CHAPTER PREVIEW

Today, intelligence is generally considered to be the ability to learn from experience, solve problems, and adapt to new situations. Psychologists debate whether intelligence is one general ability or several specific abilities. More recently, some theorists have expanded the definition of intelligence to include social intelligence, especially emotional intelligence. While a certain level of intelligence is necessary for creativity, beyond that level, the correlation is weak. Psychologists have linked people’s intelligence to brain anatomy and functioning as well as to cognitive processing speed.

Modern intelligence testing began more than a century ago in France when Alfred Binet developed questions that helped predict children’s future progress in the Paris school system. Lewis Terman of Stanford University used Binet’s ideas to develop the Stanford-Binet intelligence test. German psychologist William Stern derived the formula for the famous intelligence quotient, or IQ.

Modern aptitude and achievement tests are widely accepted only if they are standardized, reliable, and valid. Aptitude tests tend to be highly reliable but they are weak predictors of success in life. One way to test the validity of a test is to compare people who score at the two extremes of the normal curve: the challenged and the gifted.

Studies of twins, family members, and adopted children point to significant genetic determinants of intelligence scores. These and other studies also indicate that environment significantly influences intelligence test scores. Environmental differences are perhaps entirely responsible for racial gaps in intelligence. Psychologists debate evolutionary and cultural explanations of gender differences in aptitudes and abilities.

Aptitude tests, which predict performance in a given situation, are necessarily “biased” in the sense that they are sensitive to performance differences caused by cultural experiences. However, the major tests are not biased in that they predict as accurately for one group as for another. Stereotype threat can adversely affect performance and sometimes appears in intelligence testing among African-Americans and women.
Discuss the difficulty of defining intelligence, and explain what it means to “reify intelligence.”

As a socially constructed concept, intelligence varies from culture to culture. Thus, most psychologists now define intelligence as the ability to learn from experience, solve problems, and adapt to new situations. To “reify” something is to view an abstract, immaterial concept as if it were a concrete thing. Thus, to “reify IQ” is to treat the intelligence quotient as if it were a fixed and objectively real trait like height.

Present arguments for and against considering intelligence as one general mental ability.

Psychologists agree that people have specific abilities, such as verbal and mathematical aptitudes. However, they debate whether a general intelligence \( g \) factor runs through them all, as proposed by Charles Spearman. Factor analysis has identified several clusters of mental abilities, including verbal intelligence, spatial ability, and reasoning ability. Still, there seems to be a tendency for those who excel in one of the clusters to score well on others, as suggested by the results of L. L. Thurstone’s ranking of subjects’ primary mental abilities. Some psychologists today agree with Spearman’s notion that we have a common level of intelligence that can predict our abilities in all other academic areas.

Compare Gardner’s and Sternberg’s theories of intelligence.

Evidence that brain damage may diminish one ability but not others, as well as studies of savant syndrome, led Howard Gardner to propose his theory of multiple intelligences. These include linguistic, logical-mathematical, musical, spatial, bodily kinesthetic, intrapersonal, interpersonal, and natural. Robert Sternberg also proposes a triarchic theory of multiple intelligences in which he distinguishes among analytical, practical, and creative intelligences.

Describe the four aspects of emotional intelligence, and discuss criticisms of this concept.

Distinct from academic intelligence is emotional intelligence. The three components of emotional intelligence are (1) the ability to perceive emotions (to recognize them in faces, music, and stories), (2) to understand emotions (to predict them and how they change and blend), (3) to manage emotions (to know how to express them in varied situations), and (4) to use emotions to enable adaptive or creative thinking. Those who are emotionally smart often succeed in careers, marriages, and parenting where other academically smarter (but emotionally less intelligent) people fail. Critics of the idea of emotional intelligence argue that we stretch the idea of intelligence too far when we apply it to emotion.
5. Identify the factors associated with creativity, and describe the relationship between creativity and intelligence.

In general, people with high intelligence scores do well on creativity tests. But beyond a score of about 120, the correlation between intelligence scores and creativity disappears. Studies suggest five other components of creativity: expertise, imaginative thinking skills, venturesome personality, intrinsic motivation, and a creative environment. The brain regions supporting the convergent thinking tested by intelligence tests (requiring a single correct answer) differ from those supporting the divergent thinking that imagines multiple solutions to a problem (such as words beginning with the letter s).

6. Describe the relationship between intelligence and brain anatomy.

Several studies report a positive correlation (+.40) between brain size (adjusted for body size) and intelligence score. Moreover, as adults age, brain size and nonverbal intelligence test scores fall in concert. Other studies suggest that highly educated people die with more synapses. The direction of the relationship between brain size and intelligence remains unclear. Larger brain size may enable greater intelligence but it is also possible that greater intelligence leads to experiences that exercise the brain and build more connections, thus increase its size. Or some third factor may be at work. Some evidence suggests that highly intelligent people differ in their neural plasticity.

