# Individual Intelligence and Adaptive Testing

Mardis Dunham, Ph.D.
Professor and Licensed Psychologist
Murray State University (KY)
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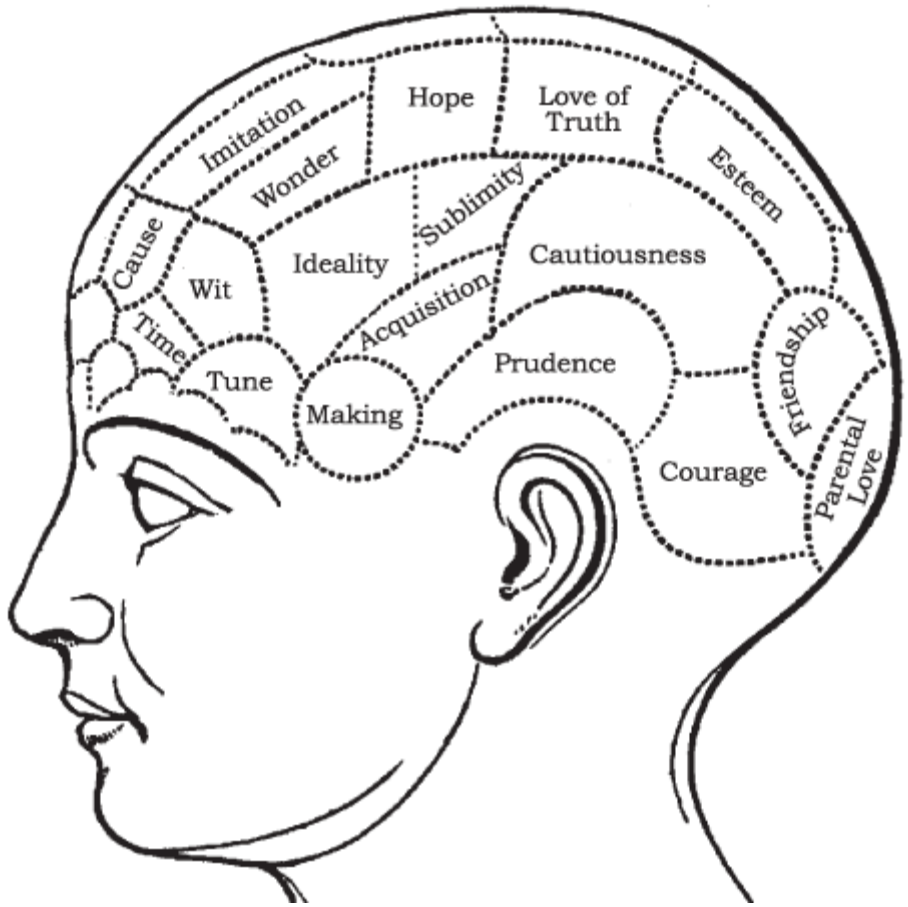
# Purpose of Workshop

- To review assessment concepts and test interpretation
- To review distinctions between screening and diagnostic tests
- To review/discuss IQ, Adaptive, and Achievement Testing concepts and purposes
- To review/discuss intellectual disabilities via case studies

# Phrenology . . .


Imitation
Hope
Love of Truth
Esteem
Wonder
Sublimity
Cause
Ideality
Cautiousness
Wit
Acquisition
Time
Friendship
Tune
Prudence
Making
Courage
Parental Love

# Important Assessment Concepts: Criterion Referenced vs Norm Referenced

- **Coverage**: Narrow vs Broad spectrum
- **Items**: Many items vs Few items
- **Purpose**: Instructional vs Diagnostic/eligibility
- **Interpretation**: Percentage of Criterion acquired vs Percentile (placement within the norm group)

