

## Standardized Tests, Intelligence & IQ, and Standardized Scores



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## Alphabet Soup!!

ACT's    SAT's    ITBS

GRE's

WISC-IV    WAIS-IV

WRAT

MCAT    LSAT

IMA RAT



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## *Uses/Functions of Standardized Tests*

- Selection and Placement
- Diagnosis
- Evaluation of Progress/Effectiveness
- Program Evaluation/(School Improvement)
- Accountability

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### **Types of Standardized Tests**

- **Aptitude Tests**
  - designed to assess general abilities
  - predict future performance (learning or task).
  - examples: WISC-III, ACT, GRE
- **Achievement Tests**
  - assess what has been learned
  - examples: ITBS, PIAT,

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### **Types of Standardized Tests (cont.)**

- **Norm-Referenced Tests**
  - compares individual performance to group norms
  - norms : average or typical group scores obtained from a specific sample in test development
  - answers question: How well did this person do in comparison to other similar persons?

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### **Types of Standardized Tests (cont.)**

- **Criterion-Referenced Tests**
  - measures the extent to which a student has mastered a specific set of learning objectives
  - compared to a standard (criterion) of mastery, not a norm group
  - Answers the question: How close did the person come to meeting the standard of mastery
  - Examples: teacher-developed tests, developmental screeners

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### ***Intelligence & IQ Tests***

Scores are part of basis for decisions:

1. Disabled? - Entitled to SSI benefits?
2. Diagnosis of learning and psych. problems
3. Eligibility & placement decisions - special ed.
4. Selection of individuals into Army, Navy, etc.
5. Job selection and promotion, etc. etc.

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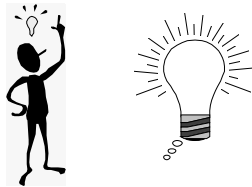
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- still disagreement about what intelligence is.
- Disagreement about how to measure it!!
- Intelligence is a construct.
- NOT directly observable...must be inferred from overt behavior.



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**Intelligence - acting or thinking in ways that are goal-directed and adaptive.**

**Theorists agree that intelligence is:**

- ◆ Adaptive – used flexibly to respond to various situations and problems
- ◆ Is related to learning ability
- ◆ Involves use of prior knowledge to analyze and understand new situations effectively
- ◆ Involves many different mental processes
- ◆ Is culture-specific

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- Psychometric theories -- intelligence made up of mental factors
- e.g., Verbal factor
- Statistical tests - factor analyses
- Or, e.g., a Performance Factor

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- Spearman (1927) - 2 kinds of factors:**
- **general factor (g)** which influences performance on all intellectual tasks.
  - **specific factors (s)** to a certain task.

**Guilford (1967, 1988) - 180 Factors**

- **6 Mental Operations**
- **5 Contents**
- **6 Products**

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**Thurstone (1938) - 7 primary mental abilities**

1. verbal comprehension
2. verbal fluency
3. number
4. spatial visualization
5. memory
6. reasoning
7. perceptual speed

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**Catell's (1963, 1971) fluid and crystallized abilities**

- o Fluid Intell.
- o Crystallized

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- 1st IQ test (France) - *Binet and Simon* 1905, 1908).
- In USA, *Lewis Terman* (1916) - Stanford-Binet.
- *David Wechsler* (1940's) - Wechsler scales
  - **most widely used individually administered IQ tests today:**
- WISC IV (Wechsler Intelligence Scale for Children - IV)
- WAIS IV (Wechsler Adult Intelligence Scale - IV)
- WPPSI-III (Wechsler Preschool & Primary Scale of Intelligence - III)

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**Old Formula for IQ:**

- $IQ = MA/CA \times 100$  (it's a quotient!!)
  - i.e. 10 year old child
- What is IQ if:
  - MA = 10??
  - MA = 7??
  - MA = 14???
- IQ is now a *deviation IQ*- a standard score.
- Mean IQ = 100; standard deviation = 15

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**WISC - IV**

This is the 4<sup>th</sup> edition of:

