Intelligence Testing

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Statistics

- Test scores are relative to the measure of central tendency and their variability.

- Measure of Central Tendency
  - Mean
    - Most useful & preferred measure of central tendency.
    - Calculated by summing scores and dividing by the number of cases (N)
    - Represents the midpoint in a normal distribution.

Statistics

- Variability
  - Range
    - Simplest measure of variability
    - Represents the difference between the highest and lowest scores
  - Variance
    - Represents the average of the squared differences of each observation from the mean.
    - How to compute: 1) Find the Mean
      2) Determine how far the score is from the mean.
      3) Square this distance.
      4) Add up these differences and compute the average.
      5) This is the variance or how the scores disperse around the mean.

Statistics

- Why is this important?

- Because it brings you to the *standard deviation.*
  - › Is the square root of the variance
  - › Represents the expected deviation from the mean for a score chosen at random.

- Without the standard deviation, we would not be able to transform raw scores into standard scores and thus, we could not engage in norm referenced interpretation.

Statistics

- Standard Scores
  - Represents a raw score's distance from the mean in units of standard deviation

  - Represent the most satisfactory or acceptable type of norm-referenced scores

  - Lack statistical problems associated with percentile ranks and developmental (age/grade equivalent) scores.

Statistics

- Standard Scores
  - Z-scores
    - $M = 0$; $SD = 1$

  - Scaled Scores
    - $M = 10$; $SD = 3$
    - Example: Scaled score of 13 is one SD above the mean.

  - T-scores
    - $M = 50$; $SD = 10$
    - Example: T = 30 is two SD below the mean

Statistics

- Standard Scores (continued)

  › Standardized Scores (AKA: Deviation IQ Scores)
    - M = 100; SD = 15
    - Example: SS=130 is two SD above the mean

Statistics

- Percentile Rank (PR)
- A percentile rank represents the % of people in a standardization sample who fell below a given score.
- PRs range from 1 to 99, with the 50th percentile representing the median for any set of scores.
  - A standard score at the 50th percentile represents a score that was equal to or better than 50% of people in the norm group.
- Problem: PRs do not allow us to interpret absolute differences between scores.
  - The difference between scores with PRs of 50 to 55 is greatly different from the distance between scores with PRs of 90 to 95.

Statistics

- Normal Distribution
  - AKA: Standard Deviation Curve
  - Is a hypothetical distribution of scores.
  - Represents a symmetrical distribution of scores with an equal number of scores above and below the midpoint (or mean).
  - The majority, if not all, psychological measurements assume a normal distribution.

Statistics

- What about grade equivalents?
  - Are a rough approximation of one's functioning that is derived by averaging raw scores of people in the norm group.
  - Are an estimate of the performance that an average student at a grade level is assumed to demonstrate on the test at a particular time in the school year.
  - **Biggest Problem: GE scores on different tests are not comparable.**
  - Must be interpreted with **extreme** caution as they are often not understood and misleading.
    - A 2nd grader with a grade equivalency of 6.9 _does not_ mean that the child can perform 6th grade work
    - It means the typical 6th grader in the 9th month of school would have received the same score if 6th graders had taken the second-grade test.

Statistics

- Confidence Intervals
  - Statistically computed.

  - Indicates the reliability of an estimate.

  - Indicates the degree of confidence you should have in that score.
    - E.g., FSIQ = 93; 95% CI = 88-98
      - So a child obtained a FSIQ on the WISC-V of 93. There is a 95% probability that his true score will fall between 88-98.

Standardized Assessment Practices

- Common Pitfalls
  - Use of a **single** test for **all** referrals.
  - Failure to recognize the implication of a particular tests use with diverse populations.
  - Relying on a single score for disability determination and placement decisions.
  - Pitfalls of self-report and other instruments
  - Failure to review the test protocol.
    - Errors of counting and recording.
    - Variability in IQ subtest response patterns.
    - Subtest scoring: Some scoring is subjective.
- Best Practices

Intelligence

- "It's all theoretical"
  - › Spearman: 2 factors ("g" and "s")
  - › Wechsler: Global view of intelligence
  - › Gardner: 8 intelligences

- No agreed upon definition of intelligence in the scientific/academic community.

Intelligence

- Snyderman & Rothman,1987
  - 1,020 experts rated important elements of intelligence
    - Abstract thinking or reasoning
    - Problem solving ability
    - Capacity to acquire knowledge
    - Memory
    - Adaptation to one's environment
    - Mental speed
    - Linguistic competence
    - Mathematical competence
    - General Knowledge
    - Creativity
    - Sensory acuity
    - Goal-directedness
    - Achievement motivation

Structure of Intelligence

- Cattell-Horn-Carroll (CHC) Theory
  - › Is the result of factor analytic research conducted over 60+ years.

  - › Is the result of an integration of Carroll's (1993) 3-stratum theory and that Cattell-Horn *Gf-Gc* Theory (Horn, 1994).

  - › Provides a relatively complete multiple intelligences taxonomy.

Structure of Intelligence

- What is CHC Theory?
  - › Is the major description of intelligence available today.