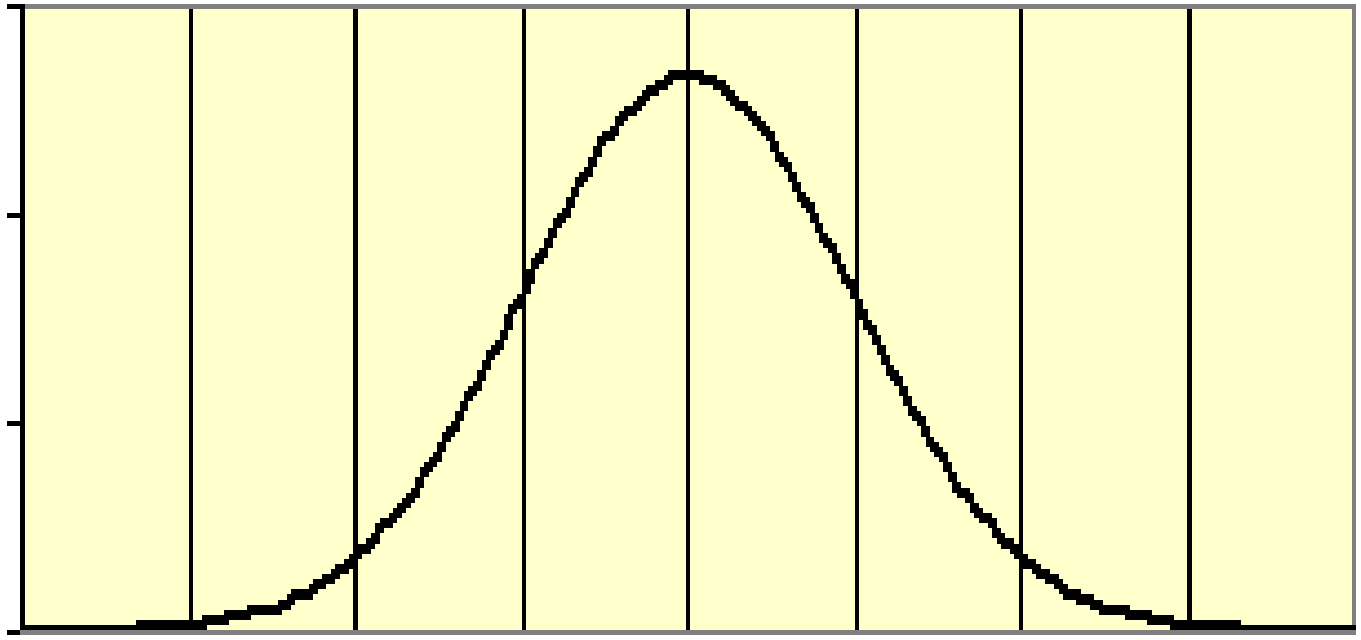
- Example Bob has mastered 83% of his times-tables through number 10.
- Bob's performance on the Woodcock-Johnson Achievement Test placed him at the 53rd percentile.
- Percentile tells the % of people, who took the same test as Bob, who scored at or below his score.
- "Anchor point" for criterion tests is the test items; for Norm-Referenced Tests it is the population of other people that same age who took that same test

# Norm-Referenced/Standardized Tests

- Used for Diagnostic and Eligibility Purposes
- Can be academic, personality, cognitive/intellectual, and adaptive
- All diagnostic, norm-referenced tests have several scales or indices, never just one stand alone score
- Items for each scale begin very easy and advance to very difficult
- The number of items a person gets correct is the **Raw Score**

- The Raw Score is then compared to the expected or average raw score for that persons age
- The fewer items correct, the lower the person's reading skills, IQ, memory, etc; the more items correct, the higher the person's skills relative to others their age.
- When the person's raw score is compared to that of 100s of others their age, the score is converted to a **Standard Score**—this is where the Normal Curve comes in
- **Standardized** means that the test is administered the same way to every person.

# IQ Normal Curve



| Standard Deviations | -4 | -3 | -2 | -1 | 0 | 1 | 2 | 3 | 4 |
|---|---|---|---|---|---|---|---|---|---|
| Wechsler IQ | 40 | 55 | 70 | 85 | 100 | 115 | 130 | 145 | 160 |
| Stanford-Binet IQ | 36 | 52 | 68 | 84 | 100 | 116 | 132 | 148 | 164 |
| Cumulative % | 0.003 | 0.135 | 2.275 | 15.866 | 50.000 | 84.134 | 97.725 | 99.865 | 99.997 |

- **Normal Curve**—an abstract mathematical construct upon which almost all mental measurement (psychometrics) are built.

- Most well standardized instruments yield scores that are normally distributed—that is, the mean, median, and mode are all the same.

- *The Normal Curve allows us to predict/determine the percentage or number of scores falling above, at or below a certain standard score or between two certain points on the curve.*

# Mean and Standard Deviation

- These are used in concert to establish how far above or below average a person's score on a test falls
- The **Mean** is the average (arithmetic mean)
- The **Standard Deviation** tells how the scores across a population of test takers is dispersed around the mean.
- Take the example of archery . . .

- **Derived or Standard scores**—often expressed as deviation IQ scores, *these scores have been transformed to have a set mean and set standard deviation.*
- **Standard scores** allow us to compare how a person performed on two different instruments relative to the population.
- For example, a standard score on an IQ test of 100 is average, but a standard score on a test of reading of 80 is below average (assuming they both have a standard deviation of 15).

# Important Scores on Standardized Tests

- Most all standardized, norm-referenced tests have an average or **Mean score of 100 and a standard deviation of 15** pts.
- **Scores 90 to 109** (or 110) are considered average for most tests (This captures the **middle 50%** of the population) **(%iles 25 to 75**)
- **Scores 85 to 115** are considered average for other tests (this captures the **middle 68%** of the population) **(%iles 15 to 85**)
- **Scores below 70** are at the lowest 2% of the population (this is the magical cut score to consider an intellectual disability.