7. Discuss findings on the correlations between perceptual speed, neural processing speed, and intelligence.

People who score high on intelligence tests tend to retrieve information from memory more quickly. Research also suggests that the correlation between intelligence score and the speed of taking in information tends to be about +.4 to +.5. Those who perceive quickly are especially likely to score higher on tests based on perceptual rather than verbal problem solving. The brain waves of highly intelligent people register a simple stimulus such as a flash of light more quickly and with greater complexity. The evoked brain response also tends to be slightly faster when people with high intelligence rather than low intelligence scores perform a simple task, such as pushing a button when an X appears on the screen. As yet, psychologists have no firm idea of why fast reactions on simple tasks should predict intelligence test performance.

Assessing Intelligence

➤ Exercises: A World War I IQ Test; Analogies and Intelligence; Issues in Testing; Reliability and Validity; Remote Associates Test
➤ Project: Joining Mensa
➤ Video: Module 17 from Psychology: The Human Experience: Pros and Cons of Intelligence Tests
➤ Transparencies: 119 Close Cousins: Aptitude and Intelligence Scores; 120 Sample Items from the Wechsler Adult Intelligence Scale (WAIS) Subtests; 121 The Normal Curve

8. Define intelligence test, and discuss the history of intelligence testing.

Psychologists define an intelligence test as a method for assessing an individual’s mental aptitudes and comparing them with those of others, using numerical scores. The modern intelligence-testing movement started more than a century ago when French psychologist Alfred Binet began assessing intellectual abilities. Together with Theodore Simon, Binet developed an intelligence test containing questions that assessed mental age and helped predict children’s future progress in the Paris school system. The test sought to identify French school children needing special attention. Binet and Simon made no assumption about the origin of intelligence.

Lewis Terman believed that intelligence was inherited. Like Binet, he believed that his test, the Stanford-Binet, could help guide people toward appropriate opportunities. William Stern derived the intelligence quotient, or IQ, for Terman’s test. The IQ was simply a person’s mental age divided by chronological age multiplied by 100. During the early part of the twentieth century,
intelligence tests were sometimes used in ways that, in hindsight, even their designers regretted—to “document” a presumed innate inferiority of certain ethnic and immigrant groups.

9. **Distinguish between aptitude and achievement tests, and describe modern tests of mental abilities such as the WAIS.**

Aptitude refers to the capacity to learn and thus **aptitude tests** are those designed to predict a person’s future performance. **Achievement tests** are designed to assess what a person has learned.

The **Wechsler Adult Intelligence Test Revised (WAIS)** is the most widely used intelligence test. It consists of 11 subtests and yields not only an overall intelligence score but also separate “verbal comprehension,” “perceptual organization,” “working memory,” and “processing speed” scores. Striking differences between these scores alert the examiner to possible learning problems or brain disorders. The tests also provide clues to cognitive strengths that a teacher or employer might build on.

10. **Discuss the importance of standardizing psychological tests, and describe the distribution of scores in a normal curve.**

Because scores become meaningful only when they can be compared with others’ performance, they must be defined relative to a pretested group, a process called **standardization**. Obviously, the group on which a test is standardized must be representative of those who will be taking the test in the future. For example, Terman recognized that a scale standardized on Parisians did not provide a satisfactory standard for evaluating Americans. Thus, he revised Binet’s test and standardized the new version by testing 2300 native-born, white Americans of differing socioeconomic levels. Standardized test results typically form a normal distribution, a bell-shaped pattern of scores that forms the normal curve. Most scores cluster around average, and increasingly fewer are distributed at the extremes. Intelligence test scores form such a curve but in the past six decades, the average score has risen 27 points, a phenomenon known as the **Flynn effect.**

11. **Explain what it means to say that a test is reliable.**

**Reliability** refers to the extent to which a test yields consistent scores. Consistency may be assessed by comparing scores on two halves of the test, on alternative forms, or on retesting. A test can be reliable but not valid.

12. **Explain what it means to say a test is valid, and describe two types of validity.**

**Validity** refers to the extent to which a test measures or predicts what it is supposed to. **Content validity** is determined by assessing whether the test truly samples the behavior that is of interest. For example, driving tests should measure driving ability. **Predictive validity** is determined by computing the correlation between test scores and some criterion, that is, some independent measure of what the test aims to assess. Aptitude tests have predictive validity if they can predict future achievement.

