Intelligence

What makes us intelligent
Or
Not so intelligent
Intelligence questions (10 nc)

- What is factor analysis?
- Howard Gardner’s multiple intelligences?
- Sternberg’s 3 intelligences?
- Emotional intelligence?
- Stanford-Binet (IQ) test?
- Aptitude vs. Achievement test?
- What are qualities of a good test?
- What is the Flynn effect?
- Gender/social differences in intelligence?
- Forms of mental retardation?
Intelligence

• The ability to learn from experience, solve problems, and use knowledge to adapt to new situations.
• Is socially constructed thus...
  Can be culturally specific.

According to this definition, are both Einstein and Ruth intelligent?
Is intelligence one thing or several different abilities?

- To find out scientists use **FACTOR ANALYSIS**: A statistical procedure that identifies clusters of related items on a test.
- Charles Spearman used FA to discovery his g or (general intelligence).

He saw using FA that doing well in one area of a test predicted that you will do well in another.
Multiple Intelligences

• Howard Gardner disagreed with Spearman’s g and instead came up with the concept of multiple intelligences.

• He came up with the idea by studying savants (a condition where a person has limited mental ability but is exceptional in one area).
Gardner’s Multiple Intelligences

- Visual/Spatial
- Verbal/Linguistic
- Logical/Mathematical
- Bodily/Kinesthetic
- Musical/Rhythmic
- Interpersonal
- Intrapersonal
- Natural

Learn More about Gardner
Gardner’s Multiple Intelligences

- Linguistic
- Logical-Mathematical
- Spatial
- Musical
- Bodily-Kinesthetic
- Interpersonal
- Intrapersonal
## Gardner’s Multiple Intelligences

<table>
<thead>
<tr>
<th>Intelligence</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Linguistic</td>
<td>Often measured on IQ tests with reading comprehension and vocabulary tests; involves sensitivity to spoken and written language, the ability to learn languages, and the capacity to use language to accomplish certain goals express oneself rhetorically or poetically; and language as a means to remember information.</td>
</tr>
<tr>
<td>Logical-Mathematical</td>
<td>Examples of people or professions?</td>
</tr>
<tr>
<td>Spatial</td>
<td></td>
</tr>
<tr>
<td>Musical</td>
<td></td>
</tr>
<tr>
<td>Bodily-Kinesthetic</td>
<td></td>
</tr>
<tr>
<td>Interpersonal</td>
<td></td>
</tr>
<tr>
<td>Intrapersonal</td>
<td></td>
</tr>
</tbody>
</table>

**Linguistic**

- Often measured on IQ tests with reading comprehension and vocabulary tests; involves sensitivity to spoken and written language, the ability to learn languages, and the capacity to use language to accomplish certain goals express oneself rhetorically or poetically; and language as a means to remember information.

- Examples of people or professions?
Gardner’s Multiple Intelligences

- **Logical-Mathematical**
  - Often measured on IQ tests with analogies, math problems and logic problems; consists of the capacity to analyze problems logically, carry out mathematical operations, and investigate issues scientifically; entails the ability to detect patterns, reason deductively and think logically.
Gardner’s Multiple Intelligences

- Linguistic
- Logical-Mathematical
- **Spatial**
- Musical
- Bodily-Kinesthetic
- Interpersonal
- Intrapersonal

- Ability to form mental images of objects and think about their relationships in space; involves the potential to recognize and use the patterns of wide space and more confined areas
Gardner’s Multiple Intelligences

- Linguistic
- Logical-Mathematical
- Spatial
- Musical
- Bodily-Kinesthetic
- Interpersonal
- Intrapersonal

- Ability to perceive and create patterns of rhythms and pitches; skill in the performance, composition, and appreciation of musical patterns
Gardner’s Multiple Intelligences

- **Linguistic**
- **Logical-Mathematical**
- **Spatial**
- **Musical**
- **Bodily-Kinesthetic**
- **Interpersonal**
- **Intrapersonal**

- Ability for controlled movement and coordination; potential of using one's whole body or parts of the body to solve problems
Gardner’s Multiple Intelligences

- Linguistic
- Logical-Mathematical
- Spatial
- Musical
- Bodily-Kinesthetic

- **Interpersonal**
  - Ability to understand other people’s emotions, motives and actions; concerned with the capacity to understand the intentions, motivations and desires of other people

- Intrapersonal
## Gardner’s Multiple Intelligences

<table>
<thead>
<tr>
<th>Intelligence</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Linguistic</td>
<td>Ability to use language to reason and express thoughts</td>
</tr>
<tr>
<td>Logical-Mathematical</td>
<td>Ability to solve problems and reason logically</td>
</tr>
<tr>
<td>Spatial</td>
<td>Ability to understand and use the spatial world</td>
</tr>
<tr>
<td>Musical</td>
<td>Ability to identify, appreciate and express beauty</td>
</tr>
<tr>
<td>Bodily-Kinesthetic</td>
<td>Ability to use the body to solve problems and express thoughts</td>
</tr>
<tr>
<td>Interpersonal</td>
<td>Ability to understand and communicate with others</td>
</tr>
<tr>
<td><strong>Intrapersonal</strong></td>
<td>Ability to know oneself and develop a sense of identity; entails the capacity to understand oneself, to appreciate one's feelings, fears and motivations.</td>
</tr>
</tbody>
</table>
Gardner’s Three New Intelligences