# Cont.

## Standard Error of Measurement

- Every score obtained on a standardized test is composed of the person's **"true" score, =/- error**.
- Error comes from poor administration, over-encouragement, giving feedback, giving suggestions, poor scoring, etc.
- This "error" is normally distributed and predictable—called the **standard error of measurement or SEm**.
- The SEm forms the confidence band within which the "true score" will fall 90% of the time (or 68% or whatever).
- The SEm can be used sparingly to help determine eligibility

# SEm Sample

- The SEm for 95% of standardized IQ, ach, and Adaptive Behavior tests is 3 pts (+/-)
- So, Julio has a Full Scale IQ of 72. If applying the SEm, his score range is 69 to 75. Because 69 is below 70, we can now consider ID.  BUT, take these scores:

**FSIQ 71**

**Verbal Comp IQ 65** **Working Memory 63**

**Perceptual Org IQ 80** **Processing Speed 77**

- Using SEM would be inappropriate
- Can use SEM for Adaptive Testing too, BUT CAUTIOUSLY

# Screening Tests

- Screening tests are brief assessments designed to find those at risk for certain disorders, who might be eligible for school programs (e.g., counseling), who might need remediation (via RTI), and who might need comprehensive evaluation (Sattler, 2008)

- e.g., depression screening, vision screening, behavior screening, substance abuse screening, ADHD screenings . . .

- Used in schools, clinics, hospitals, and private practice as part of a **two-step process**
- Typically used by paraprofessionals are quick and easy to give and score
- Minimal training required; easy to purchase
- Typically, no credential required to use

- Measure a narrow-band of functioning (e.g., attention, low mood, word reading, verbal expression)
- Commonly group or computer administered
- Typically multiple-choice format (to limit training required and to increase reliability)
- Designed to prevent unnecessary comprehensive (i.e., diagnostic and expensive) testing

# Sample Cognitive Screeners

- Kaufman Brief Intelligence Test-2 (KBIT-2)
- Scholastic Abilities Test for Adults (SATA) Aptitude Quotient
- Wechsler Abbreviated Scale of Intelligence-2 (WASI-2)
- Shipley-2
- Test of Nonverbal Intelligence (TONI)
- Raven’s Progressive matrices
- Naglieri Nonverbal Ability Test (NNAT)

# Sample Academic Screeners

- Wide Range Achievement Test
- Nelson-Denny
- Curriculum-based assessments
- Scholastic Abilities Test for Adults
- short-forms of comprehensive achievement tests

- Academic screeners often measure low-level/basic academic skills (word reading, spelling, math calculation)
- Typically no measure of academic comprehension/application or speed/fluency
- Not co-normed with cognitive tests
- Interpretation is very limited (not their purpose)

# Diagnostic Tests

- These provide detailed evaluation of one's normative and personal strengths and weaknesses in several areas
- Designed to diagnose conditions and establish eligibility for programs
- Better norming/better stratification

- Several subtests normed together—permits more comprehensive analysis of scores (e.g., unexpected differences)
- Measure low level skills and higher-order reasoning skills and sometimes fluency (for academic skills)
- Used in schools, clinics, hospitals, and private practice settings

- Require more training, practice, and credentialing to ethically administer, score, and interpret
- Typically require undergraduate training (achievement tests) and graduate training and credentials (cognitive and behavior tests)
- These tests require verification of credentials to purchase

# Sample Diagnostic Cognitive Tests

- WAIS-IV (16 – 89)
- UNIT-2 (5 to age 21-11)
- WISC-5 (6 to age 16-11)
- KABC-2 (3 to age 18-11)
- Leiter-3 (3 – 75)
- WJ-IV Cognitive (2 to age 89)
- Stanford-Binet-5 (2 – 85)
- Wechsler Memory Scale-IV (16 – 89)

# Sample Diagnostic Achievement Tests

- Woodcock-Johnson-IV Tests of Achievement (2 to age 89)
- Wechsler Individual Ach. Test-3 (6 to age 50)
- Kaufman Test of Educational Achievement-3 (3 to age 25-11)
- Gray Oral Reading Test-5 (6 to age 23-11)

# Sample Diagnostic Adaptive Tests

- Adaptive Behavior Assessment System—Third Edition (ABAS-3)
- Vineland Adaptive Behavior Scale—Third Edition (VABS-3)

# Getting more into the weeds with IQ Tests . . .

# Wechsler Adult Intelligence Scale—Fourth Edition (WAIS-IV) (2008)

- Average scores are 90 to 109

FACTORS/INDICES

- Full Scale (composite of 10 subtests)
- Verbal Comprehension (3 subtests)
- Perceptual Organization (3 subtests)
- Processing Speed (2 subtests)
- Working Memory (2 subtests)

