

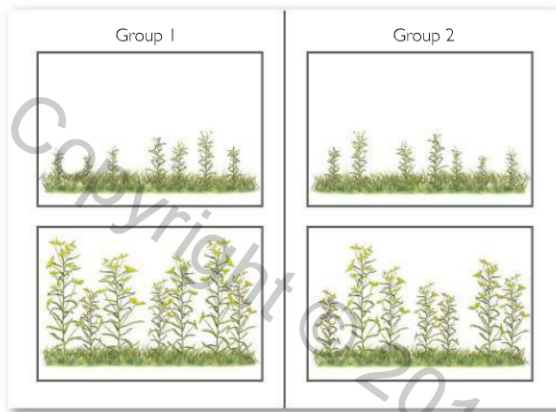


FIGURE 9.17 Drawings of Two Groups of Plants. These two groups of plants are well matched in height to start, but one outstrips the other over time due to different environmental conditions. This demonstrates how group differences in IQ could be “real” but completely environmentally determined. (Source: Based on Lewontin, 1970)

If this example sounds a bit familiar, it’s because we introduced a concept very much like it in Chapter 3 (see p. 117). As we can see, in this “thought experiment,” the plants within each group differ in height. These differences in height reflect (at least in part) genetic influences on plants’ tendencies to grow and flourish. Note, however, that at this point in the growth cycle, the plants in the two groups are, on average, roughly equal in height. Now let’s imagine that we provide one of these groups of plants (in this case, the one on the left) with plenty of water and light, but provide the other group with minimal water and light. We twiddle our thumbs and wait a few weeks and then voila: We find that the plants on the left are, on average, much taller compared with the plants on the right. Although the two groups each had equal potential to grow and flourish, environmental influences resulted in one group growing taller than the other.

So what’s the take-home message? The difference in height between these groups is *entirely environmental*—it’s due to watering and light—so we can’t explain the difference between the two groups in genetic terms. In other words, the between-group differences aren’t at all heritable. If we think of children as little “human plants” (after all, the word *kindergarten* means “child garden” in German), we can easily imagine that different races begin life with few or no average genetic differences in IQ. But over time, the cumulative effects of such factors as social deprivation and prejudice may produce notable differences in IQ among racial groups, one that’s entirely environmental in origin.

It’s also important to note that although one group of plants in our example grew taller than the other group, one or two individual plants in the shorter group actually grew taller than some plants from the taller group. This point highlights the overlapping distributions of heights in the two groups, demonstrating that even within a relatively “deprived” group, some plants exceed the growth of some members of the more “privileged” group. This point reminds us why we can’t use group differences in IQ to infer the intelligence of any given person. Although this example demonstrates that racial differences in IQ *could* be entirely environmental in nature, it doesn’t demonstrate that they *are*. We need to turn to the scientific evidence for answers to that question.

WHAT ARE THE CAUSES OF RACIAL DIFFERENCES IN IQ? Some researchers have pointed out that IQ is heritable, and have concluded that racial differences must therefore be due at least partly to genetic influences. Yet this is a faulty conclusion based on a misunderstanding of how the heritability of a trait among individuals *within* a group relates to the heritability of this trait *between* groups.

Within-group heritability is the extent to which a trait, like IQ, is heritable within groups, such as Asian Americans and women. **Between-group heritability** is the extent to which the difference in this trait between groups, such as between Asian Americans and Caucasians and between men and women, is heritable. It’s critical to keep in mind that *within-group heritability doesn’t necessarily imply between-group heritability*. That is, just because IQ is heritable within groups doesn’t imply that the difference between these groups has anything to do with their genes. Some researchers have confused within-group and between-group heritability, assuming mistakenly that because IQ is heritable within a group such as a race or gender, racial differences in IQ must themselves be heritable (Lilienfeld & Waldman, 2000; Nisbett, 1995, 2009). To return to our plant analogy, we must remember that within each group, some plants grew taller than others. These differences were caused by differences in the hardness of the genetic strain of the individual plants within each group. Nevertheless, the differences between the two groups of plants were due entirely to environmental factors, even though within-group differences were due entirely to genes.

within-group heritability

extent to which the variability of a trait within a group is genetically influenced

between-group heritability

extent to which differences in a trait between groups is genetically influenced

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So what's the evidence that racial differences in IQ result from environmental and *not* genetic factors? Most of this research comes from analyses of differences between African Americans and Caucasians, and it largely points away from a genetic explanation of racial IQ gaps.

