# Manifestations of CHC Ability Weaknesses and Empirically-based Recommendations and Interventions (Flanagan, Alfonso, & Mascolo, 2011)

| CHC Broad Ability | CHC Broad Ability Definition | General Manifestations of the CHC Broad Ability | Manifestations of the CHC Broad Ability in Academic Areas | Recommendations/Interventions |
|---|---|---|---|---|
| Processing Speed (Gs) | •Speed of processing, particularly when pressured to pay focused attention <br> •Usually measured by tasks that require rapid processing, but are relatively easy | Difficulties with: <br> •Efficient processing of information <br> •Quickly perceiving relationships (similarities and differences between stimuli or information) <br> •Working within time parameters <br> •Completing simple, rote tasks quickly | **Reading Difficulties:** <br> •Slow reading speed <br> •Impaired comprehension <br> •Need to reread for understanding <br> **Math Difficulties:** <br> •Automatic computations <br> •Computational speed is slow despite accuracy <br> •Slow speed can result in reduced accuracy due to memory decay <br> **Writing Difficulties:** <br> •Limited output due to time factors <br> •Labored process results in reduced motivation to produce <br> **Language Difficulties:** <br> •Cannot retrieve information quickly – slow, disrupted speech as cannot get out thoughts quickly enough <br> •Is slow to process incoming information, puts demands on memory store which can result in information overload and loss of meaning | •Repeated practice <br> •Speed drills <br> •Computer activities that require quick, simple decisions <br> •Extended time <br> •Reducing the quantity of work required <br> •Increasing "wait" times both after questions are asked and after responses are given |

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| Fluid Reasoning (*Gf*) | •Novel reasoning and problem solving<br>•Processes are minimally dependent on learning and acculturation<br>•Involves manipulating rules, abstracting, generalizing, and identifying logical relationships | *Difficulties with:*<br>• Higher level thinking<br>•Transferring or generalizing learning<br>•Deriving solutions for novel problems<br>•Extending knowledge through critical thinking<br>•Perceiving and applying underlying rules or process(es) to solve problems | *Reading Difficulties:*<br>•Inferential reading comprehension<br>•Abstracting main idea(s)<br>*Math Difficulties:*<br>•Math reasoning (word problems)<br>•Internalizing procedures and processes used to solve problems<br>•Apprehending relationships between numbers<br>*Writing Difficulties:*<br>•Essay writing and generalizing concepts<br>•Developing a theme<br>•Comparing and contrasting ideas | •Develop student's skill in categorizing objects and drawing conclusions<br>•Use demonstrations to externalize the reasoning process<br>•Gradually offer guided practice (e.g., guided questions list) to promote internalization of procedures or process(es)<br>•Targeted feedback<br>•Cooperative learning<br>•Reciprocal teaching<br>•Graphic organizers to arrange information in visual format<br>•Metacognitive strategies<br>•Comparison of new concepts to previously learned (same vs. different)<br>•Using analogies, similes, metaphors when presenting tasks |

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| Crystallized Intelligence *(Gc)* | • Breadth and depth and knowledge of a culture<br>• Developed through formal education and general learning experiences<br>• Stores of information and declarative and procedural knowledge<br>• Ability to verbally communicate and reason with previously learned procedures | *Difficulties with:*<br>• Vocabulary acquisition<br>• Knowledge acquisition<br>• Comprehending language<br>• Fact-based/informational questions<br>• Using prior knowledge to support learning | ***Reading Difficulties:***<br>• Decoding and comprehension<br>***Math Difficulties:***<br>• Understanding math concepts and the "vocabulary of math"<br>***Writing Difficulties:***<br>• Grammar (syntax)<br>• Bland writing with limited descriptors<br>• Verbose writing<br>• Inappropriate word usage<br>***Language Difficulties:***<br>• Understanding class lessons<br>• Expressive language – "poverty of thought" | • Provide an environment rich in language and experiences<br>• Frequent practice with and exposure to words<br>• Read aloud to children<br>• Vary reading purpose (leisure, information)<br>• Work on vocabulary building<br>• Teach morphology<br>• Use text talks |

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| Auditory Processing (Ga) | •Ability to analyze and synthesize auditory information | *Difficulties with:* <br>•Hearing information presented orally, initially processing oral information <br>•Paying attention especially in the presence of background noise <br>•Discerning the direction from which auditory information is coming <br>•Foreign language acquisition <br>•Acquiring receptive vocabulary | ***Reading Difficulties:*** <br>•Acquiring phonics skills <br>•Decoding and comprehension <br>•Using phonetic strategies <br>***Math Difficulties:*** <br>•Word problems <br>***Writing Difficulties:*** <br>•Spelling <br>•Note taking <br>•Poor quality of writing | •Phonemic awareness activities <br>•Emphasis on sight-word reading <br>•Teach comprehension monitoring (e.g., does the word I heard/read make sense in context?) <br>•Annunciating sounds in words in an emphatic manner when teaching new words for reading or spelling <br>•Use work preview/text preview to clarify unknown words <br>•Provide guided notes during note taking activities <br>•Build in time for clarification questions related to "missed" or "misheard" items during lecture <br>•Supplement oral instructions with written instructions <br>•Shortening instructions <br>•Preferential seating <br>•Localizing sound source for student <br>•Minimizing background noise |