# Descriptions of Scores

130 + Very Superior

120 – 129 Superior

110 – 119 is High Average

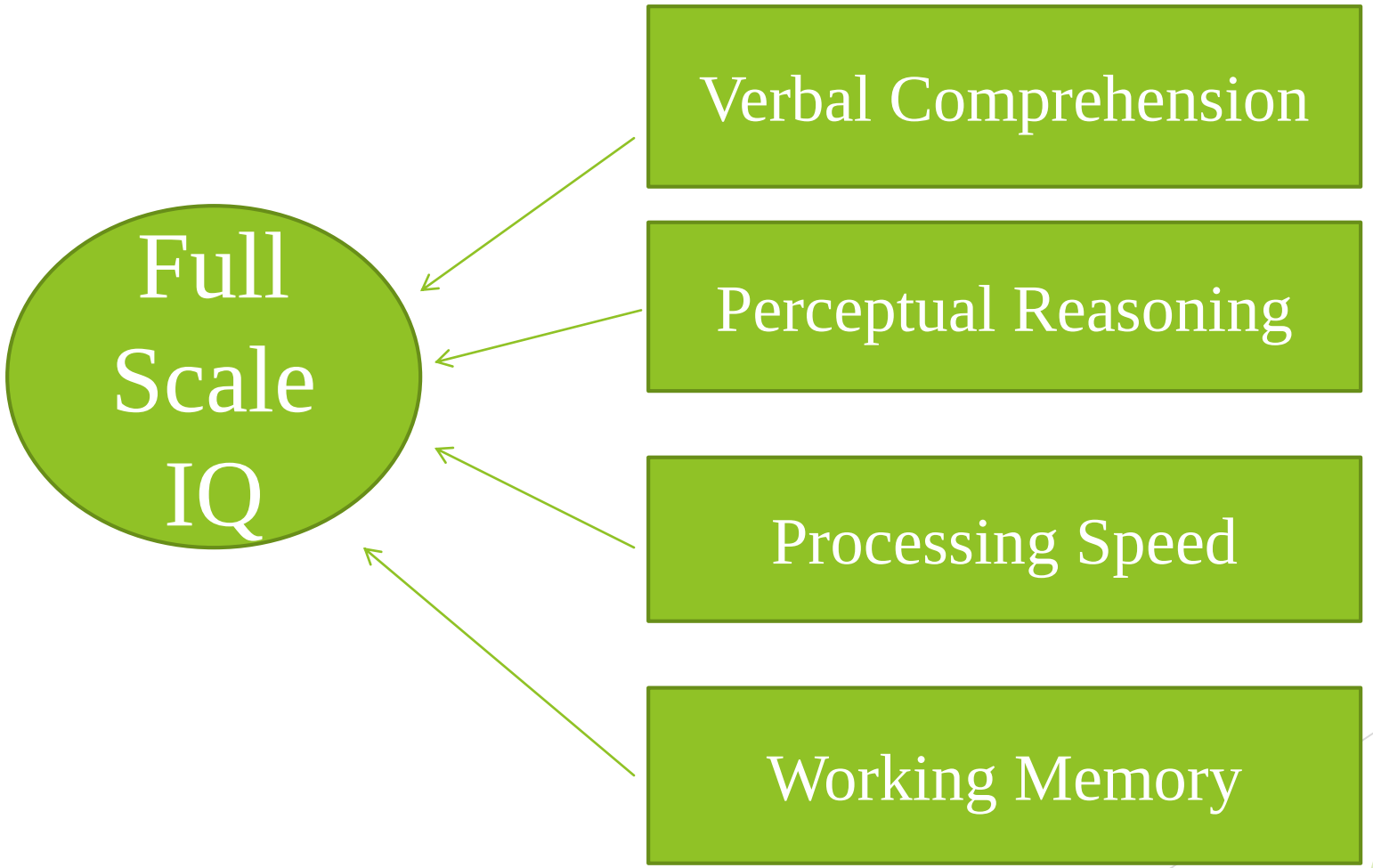
90 - 109 is Average

80 - 89 is Low Average

70 – 79 is Borderline

69 and below is Extremely Low

# Organization/Structure: FSIQ



# Scale Descriptors: Primary Scales

## FSIQ

- Primarily seen as a measure of general or overall intelligence
- Simply a compilation of 10 subtests but is generally seen as the best indicator of a wide range of factors (adaptation, learning, academics, etc.)

# Verbal Comprehension Index (VCI)

- Measures the ability to access (retrieve) and apply acquired word knowledge, verbal conceptual thinking, verbal reasoning, and verbal expression.