One study conducted in Germany shortly after World War II compared the IQ scores of children of African-American soldiers and Caucasian-German mothers with the children of Caucasian-American soldiers and Caucasian-German mothers. In both groups, mothers raised the children, so the societal environment was approximately the same. The IQs of these two groups of children didn't differ (Eyferth, 1961). Thus, the different race-related genes appeared to have no bearing on children's IQ when environment was roughly equated. Other studies have examined whether African Americans with Caucasian-European ancestry obtain a "boost" in IQ relative to those with few European ancestors, which would be expected if racial differences were genetic. This research shows that African Americans with more ancestors of Caucasian descent don't differ significantly in IQ from those with few or no such ancestors (Nisbett, 2009; Scarr et al., 1977; Witty & Jenkins, 1934). One research team even found a slight tendency in the opposite direction: African Americans with more Caucasian-European ancestry had *lower* IQs (Loehlin, Vandenberg, & Osborne, 1973). In any case, these findings provide no evidence for a genetic explanation of the IQ gap between African Americans and Caucasians.

A classic study examined the effect of cross-racial adoption on IQ. This investigation showed that the IQs of African-American children adopted by middle-class Caucasian parents were higher at age 7 than those of either the average African-American or Caucasian child (Scarr & Weinberg, 1976). This finding suggests that what appears to be a race-related effect may be more related to socioeconomic status, because a much higher percentage of African and Hispanic Americans than Caucasians and Asian Americans live in poverty. A follow-up of these children revealed that their IQs declined over a ten-year period (Weinberg, Scarr, & Waldman, 1992), which may mean that the effects of socioeconomic status are short-lived. Or it may mean that the negative effects (such as discrimination) of being a member of an ethnic minority group in a predominantly Caucasian community gradually counteract the effects of a changed environment.

TEST BIAS. One popular explanation for race differences in IQ is that the tests are biased against certain groups and in favor of others. Test bias has a specific meaning for psychologists, which differs from the popular use of the term. In scientific terms, a test isn't biased merely because some groups perform better on it than others. Psychologists don't regard a tape measure as biased because men obtain higher average scores than women when we use it to measure height; the tape measure is picking up on actual differences in height between men and women.

When psychologists refer to **test bias**, they mean that a test predicts outcomes—such as grades or occupational success—better in one group than in another (Anastasi & Urbina, 1996; Reynolds, 1999; Kaplan & Saccuzzo, 2008). Putting it a bit differently, a biased test means different things in one group than in another. Suppose that the correlation between IQ scores and college grade point average (GPA) in Caucasians is .7, as shown in **FIGURE 9.18a**, but only .25 for Asian Americans, as shown in **FIGURE 9.18b**. This finding implies that IQ is a better predictor of GPA in Caucasians than in Asian Americans. In this case, the IQ test is biased *against* Asian Americans, even though the average IQ scores for that group are higher than those of Caucasians. Thus, average differences between groups do *not* necessarily indicate test bias.

So are IQ tests racially biased? The answer isn't entirely resolved, but the answer seems to be "generally no" (Brody, 1992; Lilienfeld et al., 2010; Neisser et al., 1996). In almost all studies, researchers have found that the correlations between IQ tests and both academic and occupational achievement are about equal across races (Brown, Reynolds, & Whitaker, 1999; Gottfredson, 2009; Hunter, Schmidt, & Hunter, 1979). There may be a few exceptions on specific IQ test items (Aguinis, Culpepper, & Pierce, 2010), but they aren't sufficiently large or frequent to account for overall differences across races in IQ.

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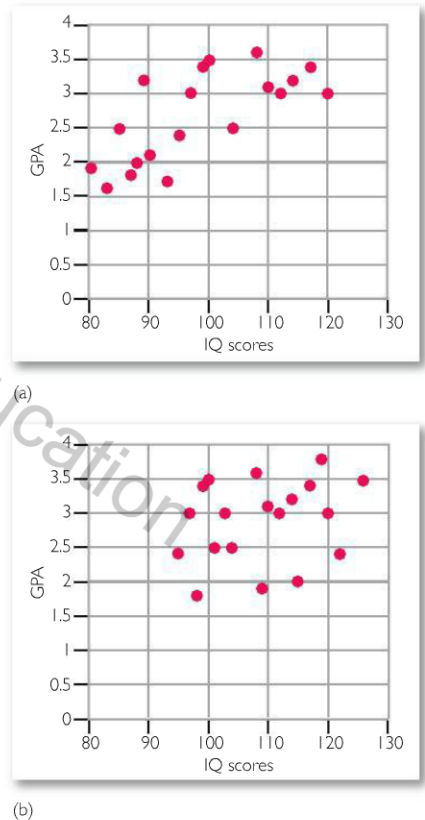


FIGURE 9.18 Two Scatterplots Representing Test Bias. These two scatterplots display a made-up example of test bias. In (a), IQ scores correlate highly with GPA for Caucasians (.7 correlation), whereas in (b), correlations between IQ scores and GPA are much lower for Asian Americans (.25). Even though Asian Americans display higher IQs on average in this example, the test is biased against them because it's a weaker predictor of GPA in that group.

test bias

tendency of a test to predict outcomes better in one group than another



? Research shows that in virtually every country ever studied, girls are better readers than boys (Halpern, 2004).

