

Unit XI

Testing and Individual Differences

Overview

Unit XI tackles the enduring question and challenge of how to define and measure intelligence. The unit reviews the theories of Howard Gardner, Charles Spearman, and Robert Sternberg and the brain structures involved in activities requiring intelligence. Next follows an explanation of the origin and rise of intelligence testing and the methods researchers utilize to ensure reliability and validity of tests. The role genetics and environment play in intelligence and the traits of those who demonstrate extreme high or extreme low scores on intelligence assessments are also covered. The unit concludes by considering the roles gender, race, and ethnicity play in intelligence.

Modules

- 60** Introduction to Intelligence

- 61** Assessing Intelligence

- 62** The Dynamics of Intelligence

- 63** Studying Genetic and Environmental Influences on Intelligence

- 64** Group Differences and the Question of Bias

Tip #11

Visit the College Board® Website and Review

Take a moment to visit the AP® Psychology page of the College Board® website to look at the Course Description. There you will find a list of all of the AP® Psychology topics and learning objectives, along with the approximate percentage of the multiple choice portion of the test that will cover those topics. As you begin to review and prepare for the exam, group your vocabulary cards from previous units into topics and set up a schedule of review that takes into account the greater emphasis on certain topics. For instance, from the Course Description you can see that States of Consciousness, Unit V, makes up about 2–4% of the test while Social Psychology, Unit XIV, accounts for about 8–10% of the exam. Obviously you only have so many hours in the day, and perhaps other AP® courses you are preparing for, so it makes sense to allocate more vocabulary review time to the sections that make up more of the test.

Module 60

Introduction to Intelligence

Before You Read

Module Summary

Module 60 discusses the difficulty of defining intelligence and presents arguments for and against considering intelligence as one general mental ability (*g*), as Charles Spearman proposed. Various theories of intelligence, including those of Howard Gardner and Robert Sternberg are presented and compared. The components of emotional intelligence are explained and the relationship between intelligence and brain structure and function is described.

Before beginning the module, take a moment to read each of the following terms and names you will encounter. You may wish to make vocabulary cards for each.

Key Terms

intelligence	savant syndrome
general intelligence (<i>g</i>)	grit
factor analysis	emotional intelligence

Key Names

Charles Spearman
L. L. Thurstone
Howard Gardner
Robert Sternberg

While You Read

Answer the following questions/prompts.

60-1

1. Why is it difficult to define intelligence? How would your definition differ from that given in the text? What would you add or delete from the text's definition?

2. When you describe someone as "smart" to which characteristics are you generally referring? Does this fit the description provided in the text?
3. Explain how L.L. Thurstone's studies on intelligence both refuted and supported the results of Charles Spearman's work with g.
4. In what way did both Thurstone and Spearman use factor analysis in the development of their theories?

60-2

1. Discuss Howard Gardner's contribution to the discussion of intelligence. How do his critics refute his work? Do you agree that all eight (or nine) of Gardner's proposed intelligences are truly intelligence, or can they be explained in some other way?
2. List the common characteristics of someone with savant syndrome.

3. Explain how the quote by Bill Gates below relates to the work of Thurstone, Spearman, and Gardner.

“You have to be careful, if you’re good at something, to make sure you don’t think you’re good at other things that you aren’t necessarily so good at . . . Because I’ve been very successful at (software development) people come in and expect that I have wisdom about topics that I don’t.”—Bill Gates (1998)

Thurstone:

Spearman:

Gardner:

4. Summarize Sternberg’s three intelligences.
5. Discuss how Robert Sternberg’s triarchic theory of intelligence agrees with Gardner’s theory. In what ways do Sternberg’s and Gardner’s theory differ?

6. What has recent research demonstrated on the issue of one versus many different types of intelligence?

Multiple intelligences
emotional intelligence
social intelligence

7. How does grit play a role in success?

60-3

1. List and elaborate on the four components of emotional intelligence.

a.

b.

c.

d.

2. How might each of the components listed above help or hinder someone involved in an unwanted break up of a relationship?

After You Read

Module 60 Review

1. Complete the chart to see if you have mastered the basics.

Theory	Brief Summary of the Theory	An Example of Someone Demonstrating This Proposed Intelligence
Spearman's general intelligence (<i>g</i>)		
Thurstone's primary abilities		
Gardner's multiple intelligences		
Sternberg's triarchic theory		

2. Jeremy can compute the day of the week for any date in the last century and multiply numbers in his mind without using a computer. He has however, scored extremely low on traditional IQ tests and has trouble communicating in a social setting with others.

a. What best described Jeremy's abilities and challenges?

b. According to Howard Gardner, in which type of intelligence does Jeremy excel?

