

Is Intelligence One General Ability or Several Specific Abilities?

Intelligence and Creativity

Emotional Intelligence

Is Intelligence Neurologically Measurable?

## MODULE 33

# Introduction to Intelligence

School boards, courts, and scientists debate the use and fairness of tests that attempt to assess people's mental abilities and assign them a score. Is intelligence testing a constructive way to guide people toward suitable opportunities? Or is it a potent, discriminatory weapon camouflaged as science? First, some basic questions:

- ▶ What is intelligence?
- ▶ How can we best assess it?
- ▶ To what extent does it result from heredity rather than environment?
- ▶ What do test score differences among individuals and groups really mean? Should we use such differences to rank people, to admit them to colleges or universities, to hire them?

Psychologists debate: Should we consider intelligence as one aptitude or many? As linked to cognitive speed? As neurologically measurable? Yet, intelligence experts do agree on this: Although people have differing abilities, intelligence is a concept and not a "thing." When we refer to someone's "IQ" (short for *intelligence quotient*) as if it were a fixed and objectively real trait like height, we commit a reasoning error called *reification*—viewing an abstract, immaterial concept as if it were a concrete thing. To reify is to invent a concept, give it a name, and then convince ourselves that such a thing objectively exists in the world. When someone says, "She has an IQ of 120," they are reifying IQ; they are imagining IQ to be a thing this person *has*, rather than a score she once obtained on a particular **intelligence test**. Better to say, "She scored 120 on the intelligence test."

Intelligence is a socially constructed concept: Cultures deem "intelligent" whatever attributes enable success in those cultures (Sternberg & Kaufman, 1998). In the Amazon rain forest, intelligence may be understanding the medicinal qualities of local plants; in an Ontario high school, it may be superior performance on cognitive tasks. In each context, **intelligence** is the ability to learn from experience, solve problems, and use knowledge to adapt to new situations. In research studies, *intelligence* is what intelligence tests measure. Historically, as we will see, that has been the sort of problem solving displayed as "school smarts."

**Hands-on healing** The socially constructed concept of intelligence varies from culture to culture. This folk healer in Peru displays his intelligence in his knowledge about his medicinal plants and understanding of the needs of the people he is helping.



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|| *New York Times* interviewer Deborah Solomon, 2004: "What is your IQ?" Physicist Stephen Hawking: "I have no idea. People who boast about their IQ are losers." ||

**intelligence test** a method for assessing an individual's mental aptitudes and comparing them with those of others, using numerical scores.

**intelligence** mental quality consisting of the ability to learn from experience, solve problems, and use knowledge to adapt to new situations.

## ► Is Intelligence One General Ability or Several Specific Abilities?

**33-1** What arguments support intelligence as one general mental ability, and what arguments support the idea of multiple distinct abilities?

You probably know some people with talents in science, others who excel at the humanities, and still others gifted in athletics, art, music, or dance. You may also know a talented artist who is dumbfounded by the simplest mathematical problems, or a brilliant math student with little aptitude for literary discussion. Are all of these people intelligent? Could you rate their intelligence on a single scale? Or would you need several different scales?

Charles Spearman (1863–1945) believed we have one **general intelligence** (often shortened to **g**). He granted that people often have special abilities that stand out. Spearman had helped develop **factor analysis**, a statistical procedure that identifies clusters of related items. He had noted that those who score high in one area, such as verbal intelligence, typically score higher than average in other areas, such as spatial or reasoning ability. Spearman believed a common skill set, the *g* factor, underlies all of our intelligent behavior, from navigating the sea to excelling in school.

This idea of a general mental capacity expressed by a single intelligence score was controversial in Spearman's day, and it remains so in our own. One of Spearman's early opponents was L. L. Thurstone (1887–1955). Thurstone gave 56 different tests to people and mathematically identified seven clusters of primary mental abilities (word fluency, verbal comprehension, spatial ability, perceptual speed, numerical ability, inductive reasoning, and memory). Thurstone did not rank people on a single scale of general aptitude. But when other investigators studied the profiles of the people Thurstone had tested, they detected a persistent tendency: Those who excelled in one of the seven clusters generally scored well on the others. So, the investigators concluded, there was still some evidence of a *g* factor.

We might, then, liken mental abilities to physical abilities. Athleticism is not one thing but many. The ability to run fast is distinct from the strength needed for power lifting, which is distinct from the eye-hand coordination required to throw a ball on target. A champion weightlifter rarely has the potential to be a skilled ice skater. Yet there remains some tendency for good things to come packaged together—for running speed and throwing accuracy to correlate, thanks to general athletic ability. So, too, with intelligence. Several distinct abilities tend to cluster together and to correlate enough to define a small general intelligence factor.