- Vocabulary, Information, and Similarities

# Perceptual Organization (POI)

- Measures the ability to grasp underlying conceptual relationships among visual stimuli, ability to use reasoning to identify and apply rules, inductive reasoning, simultaneous processing, and novel problem solving

- Block Design, Matrix Reasoning, Figure Weights

# Working Memory (WMI)

- The ability to register, maintain, and manipulate visual and auditory information in immediate/conscious awareness.
- Requires attention, concentration, good immediate storage, and mental resequencing
- Digit Span and Arithmetic

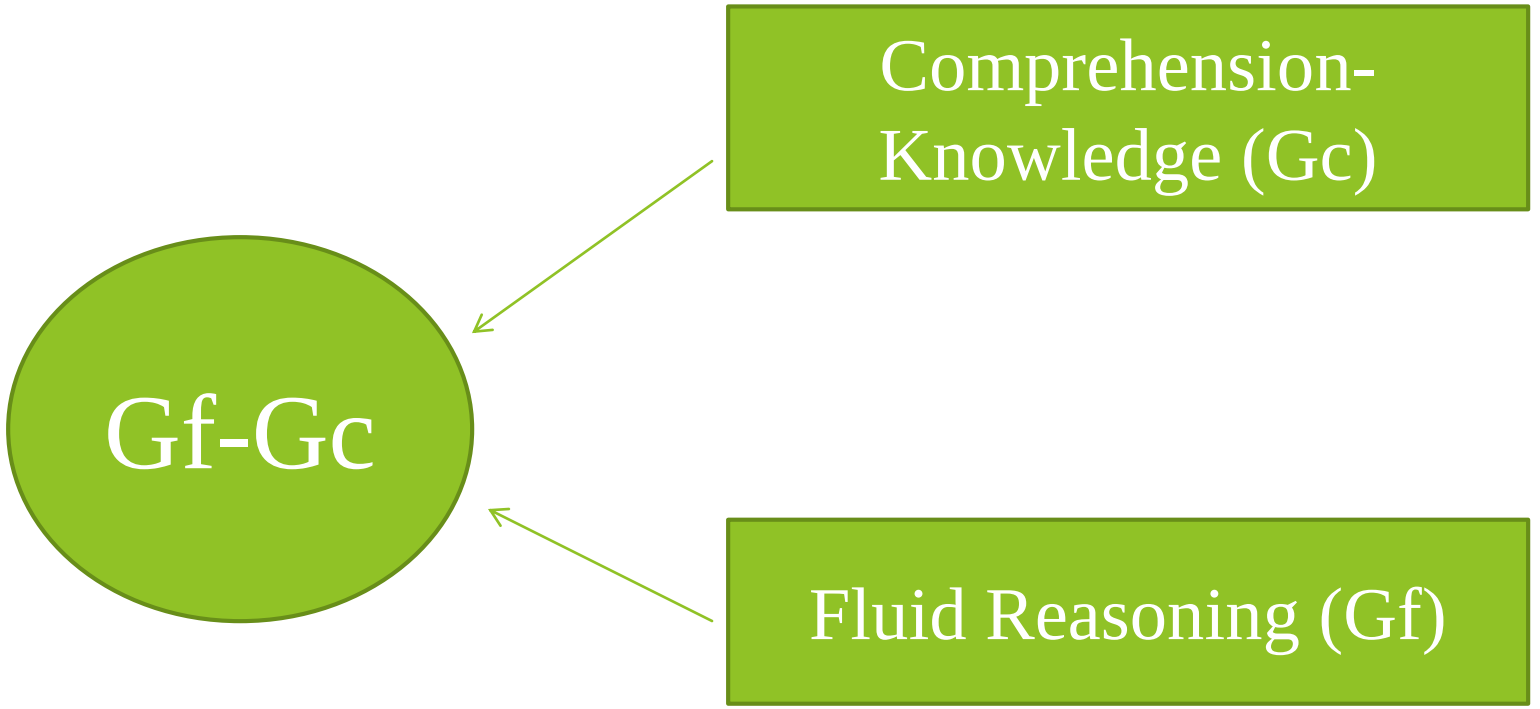
# Processing Speed (PSI)

- Measures speed and accuracy of visual registration, decision making and decision implementation.
- Taps visual scanning, visual memory, visuomotor coordination and concentration
- Coding and Symbol Search

# Woodcock-Johnson IV: Tests of Cognitive Abilities (2014)

## Schrank, McGrew, & Mather

# Organization/Structure: Gf-Gc



# Gf-Gc Composite (not for ID diagnosis)

- This estimates IQ based upon the four higher order/g-saturated subtests. **4 Subtests**
- Subtests that measure lower-level abilities are removed
- Average Scores are 90 to 110
- Like the WAIS, WJ-COG cores < 70 indicate ID

# General Intellectual Ability and GIA Extended (*may** be used for ID Diagnosis)

- **10 subtests or 14 subtests** (Extended)

*not my top test for ID

# GIA Extended Indices

## Comprehension-Knowledge (Gc)

Breadth and depth of knowledge and skills, including verbal communication and information. Reasoning, when using a previously learned procedure, is included as well

# Fluid Reasoning (Gf)

The ability to reason and solve problems that involve novel information. Includes the reorganization, transformation, and extrapolation of information

# Short-Term Working Memory (Gsm)

The ability to encode, maintain, and manipulate information in immediate awareness. Includes the capacity to perform these procedures and the efficiency of attentional control to manipulate information in immediate awareness.