Does this finding show that tests of reading are biased against boys? Why or why not? (See answer upside down at left.)



Watch in **MyPsychLab** the **Video**: In the Real World: Intelligence Tests and Stereotypes



Research suggests that stereotype threat can lead African-American students to perform worse on tests on which they believe members of their race tend to do poorly.

stereotype threat

fear that we may confirm a negative group stereotype

The finding of little or no race bias in IQ tests leads to the conclusion that IQ differences among races go hand in hand with differences in average *achievement* among races. Unfortunately, in U.S. society, some races tend to do better in school and have higher-ranking and higher-paying jobs than other races do. According to some psychologists, the most likely explanation for this state of affairs is that *society* itself is biased, leading to differences in IQ test performance and to differences in grades and career achievement among races. For example, African Americans and Hispanic Americans may receive lower scores on IQ tests because of prejudice, inferior schooling, and other environmental disadvantages. These disadvantages, in turn, leave many African and Hispanic Americans less prepared to compete in higher education and the job market. Nevertheless, the finding that IQ tests are also equally correlated with reaction time measures across races suggests that this explanation may not tell the whole story, because these measures are unlikely to be affected by social disadvantage (Jensen, 1980).

STEREOTYPE THREAT. One other environmental factor that may affect how individuals perform and achieve is **stereotype threat**. Stereotype threat refers to the fear that we may confirm a negative group stereotype, such as a view of our group as being less intelligent or less athletic than other groups. Stereotype threat creates a self-fulfilling prophecy in which those who are anxious about confirming a negative stereotype actually increase their likelihood of doing so. According to psychologist Claude Steele, stereotype threat can impair individuals' performance on IQ tests and standardized tests like the SAT. Here's his reasoning: If we're members of a group that has a reputation for doing poorly on IQ tests, the mere thought that we're taking an IQ test will arouse stereotype threat. We think, "I'm supposed to do really badly on this test." This belief, Steele (1997) contends, can itself influence behavior, leading some people who would otherwise do well to display reduced performance.

Steele has shown that stereotype threat can indeed depress African Americans' IQ scores, at least in the laboratory. When researchers gave African Americans items from an IQ test but told them the items were measuring something other than IQ, like "the ability to solve puzzles," they performed better than when the researchers told them the items were measuring IQ (Nguyen & Ryan, 2008; Steele & Aronson, 1995; Walton & Spencer, 2009). Stereotype threat manipulations may cause African-American participants to become stressed, preoccupied, or overly self-conscious, thereby impeding their performance (Logel et al., 2009; Schmader, Johns, & Forbes, 2008). Also, giving African Americans and Caucasians an in-class writing assignment designed to boost their personal identity—by asking them to identify their most important personal value, such as their friends, their family, or their need to express themselves through art—reduced the racial gap in academic performance by 40 percent (Cohen et al., 2006). The meaning of these intriguing findings isn't clear. One possibility is that thinking about what's important to us, or focusing on ourselves as individuals rather than as members of a group, renders us less vulnerable to stereotype threat. Still, most of these findings come from the tightly controlled world of the psychological laboratory and therefore may be of limited external validity (see Chapter 2). So the extent to which stereotype threat findings generalize to the real world remains an active area of investigation and debate (Danaher & Crandall, 2008; Stricker & Ward, 2004).

Some researchers (McCarty, 2001) and writers in the popular media (Chandler, 1999) have gone so far as to suggest that racial differences between African Americans and Caucasians on IQ tests are due completely to stereotype threat and self-fulfilling prophecies (Brown & Day, 2006). Nevertheless, most studies suggest that the effects of stereotype threat aren't large enough to account fully for this gap (Sackett, Hardison, & Cullen, 2004).

Our discussion leads us to the conclusion that broader societal differences in resources, opportunities, attitudes, and experiences are probably responsible for much, if not all, of the racial differences in IQ. The encouraging news, however, is that nothing in the research literature implies that racial differences in IQ are unchangeable. If environmental disadvantages can contribute to IQ differences, eradicating the disadvantages may reduce or eliminate those differences.

two groups don't demonstrate bias.
Answer: No, because average differences on a test between

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Assess Your Knowledge

FACT or FICTION?