Satoshi Kanazawa (2004) argues that general intelligence evolved as a form of intelligence that helps people solve *novel* problems—how to stop a fire from spreading, how to find food during a drought, how to reunite with one's band on the other side of a flooded river. More common problems—such as how to mate or how to read a stranger's face or how to find your way back to camp—require a different sort of intelligence. Kanazawa asserts that general intelligence scores *do* correlate with the ability to solve various novel problems (like those found in academic and many vocational situations) but do not much correlate with individuals' skills in *evolutionarily familiar* situations—such as marrying and parenting, forming close friendships, displaying social competence, and navigating without maps.

## Theories of Multiple Intelligences

**33-2** How do Gardner's and Sternberg's theories of multiple intelligences differ?

Since the mid-1980s some psychologists have sought to extend the definition of *intelligence* beyond Spearman's and Thurstone's academic smarts. They acknowledge that people who score well on one sort of cognitive test have some tendency to score well

*“g is one of the most reliable and valid measures in the behavioral domain . . . and it predicts important social outcomes such as educational and occupational levels far better than any other trait.”*

Behavior geneticist Robert Plomin (1999)

**general intelligence (*g*)** a general intelligence factor that, according to Spearman and others, underlies specific mental abilities and is therefore measured by every task on an intelligence test.

**factor analysis** a statistical procedure that identifies clusters of related items (called *factors*) on a test; used to identify different dimensions of performance that underlie a person's total score.

**savant syndrome** a condition in which a person otherwise limited in mental ability has an exceptional specific skill, such as in computation or drawing.

on another. But maybe this occurs not because they express an underlying general intelligence but rather because, over time, different abilities interact and feed one another, rather as a speedy runner's throwing ability improves after being engaged in sports that develop both running and throwing abilities (van der Maas et al., 2006).

### Gardner's Eight Intelligences

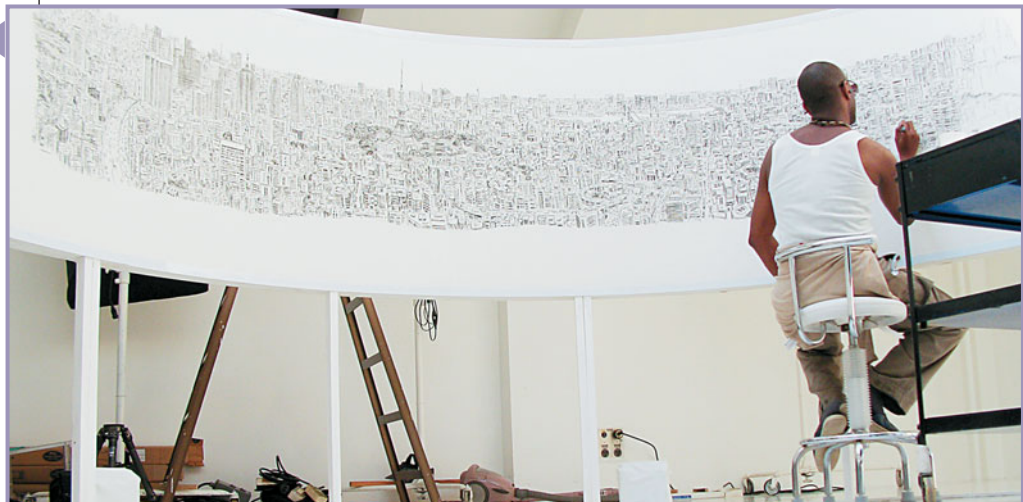
Howard Gardner (1983, 2006) views intelligence as multiple abilities that come in packages. Gardner finds evidence for this view in studies of people with diminished or exceptional abilities. Brain damage, for example, may destroy one ability but leave others intact. And consider people with **savant syndrome**, who often score low on intelligence tests but have an island of brilliance (Treffert & Wallace, 2002). Some have virtually no language ability, yet are able to compute numbers as quickly and accurately as an electronic calculator, or identify almost instantly the day of the week that corresponds to any given date in history, or render incredible works of art or musical performances (Miller, 1999). About 4 in 5 people with savant syndrome are males, and many also have autism, a developmental disorder.

Memory whiz Kim Peek, a savant who does not have autism, was the inspiration for the movie *Rain Man*. In 8 to 10 seconds, he can read and remember a page, and he has learned 9000 books, including Shakespeare and the Bible, by heart. He learns maps from the front of phone books, and he can provide MapQuest-like travel directions within any major U.S. city. Yet he cannot button his clothes. And he has little capacity for abstract concepts. Asked by his father at a restaurant to "lower your voice," he slid lower in his chair to lower his voice box. Asked for Lincoln's Gettysburg Address, he responded, "227 North West Front Street. But he only stayed there one night—he gave the speech the next day" (Treffert & Christensen, 2005).

