

Dawn P. Flanagan, Ph.D. (2011). You may use the following definitions in any way you see fit. You have permission to copy and disseminate.

Defining broad CHC abilities in “user-friendly” terms:

Fluid Intelligence (*Gf*) refers to a type of thinking that an individual may use when faced with a relatively new task that cannot be performed automatically. This type of thinking includes such things as forming and recognizing concepts (e.g., how are a dog, cat, and cow alike?), identifying and perceiving relationships (e.g., sun is to morning as moon is to *night*), drawing inferences (e.g., after reading a story, answering the question, “What will John do next?”), and reorganizing or transforming information (e.g., selecting one of several pictures to complete a puzzle). Overall, this ability can be thought of as a *problem-solving* type of intelligence. Problem-solving is important for reading comprehension (e.g., making inferences from text) and math (e.g., figuring out how to set up a math problem by using information provided in a word problem).

Crystallized intelligence (*Gc*) refers to a person’s knowledge base (or general fund of information) that has built up over time. It is like your own personal library or everything you know. Crystallized intelligence involves knowledge of one’s culture (e.g., who is the President of the United States?) as well as verbal- or language-based knowledge that has been developed during general life experiences, and formal schooling (e.g., understanding words and their meaning; understanding street signs, knowledge of current events and the history of the United States). Having well developed or good Crystallized intelligence means that one understands and uses language well, has an average or better vocabulary, and has good listening skills, for example. These abilities are important for reading, particularly reading comprehension. Children with below average Crystallized intelligence may have a hard time understanding what they read because they don’t know what the words mean or they haven’t had the life experiences that are needed to understand the words. It is important for children who are below average in this ability to work on improving it. The best way to do this is through activities that involve reading, such as going to the library. Also helpful are activities such as, watching educational programs, playing educational games, and listening and following along to others reading. When children read, they build their vocabulary and knowledge base. When vocabulary and knowledge grows, reading improves.

Visual processing (*Gv*) is an individual’s ability to think about visual patterns and visual stimuli (e.g., what is the shortest route from your house to school?). This type of ability also involves generating, perceiving, and analyzing, visual patterns and visual information (e.g., “draw a picture of what this shape would look like if I turned it upside down”). Additional examples of this type of ability include putting puzzles together, completing a maze (such as the ones often seen on children’s menus in restaurants), and interpreting a graph or chart. This type of visual processing is important when doing advanced math (e.g., geometry and calculus). But, visual processing is also important for reading because it is the type of ability that helps us automatically say “T”, when we see that letter, and say “ball”, when we see that word. Understanding what we see (letters and words on a page) is the part of visual processing that is important for reading.

Short-term memory (*Gsm*) is the ability to hold information in one's mind and then use it within a few seconds. The most common example of short-term memory is holding a phone number in one's mind long enough to dial it. Working memory is also part of the short-term memory system and involves manipulating or transforming information and using it in some way (e.g., saying the months of the year backwards). A child with short-term memory difficulties may have a hard time following directions, understanding long reading passages (e.g., a story read aloud by the teacher), spelling, sounding out words, and doing math problems (e.g., remembering the steps required to solve long math problems – first multiply, then add, then subtract). Children who have difficulties with short-term memory do better when they are taught how to use strategies to help them remember things. For example, if a child has difficulty remembering the order of operations in a long division math problem, teach the child to say, “**D**ad, **M**om, **S**ister, and **B**rother”. The first letter of each person represents an operation for long division in the correct order (i.e., **D**ivide, **M**ultiply, **S**ubtract, **B**ring-down).

Long-term retrieval (*Glr*) refers to an individual's ability to take in and store a variety of information (e.g., ideas, names, concepts) in one's mind and then retrieve it quickly and easily at a later time by using association (e.g., remembering the names of one's teachers and classmates). This ability does not represent *what* is stored in long-term memory or what you know. Rather, it represents the *process* of storing and retrieving information. When someone says, “It's on the tip of my tongue,” they are having a hard time retrieving something that they know. Sometimes children have difficulty “finding” information that they know and, therefore, cannot come up with a word or phrase that they learned. Long-term retrieval is important for reading. For example, children who have difficulty naming familiar objects quickly, naming letters quickly, or naming things that belong to a certain category quickly (e.g., name as many different kinds of candy you can think of as fast as you can) may have difficulty in reading. Overall, long-term retrieval is important in learning such things as the names of the letters of the alphabet or memorizing multiplication tables.

Auditory processing (*Ga*) refers to the ability to perceive, analyze, and synthesize a variety of auditory information (e.g., sounds). Examples of auditory processing include listening to words with missing letters and saying the correct word (e.g., hearing “olipop” and saying “lollipop”), listening to piano music and identifying the key in which the piece is being played (e.g., C sharp). Phonetic coding or phonological awareness/processing is very important during the elementary school years. Children who have difficulty with processing auditory information may have problems with learning letter-to-sound correspondence (e.g., listening to the sound “ba” and identifying it as the letter “b” when given a list of letters to choose from), reading nonsense words (e.g., bab), and sounding out words because of difficulty segmenting, analyzing, and synthesizing speech sounds. Children who are below average in auditory processing may also have difficulty in spelling, since this skill involves attending to the sequence of sounds in words. Older students who have below average auditory processing may have problems with learning a foreign language, interpreting lectures, and understanding oral directions, in addition to difficulties with spelling and sounding out words.

Processing speed (*Gs*) refers to an individual's ability to perform simple clerical tasks quickly,

especially when under pressure to maintain attention and concentration. It can also be thought of as how quickly one can think or how quickly one can take simple tests that require simple decisions. For example, how quickly an individual can cross out all of the letter “A’s” when they are embedded in multiple rows of scrambled letters is a measure of processing speed. Processing speed is important during all school years, particularly the elementary school years. Slow processing speed may interfere with reading because the rapid processing of letters and words is necessary for fluent reading. Slow processing speed may also lead to difficulties in math and writing because basic skills in these areas must be automatic (i.e., performed without much thought) before higher level skills in these areas can be carried out effectively (e.g., understanding what you read).