Standardized Tests, Intelligence & IQ, and Standardized Scores

Alphabet Soup!!
ACT's  SAT's  ITBS
GRE's
WISC-IV  WAIS-IV
WRAT
MCAT  LSAT
IMA RAT

Uses/Functions of Standardized Tests
- Selection and Placement
- Diagnosis
- Evaluation of Progress/Effectiveness
- Program Evaluation/(School Improvement)
- Accountability
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,

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?

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
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.

• 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.

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
**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
Catell’s (1963, 1971) fluid and crystallized abilities
- Fluid Intell.
- Crystallized

- 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)

Old Formula for IQ:
- IQ = MA/CA X 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
WISC - IV
This is the 4th edition of:
• The Wechsler Intelligence Scale for Children
• WISC – 1949
• WISC-R – 1974
• WISC-III – 1991
• WISC-IV – 2003

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

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)
### WISC - IV

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<th>Verbal Comprehension</th>
<th>Perceptual Reasoning</th>
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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

- 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)
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 __.”

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

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???
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.

- **Mean** = average, (sum and divide by # of scores)
  - Example: (4, 90, 5, 1)
    - Mean (Avg.) = $100/4 = 25$

- **Median**
  (Odd #) Middle score when in ranked order
  (Even #) Mid-point between 2 middle scores in ranked order
  - Example: (4, 2, 7, 1, 22)
    - Median = 4
  - Example: (4, 90, 5, 1)
    - Median = 4.5

- **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
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?”

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)
- 98 th %tile = 130 (2 sd’s > mean)
What is Median???

4, 1, 3, 9, 2
What is Median???

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

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??
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 IQ test.....what is his score??
- 16th percentile = ? IQ
- 2nd percentile = ? IQ
- 98th percentile = ? IQ
- 84th percentile = ? IQ

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....

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
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

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.

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
End of Standardized Tests
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