruction for vocabulary.
- pre-teaching new words.
- teaching as many connections to a specific word as possible with multiple exposures to a word.

Teaching Vocabulary-Word Web

(Joseph, 2006)
Teaching Vocabulary-Semantic Map

People
- Pres. Hoover
- Henry Ford

Time Period
- 1920s

Dances
- Shimmy
- Fox Trot

Literature
- Frost
- Hemingway

Inventions/Discoveries
- Radio
- Penicillin

Jazz
- Armstrong
- Ellington

Events
- Scopes Trial
- Stock Market Crash

Phonological STM Interventions

Most interventions to improve short-term memory involve rehearsal training.

Rehearsal Strategies

- Say the material over and over to oneself.
- Engage in serial repetition. This allows information to be maintained in WM for longer periods of time, thus enhancing short-term recall. Elaborative rehearsal facilitates long-term storage.
Additional Phonological STM Interventions

- Naming letters and objects
- Repeating spoken sentences
- Reciting nursery rhymes
  - Highlights the phonological structure of language
- Rhyming games
  - Enhance phonemic awareness and the ability to store phonological information

Verbal Working Memory Interventions

Elaborative Rehearsal
- Associate meaning with stimuli.
- Keeps information active in WM without repetition and also facilitates moving information to LTM.

Semantic Rehearsal
- Brief sentences using the word to be remembered.
Verbal Working Memory Interventions

Chunking
- Pairing, clustering, grouping, or association of different items into units that are processed and remembered as a whole. This facilitates short-term retention and encoding into long-term storage.

Paraphrasing
- A strategy that builds on both rehearsal and chunking. Students restate information in their own words. This requires that they reorganize and condense a large amount of linguistic information into smaller, well-integrated, and more personally meaningful units.

Executive Working Memory Interventions

Dual Encoding
- Strategies utilizing concurrent visual and verbal encoding.
- Some dual encoding occurs naturally (reading).
- In the classroom, visual and verbal materials should be utilized.
Executive Working Memory Interventions

Organizational Strategies
- Fitting existing information into an organized structure (semantic category).
- Structuring and organizing information reduces the processing load on WM, thereby allowing more efficient encoding of material into long-term retrieval.
- Organizing information involves rehearsal and the processing of information at a deeper level.

Working Memory Training

An Evidence-based intervention for working memory training.

www.cogmed.com
References


References


http://www.psychcorp.com


References


Customer Service
1-800-627-7271 (USA)
1-866-335-8418 (Canada)

Comments or Questions
Gloria Maccow, Ph.D.
gloria.maccow@pearson.com

www.psychcorp.com