1. There are few or no sex differences on spatial tasks such as mental rotation. True / False
2. The IQ difference between African Americans and Caucasians is smaller than the IQ difference within each group. True / False
3. Within-group heritability necessarily implies between-group heritability. True / False
4. Average differences between groups on a test don't necessarily indicate that the test is biased. True / False
5. Stereotype threat may account for part of the IQ difference between African Americans and Caucasians. True / False

Answers: 1. F (p. 350); 2. T (p. 352); 3. F (p. 351); 4. T (p. 353); 5. T (p. 354)



Study and Review in MyPsychLab

The Rest of the Story: Other Dimensions of Intellect

9.11 Describe how creativity and emotional intelligence relate to intelligence.

9.12 Explain why intelligence doesn't protect us from errors in thinking.

IQ, IQ, and still more IQ. Pretty much everything we've discussed in this chapter presumes that IQ is a good measure of intelligence. Although there's compelling evidence that IQ tests are valid indicators of what psychologists call intelligence, it's clear that there's far more than high IQ to living our lives intelligently. Many people without sky-high IQs are wise and thoughtful citizens of society, and many people with sky-high IQs behave in foolish, even disastrous ways. If you have any doubt about the latter, just look at the string of high-profile political sex scandals over the past decade in which well-educated and highly intelligent people got caught red-handed doing remarkably dumb things. We'll conclude the chapter with a survey of other psychological variables that can make us act intelligently—and not so intelligently.

Creativity

By age 54, German composer Ludwig van Beethoven was almost completely deaf. Yet when he reached that age in 1824, he somehow managed to compose his monumental "Ninth Symphony," even though while conducting the orchestra performing its world premiere, he couldn't hear a note of it.

"Beethoven's Ninth," as musicologists call it, was astonishing in its originality and brilliance: It was unlike any piece of music ever written. As is often the case in response to works of music, art, and literature that break the mold, some critics condemned Beethoven's Ninth as being too abrasive, too reckless, and too "different" (Goulding, 1992). Yet today, many experts consider Beethoven's "Ninth Symphony" to be the greatest piece of music ever written.

Beethoven's music personifies creativity. But like former Supreme Court Justice Potter Stewart, who defined obscenity by saying, "I know it when I see it" (*Jacobellis v. Ohio*, 1964), psychologists have found creativity easier to identify than define. Nevertheless, most psychologists agree that creative accomplishments consist of two features: They are *novel* and *successful*. When we hear an exceptionally creative piece of music, like Beethoven's Ninth, or see an exceptionally creative painting, we nod our heads and say "Wow, that's amazing. He or she got it exactly right."

Psychologists often measure creativity using tests of **divergent thinking** (Guilford, 1967; Razoumnikova, 2000): the capacity to generate many different solutions to problems. For this reason, psychologists sometimes call it "outside-the-box" thinking. For example, in the "Uses for Objects" test, participants must generate as many uses for



Bernard Madoff, shown here after his arrest in 2009, swindled thousands of extremely intelligent and well-educated investors out of huge amounts of money—in some cases many millions of dollars each. Research shows that high levels of intelligence offer no guarantee against gullibility and uncritical thinking.

divergent thinking

capacity to generate many different solutions to a problem

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Frank Lloyd Wright's architectural masterpiece Fallingwater is a prime example of a remarkable creative achievement. It still stands proudly in rural Pennsylvania.

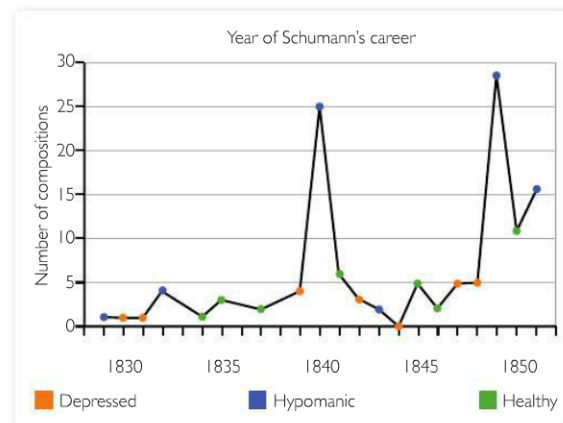


FIGURE 9.19 A Graph of Robert Schumann's Productivity. The German composer Robert Schumann almost certainly had bipolar disorder. As we can see, his productivity increased dramatically during "hypomanic" (mild manic) episodes and decreased dramatically during depressive episodes (which most people with bipolar disorder also experience; see Chapter 15). (Source: Based on data from Weisberg, 1994)

an ordinary object, like a paper clip or a brick, as they can (Hudson, 1967). It's likely, though, that tests of divergent thinking don't capture everything about creativity. To be creative, we also need to be good at **convergent thinking**: the capacity to find the single best answer to a problem (Bink & Marsh, 2000). As two-time Nobel Prize–winner Linus Pauling said, to be creative, we first need to come up with lots of ideas and then toss out all the bad ones.

We shouldn't confuse intelligence with creativity: Measures of these two capacities are only weakly or moderately associated, with correlations often in the .2 or .3 range (Furnham et al., 2006; Willerman, 1979). Many intelligent people aren't especially creative, and vice versa.

Highly creative people are an interesting lot. They tend to be bold and willing to take intellectual risks (Sternberg & Lubart, 1992). They also tend to be emotionally troubled while possessed of high self-esteem. Not surprisingly, they're not always the easiest folks to get along with (Barron, 1969; Cattell, 1971).