## Auditory Processing (Ga)

The ability to discriminate, encode, employ and synthesize auditory stimuli.

# Long-Term Retrieval (Glr)

The ability to encode, consolidate, and retrieve information over periods of time after being displaced from immediate awareness. Involves the amount that can be stored and the rate and fluency that it can be accessed or retrieved

# Visual Processing (Gv)

The ability to analyze and synthesize visual stimuli and to employ and manipulate mental images to solve problems

## Cognitive Processing Speed (Gs)

The speed and efficiency at performing cognitive tasks, particularly when under pressure to sustain controlled attention and concentration

# Academic Achievement Tests

Most popular include . . .

- Woodcock-Johnson IV Tests of Achievement (2 – 89)
- Wechsler Individual Achievement Test-IV (6 to 16-11)
- Kaufman Test of Educational Achievement(3 – 25)
- Average scores are 90 to 109, 90 to 110, or 85 to 115

All Comprehensive, standardized/Diagnostic achievement measure:

- Basic Reading, Reading Comprehension, Reading Speed, Decoding
- Math Computation, Math reasoning, Math calculation speed
- Spelling, Written expression

# Adaptive Behavior

- A person's competence in meeting the natural and social demands of one's environment, including self-help skills, social skills, communication skills, coping skills, community navigation skills. These behaviors are learned

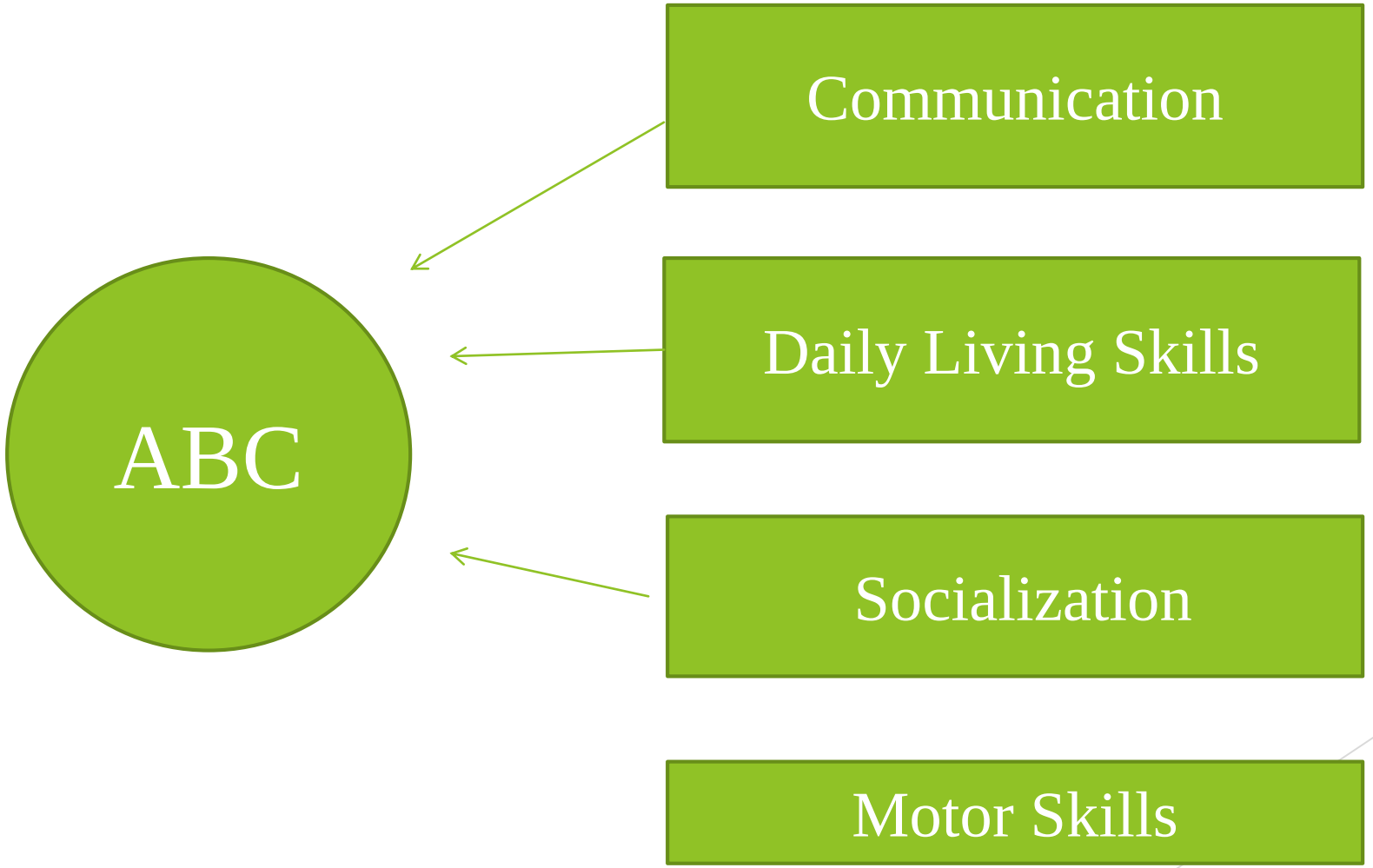
- Adaptive behavior testing is **informant driven**
- Items measure "does do" without reminders vs "can do."