- The Wechsler Intelligence Scale for Children
- WISC – 1949
- WISC-R – 1974
- WISC-III – 1991
- WISC-IV -- 2003

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**WISC - IV**

- Individually administered
- For Children 6 - 16 years of age
- 1 hour to 1 1/2 hours (avg.=1 hour, 15 min.)
- Standardized on 2,200 children
- Stratified Sample:
  - Age
  - Sex
  - Race
  - Parent education level
  - Geographic region

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**WISC IV**

**10 Main Subtests**  
**5 Alternative/Supplemental Subtests**  
**Organized into 5 Composite Scores**  
**Verbal Comprehension Index (3 & 2)**  
**Perceptual Reasoning Index (3 & 1)**  
**Working Memory Index ( 2 & 1)**  
**Processing Speed Index (2 & 1)**  
**Full Scale IQ (10 main subtests)**  
**(Mean/Avg. of each = 100; s.d. = 15)**

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## WISC - IV

Verbal Comprehension	Perceptual Reasoning
Similarities	Block Design
Vocabulary	Picture Concepts
Comprehension	Matrix Reasoning
(Information)	(Picture Completion)
(Word Reasoning)	
Working Memory	Processing Speed
Digit Span	Coding
Letter-Number	Symbol Search
Sequencing	(Cancellation)
(Arithmetic)	

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### Comments about IQ & IQ Tests

#### Test Reliability

- 5 to 8 points - No test is perfectly reliable.

#### Test Validity

- IQ tests are supposed to predict success in school.
- And, IQ tests do this job pretty well

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- Environment can produce much variability in IQ scores
- Intellectual performance based on:
  - biological factors
  - general education
  - life experiences
  - motivation
  - personality
- IQ is not like hat size - It's a range of performance (IQ +/- 5-8 pts)

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***Misconceptions about IQ Tests***

- 1. IQ tests measure innate intelligence - NOT TRUE
  - 2. IQ's are fixed and never change - NOT TRUE
  - 3. Intelligence tests are perfectly reliable - NOT TRUE
- “There is a 90% chance that the child’s IQ falls between \_\_ and \_\_.”

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- 4. IQ tests measure all we need to know about a person’s intelligence - NOT TRUE
- 5. IQ’s obtained from a variety of tests are interchangeable - NOT TRUE

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***Derived or Transformed Scores***

- Percentile Ranks** - percentage of students in norm group that scored lower than a particular score (**not** percent correct)
- Grade Equivalents** - relate students’ raw score to average scores obtained by norm group at different grade levels (*Beware!!*)
- GE = 6.3** —→ *3rd month of 6th grade*
- 2nd grader obtains GE = 5.8????**

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### Standard Scores

- **Definition** - derived scores that are based on their position on the normal curve.
- **Normal Curve/Distribution** - symmetrical distribution of scores with the majority falling near the mean (average) and progressively fewer away from the mean.
- ☞ **We know and/or can predict things about normally distributed scores**

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➤ **Mean = avg.** (sum and divide by # of scores)

**Example: (4, 90, 5, 1)**

**Mean (Avg.) =  $100/4 = 25$**

➤ **influenced by extreme scores**

□ **Median**

(Odd #) Middle score when in ranked order

(Even #) Mid-point between 2 middle scores in ranked order

**Example: (4, 2, 7, 1, 22)**

**(1, 2, 4, 7, 22 — median = 4)**

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**Example: (4, 90, 5, 1)**

**(1, 4, 5, 90 → median = 4.5)**

**Example: (8, 2, 12, 6)**

**(2, 6, 8, 12 → median = 7)**

➤ **Median *not* as influence by extreme scores**

➤ **Standard Deviation** - measure of how the scores "spread out" around the mean

➤ **IQ's have mean = 100; sd = 15**

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1. Median???

