Psych-ology

7.4 What Are Intelligence and Creativity?

Learning Objectives

By the end of this section, you will be able to:

- Define intelligence
- Explain the triarchic theory of intelligence
- Identify the difference between intelligence theories
- Explain emotional intelligence

A four-and-a-half-year-old boy sits at the kitchen table with his father, who is reading a new story aloud to him. He turns the page to continue reading, but before he can begin, the boy says, "Wait, Daddy!" He points to the words on the new page and reads aloud, "Go, Pig! Go!" The father stops and looks at his son. "Can you read that?" he asks. "Yes, Daddy!" And he points to the words and reads again, "Go, Pig! Go!"

This father was not actively teaching his son to read, even though the child constantly asked questions about letters, words, and symbols that they saw everywhere: in the car, in the store, on the television. The dad wondered about what else his son might understand and decided to try an experiment. Grabbing a sheet of blank paper, he wrote several simple words in a list: mom, dad, dog, bird, bed, truck, car, tree. He put the list down in front of the boy and asked him to read the words. "Mom, dad, dog, bird, bed, truck, car, tree," he read, slowing down to carefully pronounce *bird* and *truck.* Then, "Did I do it, Daddy?" "You sure did! That is very good." The father gave his little boy a warm hug and continued reading the story about the pig, all the while wondering if his son's abilities were an indication of exceptional intelligence or simply a normal pattern of linguistic development. Like the father in this example, psychologists have wondered what constitutes intelligence and how it can be measured.

CLASSIFYING INTELLIGENCE

What exactly is intelligence? The way that researchers have defined the concept of intelligence has been modified many times since the birth of psychology. British psychologist Charles Spearman believed intelligence consisted of one general factor, called *g*, which could be measured and compared among individuals. Spearman focused on the commonalities among various intellectual abilities and demphasized what made each unique. Long before modern psychology developed, however, ancient philosophers, such as Aristotle, held a similar view (Cianciolo & Sternberg, 2004).

Others psychologists believe that instead of a single factor, intelligence is a collection of distinct abilities. In the 1940s, Raymond Cattell proposed a theory of intelligence that divided general intelligence into two components: crystallized intelligence and fluid intelligence (Cattell, 1963). **Crystallized intelligence** is characterized as acquired knowledge and the ability to retrieve it. When you learn, remember, and recall information, you are using crystallized intelligence. You use crystallized intelligence all the time in your coursework by demonstrating that you have mastered the information covered in the course. **Fluid intelligence** encompasses the ability to see complex relationships and solve problems. Navigating your way home after being detoured onto an unfamiliar route because of road construction would draw upon your fluid intelligence. Fluid intelligence helps you tackle complex, abstract challenges in your daily life, whereas crystallized intelligence helps you overcome concrete, straightforward problems (Cattell, 1963).

Other theorists and psychologists believe that intelligence should be defined in more practical terms. For example, what types of behaviors help you get ahead in life? Which skills promote success? Think about this for a moment. Being able to recite all 44 presidents of the United States in order is an excellent party trick, but will knowing this make you a better person?

Robert Sternberg developed another theory of intelligence, which he titled the **triarchic theory of intelligence** because it sees intelligence as comprised of three parts (Sternberg, 1988): practical, creative,

and analytical intelligence (Figure 7.12).

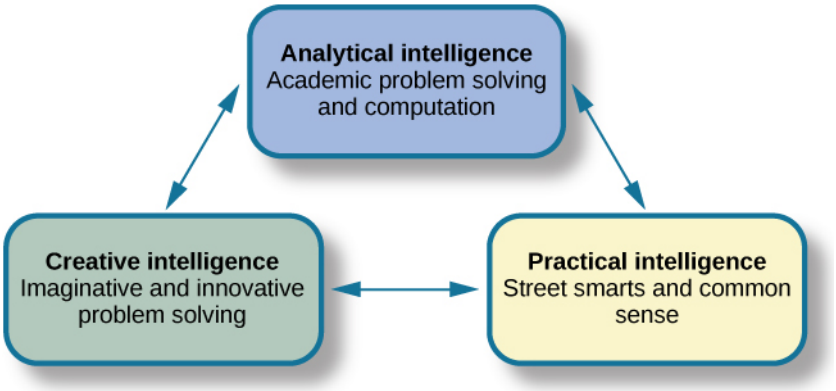

Figure 7.12 Sternberg's theory identifies three types of intelligence: practical, creative, and analytical.

