

1997). The researchers found that teachers referred African American children for developmental handicap assessment at rates significantly higher than the rates of Caucasian students in their classrooms. In addition, boys were referred in equally disproportionate numbers over girls for problems of classroom and playground behavior problems. The researchers suggested that the differences among the various student groups may have revealed more about teachers' expectancies than real individual differences.

It should be noted that researchers in the fields of psychology and education are actively studying new ways of conceptualizing and measuring children's intellectual abilities. Several leading researchers have proposed methods of testing that focus on current theories of how the human brain works, and that go far beyond the old, limited idea of a single, general intelligence score expressed as IQ (see Benson, 2003). One of these modern approaches is Robert Sternberg's Triarchic Abilities Test (1993), which is designed to measure three distinct aspects of intellectual ability: analytic intelligence, practical intelligence, and creative intelligence. Another leading researcher in the field of intelligence is Howard Gardner, who, in the early 1980s, developed his theory of multiple intelligences, which continues today to exert a powerful influence over the study and measurement of intelligence. As you will discover in the next reading, Gardner's theory contends that we have not one, or three, but eight (and, perhaps nine or more!) *separate* intelligences, and each of us has differing amounts of each one (Gardner, 2006).

- Andrews, T., Wisniewski, J., & Mulick, J. (1997). Variables influencing teachers' decisions to refer children for school psychological assessment services. *Psychology in Schools*, 34(3), 239–244.
- Benson, E. (2003). Intelligent intelligence-testing: Psychologists are broadening the concept of intelligence and how to test it [Electronic version]. *Monitor on Psychology*, 34(2), 48.
- Chaiken, A., Sigler, E., & Derlega, V. (1974). Nonverbal mediators of teacher expectancy effects. *Journal of Personality and Social Psychology*, 30, 144–149.
- Gardner, H. (2006). *Multiple intelligences: New horizons*. Jackson, TN: Perseus Books Group.
- Pfungst, O. (1911). *Clever Hans (the horse of Mr. von Osten): A contribution to experimental, animal, and human psychology*. New York: Holt, Rinehart and Winston.
- Rosenthal, R. (2002). Covert communication in classrooms, clinics, courtrooms, and cubicles. *American Psychologist*, 57, 839–849.
- Rosenthal, R., & Fode, K. (1963). The effect of experimenter bias on the performance of the albino rat. *Behavioral Science*, 8, 183–189.
- Rosenthal, R., & Jacobson, L. (1968). *Pygmalion in the classroom: Teacher expectations and pupils' intellectual development*. New York: Holt, Rinehart and Winston.
- Sternberg, R. J. (1993). *Sternberg Triarchic Abilities Test*. Unpublished test, Yale University.

Reading 14: JUST HOW ARE YOU INTELLIGENT?

Gardner, H. (1983) *Frames of mind: The theory of multiple intelligences*.
New York: Basic Books.

The heading for this chapter is an intentional play on words. The usual form of the question “Just how intelligent *are* you?” implies that you have a certain amount of intelligence. The question here, “Just *how* are you intelligent?” is unrelated to *amount* of overall intelligence and asks instead about the nature

of your particular *type* of intelligence. This implies, of course that people are not simply more or less intelligent but that each of us possesses a unique combination of various forms of intellectual abilities.

Many, if not most, of you probably have taken at least one intelligence test in your life (even if you don't remember it), and some of you may have taken several. For the most part, intelligence tests developed over the past hundred years have been designed to produce a single score. That score was called your *Intelligence Quotient* (IQ). If tests of intelligence are designed to produce a single score, a person's intelligence must also be conceptualized as a single, *general* mental ability. That is exactly how intelligence was interpreted throughout most of the 20th century. In fact, intelligence was often referred to as *g* for this general mental ability. People's IQ score, their *g*, was used widely to place, judge, categorize, and describe people in various life settings, including school, the workplace, and the military.

In the 1970s and 1980s, researchers began to question the validity of the unitary, *g*-theory approach to human intelligence. Many of the IQ tests themselves were shown to be biased toward certain economic classes and cultural groups. Moreover, children's educational opportunities were often dictated by their scores on these biased and potentially invalid scores (see the work of Robert Rosenthal in Reading 13 for an example of the dangers of this bias).

As criticisms of the early conceptualization of intelligence grew in number and influence, IQ tests began fade. At the same time, a new, and at the time radically different, view of intelligence was making its way into scientific and popular thinking about how our minds work. In stark contrast to the notion of a single, generalized intelligence, this emerging approach expanded the notion of intelligence into many *different* mental abilities, each possessing in itself the characteristics of a complete, “free-standing” intelligence. Howard Gardner, at Harvard University, introduced to the world this new view of *multiple intelligences* in his 1983 book *Frames of Mind*, which forms the basis of this chapter.