  - › Is based on the analyses of 100's of data sets that were not restricted to a major test battery.

  - › Is empirically based.

  - › Specifies 9 distinct broad domains of ability (with 69 narrow abilities).
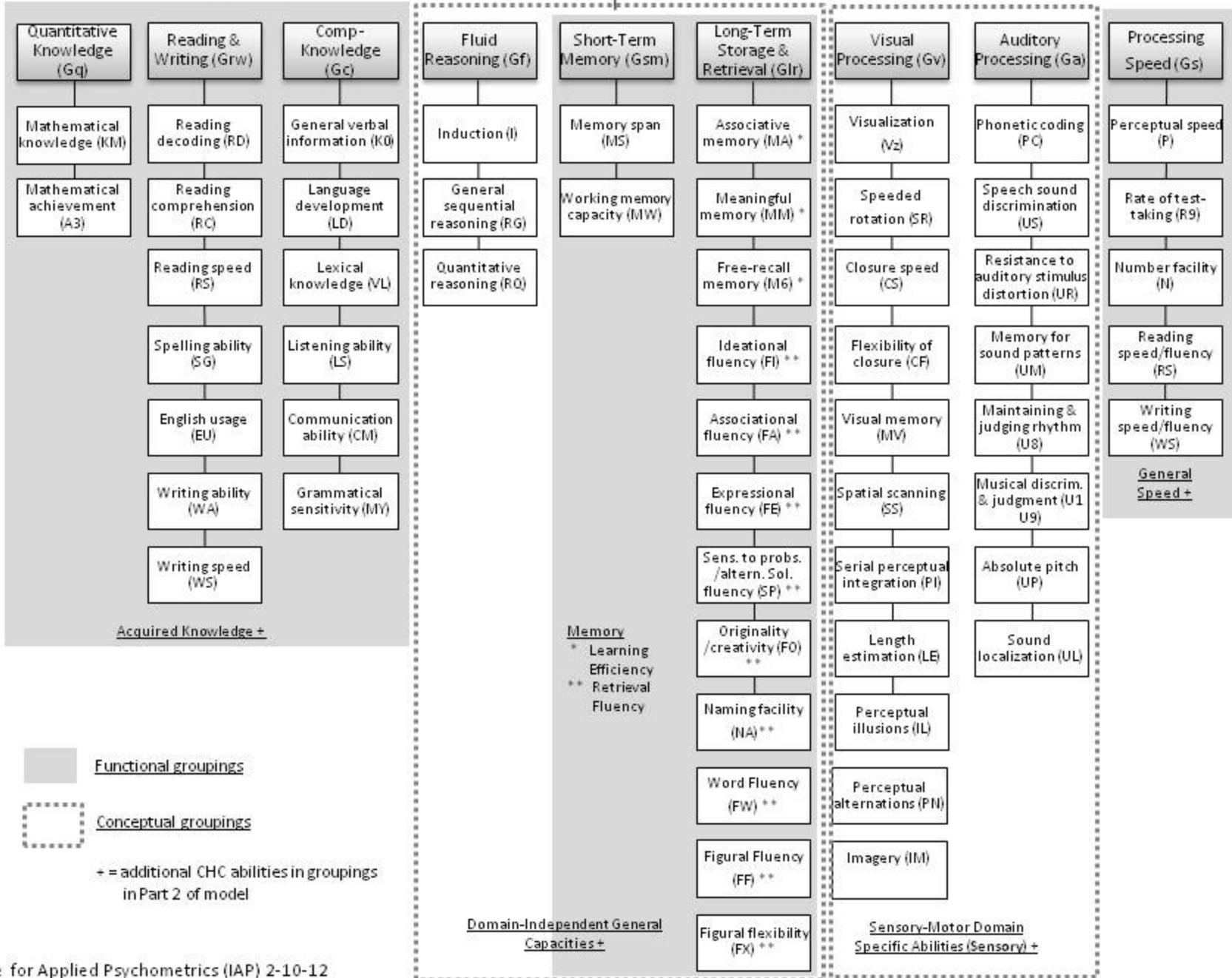
CHC model v2.0 – Part 1 (Schneider & McGrew, 2012)

General Intelligence (g)

Level									
General				General Intelligence (g)					
Broad	Quantitative Knowledge (Gq)	Reading & Writing (Grw)	Comp-Knowledge (Gc)	Fluid Reasoning (Gf)	Short-Term Memory (Gsm)	Long-Term Storage & Retrieval (Glr)	Visual Processing (Gv)	Auditory Processing (Ga)	Processing Speed (Gs)

Narrow abilities

Quantitative Knowledge (Gq)
- Mathematical knowledge (KM)
- Mathematical achievement (A3)

Reading & Writing (Grw)
- Reading decoding (RD)
- Reading comprehension (RC)
- Reading speed (RS)
- Spelling ability (SG)
- English usage (EU)
- Writing ability (WA)
- Writing speed (WS)

Comp-Knowledge (Gc)
- General verbal information (K0)
- Language development (LD)
- Lexical knowledge (VL)
- Listening ability (LS)
- Communication ability (CM)
- Grammatical sensitivity (MY)