• Naturalistic intelligence
  – ability to understand and work effectively in the natural world

• Spiritual intelligence
  – spiritual intelligence as a concern for the cosmos, the mystery of our existence, mysteries and meanings of life

• Existential intelligence
  – addressing the ultimate questions
Sternberg’s Three Aspects of Intelligence

Gardner Simplified

• **Analytical** (academic problem solving).
• **Creative** (generating novel ideas)
• **Practical** (required for everyday tasks where multiple solutions exist).
Cognitive Theories of Intelligence

• Sternberg’s Triarchic Theory
• Gardner’s Multiple Intelligences
Sternberg’s Triarchic Theory

- Practical Intelligence
- Analytical Intelligence
- Creative Intelligence
Sternberg’s Triarchic Theory

**Practical Intelligence**

Ability to cope with the environment; “street smarts”

**Analytical Intelligence**

**Creative Intelligence**
Sternberg’s Triarchic Theory

**Practical Intelligence**
- Ability to analyze problems and find correct answers;
- Ability measured by most IQ tests

**Analytical Intelligence**
- Also called *logical reasoning*

**Creative Intelligence**
Sternberg’s Triarchic Theory

- Practical Intelligence
- Analytical Intelligence
- Creative Intelligence

Form of intelligence that helps people see new relationships among concepts; involves insight and creativity.
Emotional Intelligence (EQ)

- First called social intelligence.
- The ability to perceive, express, understand, and regulate emotions.
- Some studies show EQ to be a greater predictor for future success than IQ

Apollo 13 Co2 Clip
Brain Size and Intelligence
Is there a link?

• Small +.15 correlation between head size and intelligence scores (relative to body size).

• Using an MRI we found +.44 correlation with brain size and IQ score.
Brain Function and Intelligence

• Higher performing brains use less glucose than lower performing brains.

• Neurological speed is also a bit quicker.
How do we Assess Intelligence?

- Alfred Binet and Theodore Simon set out to figure out a concept called a mental age (what a person of a particular age should know).
- They discovered that by discovering someone’s mental age they can predict future performance.
- Hoped they could use test to help children, not label them.
Terman (from Stanford) and his IQ Test

• A 8 year old has a mental age of 10, what is her IQ?

• A 12 year old has the mental age of 9, what is his IQ?

• A boy has the mental age of 10 and an IQ of 200, how old is he?

• Used Binet’s research to construct the modern day IQ test called the Stanford-Binet Test.

• IQ = Mental age/Chronological age X 100.
The Normal Curve and Stanford-Binet IQ Scores

Fig. 8.1

<table>
<thead>
<tr>
<th>Cumulative percentages</th>
<th>Stanford-Binet IQs</th>
</tr>
</thead>
<tbody>
<tr>
<td>2%</td>
<td>52</td>
</tr>
<tr>
<td>16%</td>
<td>68</td>
</tr>
<tr>
<td>50%</td>
<td>84</td>
</tr>
<tr>
<td>84%</td>
<td>100</td>
</tr>
<tr>
<td>98%</td>
<td>116</td>
</tr>
<tr>
<td>2.14%</td>
<td>132</td>
</tr>
<tr>
<td>0.13%</td>
<td>148</td>
</tr>
</tbody>
</table>
Problems with the IQ Formula

• It does not really work well on adults, why?

If a 60 year old man does as well as an average 30 year old

then his IQ would be 50!!!!!!

That makes no sense!!!!!
Modern Tests of Mental Abilities

- Wechsler Adult Intelligence Scale (WAIS) consists of 11 subtests and cues us in to strengths by using.....

  Factor Analysis
Aptitude v. Achievement Tests

**Aptitude**
- A test designed to predict a person’s future performance.
- The ability for that person to learn.

**Achievement**
- A test designed to assess what a person has learned.
How do we construct Intelligence tests?

Tests must be:

• Standardized
• Reliable
• Valid
Standardization

- The test must be pre-tested to a representative sample of people and
- Form a normal distribution or bell curve

![Normal Distribution Diagram]

- Ninety-six percent of all people fall within 30 points of 100
- Sixty-eight percent of people score within 15 points above or below 100
- 0.1% score 145 or above
- 0.1% score 55 or below
Flynn Effect

Intelligence test performance has been rising.
The Flynn Effect

- Performance on IQ scores has steadily increased over generations
  - Environmental factors?
    - Reduction in malnutrition
    - Access to schooling
    - Technological advances
Reliability

- The extent which a test yields consistent results over time.
- *Spilt halves* or *test-retest* method.
Validity

The extent to which a test measures what it is supposed to measure.