THEORETICAL PROPOSITIONS

Gardner's theory of multiple intelligences (*MI Theory*) was based on much more than simply observing the various, diverse mental skills people can demonstrate. His ideas stem from his research on the structure of the brain itself. Prior to launching his work on intelligence per se, Gardner had spent most of his career studying the biology and functioning of the brain. Gardner expanded on previous research that demonstrated that the human brain is not only diverse in its abilities but also extremely specialized in its functioning. In other words, different regions of your brain have evolved to carry out specific tasks related to thinking and knowing. This brain specialization may be demonstrated by observing, as Gardner has done, exactly what abilities are lost or diminished when a person experiences damage to a particular region of the brain. For example, language abilities reside in most people primarily in one section of the brain's left hemisphere, vision is centered in the occipital cortex at the rear of the brain, and one specific brain structure located at

the base of the visual cortex is responsible for your ability to recognize and discriminate among human faces (see Reading 1 on Michael Gazzaniga's split-brain research for more about brain specialization).

Carrying the theory of brain specialization a step further, Gardner contends that different parts of the human brain are responsible for different aspects of intelligence or, more correctly, different intelligences altogether. To defend scientifically his theory of multiple intelligences, Gardner drew upon evidence from many sources and developed criteria for defining a certain set of abilities as a unique intelligence. Gardner described his sources of data as follows:

In formulating my brief on multiple intelligences, I have reviewed evidence from a large and hitherto unrelated group of sources: studies of prodigies, gifted individuals, brain-damaged patients, *idiot-savants* [a rare form of mental retardation or autism accompanied by extraordinary talent or ability in one or two mental areas], normal children, normal adults, experts in different lines of work, and individuals from diverse cultures. (p. 9)

METHOD

Incorporating information from all these sources, Gardner then developed a set of eight indicators or "signs" that define an intelligence. Any intellectual ability, or set of abilities, must map onto most of these criteria, if it is to be considered a separate, autonomous intelligence:

1. *Potential isolation of the intelligence by brain damage.* Gardner contended that if a specific mental ability can be destroyed through brain damage (such as injury or stroke), or if it remains relatively intact when other abilities have been destroyed, this provides convincing evidence that the ability may be a separate intelligence unto itself.
2. *The existence of savants, prodigies, and other exceptional individuals relating to the intelligence.* You may be aware that certain individuals possess an extreme level of intellectual skill in one particular ability. Some mentally retarded and autistic people demonstrate "strokes of genius," and some people with normal intelligence are *prodigies*, with abilities far beyond others of their age or experience. Gardner believes that the exceptional skills of these individuals lend significant support for considering an ability as a separate intelligence.
3. *A clear set of information-processing (thinking) operations linked to the intelligence.* This refers to mental abilities that are specific to the ability under consideration. To qualify as an intelligence, an ability must involve a specific set of mental processes, which Gardner calls *core operations*, that exist in specific areas of the brain and are triggered by certain kinds of information. Table 14-1 lists the core operations for the various intelligences proposed by Gardner.
4. *A distinctive developmental history of the intelligence and the potential to reach high levels of expertise.* Gardner believes that an intelligence must include

TABLE 14-1 Core Operations and Well-Known Individual Examples of Gardner's Eight Intelligences

INTELLIGENCE	CORE OPERATIONS	FAMOUS EXAMPLES
Linguistic	Syntax (word phrasing), phonology (the sounds of speech), semantics (the meaning of words), pragmatics (word usage)	Shakespeare, J. K. Rowling, Dr. Seuss, Woody Allen
Musical	Pitch (frequency of sounds), rhythm, timbre (quality of sounds)	Mozart, Gwen Stefani, Andrea Bocelli, Paul Simon
Logical-mathematical	Numbers, quantities, categorization, causal relations	Albert Einstein, Carl Sagan, Marie Curie, B. F. Skinner
Spatial	Accurate visualization, mental rotation and transformation of images	Picasso, Frank Lloyd Wright, Leonardo da Vinci, Vincent van Gogh
Bodily-kinesthetic	Control of one's own body, control in handling objects	Charlie Chaplin, LeBron James, Serena Williams and Venus Williams
Interpersonal	Awareness of others' feelings, emotions, goals, motivations	Mohandas Gandhi, Abraham Maslow, Oprah Winfrey
Intrapersonal	Awareness of one's own feelings, emotions, goals, motivations	Plato, Hermann Rorschach, Helen Keller
Naturalist	Recognition and classification of objects in the environment; sensitivity to the natural world	Charles Darwin, Jane Goodall, Rachel Carson
Existential*	Ability to engage in transcendental concerns, such as the fundamentals of human existence, the significance of life, and the meaning of death	Elie Wiesel, Martin Luther King, Jr., Carl Rogers, Elizabeth Kübler-Ross

*proposed

a developmental path that starts with simple and basic steps and progresses through incremental milestones of increased skill levels.