Fluid Reasoning (Gf)
- Induction (I)
- General sequential reasoning (RG)
- Quantitative reasoning (RQ)

Short-Term Memory (Gsm)
- Memory span (MS)
- Working memory capacity (MW)

Long-Term Storage & Retrieval (Glr)
- Associative memory (MA) *
- Meaningful memory (MM) *
- Free-recall memory (M6) *
- Ideational fluency (FI) **
- Associational fluency (FA) **
- Expressional fluency (FE) **
- Sens. to probs. /altern. Sol. fluency (SP) **
- Originality /creativity (FO) **
- Naming facility (NA) **
- Word Fluency (FW) **
- Figural Fluency (FF) **
- Figural flexibility (FX) **

Visual Processing (Gv)
- Visualization (Vz)
- Speeded rotation (SR)
- Closure speed (CS)
- Flexibility of closure (CF)
- Visual memory (MV)
- Spatial scanning (SS)
- Serial perceptual integration (PI)
- Length estimation (LE)
- Perceptual illusions (IL)
- Perceptual alternations (PN)
- Imagery (IM)

Auditory Processing (Ga)
- Phonetic coding (PC)
- Speech sound discrimination (US)
- Resistance to auditory stimulus distortion (UR)
- Memory for sound patterns (UM)
- Maintaining & judging rhythm (U8)
- Musical discrim. & judgment (U1 U9)
- Absolute pitch (UP)
- Sound localization (UL)

Processing Speed (Gs)
- Perceptual speed (P)
- Rate of test-taking (R9)
- Number facility (N)
- Reading speed/fluency (RS)
- Writing speed/fluency (WS)

Functional / Conceptual groupings

- Acquired Knowledge +
- Domain-Independent General Capacities +
- Sensory-Motor Domain Specific Abilities (Sensory) +
- General Speed +

Memory
- * Learning Efficiency
- ** Retrieval Fluency

- ▢ Functional groupings
- ⌐ Conceptual groupings
- + = additional CHC abilities in groupings in Part 2 of model

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Why is this important?

- A number of cognitive tests / popular tests of intelligence have been modified to incorporate CHC theory as their foundation.
  - › For Example
    - Wechsler Series
    - Woodcock Johnson Tests of Cognitive Abilities

- This theory has introduced the _CHC Cross Battery approach_ to assessment.

  - › This is positive because most IQ tests do not assess all domains.

The CHC Cross Battery Approach

- Definition

  › The CHC Cross Battery Approach is a time-efficient method of intellectual assessment that allows practitioners to measure validly a wider range (or more in-depth but selected range) of cognitive abilities than that represented by any one intelligence battery in a manner consistent with contemporary psychometric theory and research on the structure of intelligence.

  › (Flanagan, McGrew, Ortiz, et. Al., 2001)

Wechsler Intelligence Scale for Children, Fifth Edition (WISC-V)

WISC-V

- Published in 2014.

- Standardized on stratified US sample of 2,200 children, 100 boys & 100 girls per age level.

- Designed to assess intellectual functions of children between the ages of 6-0 and 16-11.

WISC-V

- 7 subtests yield Full Scale IQ (SS = 40 to 160)
- 10 subtests yield 5 Primary Index Scale Scores (SS = 45 to 155)
  - 5 Index Scale Scores
    - Verbal Comprehension Index (VCI)
    - Visual Spatial Index (VSI)
    - Fluid Reasoning Index (FRI)
    - Working Memory Index (WMI)
    - Processing Speed Index (PSI)
  - Yields Subtest Scaled Scores

WISC-V

- 5 Ancillary Index Scores
  - › Quantitative Reasoning
  - › Auditory Working Memory
  - › Nonverbal
  - › General Ability
  - › Cognitive Proficiency

WISC-V

- 3 Complementary Index Scores
  - › Naming Speed
  - › Symbol Transition
  - › Storage and Retrieval

WISC-V: Full Scale IQ

- Represents general intelligence.

- Is composed of seven primary subtests
  - Similarities, Vocabulary, Block Design, Matrix Reasoning, Figure Weights, Digit Span, and Coding

WISC-V: Verbal Comprehension Index

- Reflects an individual's ability to comprehend verbal stimuli, reason with semantic material, and communicate thoughts and ideas with words.

- The VCI is a measure of crystallized intelligence. It measures the child's ability to access and apply acquired word knowledge.

- The application of this knowledge involves verbal concept formation, reasoning, and expression.

- Derived from the results of Similarities and Vocabulary.

WISC-V: Visual Spatial index

- The VSI measures the child's ability to evaluate visual details and to understand visual spatial relationships to construct geometric designs from a model.

- Derived from the results of Block Design and Visual Puzzles.

WISC-V: Fluid Reasoning Index

- Is generally considered to be the ability to solve novel problems for which there is little prior experience, cultural expectation, crystallized knowledge to guide the solution.

- Measures the child's ability to detect the underlying conceptual relationship among visual objects and to use reasoning to identify and apply rules.

- Derived from the results of Matrix Reasoning and Figure Weights.