Practical intelligence, as proposed by Sternberg, is sometimes compared to "street smarts." Being practical means you find solutions that work in your everyday life by applying knowledge based on your experiences. This type of intelligence appears to be separate from traditional understanding of IQ; individuals who score high in practical intelligence may or may not have comparable scores in creative and analytical intelligence (Sternberg, 1988).

This story about the 2007 Virginia Tech shootings illustrates both high and low practical intelligences. During the incident, one student left her class to go get a soda in an adjacent building. She planned to return to class, but when she returned to her building after getting her soda, she saw that the door she used to leave was now chained shut from the inside. Instead of thinking about why there was a chain around the door handles, she went to her class's window and crawled back into the room. She thus potentially exposed herself to the gunman. Thankfully, she was not shot. On the other hand, a pair of students was walking on campus when they heard gunshots nearby. One friend said, "Let's go check it out and see what is going on." The other student said, "No way, we need to run away from the gunshots." They did just that. As a result, both avoided harm. The student who crawled through the window demonstrated some creative intelligence but did not use common sense. She would have low practical intelligence. The student who encouraged his friend to run away from the sound of gunshots would have much higher practical intelligence.

Analytical intelligence is closely aligned with academic problem solving and computations. Sternberg says that analytical intelligence is demonstrated by an ability to analyze, evaluate, judge, compare, and contrast. When reading a classic novel for literature class, for example, it is usually necessary to compare the motives of the main characters of the book or analyze the historical context of the story. In a science course such as anatomy, you must study the processes by which the body uses various minerals in different human systems. In developing an understanding of this topic, you are using analytical intelligence. When solving a challenging math problem, you would apply analytical intelligence to analyze different aspects of the problem and then solve it section by section.

Creative intelligence is marked by inventing or imagining a solution to a problem or situation. Creativity in this realm can include finding a novel solution to an unexpected problem or producing a beautiful work of art or a well-developed short story. Imagine for a moment that you are camping in the woods with some friends and realize that you've forgotten your camp coffee pot. The person in your group who figures out a way to successfully brew coffee for everyone would be credited as having higher creative intelligence.

Multiple Intelligences Theory was developed by Howard Gardner, a Harvard psychologist and former student of Erik Erikson. Gardner's theory, which has been refined for more than 30 years, is a more recent development among theories of intelligence. In Gardner's theory, each person possesses at least eight intelligences. Among these eight intelligences, a person typically excels in some and falters in others

(Gardner, 1983). **Table 7.4** describes each type of intelligence.

Table 7.4 Multiple Intelligences

Intelligence Type	Characteristics	Representative Career
Linguistic intelligence	Perceives different functions of language, different sounds and meanings of words, may easily learn multiple languages	Journalist, novelist, poet, teacher
Logical-mathematical intelligence	Capable of seeing numerical patterns, strong ability to use reason and logic	Scientist, mathematician
Musical intelligence	Understands and appreciates rhythm, pitch, and tone; may play multiple instruments or perform as a vocalist	Composer, performer
Bodily kinesthetic intelligence	High ability to control the movements of the body and use the body to perform various physical tasks	Dancer, athlete, athletic coach, yoga instructor
Spatial intelligence	Ability to perceive the relationship between objects and how they move in space	Choreographer, sculptor, architect, aviator, sailor
Interpersonal intelligence	Ability to understand and be sensitive to the various emotional states of others	Counselor, social worker, salesperson
Intrapersonal intelligence	Ability to access personal feelings and motivations, and use them to direct behavior and reach personal goals	Key component of personal success over time
Naturalist intelligence	High capacity to appreciate the natural world and interact with the species within it	Biologist, ecologist, environmentalist

Gardner's theory is relatively new and needs additional research to better establish empirical support. At the same time, his ideas challenge the traditional idea of intelligence to include a wider variety of abilities, although it has been suggested that Gardner simply relabeled what other theorists called "cognitive styles" as "intelligences" (Morgan, 1996). Furthermore, developing traditional measures of Gardner's intelligences is extremely difficult (Furnham, 2009; Gardner & Moran, 2006; Klein, 1997).