There's evidence of a link between creativity and *bipolar disorder*, about which we'll learn more in Chapter 15. People with bipolar disorder (once called manic depression) experience episodes of greatly elevated exuberance, energy, self-esteem, and risk taking (Furnham et al., 2008). They frequently report that thoughts race through their heads more quickly than they can speak them, and they can go for days without much sleep. During these dramatic bursts of heightened mood and activity (called manic episodes), individuals with bipolar disorder who have artistic talents may become especially productive. Nevertheless, there's not much evidence that their work increases in quality, only quantity (Weisberg, 1994).

Biographical evidence suggests that many great painters such as Vincent van Gogh, Paul Gauguin, and Jackson Pollack; great writers such as Emily Dickinson, Mark Twain, and Ernest Hemingway; and great composers such as Gustav Mahler, Peter Ilyich Tchaikovsky, and Robert Schumann probably suffered from bipolar disorder (Jamison, 1993; McDermott, 2001). More recently, actresses Carrie Fisher and Catherine Zeta-Jones, and singer Sinead O'Connor have spoken publicly about their struggles with the condition. Consistent with these anecdotal reports, studies show that highly creative individuals in artistic and literary professions have higher-than-expected levels of bipolar disorder and closely related conditions (Andreasen, 1987; Jamison, 1989; see **FIGURE 9.19**).

Because they're willing to take intellectual risks, creative people typically fall flat on their faces more often than do uncreative people. Even Beethoven composed one or two notable clunkers. Probably the best predictor of the *quality* of a person's creative accomplishments is the *quantity* of that person's output (Simonton, 1999). Extremely creative artists, musicians, and scientists produce far more stuff than other people. Some of it isn't especially good, but much of it is. And every once in a while, some of it is truly great.

Interests and Intellect

Research shows that people with different intellectual strengths tend to exhibit different personality traits and interest patterns (Ackerman & Beier, 2003). When we get to the level of specific mental abilities, we find that people with different intellectual strengths typically display different intellectual interests. People with high levels of scientific and mathematical ability tend to be especially interested in investigating the workings of nature and often describe themselves as enjoying the practical deeds of everyday life, like balancing check-books or fixing things around the house. People with high levels of verbal ability tend to be interested in art and music. And people who are poor at math and spatial ability tend to be especially interested in going into professions that involve helping others (Ackerman & Heggstad, 1997; Ackerman, Kanfer, & Goff, 2005). What we're good at—and not good at—tells us quite a bit about what we like to do.

convergent thinking

capacity to generate the single best solution to a problem

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Emotional Intelligence: Is EQ as Important as IQ?

Emotional intelligence—the ability to understand our emotions and those of others and to apply this information to our everyday lives (Goleman, 1995; Mayer, Salovey, & Caruso, 2008; Salovey & Mayer, 1990)—is one of the most active topics in popular psychology today. According to some researchers, emotional intelligence consists of several subcomponents, such as the capacity to understand and recognize one's emotions, to appreciate others' emotions, to control one's emotions, and to adapt one's emotions to diverse situations (Bar-On, 2004). Most proponents of emotional intelligence maintain that "EQ" (one's emotional quotient) is just as, if not more, important as IQ for functioning effectively in the world.

Some items on emotional intelligence tests ask participants to report how good they are at handling their emotions under stress. Others ask participants to identify which emotion a face is expressing. Still others ask participants to predict what emotion a person will experience in a given situation, like meeting future in-laws for the first time or being asked an embarrassing question during a job interview (see **FIGURE 9.20**). Many American companies now provide their employees and bosses with formal training for boosting their emotional intelligence (Locke, 2005). Among other things, EQ training seminars teach workers to "listen" to their emotions when making decisions, find better means of coping with stressful job situations, and express empathy to coworkers.

When Anne's friend Maggie was feeling depressed over a recent break-up with her boyfriend, Anne took several hours off from studying for a big test to drive to Maggie's apartment and comfort her. Two weeks later, Anne was upset over an argument with her sister, and phoned Maggie to talk about it. Maggie told Anne she was busy packing for an upcoming trip and asked if they could put off talking until the following week. Anne felt _____ (Select the best choice.)

- (a) sad (b) nervous (c) embarrassed (d) resentful (e) envious



FIGURE 9.20 Item Similar to That on a Test of Emotional Intelligence. How would you do on a test of emotional

intelligence? Try your hand at this item, modeled after items on actual emotional intelligence measures. The correct answer is upside down at the bottom of the page.

Few would dispute that these are helpful skills on the job. In addition, people with low emotional intelligence are prone to some psychological problems, like depression, substance abuse (Hertel, Schutz, & Lammers, 2009), and perhaps psychopathic personality, a condition characterized by dishonesty, lack of guilt, and self-centeredness (Ermer et al., 2012; see Chapter 15).