WISC-V: Working Memory Index

- Is the ability to hold information in mind, or engaging in an interfering task, and then accurately reproducing the information or updated result.

- Can be thought of as mental control or focused attention that involves reasonably higher-order tasks, and it requires attention and concentration.

- WMI measures the child's ability to register, maintain, and manipulate visual and auditory information in conscious awareness.

- Derived from the results of Digit Span and Picture Span.

WISC-V: Processing Speed Index

- Processing speed involves the child quickly and correctly scanning or discriminating between simple visual information.

- The Processing Speed Index measures the child's speed and accuracy of visual identification, decision-making, and decision implementation.

- Derived from the results of Coding and Symbol Search.

WISC-V: Ancillary Index Scores

- Quantitative Reasoning (QRI)

  › Measures one's capacity to perform mental math operations, capacity to understand and apply quantitative relationships, verbal problem solving, working memory, and abstract conceptual reasoning.

  › Is a type of fluid reasoning (i.e., quantitative reasoning represents one's fluid reasoning using quantitative concepts).

  › Is comprised of the results obtained from the Arithmetic and Figure Weights subtests.

WISC-V: Ancillary Index Scores

- Auditory Working Memory (AWMI)
  - Provides a purer measure of auditory working memory than WMI.
  - Is comprised of the results obtained from the Digit Span and Letter-Number Sequencing.
  - Measures memory span, working memory, attention and concentration, rote memory, immediate auditory memory, numerical ability, auditory sequential processing, planning ability, and mental manipulation.

WISC-V: Ancillary Index Scores

- Nonverbal (NVI)
  - Is comprised of the results from Block Design, Visual Puzzles, Matrix Reasoning, Figure Weights, Picture Span, and Coding.
  - Substantially minimizes but does not eliminate verbal comprehension.
  - Is useful when the child/adolescent experiences verbal difficulties.

- General Ability (GAI)
  - The GAI provides an estimate of general intellectual ability that is less reliant on working memory and processing speed than the FSIQ.
  - Is comprised of the results obtained from Block Design, Similarities, Matrix Reasoning, Vocabulary, and Figure Weights.

WISC-V: Ancillary Index Scores

- Cognitive Proficiency (CPI)

  › The CPI provides an estimate of the efficiency with which information is processed in the service of learning, problem solving, and higher order reasoning.

  › Is comprised of the results obtained from Digit Span, Coding, Picture Span, and Symbol Search.

WISC-V: Complementary Index Scores

- Naming Speed (NSI)
  - Provides a broad estimate of automaticity of basic naming ability drawn from a variety of tasks.
  - Is comprised of the results from Naming Speed Literacy and Naming Speed Quantity.
- Symbol Translation
  - Provides a broad estimate of visual-verbal associative memory drawn from a variety of conditions.
  - Is comprised of the results from Immediate Symbol Translation, Delayed Symbol Translation, and Recognition Symbol Translation.
- Storage and Retrieval
  - Provides an overall measure of a child or adolescent's ability to store and retrieve learned information quickly and efficiently.

WISC-V: Basic SS Interpretation

- 130 and above = Extremely High
- 120-129 = Very High
- 110-119 = High Average
- 90-109 = Average
- 80-89 = Low Average
- 70-79 = Very Low
- 69 and below = Extremely Low

WISC-V: Interpretation

- WISC-V Interpretation
  - Report & Describe FSIQ
  - Report & Describe Primary Index Scores
  - Evaluate Index-Level and Subtest Level scale scores
  - Conduct Ancillary Analysis and Complementary Analyses

- WISC-V Case Study – Refer to Handout

Stanford Binet – Fifth Edition (SB5)

SB5

- Most recent edition published in 2003
- Age range: 2 to 85+ years
- 2003 edition retains use of hierarchical model of intelligence.
- Five factors based on CHC Theory
  - Fluid Reasoning
  - Knowledge
  - Quantitative Reasoning
  - Visual-Spatial Processing
  - Working Memory
- These 5 factors comprise two domains
  - Verbal & Nonverbal
- At the highest level, all items load on "*g*"

SB5

- Following administration of all subtests, subtest scaled scores are computed.

- Standard scores (M=100; SD=15) are derived for the FSIQ, VIQ, NVIQ, and each of the 5 factors.

SB5: Interpretation

- FSIQ: Represents general intellectual ability.
  - Question: Is the FSIQ valid?
    - Examine the difference between the VIQ & NVIQ.
      - Average difference for significance is 8.8 points.
      - Rule: If the difference is 8.8 **+** 1, check the manual
      - In not a significant difference: interpret
      - If it is a significant difference, do not interpret. Rather, determine which, VIQ or NVIQ is most representative of intellectual ability.
  - Use normative classification
    - 145-160: Very gifted or highly advanced
    - 130-144: Gifted or very advanced
    - 120-129: Superior
    - 110-119: High Average
    - 90-109: Average
    - 80-89: Low Average
    - 70-79: Borderline Delayed
    - 55-69: Mildly Delayed
    - 40-54: Moderately Delayed

SB5: Interpretation

- Interpret VIQ & NVIQ
  - › Is one score significantly higher than the other?
  - › Are they of the same magnitude?
  - › What are the implications if scores are discrepant?