Gardner's inter- and intrapersonal intelligences are often combined into a single type: emotional intelligence. **Emotional intelligence** encompasses the ability to understand the emotions of yourself and others, show empathy, understand social relationships and cues, and regulate your own emotions and respond in culturally appropriate ways (Parker, Saklofske, & Stough, 2009). People with high emotional intelligence typically have well-developed social skills. Some researchers, including Daniel Goleman, the author of *Emotional Intelligence: Why It Can Matter More than IQ*, argue that emotional intelligence is a better predictor of success than traditional intelligence (Goleman, 1995). However, emotional intelligence has been widely debated, with researchers pointing out inconsistencies in how it is defined and described, as well as questioning results of studies on a subject that is difficulty to measure and study emperically (Locke, 2005; Mayer, Salovey, & Caruso, 2004)

Intelligence can also have different meanings and values in different cultures. If you live on a small island,

where most people get their food by fishing from boats, it would be important to know how to fish and how to repair a boat. If you were an exceptional angler, your peers would probably consider you intelligent. If you were also skilled at repairing boats, your intelligence might be known across the whole island. Think about your own family's culture. What values are important for Latino families? Italian families? In Irish families, hospitality and telling an entertaining story are marks of the culture. If you are a skilled storyteller, other members of Irish culture are likely to consider you intelligent.

Some cultures place a high value on working together as a collective. In these cultures, the importance of the group supersedes the importance of individual achievement. When you visit such a culture, how well you relate to the values of that culture exemplifies your **cultural intelligence**, sometimes referred to as cultural competence.

CREATIVITY

Creativity is the ability to generate, create, or discover new ideas, solutions, and possibilities. Very creative people often have intense knowledge about something, work on it for years, look at novel solutions, seek out the advice and help of other experts, and take risks. Although creativity is often associated with the arts, it is actually a vital form of intelligence that drives people in many disciplines to discover something new. Creativity can be found in every area of life, from the way you decorate your residence to a new way of understanding how a cell works.

Creativity is often assessed as a function of one's ability to engage in **divergent thinking**. Divergent thinking can be described as thinking "outside the box;" it allows an individual to arrive at unique, multiple solutions to a given problem. In contrast, **convergent thinking** describes the ability to provide a correct or well-established answer or solution to a problem (Cropley, 2006; Gilford, 1967)

EVERYDAY CONNECTION

Creativity

Dr. Tom Steitz, the Sterling Professor of Biochemistry and Biophysics at Yale University, has spent his career looking at the structure and specific aspects of RNA molecules and how their interactions cold help produce antibiotics and ward off diseases. As a result of his lifetime of work, he won the Nobel Prize in Chemistry in 2009. He wrote, "Looking back over the development and progress of my career in science, I am reminded how vitally important good mentorship is in the early stages of one's career development and constant face-to-face conversations, debate and discussions with colleagues at all stages of research. Outstanding discoveries, insights and developments do not happen in a vacuum" (Steitz, 2010, para. 39). Based on Steitz's comment, it becomes clear that someone's creativity, although an individual strength, benefits from interactions with others. Think of a time when your creativity was sparked by a conversation with a friend or classmate. How did that person influence you and what problem did you solve using creativity?