Still, the emotional intelligence concept has its critics. In particular, it's not clear that this concept offers much beyond personality (Matthews, Zeidner, & Roberts, 2002). Most measures of emotional intelligence assess personality traits, such as extraversion, agreeableness, and openness to experience, at least as much they do intelligence (Conte, 2005). Moreover, although advocates of emotional intelligence claim that this concept predicts job performance beyond general intelligence (Mayer, Roberts, & Barsade, 2008; O'Boyle et al., 2010), at least some research suggests otherwise (Van Rooy & Viswesvaran, 2004). Nor is there much evidence that different measures of emotional intelligence are highly correlated (Conte, 2005). The most parsimonious hypothesis is that emotional intelligence isn't anything new; instead, it's a mixture of personality traits that psychologists have studied for decades.

Wisdom

Being intelligent isn't the same as being wise. Indeed, measures of intelligence are only moderately correlated with measures of wisdom (Helson & Srivastava, 2002). Robert Sternberg (2002) defined **wisdom** as the application of intelligence toward a common good. Wise people have learned to achieve a delicate balance among three often-competing interests: (1) concerns about oneself (self-interest), (2) concerns about others,

◀ OCCAM'S RAZOR

Does a simpler explanation fit the data just as well?

emotional intelligence

ability to understand our own emotions and those of others and to apply this information to our daily lives

wisdom

application of intelligence toward a common good

and (3) concerns about the broader society. Wise persons channel their intelligence into avenues that benefit others. To accomplish this end, they come to appreciate alternative points of view, even as they may disagree with them. To a substantial extent, wisdom is marked by an awareness of our biases and cognitive fallibilities (Meacham, 1990). In these respects, we can think of wise people as good scientific thinkers in everyday life (Lilienfeld, Ammirati, & Landfield, 2009). Wisdom sometimes, but by no means always, comes with age (Erikson, 1968).

Many modern scholars would agree that Tenzin Gyatso, the current Dalai Lama, exemplifies wisdom. Despite arguing forcefully for Tibet's independence from China, he has consistently advocated for nonviolence and a willingness to engage in constructive dialogue with his opponents.

from inquiry to understanding

WHY SMART PEOPLE BELIEVE STRANGE THINGS

We might assume that people with high IQs would be immune to weird ideas; if so, we'd be wrong. Data reveal that people with high IQs are at least as prone as other people to beliefs in conspiracy theories, such as the belief that President Kennedy's assassination was the result of a coordinated plot within the U.S. government (Goertzel, 1994) or that the administration of president George W. Bush orchestrated the September 11 attacks (Molé, 2006). Moreover, the history of science is replete with examples of brilliant individuals holding strange beliefs. Two-time Nobel Prize-winning chemist Linus Pauling, whom we encountered when discussing creativity, insisted that high levels of vitamin C could cure cancer, despite overwhelming evidence to the contrary.

As psychologist Keith Stanovich (2009) has shown, although IQ tests do a good job of assessing how efficiently we process information, they don't assess the ability to think scientifically. For example, measures of confirmation bias, like the Wason selection task (see Chapter 2), are barely correlated with IQ (Stanovich & West, 2008). So high levels of intelligence afford no guarantee against beliefs for which there's scant evidence (Hyman, 2002). Recent research also indicates that people with high IQs are just as prone to bias blind spot as are people with low IQs (West, Meserve, & Stanovich, 2012); as we'll recall from Chapter 1, bias blind spot (the "not me fallacy") is the tendency to believe that we're immune to biases, like confirmation bias and hindsight bias (see Chapter 8), that afflict everyone else.

In many cases, smart people embrace odd beliefs because they're adept at finding plausible-sounding reasons to bolster their opinions (Shermer, 2002). IQ is correlated positively with the ability to defend our positions effectively, but correlated negatively with the ability to consider alternative positions (Perkins, 1981). High IQ may also be related to the strength of the **ideological immune system**: our defenses against evidence that contradicts our views (Shermer, 2002; Snelson, 1993). We've all felt our ideological immune systems kicking into high gear when a friend challenges our political beliefs (say, about capital punishment) with evidence we'd prefer not to hear. First, we feel defensive, and then we frantically search our mental knowledge banks to find arguments that could refute our friend's irksome evidence. Our knack for defending our positions against competing viewpoints can sometimes lead to confirmation bias, blinding us to information we should take seriously.