- Interpret each of the SB5 factors

SB5: Interpretation

- SB5 Factors
  - Fluid Reasoning
    - Represents a person's ability to solve verbal and nonverbal problems using inductive and deductive reasoning.
  - Knowledge
    - Represents a person's accumulated fund of general information acquired through exposure.
    - Represents crystallized ability.
  - Quantitative Reasoning
    - Represents a person's ability to work with numbers and solve numerical problems.

SB5: Interpretation

- SB5 Factors
  - Visual-spatial processing
    - Represents a person's ability to see patterns, relationships, spatial orientations, or the gestalt whole among diverse pieces of a visual display.
  - Working Memory
    - Represent a person's memory processes by which information is stored in STM, evaluated, sorted and transformed.
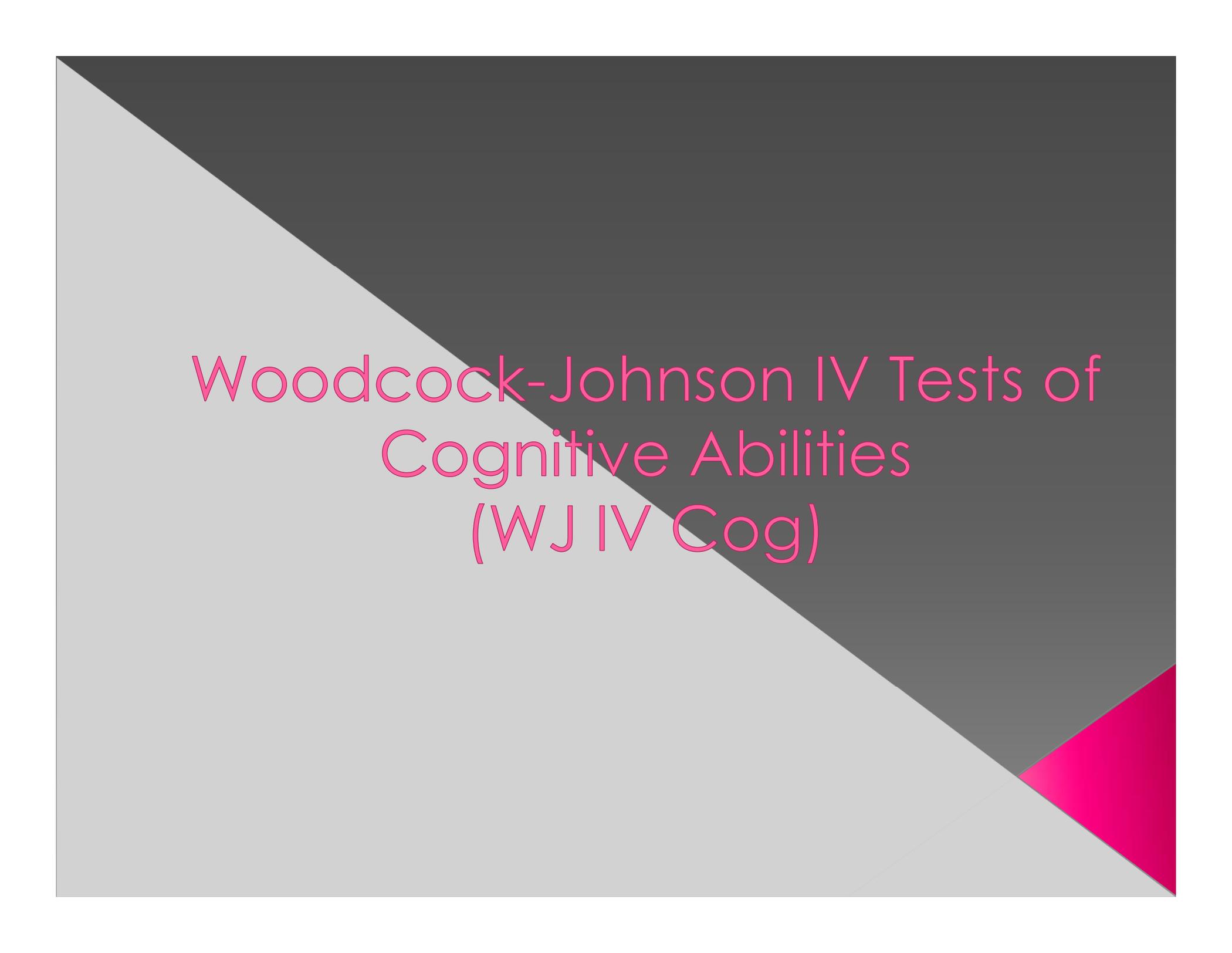
Woodcock-Johnson IV Tests of Cognitive Abilities (WJ IV Cog)

WJ IV Cog

- Published in 2014

- Age range 2 years to 90+

- Definitions of measured abilities are based primarily on CHC Theory

- Composed of 18 tests, 10 of which comprise the standard battery, and 8 that comprise the extended battery.

