Chapter 10 Intelligence
True or False??

• Research suggests that a common ingredient of expert performance in chess, dancing, sports, and music is about a **decade** of intense daily practice.

• True (p 409)

• This is known as the “10 Year Rule”. In other words, intelligence is helpful, but practice is also important.
True or False??

• Exceptionally creative architects, mathematicians, scientists, and engineers usually score no higher on intelligence tests than do their less creative peers.
  • True (pg. 410)

• The point in this is the word creative. Creativity is more than what normal intelligence tests reveal. (two thinking areas involved, also)
True or False??

• There is a modest positive correlation between brain size and intelligence score.
  True (pg 413)
• There is a +.33 correlation between brain size and intelligence score.
True or False??

• Highly educated people die with more synapses than their less-educated peers.
• True (pg 413)
• Although, this does not tell us whether people grow synapses with education, or people with more synapses seek more education, or both. But highly intelligent differ in the neural plasticity in response to the environment.
True or False??

• The concern with individual differences in intelligence is strictly a twentieth century American phenomenon.
  
  • False (pg 416)
  
  • Modern intelligence testing movement began at the turn of the twentieth century, when France passed a law requiring that all children attend school.
True or False??

• Today’s Americans score higher on intelligence tests than Americans did in the 1930s.
• True (pg 420)
• Flynn effect indicates that the average person’s intelligence test score 80 yrs. ago was, only 76.
True or False??

• Among the mentally retarded, males outnumber females by 50 percent.
• True (pg 425)
• Only about 1 percent of the population meets the criteria of mental retardation. With males outnumbering females by 50%.
True or False??

• As adopted children grow older, their intelligence scores become more similar to those of their biological parents than to those of their adoptive parents.

True pg 428

Genetic influences, not environmental ones, become more apparent as we accumulate life experiences. (this is true in identical twins, also. They continue to increase similarities into their 80’s)
True or False??

• Recent research findings support a “Mozart effect,” that is, that having infants listen to classical music boosts their cognitive ability.
• False (pg 430)
• This has been discounted as a finding.
• Research has revealed small but enduring cognitive benefits to either keyboard or vocal music training, also.
True or False??

• Aptitude scores, such as SAT scores, are a much better predictor of the college performance of Whites than it is of Blacks.
• False (Pg436)
• From eighth grade through the early high school years, the average aptitude score of the white students increased, which those of the black student decreased creating a gap that reached its widest point at about the time that high school students take college admissions test. But during college, the black students scores increased more than four times as much as those of their white counterparts, thus greatly decreasing the aptitude gap.
What is Intelligence?


Physicist Stephen Hawking: “I have no idea. People who boast about their IQ are losers.”
<table>
<thead>
<tr>
<th>Aptitude</th>
<th>Exemplar</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Linguistic</td>
<td>T. S. Eliot, poet</td>
</tr>
<tr>
<td>2. Logical-mathematical</td>
<td>Albert Einstein, scientist</td>
</tr>
<tr>
<td>3. Musical</td>
<td>Igor Stravinsky, composer</td>
</tr>
<tr>
<td>4. Spatial</td>
<td>Pablo Picasso, artist</td>
</tr>
<tr>
<td>5. Bodily-kinesthetic</td>
<td>Martha Graham, dancer</td>
</tr>
<tr>
<td>6. Intrapersonal (self)</td>
<td>Sigmund Freud, psychiatrist</td>
</tr>
<tr>
<td>7. Interpersonal (other people)</td>
<td>Mahatma Gandhi, leader</td>
</tr>
<tr>
<td>8. Naturalist</td>
<td>Charles Darwin, naturalist</td>
</tr>
</tbody>
</table>
What is Intelligence?