- **Content Validity**: does the test sample a behavior of interest

- **Predictive Validity**: does the test predict future behavior.

Criterion related validity
Does Intelligence Change Over Time?

• By age 3, a child’s IQ can predict adolescent IQ scores.

• Depends on the type of intelligence, crystallized or fluid.
What is fluid intelligence?

• Our ability to learn new things, like technology.
What is crystallized intelligence?

• Old people intelligence, ability to relate information to past experiences.
Extremes of Intelligence
Group Differences in Intelligence Test Scores

• The Bell curve is different for Whites v. Black.

• Math scores are different across genders and the highest scores are for Asian males.

Why?
Nature or Nurture
Test Bias?

Tests do discriminate.
But some argue that their sole purpose is to discriminate.
We have to look at the type of discrimination.
Chapter 9 Quiz

Intelligence
See if you can figure out what these seven words all have in common?

1. Banana
2. Dresser
3. Grammar
4. Potato
5. Revive
6. Uneven
7. Assess
Don’t forget to write your answers on a separate piece of paper to grade when you’re done!

1. Aptitude tests are designed to measure
   a. Previously learned facts
   b. Future performance
   c. Previously learned skills
   d. Your IQ score
2. A standardization sample for developing a test

a. Should be representative of all the types of people for whom the test is designed
b. Is an early version of the test to determine questions that differentiate individuals
c. Is a set of norms that will determine what score should be considered passing
d. Should include people from all different age groups, ethnic groups, and genders
3. The Flynn effect is the finding that

a) intelligence seems to increase with every generation
b) television has decreased intellectual performance
c) linguistic scores decline with age
d) the more times people take a test, the better they tend to score
4. Advantages of group tests as compared to individualized tests include:

a. That they are cheaper and give more accurate results
b. That they can be given to a large group of people at one time and are cheaper to grade
c. The ability to establish rapport between the examiner and subjects to put them at ease
d. That they have proven to be more reliable and valid in measuring abilities
5. Which of the following best describes Charles Spearman’s $g$ of intelligence?

a. There are many factors that determine intelligence, but genetics is the most important one.
b. The internal validity of an intelligence test is $g$.
c. A general intelligence that underlies success on a wide variety of tasks is $g$.
d. Giftedness is determined by both innate ability to perform and experiences one has in life.
e. The $g$ is measured by the speed with which one can process information.
6. If a test is reliable, it means that

    a) it tests what it is supposed to test
    b) it is a fair assessment
    c) it yields consistent results
    d) it is also valid
7. Freddie is a 10-year-old boy with a mental age of 12. according to the scoring of the Stanford-Binet test, Freddie’s intelligence quotient score is

a. 12
b. 83
c. 95
d. 120
8. A comparison of the scores of African-American test takers to the scores of European-American test takers on current popular intelligence tests such as the Wechsler Adult Intelligence Scale and the Stanford-Binet indicates that

a. Black students outperform white students on creative and practical intelligence scores
b. Adopted black children score higher than their biological siblings
c. There is no difference between the scores of whites and blacks
d. The mean of black students is lower than the mean of white students
9. During development of standardized tests, questions that are answered correctly by almost all students and those that are missed by almost all students are eliminated. Why?

   a. Only questions that are moderately difficult should be included on a test
   b. These questions fail to show individual differences in abilities
   c. These questions are poorly written
   d. The questions may be valid, but they are not reliable
10. Barika, who is 75, takes longer to solve problems that require abstract reasoning than she did when she was 35. This tendency indicates

a. A decrease in her overall intelligence level
b. An increase in her crystallized ability
c. A decline in her fluid intelligence
d. Failing eyesight, which can be compensated for by large print being used on a test
11. Intelligence tests tend to measure _______ thinking; tests of creativity tend to measure _______ thinking.

a. Divergent; convergent
b. Divergent; divergent
c. Convergent; divergent
d. Convergent; convergent
12. The form of mental retardation that is caused by the presence of an extra chromosome is

   a. Phenylketonuria
   b. Hydrocephaly
   c. Psychosocial
   d. Down Syndrome
13. If your score falls at the 75\textsuperscript{th} percentile on a standardized test, which of the following is an accurate interpretation?

a. You correctly answered 75\% of the items on the test.

b. 75\% of the people who took the test scored higher than you.

c. 75\% of the people who took the test scored at or below your score.

d. Your answers to pairs of similar items on the test were the same 75\% of the time.
14. Which of the following represents the strongest test-retest reliability for a test?

a. 0.00  
b. -0.75  
c. +0.70  
d. +0.90
15. Whose research and conclusions triggered an emotional debate over ethnic differences in intelligence?

a. Arthur Jensen
b. David Wechsler
c. Francis Galton
d. Alfred Binet
Chapter 9 Answer Key

1. B  
2. A  
3. A  
4. B  
5. C  
6. C  
7. D  
8. D  
9. B  
10. C  
11. C  
12. D  
13. C  
14. D  
15. A