7.6 The Source of Intelligence

Learning Objectives

By the end of this section, you will be able to:

- Describe how genetics and environment affect intelligence
- Explain the relationship between IQ scores and socioeconomic status
- Describe the difference between a learning disability and a developmental disorder

A young girl, born of teenage parents, lives with her grandmother in rural Mississippi. They are poor—in serious poverty—but they do their best to get by with what they have. She learns to read when she is just 3 years old. As she grows older, she longs to live with her mother, who now resides in Wisconsin. She moves there at the age of 6 years. At 9 years of age, she is raped. During the next several years, several different male relatives repeatedly molest her. Her life unravels. She turns to drugs and sex to fill the deep, lonely void inside her. Her mother then sends her to Nashville to live with her father, who imposes strict behavioral expectations upon her, and over time, her wild life settles once again. She begins to experience success in school, and at 19 years old, becomes the youngest and first African-American female news anchor ("Dates and Events," n.d.). The woman—Oprah Winfrey—goes on to become a media giant known for both her intelligence and her empathy.

HIGH INTELLIGENCE: NATURE OR NURTURE?

Where does high intelligence come from? Some researchers believe that intelligence is a trait inherited from a person's parents. Scientists who research this topic typically use twin studies to determine the heritability of intelligence. The Minnesota Study of Twins Reared Apart is one of the most well-known twin studies. In this investigation, researchers found that identical twins raised together and identical twins raised apart exhibit a higher correlation between their IQ scores than siblings or fraternal twins raised together (Bouchard, Lykken, McGue, Segal, & Tellegen, 1990). The findings from this study reveal a genetic component to intelligence (**Figure 7.16**). At the same time, other psychologists believe that intelligence is shaped by a child's developmental environment. If parents were to provide their children with intellectual stimuli from before they are born, it is likely that they would absorb the benefits of that stimulation, and it would be reflected in intelligence levels.

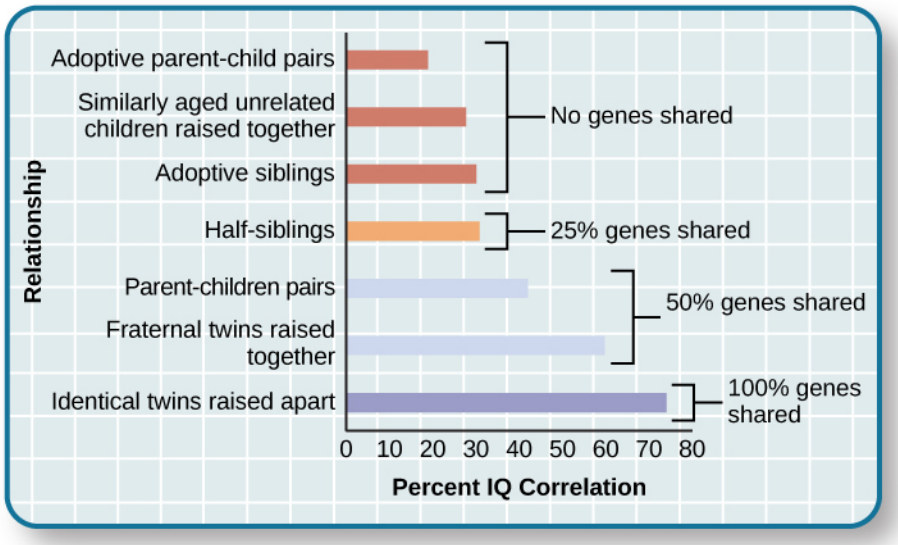

Figure 7.16 The correlations of IQs of unrelated versus related persons reared apart or together suggest a genetic component to intelligence.

The reality is that aspects of each idea are probably correct. In fact, one study suggests that although genetics seem to be in control of the level of intelligence, the environmental influences provide both stability and change to trigger manifestation of cognitive abilities (Bartels, Rietveld, Van Baal, & Boomsma, 2002). Certainly, there are behaviors that support the development of intelligence, but the genetic component of high intelligence should not be ignored. As with all heritable traits, however, it is not always possible to isolate how and when high intelligence is passed on to the next generation.