- Intelligence is hard to define it is a Reification.
- **Reification** is the viewing of an abstract immaterial trait as if it was a concrete item.
  - Invent a concept, give it a name and then convince ourselves that such a thing objectively exists in the world.
  - Having an IQ of 130 (intelligence Quotient) people are imagining it to be a thing this person has rather than a score she once obtained on a particular IQ test. Better to say you scored a 130 on an IQ test.
- Intelligence is a socially constructed concept.
- **Intelligence** is defined as the ability to learn from experience, solve problems., and use knowledge to adapt to new situations.
General Intelligence

- **Factor analysis** is the statistical procedure used to identify clusters of test items that measure a common ability.
- Some individual abilities seem to be related to others.
- **Spatial** is related to reasoning while **verbal intelligence** is usually related to **paragraph comprehension** and **vocabulary items**.
- **Charles Spearman** developed factor analysis. Brought up the **theory of ‘g’**
- G is the factor that underlies the various clusters.
- Spearman believed that the g factor was in charge of **all areas** of intelligence.
General Intelligence

- **L.L. Thurstone** opposed Spearman and revealed that there were **seven clusters** of primary mental abilities. Although he did not rank his subjects on a single scale of general aptitude, he revealed that there were **seven primary mental abilities.**
  - Such as
    - Word fluency
    - Verbal comprehension
    - Spatial ability
    - Perceptual speed
    - Numerical ability
    - Inductive reasoning
    - Memory.
  - Others found that there was a connection between how well some did on certain categories than others, thus not ruling out the possibility of the g factor.

- Athleticism is also made up of many different factors such as speed, strength, etc.

- Satoshi Kanasawa also argued the fact that general intelligence evolved as a form of intelligence that helps people solve **novel problems** (or experiences).
Gardner’s Intelligences

- Logical-mathematical
- Musical
- Kinesthetic (athletic)
- Interpersonal (social skills)
- Intrapersonal (personal adjustment)
- Spatial (artistic)
- Naturalistic intelligence (understanding nature)
- Linguistic

Cognition, Language, and Intelligence
Contemporary Intelligence Theories

- Howard Gardner also supported Thurstone’s idea. He noticed that brain damage may diminish one type of ability but not another.
- He noted that certain abilities allowed our ancestors to cope with different situations.
- Savant Syndrome is the condition which a person is limited in mental ability has an exceptional specific skill.
Contemporary Intelligence Theories

- 4/5 people with this syndrome are **males** and many have **autism**.
- Gardner states that all forms of intelligence has **intrinsic value** yet it is one’s culture and context that place greater value on some capacities than others.
- **Robert Sternberg** agreed with Gardner and also held a **triarchic theory** which consisted of three intelligences including analytical, Creative and Practical Intelligences.
Sternberg’s Three Intelligences “Triarchic Theory”

• **Analytical** -(academic problem solving) intelligence- single right answer.

• **Creative Intelligence**- reacting adaptively to “novel” situations or generating new ideas.

• **Practical Intelligence**- every day tasks. (Managerial success for example)
Intelligence and Creativity

- **Creativity** is the ability to produce ideas that are both novel and valuable.
- People who do well on IQ tests also do well on creativity tests.
- Those who score higher than 120 are less likely to correlate their creativity success.
- Convergent thinking demands a single correct answer.
- Divergent thinking imagines multiple possible answers to a problem.
Intelligence and Creativity

• Injury to the left parietal lobe damages the convergent thinking (Convergent thinking is generally associated with math and science & Divergent thinking is generally associated with humanities and arts) thinking tested by IQ tests.

• Injury to certain areas of the frontal lobe destroys imagination although it does not affect reading, writing and arithmetic skills.