Module 61

Assessing Intelligence

Before You Read

Module Summary

Module 61 discusses the history and evolution of intelligence testing and distinguishes between aptitude and achievement tests. The meaning of standardization is explained, and validity and reliability in relation to testing is covered. The normal curve is also described.

Before beginning the module, take a moment to read each of the following terms and names you will encounter. You may wish to make vocabulary cards for each.

Key Terms

intelligence test	standardization
achievement test	normal curve
aptitude test	reliability
mental age	validity
Stanford-Binet Intelligence quotient (IQ)	content validity
Wechsler Adult Intelligence Scale (WAIS)	predictive validity

Key Names

Francis Galton
Alfred Binet
Louis Terman
David Wechsler

While You Read

Answer the following questions/prompts.

61-1

1. Describe the difference between an aptitude and an achievement test. Give an example of each.

61-2

1. Explain how Francis Galton attempted to measure intelligence. Discuss which of his assertions were disproved and which have shown a lasting impact on the study of intelligence.
2. Discuss the events leading up to Alfred Binet's commission to develop intelligence tests for French children.
3. What components did Binet emphasize in his assessment of intelligence? How did his ideas regarding intelligence differ from other psychologists and philosophers at the time?
4. Explain the relationship Binet described between mental age and chronological age.
5. What were Binet's hopes and fears regarding the implementation of his test?
6. How did Lewis Terman revise Binet's original tests for use with American children?
7. Compare and contrast Binet's and Terman's ideas on the importance of intelligence test results.

8. How did Terman find that Binet's original test may have a cultural bias?

9. Practice using William Stern's IQ formula in the scenarios below. Begin by writing out his formula for calculating IQ in the space below.

IQ = _____

Without using a calculator, show your work when calculating the IQ of

a. a 10-year-old boy who answers questions at an 8-year-old level

b. a 6-year-old boy who answers questions at a 10-year-old level

c. a 7-year-old girl who answers questions at the 7-year-old level

10. Discuss how the use and calculation of IQ scores has changed since Stern's formula was used.

11. Explain the misuses and abuses of intelligence testing in our culture through the early 1900s.

12. Discuss the components and subsets of David Wechsler's intelligence test. How does it differ from the Stanford-Binet?

61-3

1. What population should be used in order to standardize the AP[®] Psychology exam you will be taking? After determining your population, explain how the exam can be standardized.
2. Draw and label a normal curve of intelligence scores in the space below. Include three standard deviations above and below the mean and the percentages that fall within one, two and three standard deviations. Refer to Figure 61.2 when finished to check your work.
3. Why is the normal curve important to standardized testing?

4. Define the *Flynn effect* and describe the explanations that have been suggested for this phenomenon.
5. Why is reliability a key consideration in test development? What are two specific methods researchers utilize to measure the reliability of a test?
6. In what way is validity different from reliability?
7. How can a test be reliable and yet invalid?
8. How does the content validity differ from predictive validity of a test? Give a real-life example of a test that demonstrates both content and predictive validity.

9. Explain how tests such as the ACT or SAT can have questionable predictive validity?

After You Read

Module 61 Review

Answer the following questions to see if you have mastered the basics.

1. When and why were intelligence tests created?

2. Alfred Binet referred to children's actual age in years as their _____ age and their performance ability level as their _____ age.

3. The rising average intelligence test score over the last century is referred to as the _____.

4. The Advanced Placement® exam you will take this year is an example of a(n) _____ test.

5. The researcher credited with adapting and revising Binet's original test for use with American children is
 - a. Francis Galton.
 - b. Charles Darwin.
 - c. Louis Terman.
 - d. William Stern.
 - e. David Wechsler.

6. A 34-year-old test-taker is asked to use white and red shaded geometric blocks to make patterns. The tester is most likely taking the
 - a. Stanford-Binet.
 - b. MMPI.
 - c. Stern-Terman.
 - d. WAIS.
 - e. Achievement Test.