# Adaptive Behavior Tests

## Vineland Adaptive Behavior Scales—Third Edition (VABS-3) (2016)

- Adequate/Average scores = 86 – 114
- Ages Birth – 90+ for Interview Form
- Ages 3 – 90+ for Domain Form
- Teacher Forms, Parent Forms
- Provides a measure of maladaptive behavior

# VABS-3 Organizational Structure:



# VABS-3 Domains

**Communication**: measures receptive, expressive, and written communication effectiveness

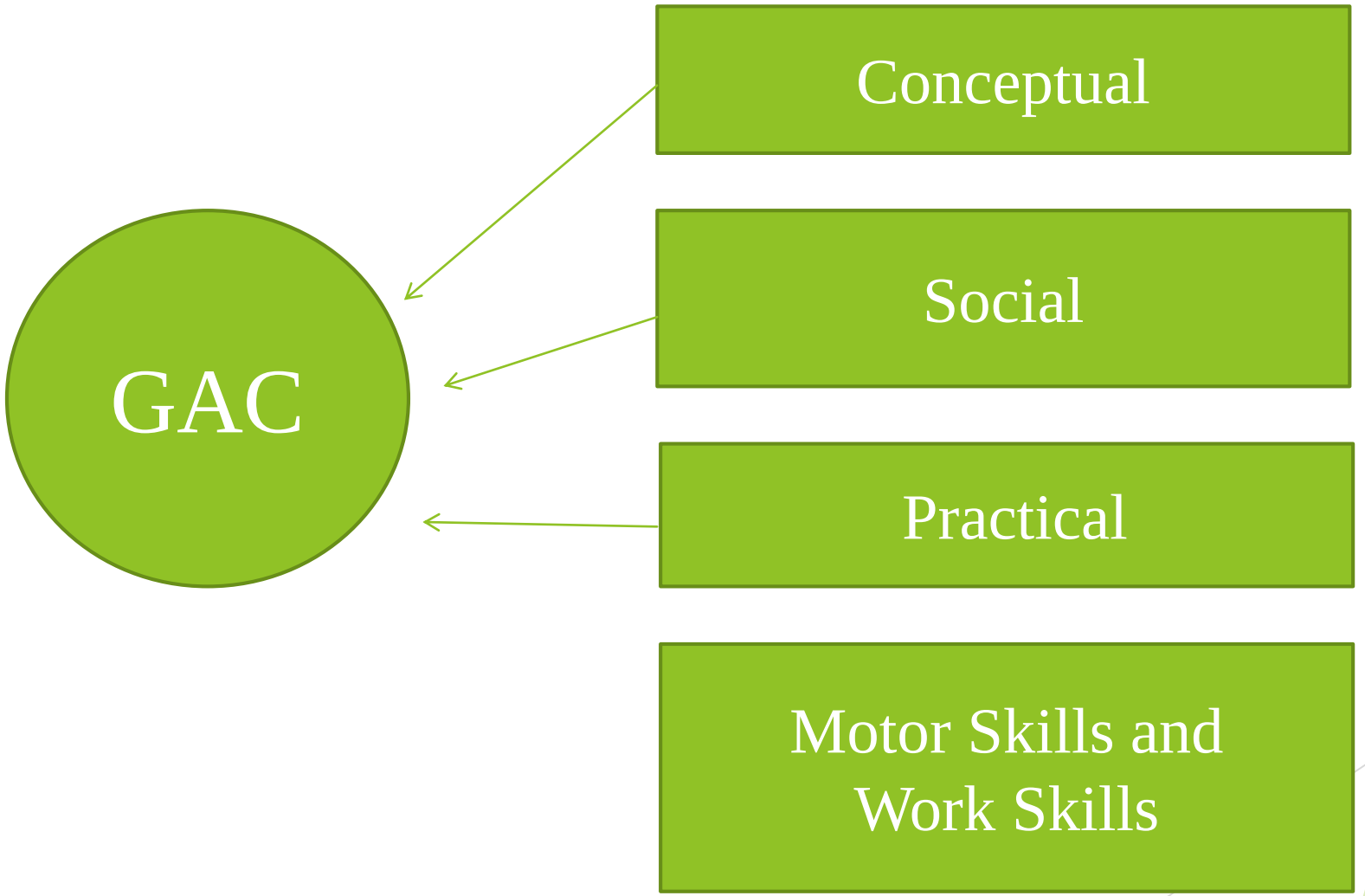
**Daily Living Skills:** measures self-sufficiency in personal living/self-help, including dressing and hygiene; skill in performing household tasks, including food preparation; community living

**Socialization:** measures effectiveness in responding/relating to others, conversational interactions, and emotional/behavioral control

# Adaptive Behavior Assessment System—Third Edition (ABAS-3) (2015)

- Adequate/Average scores = 90 - 109
- Ages Birth – 89
- Teacher, caregiver, other adult forms

# ABAS-3 Organizational Structure:



# ABAS-3 Domains

**Conceptual**: measures behaviors needed to communicate with others, apply academic skills, and manage and accomplish tasks.