- Selective Testing

WJ IV Tests of Cognitive Abilities Selective Testing Table

		Composites			CHC Factors							Narrow Ability, Other						
		General Intellectual Ability (GIA)	Brief Intellectual Ability	Gf-Gc Composite	Comprehension-Knowledge (Gc)	Fluid Reasoning (Gf)	Short-Term Working Mem. (Gwm)	Cognitive Processing Speed (Gs)	Auditory Processing (Ga)	Long-Term Retrieval (Glr)	Visual Processing (Gv)	Quantitative Reasoning (RQ)	Auditory Memory Span (MS)	Number Facility (N)	Perceptual Speed (P)	Vocabulary (VL/LD)	Cognitive Efficiency	
Standard Easel	COG 1 Oral Vocabulary (*Gc*)	◆	◆	◆	◆											◆		COG 1
	COG 2 Number Series (*Gf*)	◆	◆	◆		◆						◆						COG 2
	COG 3 Verbal Attention (*Gwm*)	◆	◆				◆										□	COG 3
	COG 4 Letter-Pattern Matching (*Gs*)	◆						◆							◆		◆	COG 4
	COG 5 Phonological Processing (*Ga,Glr*)	◆							◆									COG 5
	COG 6 Story Recall (*Glr*)	◆								◆								COG 6
	COG 7 Visualization (*Gv*)	◆									◆							COG 7
	COG 8 General Information (*Gc*)			◆	◆													COG 8
	COG 9 Concept Formation (*Gf*)			◆		◆												COG 9
	COG 10 Numbers Reversed (*Gwm*)						◆						◆				◆	COG 10
Extended Easel	COG 11 Number-Pattern Matching (*Gs*)													◆	◆		□	COG 11
	COG 12 Nonword Repetition (*Ga,Gwm*)								◆									COG 12
	COG 13 Visual-Auditory Learning (*Glr*)									◆								COG 13
	COG 14 Picture Recognition (*Gv*)										◆							COG 14
	COG 15 Analysis-Synthesis (*Gf*)					□						◆						COG 15
	COG 16 Object-Number Sequencing (*Gwm*)						□											COG 16
	COG 17 Pair Cancellation (*Gs*)							◆										COG 17
	COG 18 Memory for Words (*Gwm*-MS)												◆					COG 18
Oral	OL 1 Picture Vocabulary (*Gc*)				□											◆		OL 1
	OL 5 Sentence Repetition (*Gwm,Gc*)												◆					OL 5

◆ Tests required to create the cluster listed in the column heading.
□ Additional tests required to create an extended version of the cluster listed.

WJ IV Cog: 3 Composite Scores

- General Intellectual Ability (GIA)
  - Provides an overall measure of one's cognitive ability or intelligence.
  - Is derived from tests 1 through 7 of the assessment, which serve to measure different CHC abilities including vocabulary, quantitative reasoning, working memory, perceptual speed, phonological processing, meaningful memory, and visualization ability.

WJ IV Cog: 3 Composite Scores

- Brief Intellectual Ability (BIA)
  - Tests 1 through 3
- *Gf-Gc* Composite
  - Measure of intellectual development that is derived from the Comprehension-Knowledge (*Gc*) and Fluid Reasoning (*Gf*) tests.
  - Comprised of the four tests of Oral Vocabulary, Number Series, General Information, and Concept Formation.
  - This combined measure of the two most important cognitive abilities (i.e., verbal-comprehension knowledge and fluid reasoning) is highly correlated with general intelligence (g) as measured by the WJ IV COG General Intellectual Ability (GIA) cluster score.
  - Unlike this broad-based measure of intellectual ability, the *Gf-Gc* Composite score removes tests that involve lower-level, less complex abilities, which are often central to one's learning difficulties, and thus can provide a better estimate of one's academic potential.

WJ IV Cog: CHC Factor Scores

- Comprehension-Knowledge (*Gc*)
  - Refers to the breadth and depth of a person's acquired knowledge, the ability to communicate one's knowledge, and the ability to reason using previously learned experiences and procedures. It may also be referred to as one's crystallized intelligence or verbal ability.
  - Is comprised of two tests
    - Oral Vocabulary
    - Assesses one's knowledge of words and their meanings.
  - General Information
    - Measures general object knowledge.

WJ IV Cog: CHC Factor Scores

- Fluid Reasoning (*Gf*)
  - The broad ability of reasoning, forming concepts, and solving problems by way of using unfamiliar information or novel procedures.
  - The tasks that comprise this cluster of the WJ IV COG include tests assessing one's ability to form concepts and quantitative reasoning.
  - Is comprised of two tests
    - Number Series
    - Measures the narrow abilities of quantitative reasoning, deductive reasoning, and inductive reasoning.
    - Requires the examinee to supply the missing number from a sequence of numbers following a mathematical relationship.
  - Concept Formation
    - Measures categorical reasoning ability, flexibility in thinking, and induction.