Range of Reaction is the theory that each person responds to the environment in a unique way based on his or her genetic makeup. According to this idea, your genetic potential is a fixed quantity, but whether you reach your full intellectual potential is dependent upon the environmental stimulation you experience, especially in childhood. Think about this scenario: A couple adopts a child who has average genetic intellectual potential. They raise her in an extremely stimulating environment. What will happen to the couple's new daughter? It is likely that the stimulating environment will improve her intellectual outcomes over the course of her life. But what happens if this experiment is reversed? If a child with an extremely strong genetic background is placed in an environment that does not stimulate him: What happens? Interestingly, according to a longitudinal study of highly gifted individuals, it was found that "the two extremes of optimal and pathological experience are both represented disproportionately in the backgrounds of creative individuals"; however, those who experienced supportive family environments were more likely to report being happy (Csikszentmihalyi & Csikszentmihalyi, 1993, p. 187).

Another challenge to determining origins of high intelligence is the confounding nature of our human social structures. It is troubling to note that some ethnic groups perform better on IQ tests than others—and it is likely that the results do not have much to do with the quality of each ethnic group's intellect. The same is true for socioeconomic status. Children who live in poverty experience more pervasive, daily stress than children who do not worry about the basic needs of safety, shelter, and food. These worries can negatively affect how the brain functions and develops, causing a dip in IQ scores. Mark Kishiyama and his colleagues determined that children living in poverty demonstrated reduced prefrontal brain functioning comparable to children with damage to the lateral prefrontal cortex (Kishyama, Boyce, Jimenez, Perry, & Knight, 2009).

The debate around the foundations and influences on intelligence exploded in 1969, when an educational psychologist named Arthur Jensen published the article "How Much Can We Boost I.Q. and Achievement" in the *Harvard Educational Review*. Jensen had administered IQ tests to diverse groups of students, and

his results led him to the conclusion that IQ is determined by genetics. He also posited that intelligence was made up of two types of abilities: Level I and Level II. In his theory, Level I is responsible for rote memorization, whereas Level II is responsible for conceptual and analytical abilities. According to his findings, Level I remained consistent among the human race. Level II, however, exhibited differences among ethnic groups (Modgil & Routledge, 1987). Jensen's most controversial conclusion was that Level II intelligence is prevalent among Asians, then Caucasians, then African Americans. Robert Williams was among those who called out racial bias in Jensen's results (Williams, 1970).

Obviously, Jensen's interpretation of his own data caused an intense response in a nation that continued to grapple with the effects of racism (Fox, 2012). However, Jensen's ideas were not solitary or unique; rather, they represented one of many examples of psychologists asserting racial differences in IQ and cognitive ability. In fact, Rushton and Jensen (2005) reviewed three decades worth of research on the relationship between race and cognitive ability. Jensen's belief in the inherited nature of intelligence and the validity of the IQ test to be the truest measure of intelligence are at the core of his conclusions. If, however, you believe that intelligence is more than Levels I and II, or that IQ tests do not control for socioeconomic and cultural differences among people, then perhaps you can dismiss Jensen's conclusions as a single window that looks out on the complicated and varied landscape of human intelligence.

In a related story, parents of African American students filed a case against the State of California in 1979, because they believed that the testing method used to identify students with learning disabilities was culturally unfair as the tests were normed and standardized using white children (*Larry P. v. Riles*). The testing method used by the state disproportionately identified African American children as mentally retarded. This resulted in many students being incorrectly classified as "mentally retarded." According to a summary of the case, *Larry P. v. Riles*:

> In violation of Title VI of the Civil Rights Act of 1964, the Rehabilitation Act of 1973, and the Education for All Handicapped Children Act of 1975, defendants have utilized standardized intelligence tests that are racially and culturally biased, have a discriminatory impact against black children, and have not been validated for the purpose of essentially permanent placements of black children into educationally dead-end, isolated, and stigmatizing classes for the so-called educable mentally retarded. Further, these federal laws have been violated by defendants' general use of placement mechanisms that, taken together, have not been validated and result in a large over-representation of black children in the special E.M.R. classes. (*Larry P. v. Riles*, par. 6)

Once again, the limitations of intelligence testing were revealed.