5. *Evidence that the intelligence has developed through evolutionary time.* Human intelligence has evolved over millions of years as one of many adaptive mechanisms that have allowed us to survive as a species. If a particular set of abilities is to be defined as an intelligence, Gardner believes the skills involved should show evidence of evolutionary development, based on cross-cultural research and observations of similar types of abilities in nonhuman animals (such as the "mental maps" in the rats in Tolman's research discussed in Reading 15.).
6. *Ability to study the intelligence with psychological experiments.* Gardner maintains that any ability proposed as an intelligence be confirmed using solid experimental techniques to be considered an intelligence. An example of this might be an experiment to determine a person's speed and accuracy

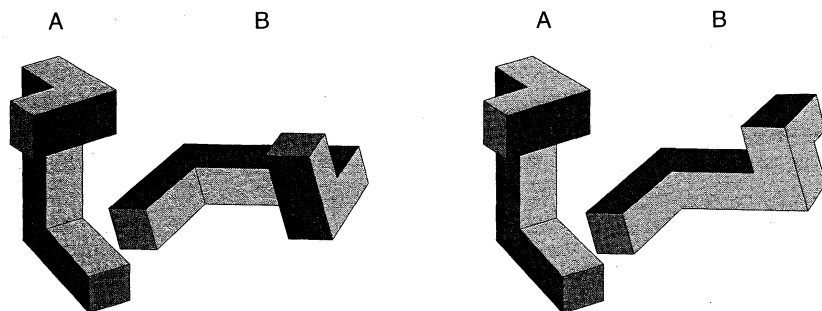


FIGURE 14-1 Example of Mental Rotation Task to Assess Spatial Intelligence. Are the two figures in each set the same or different?

in a *mental rotation task* as a sign of spatial relationships skills. Figure 14-1 contains a demonstration of this task. How fast can you figure it out?

7. *Ability to measure the intelligence with existing standardized tests.* Here, Gardner acknowledges the potential value of IQ and other intelligence tests of the past. However, the value he sees is not in the tests' ability to produce a single intelligence score but in the fact that some of the tests contain various subscales that may, in fact, measure different intelligences.
8. *Aspects of the intelligence may be represented by a system of symbols.* Gardner proposes that any human intelligence should incorporate a system of symbols. The most obvious of these, of course, are human language and math. Other examples of symbol systems include notation for musical ability and pictures for spatial skills.

In the next section we look at a summary of the intelligences Gardner proposed as part of his original theory in his 1983 book. Each intelligence included was analyzed using his eight criteria. If an intellectual ability failed to meet most of the criteria, it was rejected. Through this process of elimination, Gardner originally suggested seven distinct human intelligences, later added an eighth, and has recently proposed a ninth.

RESULTS

Gardner discussed each of his original seven intelligences in detail in his 1983 book. Here, you will find brief descriptions of each intelligence, along with a quote from Gardner, to give you the "flavor" of the abilities described. In addition, Table 14-1 summarizes the core operations of each intelligence and provides examples of several well-known individuals who would be likely to scoring high on the abilities that comprise each intelligence. Although Gardner does not endorse any single test for measuring multiple intelligences, many have been developed. You can try some of these online simply by searching for "tests of multiple intelligence," but keep in mind that a great deal of material on the Internet is of questionable validity.

Linguistic Intelligence. If you are strong in linguistic intelligence, you are able to use words in ways that are more skillful, useful, and creative than the average person. You are able to use language to convince others of your position; you can memorize and recall detailed or complex information; you are better than most at explaining and teaching concepts and ideas to others; and you enjoy using language to talk about language itself. Gardner suggested that talented poets are good examples of individuals possessing strong linguistic intelligence:

In the poet's struggles over the wording of a line or stanza, one sees at work some central aspects of linguistic intelligence. The poet must be superlatively sensitive to the shades of meanings of words and must try to preserve as many of the sought-after meanings as possible. . . . A sensitivity to the order among words, the capacity to follow the rules of grammar, and, on carefully selected occasions, to violate them. At a somewhat more sensory level—a sensitivity to the sounds, rhythms, inflections, and meters of words—that ability to make poetry even in a foreign tongue beautiful to hear. (pp. 77–78)

Musical Intelligence. You are probably already guessing some of the components of musical intelligence: gifted abilities involving sound, especially pitch, timbre, and rhythm. Gardner claimed that this is the earliest of all intelligences to emerge. Musical child prodigies serve as examples of individuals who are "musical geniuses." Gardner points to the musical composer to illustrate musical intelligence:

[A] composer can be readily identified by the facts that he constantly has "tones in his head"—that is, he is always, somewhere near the surface of consciousness, hearing tones, rhythms, and larger musical patterns. (p. 101)

Logical-Mathematical Intelligence. This intelligence enables you to think about, analyze, and compute various relationships among abstract objects, concepts, and ideas. High levels of this intelligence may be found among mathematicians, scientists, and philosophers, but they may also be present in those individuals who are obsessed with sports statistics, design computer code, or develop algorithms as a hobby:

What characterizes [this] individual is a love of dealing with abstraction. . . . The mathematician must be absolutely rigorous and perennially skeptical: no fact can be accepted unless it has been proved rigorously by steps that are derived from universally accepted first principles. . . . One obvious source of delight attends the solution of a problem that has long been considered insoluble. (pp. 138–141)

Spatial Intelligence. You would score well in spatial intelligence if you are skilled in creating, visualizing, and manipulating mental images. These are abilities that come naturally and easily to those in various visually oriented professions or avocations, such as artists, sculptors, interior decorators, engineers, and architects. To be more specific, Gardner explained that spatial intelligence entails:

The ability to recognize instances of the same element; the ability to transform or to recognize a transformation of one element into another; the capacity to