Using such evidence, Gardner argues that we do not have *an* intelligence, but rather *multiple intelligences*. He identifies a total of eight (TABLE 33.1), including the verbal and mathematical aptitudes assessed by standard tests. Thus, the computer programmer, the poet, the street-smart adolescent who becomes a crafty executive, and the basketball team's point guard exhibit different kinds of intelligence (Gardner, 1998). He notes,

If a person is strong (or weak) in telling stories, solving mathematical proofs, navigating around unfamiliar terrain, learning an unfamiliar song, mastering a new game that entails dexterity, understanding others, or understanding himself, one simply does not know whether comparable strengths (or weaknesses) will be found in other areas.

**Islands of genius: Savant syndrome** After a 30-minute helicopter ride and a visit to the top of a skyscraper, British savant artist Stephen Wiltshire began seven days of drawing that reproduced the Tokyo skyline.



© The Stephen Wiltshire Gallery



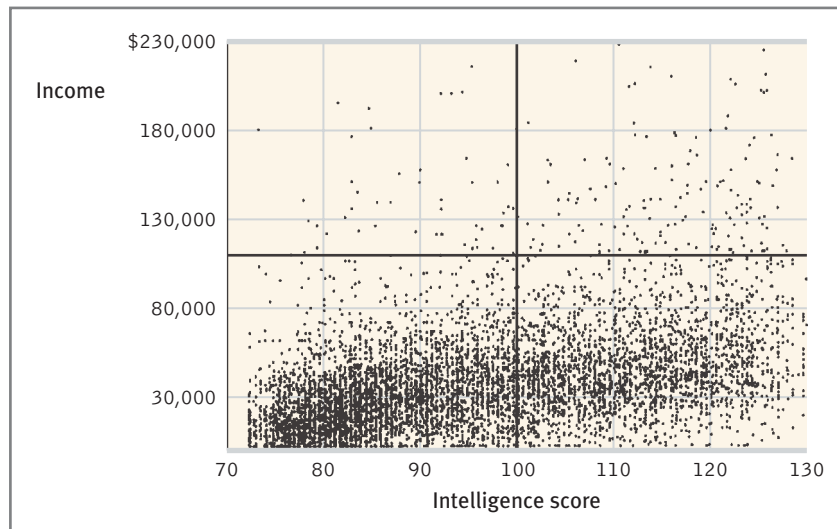
A general intelligence score is therefore like the overall rating of a city—which tells you something but doesn’t give you much specific information about its schools, streets, or nightlife.

Wouldn’t it be wonderful if the world were so just, responds intelligence researcher Sandra Scarr (1989). Wouldn’t it be nice if being weak in one area would be compensated by genius in some other area? Alas, the world is not just. General intelligence scores predict performance on various complex tasks, in various jobs, and in varied countries; *g* matters (Bertua et al., 2005; Gottfredson, 2002a,b, 2003a,b; Rindermann, 2007). In two digests of more than 100 data sets, academic intelligence scores that predicted graduate school success also predicted later job success (Kuncel et al., 2004; Strenze, 2007; see also **FIGURE 33.1**).

**TABLE 33.1 Gardner’s Eight Intelligences**

Aptitude	Exemplar
1. Linguistic	T. S. Eliot, poet
2. Logical-mathematical	Albert Einstein, scientist
3. Musical	Igor Stravinsky, composer
4. Spatial	Pablo Picasso, artist
5. Bodily-kinesthetic	Martha Graham, dancer
6. Intrapersonal (self)	Sigmund Freud, psychiatrist
7. Interpersonal (other people)	Mahatma Gandhi, leader
8. Naturalist	Charles Darwin, naturalist

|| Gardner (1998) has also speculated about a ninth possible intelligence—*existential intelligence*—the ability “to ponder large questions about life, death, existence.” ||



**FIGURE 33.1 Smart and rich?** Jay Zagorsky (2007) tracked 7403 participants in the U.S. National Longitudinal Survey of Youth across 25 years. As shown in this scatterplot, their intelligence scores correlated +.30, a moderate positive correlation, with their later income.

Even so, “success” is not a one-ingredient recipe. High intelligence may help you get into a profession (via the schools and training programs that take you there), but it won’t make you successful once there. The recipe for success combines talent with *grit*: Those who become highly successful are also conscientious, well-connected, and doggedly energetic. Anders Ericsson (2002, 2007; Ericsson et al., 2007) reports a *10-year rule*: A common ingredient of expert performance in chess, dancing, sports, computer programming, music, and medicine is “about 10 years of intense, daily practice.”



#### **Spatial intelligence genius**

In 1998, World Checkers Champion Ron “Suki” King of Barbados set a new record by simultaneously playing 385 players in 3 hours and 44 minutes. Thus, while his opponents often had hours to plot their game moves, King could only devote about 35 seconds to each game. Yet he still managed to win all 385 games!