WHAT ARE LEARNING DISABILITIES?

Learning disabilities are cognitive disorders that affect different areas of cognition, particularly language or reading. It should be pointed out that learning disabilities are not the same thing as intellectual disabilities. Learning disabilities are considered specific neurological impairments rather than global intellectual or developmental disabilities. A person with a language disability has difficulty understanding or using spoken language, whereas someone with a reading disability, such as dyslexia, has difficulty processing what he or she is reading.

Often, learning disabilities are not recognized until a child reaches school age. One confounding aspect of learning disabilities is that they often affect children with average to above-average intelligence. At the same time, learning disabilities tend to exhibit comorbidity with other disorders, like attention-deficit hyperactivity disorder (ADHD). Anywhere between 30–70% of individuals with diagnosed cases of ADHD also have some sort of learning disability (Riccio, Gonzales, & Hynd, 1994). Let's take a look at two examples of common learning disabilities: dysgraphia and dyslexia.

Dysgraphia

Children with **dysgraphia** have a learning disability that results in a struggle to write legibly. The physical task of writing with a pen and paper is extremely challenging for the person. These children often have extreme difficulty putting their thoughts down on paper (Smits-Engelsman & Van Galen, 1997). This difficulty is inconsistent with a person's IQ. That is, based on the child's IQ and/or abilities in other areas, a child with dysgraphia should be able to write, but can't. Children with dysgraphia may also have problems with spatial abilities.

Students with dysgraphia need academic accommodations to help them succeed in school. These accommodations can provide students with alternative assessment opportunities to demonstrate what they know (Barton, 2003). For example, a student with dysgraphia might be permitted to take an oral exam rather than a traditional paper-and-pencil test. Treatment is usually provided by an occupational therapist, although there is some question as to how effective such treatment is (Zwicker, 2005).

Dyslexia

Dyslexia is the most common learning disability in children. An individual with **dyslexia** exhibits an inability to correctly process letters. The neurological mechanism for sound processing does not work properly in someone with dyslexia. As a result, dyslexic children may not understand sound-letter correspondence. A child with dyslexia may mix up letters within words and sentences—letter reversals, such as those shown in **Figure 7.17**, are a hallmark of this learning disability—or skip whole words while reading. A dyslexic child may have difficulty spelling words correctly while writing. Because of the disordered way that the brain processes letters and sound, learning to read is a frustrating experience. Some dyslexic individuals cope by memorizing the shapes of most words, but they never actually learn to read (Berninger, 2008).

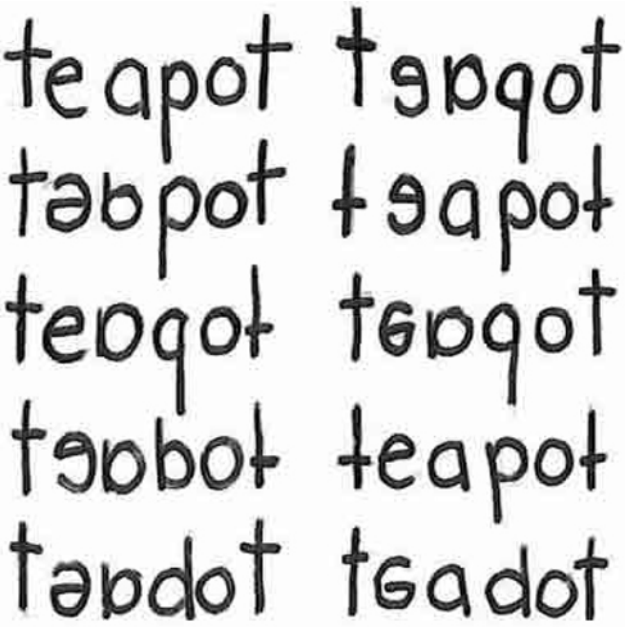

Figure 7.17 These written words show variations of the word "teapot" as written by individuals with dyslexia.