• There are five components of creativity including:
  – expertise (the well developed base of knowledge)
  – Imaginative thinking skills (the ability to see things in novel ways to recognize patterns to make connections)
  – A venturesome personality (tolerating ambiguity and risk, perseverance in overcoming obstacles)
  – Intrinsic motivation (being motivated by interest, enjoyment, satisfaction and challenge)
  – Creative environment (sparking, supporting and refining creative ideas)
Intelligence and Creativity

• Amabile’s experiments also reveal that a creative environment frees individuals from the concern about social approval.
• If students were not worried about being graded, they would be more creative.
• Amabile states that managers should allow employees to work on what they are naturally interested in and provide time, freedom and support to reach these goals.
Emotional Intelligence

- Emotional intelligence is the ability to perceive, understand, manage and use emotions.
- In some cases, brain damage may also damage the potential of emotional intelligence.
- Those with high emotional intelligence are less likely to be depressed, suffer from anxiety and anger.
- They can delay gratification for long range goals rather than being overtaken by sudden impulses.
- Gardner and other researchers believe that the role of emotional intelligence is stretched too much. The processing of space, music and information about ourselves should also be taken into heed.
- The g factor does predict occupational status and job performance.
- Other components are needed however to succeed within the job.
Is Intelligence Neurologically Measurable?

• There is a +.40 correlation between brain size and the person’s intelligence score.

• As adults age, their brain size and nonverbal intelligence will also fall.

• The more synapses one has, the more intelligent they are.

• Intelligent people do differ in their neural plasticity.
Is Intelligence Neurologically Measurable?

- Richard Haier correlated intelligence scores by measuring the volume of neural bodies (gray matter) and the volume of axons and dendrites (white matter).
- Higher intelligence scores were linked with more gray matter in some specific areas known to be involved in memory, attention, and language.
- Einstein’s brain was 15% larger in the parietal lobe’s lower region. Which is the center for processing mathematical and spatial information.
Brain Function

• The left frontal lobe is used for verbal questioning and both of the sides are used for spatial questioning. John Duncan noticed that information from various areas seemed to converge in this given spot.

• Earl Hunt found that verbal intelligence scores are predictable from the speed which the person retrieved information from memory.

• The correlation between the IQ score and the speed of taking in perceptual information tend to be +.4 and +.5. Those who replied higher tend to score higher on IQ tests especially those based on perceptual over verbal problem solving.
Brain Function

• Those who are more intelligent are revealed to have their brain waves register a simple stimulus more quickly and with greater complexity.

• Seems like those with quicker responses, tend to acquire more knowledge.
Assessing Intelligence

• An intelligence test is a method for assessing an individual’s mental aptitudes and comparing them with those of others, using numerical scores.

• Alfred Binet devised the first IQ test to eliminate bias and to place French children into the appropriate classrooms. Theodore Simon also worked on this with him. They wanted to measure a child’s mental age.

• The mental age was a measure of intelligence test performance devised by Binet. The chronological age that most typically corresponds to a given level of performance. So a child with a the age of 9 is said to have the mental age of 9.

• Binet and Simon devised a test in which they had varied reasoning and problem-solving questions that might predict school achievement.
Assessing Intelligence

• To raise the capacities of low scoring children, Binet recommended “mental orthopedics” which would develop their attention spans.

• Lewis Terman used some parts of Binet’s tests and added other parts to fit the needs of Californian children. He named it the Stanford-Binet.

• William Stern then devised the intelligence quotient also known as the IQ test.

• \[ \text{IQ} = \frac{\text{mental age}}{\text{chronological age}} \times 100 \]

• The IQ works best for children but not for adults.
Construction of Intelligence Tests

- **Binet** – score is intelligence quotient (IQ)

\[
IQ = \frac{\text{Mental Age (MA)}}{\text{Chronological Age (CA)}} \times 100
\]

- **Ratio IQ** no longer used
- **New approach**: deviation IQ and normal distribution
Modern Tests of Mental Abilities

• **Aptitude tests** predict the ability to learn a new skill.
• **Achievement tests** reflect what you have learned.
• Both tests measure **both ability and its development**.
• The **Wechelser Adult Intelligence Scale (WAIS)** is the most widely used intelligence test.
  – It consists of verbal and performance subtests. It also separates scores for verbal comprehension, perceptual organization, working memory and processing speed.
  – It can also reveal learning/ language disabilities. Allowing psychologists to reveal a new plan for those who have suffered strokes, etc.
  – The test also provides cues for cognitive strengths.
Standardization