WJ IV Cog: CHC Factor Scores

- Short-Term Working Memory (*Gwm*)
  - Provides a measure of one's capacity to attend to information, hold the information in immediate awareness, and then perform a mental operation on the information, such as answering a question about the information or rearranging the information to meet a task demand.
  - Is comprised of two tests
    - Verbal Attention
      - Is a measure of short-term working memory or verbal working memory that taps into one's attentional control or controlled executive function, which is a critical ability necessary for efficient working memory.
      - This task requires the examinee to listen to an intermingled series of animals and digits presented on the auditory recording and subsequently answer a specific question regarding the sequence.
  - Numbers Reversed
    - Is a measure of working memory capacity.
    - Requires the examinee to hold a span of numbers in immediate awareness while performing a mental operation on it.

WJ IV Cog: CHC Factor Scores

- Cognitive Processing Speed (*Gs*)
  - Is the ability to quickly perform both simple and complex cognitive tasks, and helps determine how efficient an individual will be in performing a task or in learning a new task.
  - Is comprised of two tests
    - Letter-Pattern Matching
      - Is a perceptual speed task that requires the examinee to make comparisons based on rapid visual searches.
      - This task measures an aspect of cognitive efficiency in that it assesses the speed at which an individual can make visual symbol discriminations and identify common orthographic patterns.
    - Pair Cancellation
      - Requires the examinee to quickly identify and circle instances of a repeated pattern among stimulus items, and provides information about one's executive processing, attention/concentration, and processing abilities.
      - As an executive processing test, this measure provides information about one's interference and inhibition control.
      - As a measure of attention / concentration, this test provides information about sustained attention, as the test requires the examinee to stay on task in a vigilant manner.
      - Considering that this test is timed, it also provides information about the examinee's ability to perform a simple cognitive task under time pressure.

WJ IV Cog: CHC Factor Scores

- Auditory Processing (*Ga*)
  - Is the ability to encode, synthesize, and discriminate auditory stimuli, including the ability to employ auditory information in task performance.
  - Auditory processing is a broad ability that subsumes many of those abilities referred to as phonological awareness, phonological processing, phonological sensitivity, and phonetic coding.
    - Is comprised of two tests
      - Phonological Processing
        - Measures word activation, fluency of word access, and word restricting via phonological codes.
        - This test is comprised of three subtests (i.e., Word Access, Word Fluency, and Substitution). The Word Access subtest requires the examinee to provide a word that has a specific phonemic element in a specific location. The Word Fluency task requires the examinee to name as many words as possible that begin with a specified sound in one minute. Finally, the Substitution subtest requires the examinee to substitute part of a word to create a new word.
      - Nonword Repetition
        - Measure of phonological processing, measuring aspects of auditory processing and short-term working memory, or what is often described as phonological short-term memory or the phonological loop.
        - Requires the examinee to listen to a nonsense word and then repeat the word exactly.

WJ IV Cog: CHC Factor Scores

- Long-Term Retrieval (*Glr*)
  - The ability to store information and fluently retrieve it later in the process of thinking.
  - It involves both the amount of information that can be stored, as well as the rate and fluency with which the information can be retrieved and accessed.
  - Is comprised of two tests
    - Story Recall
      - Measures one's listening ability with attention to oral instructions, formation of mental representations in the stimulus phase, and story reconstruction in the response phase.
    - Visual-Auditory Learning
      - Measures one's associative memory.

WJ IV Cog: CHC Factor Scores

- Visual Processing (*Gv*)
  - Represents one's ability to perceive, analyze, synthesize, and think with visual patterns, including the ability to store and recall visual representations.
  - Includes a number of specific, narrow, visual or spatial abilities, including the ability to manipulate objects or patterns mentally, the ability to identify visual representations that appear in obscure or vague circumstances, visual imagery, and visual memory.
  - Is comprised of two tests
    - Visualization
      - Includes two subtests, Spatial Relations and Block Rotation, both of which require the abilities of spatial relations, visualization, and visual-spatial manipulation.
      - The Spatial Relations test requires the examinee to identify the two or three pieces that form a complete target shape. The item difficulty increases as the pieces that form the shape are flipped, rotated, and become more similar in appearance.
      - The Block Rotation test requires the examinee to identify the two block patterns that matched the target pattern.
    - Picture Recognition
      - Measures one's visual memory for objects or pictures,

WJ IV Cog

- Narrow Ability & Other Clinical Clusters

  › Quantitative Reasoning (*RQ*)
  › Auditory Memory Span (*MS*)
  › Number Facility (*N*)
  › Perceptual Speed (*P*)
  › Vocabulary (*VL/LD*)
  › Cognitive Efficiency