Robert Sternberg (2002) suggested that because people with high IQs tend to know many things, they're especially vulnerable to the sense that they know much more than



One of the photographs from the famous Cottingley fairies hoax that took in writer Arthur Conan Doyle. Even extremely intelligent people can be fooled by fake claims.

ideological immune system

our psychological defenses against evidence that contradicts our views

they do. Take the brilliant writer Sir Arthur Conan Doyle, who invented the character Sherlock Holmes. Conan Doyle, was a devoted believer in the paranormal who was taken in by an embarrassingly obvious prank (Hines, 2003). In the 1917 "Cottingley fairies" hoax, two young British girls insisted that they'd photographed themselves along with dancing fairies. Brushing aside the criticisms of doubters, Conan Doyle wrote a book about the Cottingley fairies and defended the girls against accusations of trickery. He'd forgotten the basic principle that extraordinary claims require extraordinary evidence. The girls eventually confessed to doctoring the photographs after someone discovered they'd cut the fairies out of a book (Randi, 1982). Conan Doyle, who had a remarkably sharp mind, may have assumed that he couldn't be duped.

The message here is that none of us is immune from errors in thinking. When intelligent people neglect the safeguards afforded by the scientific method, they'll often be fooled.

◀ EXTRAORDINARY CLAIMS

Is the evidence as strong as the claim?

Assess Your Knowledge

FACT or FICTION?

1. Intelligence and creativity are highly correlated. True / False
2. The work of highly creative people is almost always high in quality. True / False
3. Emotional intelligence and personality aren't entirely independent. True / False
4. People with high IQs are almost always better at considering alternative points of view than are people with low IQs. True / False

Answers: 1. F (p. 355); 2. F (p. 356); 3. T (p. 357); 4. F (p. 358)



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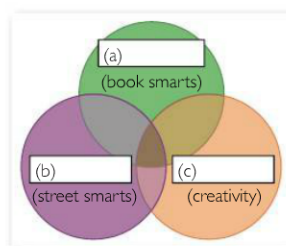
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What Is Intelligence? Definitional Confusion 322–330

9.1 IDENTIFY DIFFERENT MODELS AND TYPES OF INTELLIGENCE.

Sir Francis Galton proposed that intelligence stems from sensory capacity. Binet and Simon, who developed the first intelligence test, argued that intelligence consists of higher mental processes such as reasoning, understanding, and judgment. Spearman observed that tests of mental ability tend to be positively correlated. To explain this pattern, he invoked the existence of *g*, or general intelligence, but also posited the existence of *s*, or specific factors unique to particular mental tasks. Some psychologists have argued for the existence of multiple intelligences. According to them, there are different ways of being smart. Nevertheless, it's not clear whether these proposed intelligences are independent of each other or of a more general intelligence factor.

1. According to Galton's conception of intelligence, someone who has excellent eyesight and hearing would also have (high/low) intelligence. (p. 323)
2. Binet and Simon developed what is considered to be the first _____, which served as a model for many intelligence researchers who followed in their footsteps. (p. 323)
3. In trying to define intelligence, early twentieth-century researchers agreed that it was related to _____. (p. 323)
4. The theory of _____, developed by Charles Spearman, which accounted for the differences in intellect among people, could be explained by a single common factor. (p. 324)
5. According to Spearman, someone's intelligence is dependent not only on his or her general intelligence, or *g*, but also on his or her _____ or _____. (p. 325)
6. When driving a vehicle you've never driven, you're relying on your capacity for _____, but when you answer a question on a history test, you're relying on your capacity for _____. (p. 325)
7. According to Gardner's model of multiple intelligences, there are many different types of intelligence, which he refers to as _____. (p. 326)
8. Identify the three kinds of intelligence in Sternberg's Triarchic Model of Intelligence. (p. 327)

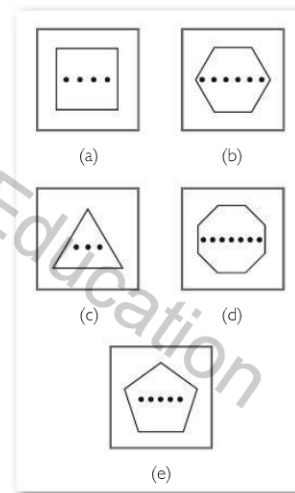


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9.2 DESCRIBE THE CONNECTION BETWEEN INTELLIGENCE AND BRAIN SIZE AND EFFICIENCY.

Brain size and intelligence are moderately positively correlated in humans. Some evidence suggests that people with high levels of intelligence possess especially efficient brains. Intelligence also seems related to faster reaction times, as well as working memory capacity, and probably stems in part from the activity of the prefrontal cortex.

9. Haier's study of college students who played the video game Tetris indicated that the brains of the more intelligent students were especially _____ at mental processing. (p. 329)
10. Which of these images displays a different pattern than the others? What underlying abilities might be required to enable someone to answer this *g*-loaded question correctly? (p. 329)



Intelligence Testing: The Good, the Bad, and the Ugly 331–341

9.3 DETERMINE HOW PSYCHOLOGISTS CALCULATE IQ.

Stern defined the intelligence quotient (IQ) as mental age divided by chronological age, with the result multiplied by 100. This simple formula becomes problematic in adolescence and adulthood, because mental age tends to level out at around age 16. As a consequence, most modern intelligence tests define IQ in terms of deviation IQ.

