

Gf - FLUID INTELLIGENCE



- Novel reasoning and problem solving
- Ability to reason, form concepts, and solve problems that often include novel information or procedures
- Basic reasoning processes that depend minimally on learning and acculturation
- Manipulating abstractions, rules, generalizations, and logical relations

FLUID INTELLIGENCE (Gf) NARROW ABILITIES

General Sequential Reasoning (RG): Ability to start with stated rules, premises, or conditions, and to engage in one or more steps to reach a solution to a problem.

Induction (I): Ability to discover the underlying characteristic (e.g., rule, concept, process, trend, class membership) that governs a problem or a set of materials.

Quantitative Reasoning (RQ): Ability to inductively and deductively reason with concepts involving mathematical relations and properties.

Piagetian Reasoning (RP): Seriation, conservation, classification and other cognitive abilities as defined by Piaget.

Speed of Reasoning (RE): (Not clearly defined)

Gc - Crystallized Intelligence



- Breadth and depth of knowledge of a culture
- Abilities developed through an *investment* of abilities into learning through education and experience
- Store of informational declarative and procedural knowledge
- Ability to communicate (especially verbally) and to reason with previously learned procedures
- Abilities that reflect the role of learning and acculturation
- *Not* the same as achievement



Crystallized Intelligence (Gc) Narrow Abilities

Language Development (LD): General development, or the understanding of words, sentences, and paragraphs (not requiring reading), in spoken native language skills.

Lexical Knowledge (VL): Extent of vocabulary that can be understood in terms of correct word meanings.

Listening Ability (LS): Ability to listen and comprehend oral communications.

General (verbal) Information (K0): Range of general knowledge.

Information about Culture (K2): Range of cultural knowledge (e.g., music, art).

General Science Information (K1): Range of scientific knowledge (e.g., biology, physics, engineering, mechanics, electronics).

Geography Achievement (A5): Range of geographic knowledge.

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Crystallized Intelligence (Gc) Narrow Abilities

Communication Ability (CM): Ability to speak in “real life” situations (e.g., lecture, group participation) in an adult-like manner.

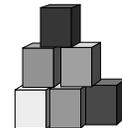
Oral Production and Fluency (OP): More specific or narrow oral communication skills than reflected by Communication Ability (CM).

Grammatical Sensitivity (MY): Knowledge or awareness of the grammatical features of the native language.

Foreign Language Proficiency (KL): Similar to Language Development (LD) but for a foreign language.

Foreign Language Aptitude (LA): Rate and ease of learning a new language.

Gv - VISUAL PROCESSING



- **Ability to analyze and synthesize visual stimuli**
 - **Perceptions and manipulations of visual shapes**
 - **Fluent thinking with stimuli that are visual in the *minds eye***
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Visual Processing (Gv) Narrow Abilities

Spatial Relations (SR): Ability to rapidly perceive and manipulate relatively simple visual patterns or to maintain orientation with respect to objects in space.

Visual Memory (MV): Ability to form and store a mental representation or image of a visual stimulus and then recognize or recall it later.

Closure Speed (CS): Ability to quickly combine disconnected, vague, or partially obscured visual stimuli or patterns into a meaningful whole, without knowing in advance what the pattern is.

Flexibility of Closure (CF): Ability to find, apprehend, and identify a visual figure or pattern embedded in a complex visual array, when knowing in advance what the pattern is.

Visual Processing (Gv) Narrow Abilities

Spatial Scanning (SS): Ability to accurately and quickly survey a spatial field or pattern and identify a path through the visual field or pattern.

Serial Perceptual Integration (PI): Ability to apprehend and identify a pictorial or visual pattern when parts of the pattern are presented rapidly in serial or successive order.

Length Estimation (LE): Ability to accurately estimate or compare visual lengths and distances without using measurement instruments.

Perceptual Illusions (IL): Ability to resist being affected by perceptual illusions involving geometric figures.

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Visual Processing (Gv) Narrow Abilities

Perceptual Alternations (PN): Consistency in the rate of alternating between different visual perceptions.

Imagery (IM): Ability to vividly mentally manipulate abstract spatial forms. (Not clearly defined by existing research.)