**The Dynamics of Intelligence**

➤ Lectures: Why Do Intelligent People Fail?; Giftedness  
➤ Transparency: 122 Degrees of Mental Retardation

13. **Describe the stability of intelligence scores over the life span.**

The stability of intelligence test scores increases with age. By age 4, children’s performance on intelligence tests begins to predict their adolescent and adult scores. After about age 7, intelligence scores, though certainly not fixed, stabilize.
14. **Discuss the two extremes of the normal distribution of intelligence.**

At one extreme of the normal distribution are people whose intelligence scores fall below 70. To be labeled as having *mental retardation*, a child must have both a low test score and difficulty adapting to the normal demands of living independently. Severe mental retardation sometimes results from known physical causes, such as *Down syndrome*, a disorder attributed to an extra chromosome in the person’s genetic makeup. Most mentally challenged adults can, with support, live in mainstream society.

At the other extreme are the “gifted.” Contrary to the popular myth that they are frequently maladjusted, research suggests that high-scoring children are healthy, well adjusted, and academically successful. Controversy surrounds “gifted child” programs in which the “gifted” are segregated and given academic enrichment not available to the masses. Critics note that tracking by aptitude sometimes creates a self-fulfilling prophecy: those implicitly labeled “ungifted” can be influenced to become so. Denying lower-ability students opportunities for enriched education can widen the achievement gap between ability groups and increase their social isolation from one another.

### Genetic and Environmental Influences on Intelligence

- Lectures: Genes and Intelligence; Teaching Intelligence; Environmental Explanation of Group Differences; The National Commission on Testing and Public Policy; Intelligence as Culturally Defined; The SAT: A Case Study in Testing; Unanswered Questions about Intelligence
- Exercises: Incremental Versus Entity Theories of Intelligence; Blacks as a “Castelike” Minority; Culture-Biased and Culture-Fair Tests
- Video: Module 4 of *The Brain* series, 2nd ed.: Intelligence and Culture
- Transparency: 123 Group Differences and Environmental Impact

15. **Discuss the evidence for the genetic contribution to individual intelligence, and explain what psychologists mean by the heritability of intelligence.**

Studies of twins, family members, and adopted children together point to a significant genetic contribution to intelligence scores. For example, the test scores of identical twins reared separately are similar enough to lead one researcher to estimate that about 70 percent of intelligence score variation can be attributed to genetic variation. Furthermore, the most genetically similar people have the most similar scores ranging from +.85 for identical twins raised together, to about +.33 for unrelated individuals raised together. As noted in Chapter 3, heritability refers to the extent to which differences among people are attributable to genes. To say that the heritability of intelligence is 50 percent does not mean that half of an individual’s intelligence is inherited. Rather it means that we can attribute to heredity 50 percent of the variation of intelligence among those studied.

16. **Discuss the evidence for environmental influences on individual intelligence.**

Studies of twins, family members, and adopted children also provide evidence for environmental influences on intelligence. The intelligence test scores of fraternal twins reared together are more similar than those of other siblings, and the scores of identical twins reared apart are less similar than the scores of identical twins raised together. Studies of children reared in extremely neglectful or enriched environments also indicate that life experiences significantly influence intelligence test scores. For example, research indicates that schooling and intelligence contribute to each other (and that both enhance later income).

17. **Describe ethnic similarities and differences in intelligence test scores, and discuss some genetic and environmental factors that might explain them.**

African-Americans average about 10 points lower than white Americans on intelligence tests. European New Zealanders outscore native Maori New Zealanders, Israeli Jews outscore Israeli Arabs, and most Japanese outscore the stigmatized Japanese minority. Research suggests that environmental differences are largely responsible for these group differences. Consider: (1) genetics
research indicates that the races are remarkably alike under the skin; (2) race is not a neatly
defined biological category; (3) Asian students outperform North American students on math
achievement and aptitude tests; (4) intelligence test performance of today’s better-fed, better-
educated, and more test-prepared population exceeds that of the 1930s population by the same
margin that the score of the average White today exceeds that of the average Black; (5) white and
black infants tend to score equally well on tests measuring preferences for looking at novel stim-
uli—a predictor of future intelligence; and (6) in different eras, different ethnic groups have expe-
rienced periods of remarkable achievement.

18. **Describe gender differences in abilities.**

   Although gender similarities far outnumber gender differences, we find the differences in abilities
more interesting. Research indicates that, compared to boys, girls are better spellers, are more ver-
bally fluent, are better at locating objects and are more sensitive to touch, taste, and color. Boys
are more likely than girls to be underachievers, and outperform girls at math problem solving but
underperform them in math computation. Women detect emotions more easily than do men.

19. **Discuss whether intelligence tests are biased, and describe the stereotype threat phenomenon.**

   Intelligence tests are “biased” in the sense that they are sensitive to performance differences
caused by cultural experience. However, tests are not biased in that they predict as accurately for
one group as they do for another. For example, the predictive validity is roughly the same for
blacks and whites and for rich and poor. **Stereotype threat** is a self-confirming concern that one
will be evaluated based on a negative stereotype. The phenomenon sometimes appears in intelli-
genence testing among African-Americans and among women of all colors.