

Chapter 8

Intelligence

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An Intelligence Test

1. Removing an appendix is called an appendectomy, removing tonsils is called a tonsillectomy. What is it called when they remove a growth from your head?
2. What 2 things that you can eat can never have for breakfast?
3. If a farmer raises wheat in dry weather, what does he raise in wet weather?
4. What would you call a person who did not have all his fingers on one hand?
5. Which is greater: six dozen dozen or half a dozen dozen?
6. Could one get down from a camel?
7. How could a man be severely injured being hit by some tomatoes?

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Can you describe someone who is intelligent?

Can people be intelligent in different ways?

So what is intelligence?

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## Measuring Intelligence: A Brief History

- **Alfred Binet (1905)**
  - A Test to determine "Mental age"
  - Why would one want to do this?
- **Lewis Terman (1916)**
  - Stanford-Binet Intelligence Scale
  - Intelligence Quotient (IQ) =  $MA/CA \times 100$
- **David Wechsler (1955)**
  - Wechsler Adult Intelligence Scale (WAIS)
  - Verbal IQ, Performance IQ (non-verbal)
  - Scores are "normalized" (score refers to a place in "normal distribution")

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Test	Description	Example
<b>Verbal scale</b>		
Information	Taps general range of information	On what continent is France?
Comprehension	Taps understanding of social conventions and ability to read and give appropriate	Why are children required to go to school?
Arithmetic	Taps arithmetic reasoning through verbal problems	How many hours will it take to drive 300 miles at 60 miles per hour?
Similarities	Asks in what way certain objects or concepts are similar (verbal abstract thinking)	How are a calculator and a typewriter alike?
Digit span	Taps attention and oral memory by orally presenting series of digits to be repeated forward or backward	Repeat the following numbers backward: 2 4 5 3 1 6
Vocabulary	Taps ability to define language difficult words	What does audacity mean?
<b>Performance scale</b>		
Digit symbol	Taps speed of learning through figure coding tasks in which numbers must be associated with marks of various shapes	Shown:  Fill in:
Picture completion	Taps visual abilities and visual memory through presentation of an incomplete picture. The missing part must be discerned and named	Tell me what is missing:
Block design	Taps ability to perceive and analyze patterns by presenting designs that must be copied with blocks	Assemble blocks to match this design:
Picture arrangement	Taps understanding of social situations through a series of scenes. Copy the pictures that must be arranged in the right sequence to tell a story	Put the pictures in the right order:
Object assembly	Taps ability to deal with part-whole relationships by presenting several pieces that must be assembled to form a complete object	Assemble the pieces into a complete object:

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- Subtests on the Wechsler Adult Intelligence Scale (WAIS).**
- Scales yield separate verbal and performance (nonverbal) IQ scores.
  - The verbal scale consists of six subtests
  - The performance scale is made up of five subtests.
  - Examples of low-level (easy) test items that closely resemble those on the WAIS are shown on the right

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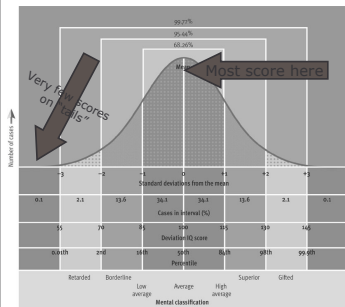
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## What's Normally Distributed (Bell Curve)?



- The Bell Shaped Curve
- What kinds of characteristics are normally distributed
- IQ scores tend to be too!
- Implications?
  - Comparison of individual against what is known about the population (others)
    - Deviation IQ Scores and Std Deviations
    - Percentiles

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## Interpretation: What Do Modern IQ Scores Mean?

- Deviation IQ
  - Based on the normal distribution and the standard deviation
    - Mean (average score) set at 100
    - Standard deviation (average variability of scores around mean) set at 15
      - IQ score indicates where you fall in the normal distribution
      - Percentile indicates percentage of people who score at or below the score one has obtained
- What does it mean your IQ score was 85, 115, 130, 145 on a normalized test?
  - Where would you be "in line"?

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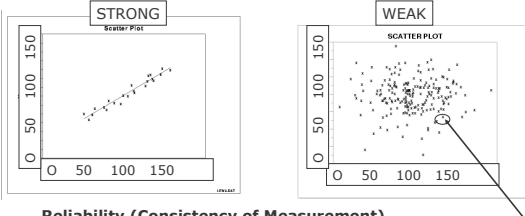
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## Are IQ Tests "Reliable"?

- If you took an IQ test and scored 85 one day and 145 the next?
  - What you say about the test?