Gsm - SHORT-TERM MEMORY

- **The ability to hold information in immediate awareness and then use it within a few seconds**
 - **Memory *and* learning abilities in Carroll's model**
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Short-Term Memory (Gsm) Narrow Abilities

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Memory Span (MS): Ability to attend to and immediately recall temporally ordered elements in the correct order after a single presentation.

Working Memory (MW): Ability to temporarily store and perform a set of cognitive operations on information that requires divided attention and the management of the limited capacity of short-term memory.

Learning Abilities (L1): A number of factors that are specific to particular kinds of learning situations and memory [Also listed under Glr] (Not clearly defined by existing research.)

Glr - LONG-TERM RETRIEVAL



- Ability to *store* information (e.g., concepts, ideas, items, names) in long-term memory and to fluently *retrieve* it later through association
- *Associative storage and retrieval*
- Should *not be confused with acquired stores of knowledge (Gc and Gq)*
- Length of intervening time is not the critical feature
 - presence of *intervening tasks that engage short-term memory* is key

Long-term Retrieval (Glr) Narrow Abilities

Associative Memory (MA): Ability to recall one part of a previously learned but unrelated pair of items when the other part is presented (i.e., paired-associative learning).

Meaningful Memory (MM): Ability to recall a set of items where there is a meaningful relation between items or the items comprise a meaningful story or connected discourse.

Free Recall Memory (M6): Ability to recall as many unrelated items as possible, in any order, after a large collection of items is presented.

Ideational Fluency (FI): Ability to rapidly produce a series of ideas, words, or phrases related to a specific condition or object. Quantity not quality is emphasized.

Associational Fluency (FA): Ability to rapidly produce words or phrases associated in meaning (semantically associated) with a given word or concept.

Long-term Retrieval (Glr) Narrow Abilities

Expressional Fluency (FE): Ability to rapidly think of and organize words or phrases into meaningful complex ideas under high general or more specific cueing conditions.

Naming Facility (NA): Ability to rapidly produce names for concepts when presented with a pictorial or verbal cue.

Word Fluency (FW): Ability to rapidly produce words that have specific phonemic, structural, or orthographic characteristics (independent of word meanings).

Figural Fluency (FF): Ability to rapidly draw or sketch several examples or elaborations when given a starting visual or descriptive stimulus.

Figural Flexibility (FX): Ability to quickly change set in order to generate new and different solutions to figural problems.

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Long-term Retrieval (Glr) Narrow Abilities

Sensitivity to Problems (SP): Ability to identify and state practical problems in a given situation or rapidly think of and state various solutions to, or consequences of, such problems.

Originality/Creativity (FO): Ability to rapidly produce original, clever, or uncommon verbal or ideational responses to specified tasks.

Learning Abilities (L1): A number of factors that are specific to particular kinds of learning situations and memory [Also listed under *Gsm*] (Not clearly defined by existing research).

Ga - AUDITORY PROCESSING



- **Ability to analyze and synthesize auditory stimuli**
 - **Perception or discrimination of auditory patterns of sound or speech, especially when difficult due to fine discriminations, auditory distortion, or complex musical structure**
 - **Does not require the comprehension of language**
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Auditory Processing (Ga) Narrow Abilities

Phonetic Coding: Analysis (PC:A): Ability to segment larger units of speech sounds into smaller units of speech sounds.

Phonetic Coding: Synthesis (PC:S): Ability to blend smaller units of speech together into larger units of speech

Speech Sound Discrimination (US): Ability to detect differences in speech sounds under conditions of little distraction or distortion.

Resistance to Auditory Stimulus Distortion (UR): Ability to understand speech and language that has been distorted or masked in one or more ways.

Memory for Sound Patterns (UM): Ability to retain on a short-term basis auditory events such as tones, tonal patterns, and voices.

General Sound Discrimination (U3): Ability to discriminate tones, tone patterns, or musical materials with regard to pitch, intensity, duration, and rhythm.

Auditory Processing (Ga) Narrow Abilities

Temporal Tracking (UK): Ability to track auditory temporal events so as to be able to count, rearrange, or anticipate them.