**Practical:** measures behaviors needed to address personal and health needs, take care of home, classroom, or work settings, and function in a community.

**Social:** measures behaviors needed to engage in interpersonal interactions, act with social responsibility, and use leisure time.

# Quick Review of Intellectual Disabilities

Intelligence disabilities is defined by the DSM-V (and for all previous editions) requires:

1. IQ and adaptive behavior is two standard deviation units below the mean—that is, an IQ below 70

2. Condition must occur during the developmental period (i.e., childhood)

- Other conditions, occurring beyond the developmental period, can cause significant intellectual impairment as well. E.g., brain tumors and injuries, toxicity, poisonings, various neurological conditions

# Four Levels of Intellectual Disabilities

| IQ Level | Range | Approx. Mental Age as Adult |
|---|---|---|
| Mild | 50-55 to 70 | 8-3 to 10-9 |
| Moderate | 35-40 to 50-55 | 5-7 to 8-2 |
| Severe | 20-25 to 35-40 | 3-2 to 5-6 |
| Profound | <20-25 | <3-2 |

# ETIOLOGY

**Genetic Disorders**

**Fragile X Syndrome**

**Glactosemia**

**Lesch-Nyhan Syndrome**

**Neurofibromatosis 1**

**Phenylketonuria (PKU)**

**Rett Syndrome**

**Rubinstein Taybi Syndrome**

**Tay-Sachs Disease**

**Tuberous Sclerosis**

# Chromosomal Deviations

**Angleman syndrome**

**Cri-du-chat syndrome**

**Down syndrome**

**Edwards syndrome**

**Klinefelter’s syndrome**

**Patau syndrome**

**Prader-Willi syndrome**

**Cranial Malformations**

**Hydrocephalus**

**Microcephalus**

**Other Congenital Factors**

**Congenital Hypothyroidism (Cretinism)**

**Congenital Toxoplasmosis**

**Fetal Alcohol Syndrome (FAS)**

**Human Immunodeficiency Virus type 1 (HIV-1)**

**Rh Incompatibilities**

**Rubella**

**Syphilis**

**Perinatal Factors**

**Cytomegalovirus (CMV)**

**Extreme Prematurity (1-1.5 lb. birth weight)**

# Perinatal Factors

- Hypoxic-ischemic encephalopathy
- Neural tube defect
- Placental dysfunction
- Tetrogens

# Mild Intellectual Disability

- Large familial connection
- 85% of all persons with Intellectual Disabilities
- Combination of genetics and below average environmental conditions
- Often non-organic etiologies

- Limitations are primarily manifested during school—may not be as readily apparent as adults
- Highly imitative, externally motivated
- Mild to moderate lag in behavioral development
- Intervention designed to teach functional social, vocational and academic skills

# Moderate, Severe, Profound

- Rates about equal across ethnic groups/socio-economic levels
- Sibling IQ usually Average
- 15% of all persons with ID
- Due to single gene defects (Down Syndrome)
- Chromosomal abnormalities (Turner's Syndrome)
- Typically have brain malformations stemming from prenatal development
- Interventions designed to teach functional social, language, and self-help skills

# Case Studies

## Mahlia

| WAIS-IV | | VABS-3 | |
|---|---|---|---|
| Full Scale IQ | 72 | Composite | 78 |
| Verbal Comprehension | 64 | Communication | 66 |
| Perceptual Reasoning | 86 | Daily Living | 74 |
| Working Memory | 67 | Socialization | 83 |
| Processing Speed | 79 | | |

# Oscar

| **WAIS-IV** | | **ABAS-3** | |
|---|---|---|---|
| Full Scale IQ | 69 | Composite | 72 |
| Verbal Comprehension | 72 | Conceptual | 73 |
| Perceptual Reasoning | 61 | Social | 65 |
| Working Memory | 73 | Practical | 69 |
| Processing Speed | 70 | | |

# Lexis

| WAIS-IV | | VABS-3 | |
|---|---|---|---|
| Full Scale IQ | 55 | Composite | 56 |
| Verbal Comprehension | 64 | Communication | 72 |
| Perceptual Reasoning | 50 | Daily Living | 48 |
| Working Memory | 59 | Socialization | 51 |
| Processing Speed | 71 | | |

# Comments and Questions

Mardis Dunham, Ph.D., Professor

Murray State University

mdunham@murraystate.edu

Kentucky Licensed Psychologist

Kentucky Certified School Psychologist