7. A researcher who wishes to be sure her personality test for teen introversion is accepted in the field initially gives it to a representative sample of teens to establish a base line performance score to which other test-takers will be compared. She will also be certain that all test takers are provided with the same instructions for the test. This researcher is in the process of
- making the test reliable.
 - establishing the aptitude quotient.
 - validating the test.
 - establishing the achievement quotient.
 - standardizing the test.
8. Draw and label the normal curve of intelligence scores in the space below. Once finished, use it to answer questions 9 and 10.
9. According to your normal curve from #8, a score of 115 is higher than what percentage of scores?
- 68%
 - 95%
 - 2%
 - 84%
 - 81.5%
10. According to your normal curve from #8, approximately 99% of scores fall between which two scores on an intelligence test?
- 55-70
 - 70-130
 - 55-145
 - 145 and beyond
 - 115-145
11. Gwen is attempting to produce a solid intelligence test that will give dependable and consistent results each time it is taken. She gives her prototype test to one group then retests them one week later to determine if their scores will be similar. Gwen is attempting to demonstrate the test's
- reliability.
 - validity.
 - standardization.
 - Flynn effect.
 - normality.
12. Cynthia is preparing for her semester exam in biology. Her instructor has covered 7 units and Cynthia expects to see material from all 7 units on the exam. When over one-half of the exam deals with the life cycle of the Amazon tree frog that was not covered in any of the chapters, Cynthia is upset. Her dissatisfaction with the exam comes primarily due the exam's lack of
- predictive validity.
 - aptitude validity.
 - content validity.
 - split-half reliability.
 - test-retest reliability.

Module 62

The Dynamics of Intelligence

Before You Read

Module Summary

Module 62 discusses the changes in crystallized and fluid intelligence that occur with age. Studies comparing intelligence over the decades are presented to prove that intelligence is stable over time. The traits of those at the low and high extremes of intelligence are discussed.

Before beginning the module, take a moment to read each of the following terms you will encounter. You may wish to make vocabulary cards for each.

Key Terms

cohort	longitudinal study
crystallized intelligence	intellectual disability
fluid intelligence	Down syndrome
cross-sectional study	

While You Read

Answer the following questions/prompts.

62-1

1. Summarize the early cross-sectional research which gave way to the idea of intellectual decline over the lifespan.

2. How did the longitudinal studies begun in the 1920s challenge the findings of cross-sectional evidence discussed earlier?

3. Explain crystallized and fluid intelligence and how it changes as we age.

4. List several tasks and skills which older people perform better than younger individuals.

62-2

1. Explain the difference between a cross-sectional and longitudinal design in research.

2. How could the Flynn effect discussed earlier in this unit help us better understand why cross-sectional research regarding intelligence may be misleading?

62-3

1. Explain the evidence that supports the claim that intelligence remains stable over the life span.
2. What are the reasons that researchers believe those who are more intelligent generally lead longer, healthier lives?

62-4

1. Discuss the two components required before a label of intellectual disability can be applied to a child.
2. What is one of the challenges of creating strict cutoffs for labeling an individual as intellectually disabled?
3. Explain how the Flynn effect may be correlated with changes in independent living for those with an intellectual disability.

4. Discuss Lewis Terman's work with his "Termites." What were his findings?
5. Explain how recent studies of math and verbal "whiz kids" support Terman's findings.

After You Read

Module 62 Review

Select the best answer to see if you have mastered the basics.

1. In an experiment to test the cognitive abilities of various age groups, a researcher forms four groups of equal numbers of participants. Those aged 15–25 are in Group 1, 26–35 in Group 2, 36–45 in Group 3, and 46–55 in Group 4. The researcher is utilizing which method to test his hypothesis?
 - a. naturalistic observation
 - b. cross-sectional
 - c. case study
 - d. longitudinal
 - e. survey
2. If Roger is in his late 70s, which task is he likely to have difficulty with?
 - a. Recalling the mnemonic devices for the names of the five Great Lakes.
 - b. Naming the original thirteen colonies.
 - c. Reading the Sunday newspaper and understanding what he read.
 - d. Playing Scrabble with his grandchildren.
 - e. Coming up with as many different and novel uses for a brick.
3. Roger is a retired math professor in his 70s and is curious about the cognitive changes he might experience in this stage of life. Advise Roger on the changes he can expect in his
 - a. fluid intelligence:
 - b. crystallized intelligence:

4. How might longitudinal versus cross sectional studies provide a different picture of Roger's aging?

5. Tanya is 11-years old, she has trouble following along in school and is not passing any of her classes. What determination is generally used to see if Tanya may qualify for special services to help her academic performance?

Module 63

Studying Genetic and Environmental Influences on Intelligence

Before You Read

Module Summary

Module 63 discusses the evidence for a genetic influence on intelligence and explains what is meant by heritability. The module also discusses the evidence for environmental influences on intelligence.

Before beginning the module, take a moment to read each of the following term and name you will encounter. You may wish to make vocabulary cards for each.

