The Differential Ability Scales-II and CHC Theory
Gloria Maccow, Ph.D., Assessment Training Consultant

Why Students are Struggling to Learn:
Analyzing DAS-II Test Results
Within a CHC Framework
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Assessment Training Consultant

Objectives

- Describe CHC structure of human cognitive abilities.
- Describe the DAS-II subtests in relation to broad CHC factors.
- Discuss how these factors operate for normal cognitive functioning.

CHC Theory:
A Historical Perspective
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Brief History

<table>
<thead>
<tr>
<th>Year</th>
<th>Event</th>
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<tbody>
<tr>
<td>1904</td>
<td>Spearman: Performance on all mental tasks is explained by a single underlying construct of intelligence, the g factor, and by the factors that are specific to each task.</td>
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<td>1940s</td>
<td>Raymond Cattell: Two general factors make up intelligence: fluid intelligence (g_f) and crystallized intelligence (g_c).</td>
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<td>1960s-1990s</td>
<td>Cattell-Horn Gf-Gc Theory. John Horn added to Cattell’s original Gf and Gc factors such as visual perception, short-term memory, long-term storage and retrieval, speed of processing, auditory processing ability, quantitative ability, reading and writing ability.</td>
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<td>1993</td>
<td>Carroll’s three-stratum model: described three strata to explain human cognitive abilities. The broadest, stratum III, is a general factor consistent with Spearman’s g. At stratum II are broad abilities, including fluid and crystallized intelligence, and at stratum I are narrow abilities.</td>
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Comparing Cattell-Horn and Carroll

- General ability factor.
- Quantitative knowledge and quantitative reasoning.
- Reading/Writing factor.
- Short-term memory.

CHC Theory of Cognitive Abilities

- McGrew (1997) proposed an integrated CHC theory.
- CHC theory includes 10 broad cognitive abilities and about 70 narrow abilities.
Verbal and Visual-Spatial Abilities

- Two major systems through which we receive, perceive, process, and remember information.
- The systems are linked to auditory and visual modalities and are represented by Gc and Gv in CHC theory.
- The Verbal Cluster and the Spatial Cluster on the DAS-II assess verbal and visual-spatial processing, respectively.
**Auditory Processing**

- Auditory processing is concerned with analysis of sound patterns.
- Auditory processing abilities are linked to development of higher-order language skills (Gc), but they are more closely linked to the auditory system than Gc.
- The Phonological Processing subtest on the DAS-II measures auditory processing.

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**Complex Information Processing**

- Complex mental processing requires the integration of the auditory-verbal and visual-spatial systems.
- Factorially, this integrative system is represented by the fluid reasoning (Gf) factor in CHC theory.
- The Nonverbal Reasoning Cluster on the DAS-II measures fluid reasoning.

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**Short-term Memory**

- Some cognitive tests, e.g., WJ-III, use a single factor to represent memory.
- CHC theory does not distinguish separate modality-related memory systems.
- The DAS-II does not treat short-term memory as unitary and assesses visual short-term memory and auditory short-term memory.
Visual short-term Memory

- **Recognition of Pictures (Early Years)**
  - Measures short-term, nonverbal visual memory through recognition of familiar objects.

- **Recall of Designs (School-Age)**
  - Measures short-term recall of visual and spatial relationships by reproducing abstract figures.

Auditory Short-term Memory

- **Recall of Digits Forward**
  - Measures short-term auditory memory and oral recall of sequences of numbers.

Working Memory

- The subtests that load on the Working Memory cluster also measure short-term memory.
- The subtests are Recall of Digits Backward and Recall of Sequential Order.
Recall of Sequential Order
- Child hears a list of parts of the body and has to order from highest to lowest.
- Measures short-term recall of verbal and pictorial information.

Visual-Verbal Memory System
- The ability to hold information in visual-verbal short-term memory is important to solve problems that require manipulation of visual information that has verbal associations.
- Consistent with CHC theory, the DAS-II assesses long-term storage and retrieval (Glr) with tasks that have both visual and verbal components - the Recall of Objects subtest.
- Recall of Objects measures short-term and intermediate-term recall of verbal and pictorial information.

Processing Speed
- Tasks that require simple operations and that must be performed with relative speed are used to assess the CHC processing speed factor (Gs).
- On the DAS-II, the Gs factor is measured by the Processing Speed cluster, which includes the Rapid Naming subtests and the Speed of Information Processing subtest.
- Rapid Naming measures automaticity of integration of visual symbols with phonologically-referenced naming.
- Speed of Information Processing measures quickness in performing simple mental operations.
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### CHC Factors and DAS-II

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<thead>
<tr>
<th>CHC Factor</th>
<th>DAS-II Cluster/Subtest</th>
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<tr>
<td>Crystallized Ability</td>
<td>Verbal Cluster</td>
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<tr>
<td>Fluid Reasoning</td>
<td>Nonverbal Reasoning Cluster</td>
</tr>
<tr>
<td>Visual-Spatial Processing</td>
<td>Spatial Cluster</td>
</tr>
<tr>
<td>Short-Term Memory</td>
<td>Working Memory Cluster. Subtests: Recognition of Pictures; Recall of Digits.</td>
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<tr>
<td>Long-term Storage and Retrieval</td>
<td>Recall of Objects subtest</td>
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<tr>
<td>Cognitive Processing Speed</td>
<td>Processing Speed Cluster</td>
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<tr>
<td>Auditory Processing</td>
<td>Phonological Processing</td>
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### References


Part 2 of this webinar will be presented
February 27, 2013
12:00 noon - 1:00 pm EST

https://cc.readytalk.com/cc/s/registrations/new?cid=ktzs43aw7eew