8, 2, 6, 1, 3

2. An 8-year-old boy obtains a mental age of 8 years on an IQ test. What is his IQ according to the "old formula?"

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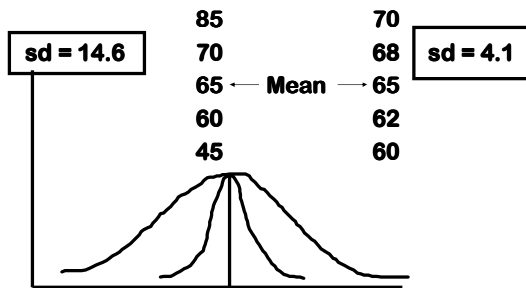
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**Distributions with different sd's**



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***Important Standard Scores***

- Mean IQ = 100 (sd = 15)
- 68% of IQ's are between +1 and -1 sd
- (68% of IQ's are between 85 - 115)
- 84th %tile = 115 (1 sd > mean)
- 50th %tile = 100 (Mean/Avg)
- 16th %tile = 85 (1 sd < mean)
- 2nd %tile = 70 (2 sd's < mean)
- 98th %tile = 130 (2 sd's > mean)

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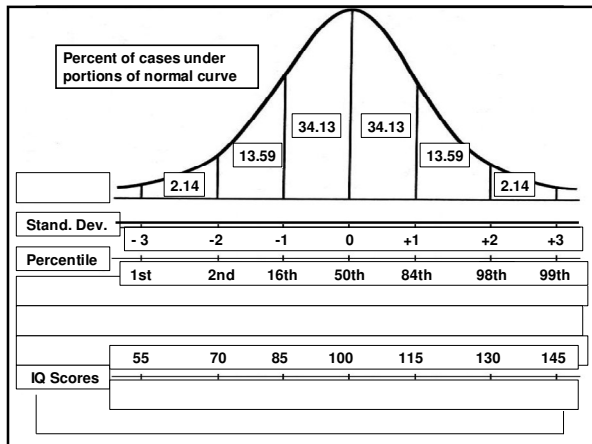
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> 4,1,3,9,2  
 > What is Median???  
  
 > 3,5,1,2,9,10  
 > What is Median???

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50% of IQ scores are below what score  
  
 A student scores 1 standard deviation below the mean on an achievement test – what is his/her percentile score??

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- 1000 people take an IQ test (mean = 100 & s.d. = 15)....approx. how many would we expect to score between 85 and 115??
- A student scores at the \_\_\_ percentile on I Q test.....what is his score??
- 16<sup>th</sup> percentile = ? IQ
- 2<sup>nd</sup> percentile = ? IQ
- 98<sup>th</sup> percentile = ? IQ
- 84<sup>th</sup> percentile = ? IQ

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- Mike takes an achievement test. The mean of scores is 300, and the standard deviation is 25. If Mike does better than 84% of the people his age who take the test, his standard score is....

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### Test Reliability

- **Definition - consistency or accuracy of test scores by same person at different times, with different sets of equivalent items, or across test items.**
- Reliability increases with more items
- Usually expressed as a reliability coefficient (correlation!!) on scale from .00 to 1.00;
- $r = .90$  (High)/ $r = .60$  (Moderate)/ $r = .30$  (Low)
- $r = .80$  and above acceptable

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□ The reliability coefficient expresses the degree to which there is consistency in measurement of the test scores.

□ Reliability is also related to:  
Error of Measurement (s.e.m.)

**3 Major Types of Reliability**

1. Test-Retest Reliability
2. Alternate Form Reliability
3. Internal Consistency Reliability

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**Test Validity**

**Definition - degree to which a test measures or accomplishes what it was supposed to measure or accomplish.**

➤ No test is simply valid or not - rather it is said to be valid or not for a specific purpose.

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**Test Validity**

**3 Major Types of Validity**

1. Content Validity
2. Construct Validity
3. Criterion-Related Validity
  - a. Predictive
  - b. Concurrent

□ Validity implies reliability, but not vice versa

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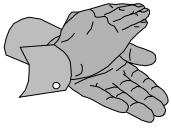
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***End of  
Standardized Tests  
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