Key Term

heritability

Key Name

Carol Dweck

While You Read

Answer the following questions/prompts.

63-1

1. In Module 14 (Unit III), the concept of heritability was discussed. Refresh your memory by defining heritability in your own words.
2. Explain why the heritability of intelligence can range from 50% to 80%.

3. How do you account for heritability in your own levels of intelligence?
4. Using the data presented in Figure 63.1, explain why siblings raised together would have a lower correlation of intelligence scores than fraternal twins raised together.
5. Discuss the findings of behavior geneticists with regard to the heritability of intelligence in adoptive children and their families.

63-2

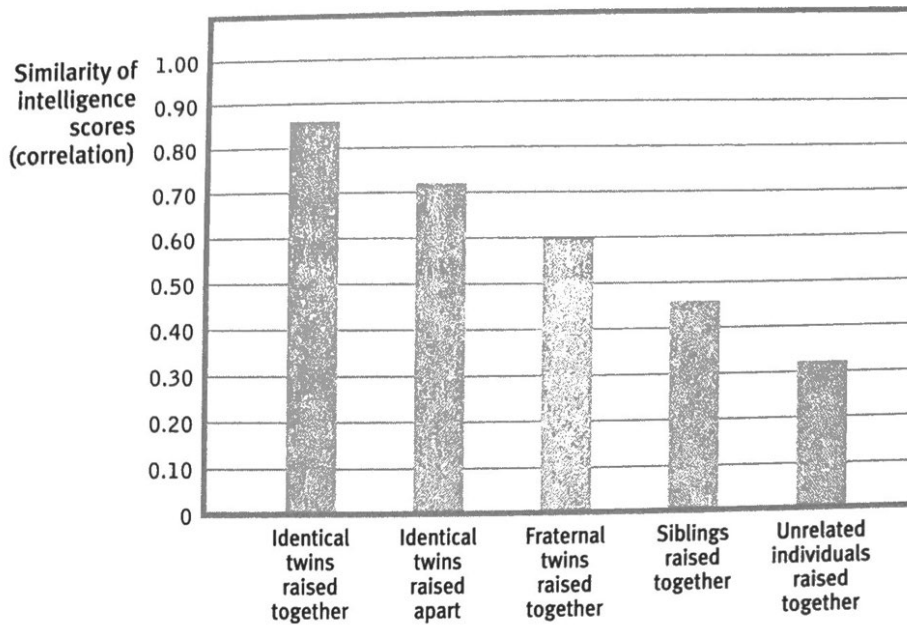
1. Compare the varying effects of early enrichment on the development of intelligence. In what instances does early intervention contribute to intelligence and in what instances do we see little or no impact?

2. How does epigenetics (which you learned about in Module 14) explain the weaving together of genes and experience in intelligence?
3. Explain how schooling influences the development of intelligence.
4. Discuss the difference of a fixed versus growth mindset as it relates to the topic of intelligence according to Carol Dweck.

After You Read

Module 63 Review

Answer the following questions to see if you have mastered the basics.



Use the graph above to answer questions 1 and 2.

1. Janelle and Chantelle are identical twins but grew up in different homes. Janelle's score on an intelligence test is 134. What can you predict about Chantelle's intelligence test score? Provide a rational explanation based on your reading.

2. Timothy and Kristen are both adopted children living in the Murphy's home. They are unrelated. Kristen has an intelligence test score of 101. What can you predict about Timothy's intelligence test score?

3. How can teachers use the work of Carol Dweck regarding mindsets in order to have the student learn the most they possibly can from each course in which they are enrolled?

Module 64

Group Differences and the Question of Bias

Before You Read

Module Summary

Module 64 describes research of gender, cultural and racial differences in mental ability scores. The question of bias in intelligence tests is discussed.

Before beginning the module, take a moment to read each of the following term you will encounter. You may wish to make vocabulary cards for each.

Key Term

stereotype threat

While You Read

Answer the following questions/prompts.