**Reliability (Consistency of Measurement)**  
 Most normalized tests are exceptionally reliable  
 - correlations into the .90s ( $r=.90$ )

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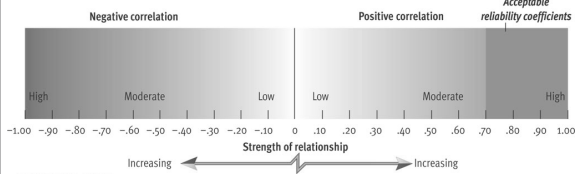
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## Understanding Correlation Coefficients



- The closer the correlation coefficient gets to either  $-1.00$  or  $+1.00$ , the stronger the relationship.
- At a minimum, reliability estimates for psychological tests must be moderately high positive correlations ( $r=.70$  and  $.95$ ).
- **NOTE:** Correlations measuring reliability assess consistency
- **NOTE:** Correlations of validity measure accuracy/predictive strength

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**Are IQ Tests “Valid”?**

If people who scored of 145 on an IQ test were typically less successful in school than people who scored 85,....

What would you say about the IQ Test? Why?

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**Are IQ Tests “Valid”?**

- **Validity** Does it accurately measure what it is supposed to and can it predict (“valid predictor”)?
- **General Conclusions:** IQ tests are valid indicators of academic/verbal intelligence
  1. **Academic Success:** Correlation moderately to strongly with school performance variables
    - $r = .50$ s with grades
    - $r = .60$ s-. $.80$ s with number of years in school
  2. **Vocational Success:** Predictive of occupational attainment, but not strongly predictive of performance ( $r = .27$ )

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**What Determines of Intelligence**

- **Heredity**
  - Family and twin studies
  - Heritability estimates
- **Environment**
  - Adoption studies
  - Cumulative deprivation hypothesis
- **Interaction**
  - The concept of the reaction range

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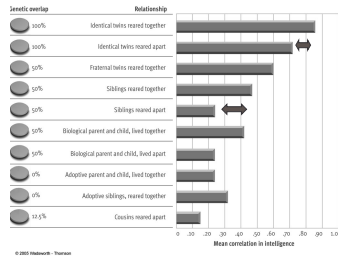
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## What Determines of Intelligence

- **Heredity/**
  - Heritability estimates
  - Family and twin studies
- **Environment**
  - Heritability estimates from adoption studies
  - Cumulative deprivation hypothesis




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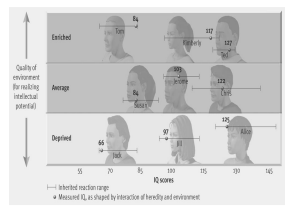
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## What Determines of Intelligence

- **Interaction of Heredity & Environment**
  - Reaction Range
  - Socioeconomic Disadvantage-Explanation for Cultural Variations
    - Independent of one's race ("race factored out") those from lower SES do about 15 points worse on IQ tests




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## New Directions in the Assessment and Study of Intelligence

- **Exploring Biological Indexes of Intelligence**
  - Reaction time and inspection time
- **Cognitive Processes and Intelligence**
  - Sternberg's triarchic theory and "successful intelligences" (practical, analytical, creative)
- **Expanding the Concept of Intelligence**
  - Gardner's multiple intelligences
  - Salovey's Emotional Intelligence

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**Table 8.4**

**Table 8.4 Gardner's Eight Intelligences**

Intelligence	End-States	Core Components
Logical-mathematical	Scientist Mathematician	Sensitivity to, and capacity to discern, logical or numerical patterns; ability to handle long chains of reasoning
Linguistic	Poet Journalist	Sensitivity to the sounds, rhythms, and meanings of words; sensitivity to the different functions of language
Musical	Composer Violinist	Abilities to produce and appreciate rhythm, pitch, and timbre; appreciation of the forms of musical expressiveness
Spatial	Navigator Sculptor	Capacities to perceive the visual-spatial world accurately and to perform transformations on one's initial perceptions
Bodily-kinesthetic	Dancer Athlete	Abilities to control one's body movements and to handle objects skillfully
Interpersonal	Therapist Salesperson	Capacities to discern and respond appropriately to the moods, temperaments, motivations, and desires of other people
Intrapersonal	Person with detailed, accurate self-knowledge	Access to one's own feelings and the ability to discriminate among them and draw upon them to guide behavior; knowledge of one's own strengths, weaknesses, desires, and intelligences
Naturalist	Biologist Naturalist	Abilities to recognize and categorize objects and processes in nature

Sources: Adapted from Gardner, H., & Hatch, T. (1989). Multiple intelligences go to school: Educational implications of the theory of multiple intelligences. *Educational Researcher*, 18(3), 4-10. American Educational Research Association. Additional information from Gardner, 1998.

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