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| Long-Term Retrieval (*Glr*) | •Ability to store information (e.g., concepts, words, facts) and fluently retrieve it later through association | Difficulties with:<br>•Learning new concepts<br>•Retrieving or recalling information by using association<br>•Performing consistently across different task formats (e.g., recognition versus recall formats)<br>•Speed with which information is retrieved and/or learned<br>•Paired learning (visual-auditory)<br>•Recalling specific information (words, facts) | ***Reading Difficulties:***<br>•Accessing background knowledge to support new learning while reading (Associative Memory deficit)<br>•Slow to access phonological representations during decoding (RAN deficit)<br>***Math Difficulties:***<br>•Recalling procedures to use for math problems<br>•Memorizing and recalling math facts<br>***Writing Difficulties:***<br>•Accessing words to use during essay writing<br>•Specific writing tasks (compare and contrast; persuasive writing) conceptual)<br>•Note-taking<br>***Language Difficulties:***<br>•Expressive – circumlocutions, speech fillers, "interrupted" thought, pauses<br>•Receptive – making connections throughout oral presentations (e.g., class lecture) | •Repeated practice with and review of newly presented information<br>•Teach memory strategies (verbal rehearsal to support encoding, use of mnemonic devices)<br>•Use multiple modalities when teaching new concepts (pair written with verbal information)*<br>•Limit the amount of new material to be learned; introduce new concepts gradually and with a lot of context<br>•Be mindful of when new concepts are presented<br>•Make associations between newly learned and prior information explicit<br>•Use lists to facilitate recall (prompts)<br>•Expand vocabulary to minimize impact of word retrieval deficits<br>•Build in wait-time for student when fluency of retrieval is an issue<br>•Provide background knowledge first before asking a question to "prime" student for retrieval |

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| Visual Processing (*Gv*) | •Ability to analyze and visualize information | *Difficulties with:*<br>•Recognizing patterns<br>•Reading maps, graphs, charts<br>•Attending to fine visual detail<br>•Recalling visual information<br>•Appreciation of spatial characteristics of objects (e.g., size, length)<br>•Recognition of spatial orientation of objects | ***Reading Difficulties:***<br>•Orthographic coding (using visual features of letters to decode)<br>•Sight-word acquisition<br>•Using charts and graphs within a text in conjunction with reading<br>•Comprehension of text involving spatial concepts (e.g., social studies text describing physical boundaries, movement of troops along a specified route)<br>***Math Difficulties:***<br>•Number alignment during computations<br>•Reading and interpreting graphs, tables, and charts<br>***Writing Difficulties:***<br>•Spelling sight-words<br>•Spatial planning during writing tasks (e.g., no attention to margins, words that overhang a line)<br>•Inconsistent size, spacing, position, and slant of letters | • Capitalize on student's phonemic skills for decoding tasks<br>• Teach orthographic strategies for decoding (e.g., word length, shape of word)<br>• Overlay graphs and charts with visual labels<br>• Provide written or oral explanation for visual concepts<br>• Review spatial concepts and support comprehension through the use of hands-on activities and manipulatives (e.g., using models to demonstrate the moon's orbital path)<br>• Highlight margins during writing tasks<br>• Provide direct handwriting practice<br>• Use graph paper to assist with number alignment |

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| Short-Term Memory (*Gsm*) | •Ability to hold information in immediate awareness and use or transform it within a few seconds | *Difficulties with*: <br>•Following oral and written instructions <br>•Remembering information long enough to apply it <br>•Remembering the sequence of information <br>•Rote memorization | ***Reading Difficulties:*** <br>•Reading comprehension <br>•Decoding multisyllabic words <br>•Orally retelling or paraphrasing what one has read <br>***Math Difficulties:*** <br>•Rote memorization of facts <br>•Remembering mathematical procedures <br>•Multi-step problems and regrouping <br>•Extracting information to be used in word problems <br>***Writing Difficulties:*** <br>•Spelling multisyllabic words <br>•Redundancy in writing (word and conceptual levels) <br>•Note taking | •Provide opportunities for repeated practice and review <br>•Provide supports (e.g., lecture notes, study guides, written directions) to supplement oral instruction <br>•Break down instructional steps for student <br>•Provide visual support (e.g., times table) to support acquisition of basic math facts <br>•Outline math procedures for student and provide procedural guides or flashcards for the student to use when approaching problems <br>•Highlight important information within a word problem <br>•have student write all steps and show all work for math computations |