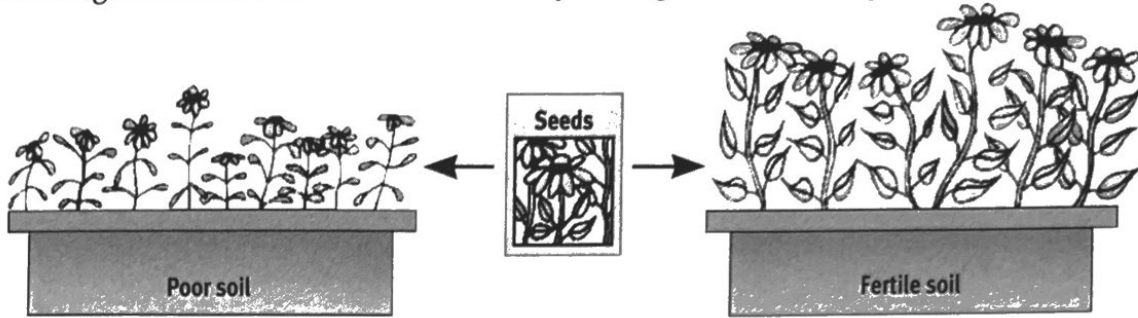
64-1

1. Summarize the findings of various researchers regarding differing intellectual abilities of girls versus boys.
2. How do biological and sociological (nature and nurture) factors play a role in these differing abilities?

64-2

1. Summarize the findings of various researchers regarding differing intellectual abilities in racial and ethnic groups.

2. Using the following figure, explain why the flowers in the garden box to the right have grown larger than the flowers in the left garden box. Describe the heritability of height in this example.



3. Using the figure above, explain why certain flowers in the left garden box are taller than other flowers in that same box. Describe the heritability of height in this example.

4. Provide research from the text to indicate that difference found between blacks and whites on intelligence tests are likely due to environmental differences.

64-3

1. Explain and compare the two meanings of bias in a test. Use examples to illustrate your comparison.
2. Give a specific example of how a question on an intelligence test may be biased against some cultural groups.
3. Using examples from the text, explain how the stereotype threat hijacks mental performance for groups about whom stereotypes may exist?
4. Suggest two ways that stereotype threat could be reduced in testing situations.

After You Read

Module 64 Review

Answer the following questions to see if you have mastered the basics.

1. You are good friends with a girl in your class who believes that girls are much smarter than boys. Since you are studying psychology and intelligence, what can you tell her about the validity of her beliefs?
2. A teacher in your school tells you that boys are evolutionarily built for hunting and girls are evolutionarily built for gathering. What evidence can you provide to support that statement? What evidence can you provide to refute this statement?
3. Your friend believes that all intelligence tests are biased as they only reflect the environment and experiences you have been exposed to. Another friend responds that intelligence tests are not biased. Since you are taking psychology, how can you respond to your friends?
4. Explain why heredity may contribute to individual differences in intelligence but not necessarily contribute to group differences.

✓ Check Yourself

Now that you have mastered the basics, work through the problems below to see if you can *synthesize, evaluate, and analyze* what you have learned.

Justin is an unusually bright seventh grade student who is being tested for acceptance into a school for gifted children. He has taken one intelligence test three times and received the scores of 150, 149, and 150. Justin is an accomplished and recognized violist, and has been invited to perform with the National Symphony Orchestra. He has many friends and is so well-liked in his school that he won the election for class president. As president, Justin has presented some cool new ideas for homework help, class service projects and an innovative way to move the lunch trays through the cafeteria. However, he is also known to be a silly kid who forgets his lunch quite frequently, gets lost in the halls of the school and often does not have his assignments or materials for class. His parents worry that despite his IQ, his distracted habits may inhibit his future success.

Answer the following questions with specific information from the scenario above to support your response.

1. What is the relationship of Justin's intelligence test scores to other scores on the normal curve?
2. Which two of Gardner's multiple intelligences does Justin seem to possess?
3. How would you assess Justin's three components of intelligence as Robert Sternberg would identify them?
4. How reliable are the intelligence tests Justin has taken?



Before You Move On

Use the checklist below to verify your understanding of the unit's main points.

Can I define intelligence and lists characteristics of how psychologists measure intelligence using?

- Abstract versus verbal measures
- Speed of processing

Can I discuss how culture influences the definition of intelligence?

Can I compare and contrast the historic and contemporary theories of intelligence of:

- Charles Spearman
- Howard Gardner
- Robert Sternberg

Can I explain how psychologists design tests, including standardization strategies and other techniques to establish reliability and validity?

How do I interpret the meaning of scores in terms of the normal curve?

Can I describe relevant labels related to intelligence testing such as?

- Gifted
- Intellectually disabled

Can I debate the appropriate testing practices, particularly in relation to culture-fair and biased-free tests?

Can I identify key contributors in intelligence research and testing such as?

- Alfred Binet
- Francis Galton
- Howard Gardner
- Charles Spearman
- Robert Sternberg
- Louis Terman
- David Wechsler