Musical Discrimination and Judgment (U1, U9): Ability to discriminate and judge tonal patterns in music with respect to melodic, harmonic, and expressive aspects (e.g., phrasing, tempo, and intensity variations).

Maintaining and Judging Rhythm (U8): Ability to recognize and maintain a musical or equal time beat.

Sound-Intensity/Duration Discrimination (U6): Ability to discriminate sound intensities and to be sensitive to the temporal/rhythmic aspects of tonal patterns.

Sound-Frequency Discrimination (U5): Ability to discriminate frequency attributes (pitch and timbre) of tones.

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Auditory Processing (Ga) Narrow Abilities

Hearing and Speech Threshold Factors (UA, UT, UU):
Ability to hear pitch and varying sounds over a range of audible frequencies.

Absolute Pitch (UP): Ability to perfectly name or identify the pitch of tones.

Sound Localization (UL): Ability to localize heard sounds in space.

Gs - PROCESSING SPEED



- **Attentive speediness**
 - **Usually measured by tasks that require rapid cognitive processing, but little thinking**
 - **Speed of automatic processing, particularly when pressured to maintain focused attention**
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Processing Speed (Gs) Narrow Abilities

Perceptual Speed (P): Ability to rapidly search for and compare known visual symbols or patterns presented side-by-side or separated in a visual field.

Rate-of-Test-Taking (R9): Ability to rapidly perform tests which are relatively easy or that require very simple decisions.

Number Facility (N): Ability to rapidly and accurately manipulate and deal with numbers, from elementary skills of counting and recognizing numbers to advanced skills of adding, subtracting, multiplying, and dividing numbers.

Gt - DECISION/REACTION TIME OR SPEED

- **Quickness in providing correct answers**
 - **Quickness in deciding on answers**
 - **Decision time**
 - **Typically assessed with problems of moderate difficulty**
 - **Not assessed by any intelligence battery**
 - **An unclear construct**
 - *Is it more of a cognitive style (e.g., reflectivity vs impulsivity) variable?*
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Reaction/Decision Speed (Gt)

Narrow Abilities

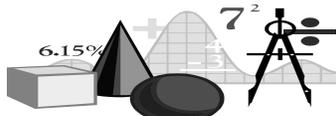
Simple Reaction Time (R1): Reaction time to the presentation of a single visual or auditory stimulus.

Choice Reaction Time (R2): Reaction time to one of two or more alternative stimuli, depending on which alternative is signaled.

Semantic Processing Speed (R4): Reaction time when the decision requires some encoding and mental manipulation of stimulus content.

Mental Comparison Speed (R7): Reaction time where the stimuli must be compared for a particular attribute.

Gq - QUANTITATIVE KNOWLEDGE



- **Ability to manipulate numeric symbols and to reason procedurally with quantitative information and relations**
- **Store of quantitative declarative and procedural knowledge**
- **Math achievement and knowledge**

Quantitative Knowledge (Gq) Narrow Abilities

Mathematical Knowledge (KM): Range of general knowledge about mathematics.

Mathematical Achievement (A3): Measured mathematics

Grw - READING/WRITING



- Reading and writing of language
 - English language ability
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Reading/Writing (Grw) Narrow Abilities

Reading Decoding (RD): Ability to recognize and decode words or pseudowords in reading.

Reading Comprehension (RC): Ability to comprehend connected discourse during reading.

Verbal (printed) Language Comprehension (V): General development, or the understanding of words, sentences, and paragraphs in native language, as measured by reading vocabulary and reading comprehension tests.

Cloze Ability (CZ): Ability to supply words deleted from prose passages that must be read.

Spelling Ability (SG): Ability to spell. (Not clearly defined by existing research).

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Reading/Writing (Grw) Narrow Abilities

Writing Ability (WA): Ability to write with clarity of thought, organization, and good sentence structure. (Not clearly defined by existing research).

English Usage Knowledge (EU): Knowledge of writing in the English language with respect to capitalization, punctuation, usage, and spelling.

Reading Speed (RS): Time required to silently read a passage or series of sentences as quickly as possible.