- WJ IV Cog Case Study – Refer to Handout

Nonverbal Intelligence Tests

- Comprehensive Nonverbal Test of Intelligence, Second Edition (CTONI-2)
  - Uses nonverbal formats to estimate the general intelligence of children and adults when performance on typically used tests may be impacted by language or motor abilities.
  - Not based on one particular theory of intelligence.
  - Ages 6:0 to 89:11.
  - Comprised of 6 subtests assessing
    - Analogical Reasoning
    - Categorical Reasoning
    - Sequential Reasoning
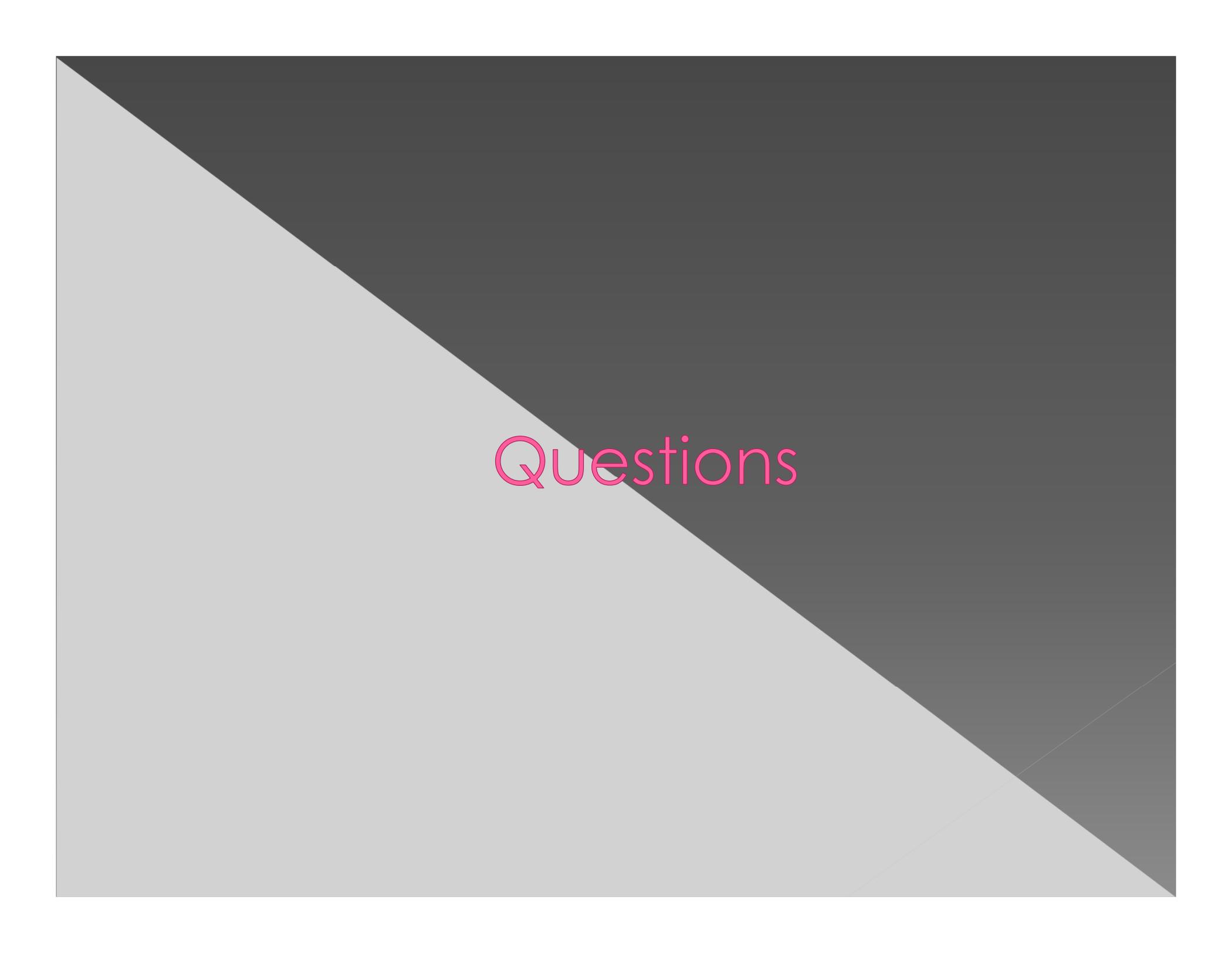
Nonverbal Intelligence Tests

- Tests of Nonverbal Intelligence, Fourth Edition (TONI-4)
  - Brief test of intelligence.
    - 15 to 20 minutes to administer.
  - Ages 6 years to 89 years, 11 months.
  - Measures two components of intelligence
    - Abstract reasoning & problem-solving.
  - Employs a nonverbal, motor-reduced format.

Nonverbal Intelligence Tests

- Wechsler Nonverbal Scale of Ability
  - Measures general ability nonverbally.
  - Is appropriate for individuals ages 4:0 to 21:11.
  - Pictorial directions and verbal directions are used to administer the subtests.
  - Six subtests are combined into a two-subtest version and a four subtest version.
    - Four subtest version is more robust than the two subtest version.

Nonverbal Intelligence Tests

- Leiter International Performance Scale, Third Edition (Leiter-3)
  - Designed to "measure nonverbal intelligence and abilities as well as attention and memory functioning."
  - Completely nonverbal.
  - Ages 3 to 75 years and older.
  - Intended for use with individuals who would benefit from a nonverbal measure of cognitive ability
    - Autism Spectrum Disorders, Communication Disorders, Cognitive Delay, ELL, Hearing Impairment, and TBI.

Questions