when he set out to prove that intelligence was inherited. He used quantitative studies of prominent individuals and their families.

British psychologist and statistician Charles Spearman in 1904 introduced a central concept of intelligence psychometrics, pointing out that people who perform well on one type of intelligence test tend to do well on others also. This general mental ability that carried over from one type of cognitive testing to another, Spearman named g—for general intelligence. Spearman concluded that g consisted mainly of the ability to infer relationships based on one’s experiences. Spearman’s work led to the idea that intelligence is focused on a single, main component.

French psychologists Alfred Binet and Theodore Simon followed in 1905, introducing the concept of mental age to match chronological age in children with average ability. In bright children, mental age would exceed chronological age; in slower learners, mental age would fall below chronological age. Simon and Binet’s test was introduced into the United States in a modified form in 1916 by Stanford psychologist Lewis Terman, and with it the concept of the intelligence quotient (I.Q.), the mental age divided by chronological age and multiplied by 100.

With the adoption of widespread testing using the Stanford-Binet and two versions created for the Army in World War I, the concept of the intelligence test departed from Binet and Simon’s initial view. Intelligence became associated with a fixed, innate, hereditary value. That is, one’s intelligence, as revealed by IQ tests, was locked at a certain level because of what was seen as its hereditary basis. Although a number of well-known and respected psychologists objected to this characterization of intelligence, it gained popularity, especially among the public.

At this time, people placed great faith in the role of science in improving society; intelligence tests were seen as a specific application of science that could be used beneficially. Unfortunately, because of the nature of the tests and because of many people’s willingness to accept test results uncritically, people of racial minorities and certain ethnic groups were deemed to be genetically inferior with regard to intelligence compared to the majority.

Some early psychologists thought that measuring the speed of sensory processes and reaction times might indicate an individual’s intelligence. This approach provided no useful results. Subsequently, tests reflecting white American culture and its values provided the benchmark for assessing intelligence. Although such tests indicate the degree of academic success that an individual is likely to experience, many have questioned the link to the abstract notion of intelligence, which extends beyond academic areas.

Immigration laws restricted entry into the United States of “inferior” groups, based on the results of early intelligence testing, according to some scholars. This claim seems to have some merit, although many psychologists objected to the conclusions that resulted from mass intelligence testing. In large part, the immigration laws seemed to reflect the attitudes of Americans in general regarding certain groups of people.

In the 1940s, a different view of intelligence emerged. Rejecting Spearman’s emphasis on g, American psychologist L.L. Thurstone suggested that intelligence consists of specific abilities. He identified seven primary intellectual abilities: word fluency, verbal comprehension, spatial ability, perceptual speed, numerical ability, inductive reasoning, and memory.

Taking Thurstone’s concept even further, J.P. Guilford developed the theory that intelligence consists of as many as five different operations or processes (evaluation, convergent production, divergent production, memory, and cognition), five different types of content (visual, auditory, symbolic, semantic, and behavioral) and six different products (units, classes, relations, systems, transformation, and implications). Each of these different components was seen as independent; the result being an intelligence theory that consisted of 150 different elements.

In the past few decades, psychologists have expanded the notion of what constitutes intelligence. Newer definitions of intelligence encompass more diverse aspects of thought and reasoning. For example, psychologist Robert Sternberg developed a three-part theory of intelligence that states that behaviors must be viewed within the context of a particular culture (i.e., in some cultures, a given behavior might be highly regarded whereas in another, the same behavior is given low regard); that a person’s experiences impact the expression of intelligence; and that certain cognitive processes control all intelligent behavior. When all these aspects of intelligence are viewed together, the importance of how people use their intelligence becomes more important than the question of “how much” intelligence a person has. Sternberg has suggested that current intelligence tests focus too much on what a person has already learned rather than on how well a person acquires new skills or knowledge. Another multifaceted approach to intelligence is Howard Gardner’s proposal that people have eight intelligences: logical-mathematical, linguistic, musical, spatial, bodily-kinesthetic, interpersonal, intrapersonal and the naturalistic.

Daniel Goleman has written about an emotional intelligence of how people manage their feelings, interact
and communicate, combining the interpersonal and intrapersonal of Gardner’s eight intelligences.

One feature that characterizes the newly developing concept of intelligence is that it has broader meaning than a single underlying trait (e.g., Spearman’s g). Sternberg and Gardner’s emergent ideas suggest that any simple attempt at defining intelligence is inadequate given the wide variety of skills, abilities, and potential that people manifest.

Some of the same controversies that surfaced in the early years of intelligence testing have recurrently throughout this century. They include the question of the relative effects of environment versus heredity, the degree to which intelligence can change, the extent of cultural bias in tests, and even whether intelligence tests provide any useful information at all.

The current approach to intelligence involves how people use the information they possess, not merely the knowledge they have acquired. Intelligence is not a concrete and objective entity, though psychologists have looked for different ways to assess it. The particular definition of intelligence that has currency at any given time reflects the social values of the time as much as the scientific ideas.

The approach to intelligence testing, however, remains closely tied to Charles Spearman’s ideas, despite new waves of thinking. Tests of intelligence tend to mirror the values of our culture, linking them to academic skills such as verbal and mathematical ability, although performance-oriented tests exist.

See also Culture-fair test; Stanford-Binet intelligence scales; Wechsler Intelligence Scales

Further Reading

---

**Intelligence quotient**

A measurement of intelligence based on standardized test scores.

Although intelligence quotient (IQ) tests are still widely used in the United States, there has been increasing doubt voiced about their ability to measure the mental capacities that determine success in life. IQ testing has also been criticized for being biased with regard to race and gender. In modern times, the first scientist to test mental ability was Alfred Binet, a French psychologist who devised an intelligence test for children in 1905, based on the idea that intelligence could be expressed in terms of age. Binet created the concept of “mental age,” according to which the test performance of a child of average intelligence would match his or her age, while a gifted child’s performance would be on par with that of an older child, and a slow learner’s abilities would be equal to those of a younger child. Binet’s test was introduced to the United States in a modified form in 1916 by Lewis Terman. The scoring system of the new test, devised by German psychologist William Stern, consisted of dividing a child’s mental age by his or her chronological age and multiplying the quotient by 100 to arrive at an “intelligence quotient” (which would equal 100 in a person of average ability).

The Wechsler Intelligence Scales, developed in 1949 by David Wechsler, addressed an issue that still provokes criticism of IQ tests today: the fact that there are different types of intelligence. The Wechsler scales replaced the single mental-age score with a verbal scale and a performance scale for nonverbal skills to address each test taker’s individual combination of strengths and weaknesses. The Stanford-Binet and Wechsler tests (in updated versions) remain the most widely administered IQ tests in the United States. Average performance at each age level is still assigned a score of 100, but today’s scores are calculated solely by comparison with the performance of others in the same age group rather than test takers of various ages. Among the general population, scores cluster around 100 and gradually decrease in either direction, in a pattern known as the normal distribution (or “bell”) curve.

Although IQ scores are good predictors of academic achievement in elementary and secondary school, the correspondence between IQ and academic performance is less consistent at higher levels of education, and many have questioned the ability of IQ tests to predict success later in life. The tests don’t measure many of the qualities necessary for achievement in the world of work, such as persistence, self-confidence, motivation, and interpersonal skills, or the ability to set priorities and to allocate one’s time and effort efficiently. In addition, the creativity and intuition responsible for great achievements in both science and the arts are not reflected by IQ tests. For example, creativity often involves the ability to envision multiple solutions to a problem (a trait educators call divergent thinking); in contrast, IQ tests require the choice of a single answer or solution to a problem, a type of task that could penalize highly creative people.