- Psychological tests must meet three criteria, they must be standardized, reliable and valid. Both the Stanford-Binet and the Wechler test meets these requirements.
- Standardization is defining meaningful scores by comparison with the performance of a pretested standardization group.
- The test results from these standardized tests form a normal distribution that forms a normal curve.
- The average score is 100.
- The Flynn effect is how standardized test scores are improving around the world.
Cognition, Language, and Intelligence

Normal Distribution

Percent of persons scoring in each segment under the normal curve

IQ scores

Below average

Average

Above average

Number of persons obtaining each score

Few

Many

IQ scores

70

115

130

145

13.59%

13.59%

34.13%

34.13%

2.14%

2.14%
Reliability

- Reliability is the extent to which a test yields consistent results, as assessed by the consistency of the scores on two halves of the test, on alternate forms of the test, or on retesting.
- The higher the correlation between the test-retest or the split-half scores, the higher the test’s reliability.
Validity

- Validity is the extent to which a test measures or predicts what is supposed to.
- Content Validity is the extent to which a test samples the behavior that is of interest.
- Criterion is the behavior that a test is designed to predict. The measure is used in defining whether the test has predictive validity.
- Predictive Validity is the success with which a test predicts the behavior it is designed to predict. It is assessed by computing the correlation between test scores and the criterion behavior.
- The correlation between intelligence score and school performance is +.60. Between SAT and first year college performance is below +.50 while GRE and graduate school performance is less than +.30.
Stability or Change?

- Children’s performance and on intelligence tests start to predict future success starting at age 4, even though they do fluctuate during this age. By age 7, they become more stable and consistent.

- The stability of intelligence score increases with age.
Extremes of Intelligence

- Mental retardation is the condition of limited mental ability, indicated by an intelligence score of 70 or below and difficulty in adapting to the demands of life varies from mild to profound.
- Down Syndrome is a condition of retardation and associated physical disorders caused by an extra chromosome in one’s genetic makeup.
- Terman proved that highly intelligent children with IQs over 135 are well adjusted, healthy and had good grades. They were not a different world than their peers as otherwise thought.
- Children with extraordinary academic gifts are sometimes isolated, introverted and in their own worlds but most thrive.
Genetic Influences

- Identical twins reared together have virtually the same scores.
- Fraternal twins reared together have really different scores.
- Identical Twins reared apart have slightly more different IQ scores about 12%.
- Identical twins brain scans show similar gray matter composition.
- There is a possible intelligence gene on chromosome 6.
- Mice get smarter when an extra gene is inserted into the eggs.
Environmental Influences

- Heritability increases as environmental differences decrease.
- There are very pronounced, dramatic effects with early intervention.
- High quality preschools boost emotional intelligence.
- Schooling and intelligence contribute to each other.
Ethnic Similarities and Differences

• Racial groups differ in their average scores on IQ tests.

• Asians have higher math scores than North Americans, maybe because they spend 30% more days in school each year, they spend more time in and out of class on math and they are more conscientious about test scores.

• The difference is not due to genetics but due to environment.
Gender Similarities and Differences

• Girls have higher computational scores
• Boys scored higher 45 points higher on the math section of the SAT
• Boys have better problem solving scores.
• Girls were better at locating objects, more sensitive, spelling and verbal ability
• Exposure to high levels of male sex hormones during the prenatal period do enhance spatial abilities.
• Women are more better at emotional-detecting ability.
The Question of Bias

- IQ tests measure environmental advantages which some people do not have access to.
- Stereotype threat is a self-confirming concern that one will be evaluated based on a negative stereotype.
- Aptitude tests aim to predict how well a test-taker will perform in a given situation.