11. Using Wilhelm Stern's IQ formula, complete the equation and calculate IQ for the example provided. Then explain the flaw in this formula when applying it to two adults with a mental age of 18, the first an 18-year-old and the second a 35-year-old. (p. 331)

$$\frac{8}{\text{(mental age)}} \div \frac{10}{\text{(chronological age)}} = \frac{\quad}{\text{(total)}} \times \frac{\quad}{\quad} = \frac{\quad}{\text{(IQ)}}$$

12. When computing IQ, modern researchers rely on a statistic called _____. (p. 332)

9.4 EXPLAIN THE HISTORY OF MISUSE OF INTELLIGENCE TESTS IN THE UNITED STATES.

Eugenics was the effort to improve a population's "genetic stock" by encouraging people with "good genes" to reproduce, by discouraging people with "bad genes" from reproducing, or both. IQ tests became an important tool of the eugenics movement, because many proponents of eugenics wanted to minimize the reproduction and immigration of individuals with low IQs. In part because of eugenics, many people today view IQ tests with skepticism.

13. _____ is one of the extremely disturbing practices that came about as a result of the eugenics movement. (p. 332)

9.5 DESCRIBE TESTS OF INTELLIGENCE USED TODAY AND EVALUATE THE RELIABILITY AND VALIDITY OF IQ SCORES.

Psychologists have developed IQ tests for both adults, such as the WAIS-IV, and children, such as the WISC-IV. IQ scores are reasonably stable in adulthood, although they aren't especially stable in infancy or early childhood. IQ tests predict a variety of important real-world outcomes, including job performance and physical health.

14. Psychologists have developed many different adult IQ tests, but the most commonly used is the _____. (p. 333)
15. Apply your knowledge of the WAIS by viewing each visual example and identifying its corresponding test and description. (p. 334)

Test	Description	Example
(a) _____		Shown:  Fill in: 
(b) _____		Tell me what is missing: 
(c) _____		Assemble blocks to match this design: 

16. The _____ of IQ tests indicates whether these tests accurately measure what they purport to measure. (p. 338)

9.6 DISTINGUISH THE UNIQUE CHARACTERISTICS OF MENTAL RETARDATION AND GENIUS.

There are four categories of mental retardation: mild, moderate, severe, and profound. At least 85 percent of individuals with mental retardation fall into the mild category. Terman's study of gifted schoolchildren helped to debunk widespread ideas that child prodigies "burn out" in adulthood and that genius often leads to insanity.

17. Three criteria define mental retardation: (1) onset prior to adulthood, (2) IQ below approximately _____, and (3) inadequate adaptive functioning. (p. 339)
18. About 1 percent of persons in the United States, most of them (females/males), fulfill the criteria for mental retardation. (p. 340)

19. _____ is an organization whose members score in the top _____ percent of the IQ range. (p. 340)
20. The results of Lewis Terman's classic studies of intellectually gifted individuals disputed the popular notion that there's an intimate link between genius and _____. (p. 341)

Genetic and Environmental Influences on IQ 342–348

9.7 EXPLAIN HOW GENETIC INFLUENCES CAN BE DETERMINED FROM FAMILY, TWIN, AND ADOPTION STUDIES.

Twin and adoption studies suggest that at least some of the tendency for IQ to run in families is genetically influenced, although these studies also offer convincing evidence of environmental effects on IQ. The heritability of IQ appears to be relatively low, however, among extremely poor individuals, perhaps reflecting the adverse effects of environmental deprivation on the expression of genetic potential.

21. Galton conducted one of the first _____ of intelligence to determine whether intellectual brilliance runs in families. (p. 342)
22. Twin studies tell us that IQ is influenced by both _____ and _____ factors. (p. 342)
23. _____ studies are a way for researchers to separate environmental effects from genetic effects on IQ and other psychological traits. (p. 343)
24. If a child from a deprived environment is adopted into an enriched family environment, we would expect this child's IQ to (increase/decrease/stay the same). (p. 343)

9.8 IDENTIFY POTENTIAL ENVIRONMENTAL INFLUENCES ON IQ.

Schooling is related to high IQ scores. Research suggests that both poverty and nutrition are causally related to IQ, although disentangling the effects of nutrition from other factors, such as social class, is challenging.

25. Environmental influences on intelligence can be divided into two types: the _____ environment, such as school and parents, and the _____ environment, such as nutrition and exposure to toxins. (p. 344)
26. What effect, according to Ceci, does summer vacation have on a child's IQ, and what does this finding suggest about the factors contributing to performance on IQ tests? (p. 345)



27. According to studies like Rosenthal and Jacobson's, if a teacher thinks a student has obtained a high IQ score, that teacher will give (more/less) attention to that student. This finding is related to the _____ effect. (p. 345)