


**Intelligence**

It is one of the human characteristics to which we attribute the most significance, yet also one of the most poorly defined and misunderstood.



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**Psychometrics**

- the measurement of psychological functions such as intelligence



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**Intelligence defined:**

- Wechsler – The global and aggregate capacity of an individual to think rationally, to act purposefully, and to deal effectively with his environment.
- This global capacity is often termed general intelligence or abbreviated *g*.



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### Intelligence defined:

- Cattell makes the distinction between *crystallized* and *fluid* intellectual abilities.
- Crystallized = intellectual abilities which are dependent on experience, such as verbal and numerical abilities. These abilities do not appear to decline significantly in old age.
- Fluid = intellectual abilities such as memory, attention span, nonverbal analysis and reasoning, which are not highly affected by experience. These skills are more likely to decline in old age.

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### CHC Theory

- Widely recognized as the most empirically validated theoretical structural model of human cognitive abilities.
- Evolved over 100 years of psychometric-based research.
- Previously recognized as *Gf-Gc* theory, the **Cattell-Horn Gf-Gc** (Horn, 1991; Horn & Noll, 1997) and **Carroll three-stratum** models of cognitive abilities (Carroll, 1993, 1997) have recently been integrated under a common theoretical umbrella (viz., **Cattell-Horn-Carroll theory**).

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### CHC Theory

- CHC theory is a hierarchical framework of human cognitive abilities that consists of three strata:
- general intelligence or *g* (stratum III),
- broad cognitive abilities (stratum II), and
- narrow cognitive abilities (stratum I).

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### CHC Theory

- The broad cognitive abilities include:
- Fluid Reasoning (*Gf*),
- Comprehension- Knowledge (*Gc*),
- Short term Memory (*Gsm*),
- Visual – Spatial Thinking (*Gv*),
- Auditory Processing (*Ga*),
- Long term Retrieval (*Glr*),
- Processing Speed (*Gs*).

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### CHC Theory

- Additional broad abilities have been considered by others including:
- Decision/Reaction Time or Speed (*Gt*),
- Reading and Writing (*Grw*),
- and Quantitative Knowledge (*Gq*) (McGrew & Flanagan, 1998).
- The broad cognitive abilities subsume approximately 70 narrow cognitive abilities.

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### CHC Theory

- It is important to note that the primary architects of CHC theory do not agree on the validity of *g*.
- Carroll's model includes a higher order general intelligence factor while Horn argues against the validity of *g*.

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### CHC Theory: Carroll's Synthesis

- The publication of **John B. Carroll's** seminal **Human Cognitive Abilities: A Survey of Factor Analytic Studies** (Carroll, 1993) provided a much needed systematic organization and integration of over 50 years of research on the structure of human cognitive abilities.
- In this treatise, Carroll reported the results of a systematic exploratory factor analysis of over 460 human ability data sets, many of which were classic data sets reported during the past 50 to 60 years.

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### CHC Theory: Carroll's Synthesis

- Through the application of a systematic and uniform methodology, Carroll produced an empirical meta-analysis of the extant human cognitive abilities literature.
- Without a doubt, Carroll's factor analytic meta-analysis of the world's literature on human cognitive abilities is *the* pivotal contribution that has resulted in the recognition of a systematic taxonomic system for organizing and describing human cognitive abilities.

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### CHC Theory: Specifics About Some of the Broad Cognitive Factors

- **Comprehension-Knowledge** is considered one of the three higher-level human abilities.
- It continues to improve throughout the lifespan and is equated with "wisdom".
- This includes the skills needed to solve familiar problems, including long-term memory skills.
- Deficits in this factor can contribute to problems with reading comprehension, math reasoning, and meaningful written expression

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CHC Theory:

Specifics About Some of the Broad Cognitive Factors

- **Long-Term Retrieval** is not the same as long term memory, but rather the ability to gain access to long term memory.
- It tends to develop rapidly and then drops with age.
- It is related to reading fluency.

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CHC Theory:

Specifics About Some of the Broad Cognitive Factors

- **Visual-Spatial Thinking** is the second of the three higher level human abilities.
- Visual Spatial Thinking tends to have an inverse relationship with most academic skills and tends to have little to do with traditional academics.
- Skills related to this factor include interior decoration, art, reading a map, etc.

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CHC Theory:

Specifics About Some of the Broad Cognitive Factors

- **Auditory Processing** predicts skills such phonemic awareness, second language learning, and musical ability.
- Problems with phonemic awareness account for 80-90% of reading and writing problems.

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CHC Theory:

Specifics About Some of the Broad Cognitive Factors

- **Fluid Reasoning** develops up to the mid 0's and then drops and involves the ability to solve novel problems.
- It is the third of the higher level human abilities.
- This includes math and scientific thinking and creative abilities.

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CHC Theory:

Specifics About Some of the Broad Cognitive Factors

- **Processing Speed**, although a conceptually simple skill, is a very powerful predictor of basic academic skills such as reading, spelling and math, and is the single strongest predictor of math calculation skills.

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