

Chess and IQ

by Bill Wall

An intelligence quotient or IQ is a number derived from a set of standardized tests developed to measure a person's cognitive abilities, or intelligence, in relation to their age group. Originally, IQ represented the ratio between a person's "mental age" and actual chronological age.

Intelligence is often viewed by computer scientists as the ability to process information, by psychologists as the ability to deduce relationships, by educators as the ability to learn, and by biologists as the ability to adapt to the environment.

Some sources say the adult with the highest IQ that ever lived was Leonardo da Vinci, with an IQ of 220. Of course he lived before the development of IQ tests. Also, there is no set way to measure intelligence as there are too many aspects to take into account, such as memory and problem-solving. The Guinness Book of World Records stopped using the IQ as a category in 1990 after concluding that IQ tests are not reliable enough to designate a single world record holder.

In 1870, Hippolyte Taine (1828-1893), a French critic and historian, stated that playing several games of blindfold chess was an achievement in visual memory and high intelligence. If measured in his day, Taine would have had a very high IQ. Taine asked a chessplayer how he understood imagination and images and how he played blindfold chess. Taine believed that the type of imagery used in chess was an "internal mirror" that reflected the precise state of the things being imagined.

In 1893, Alfred Binet (1857-1911) made a study of the connection between mathematics and chess. After questioning a large number of leading chess players, he found that over 90% of them were good mental calculators and had good memories. On the other hand, he found that some mathematicians played chess, but few were strong players.

In 1894, Alfred Binet (1857-1911) conducted one of the first psychological studies into chess. He investigated the cognitive facilities of chess masters. Binet hypothesized that chess depends upon the phenomenological qualities of visual memory. He found that only chess masters were able to play chess successfully without seeing the board and intermediate players found it impossible to play a game of blindfold chess. Binet found that experience, imagination, and memories of abstract and concrete varieties were required in master chess. His work was titled: *Psychologie des Grands Calculateurs et des Joueurs d'Echecs*. Binet relied much on chess masters such as Alphonse Goetz (French Champion in 1914), Rosenthal, Arnous de Riviere, Janowski, and Taubenhaus.

Binet thought that playing blindfold chess would require strong powers of memory and of visualization. However, he found this was not the case. It was not that the expert blindfold player could visualize a chessboard better than the amateur. It was the opposite that was true. The good blindfold player was not dependent on the visual aspect of the game. It was the amateur who tried to picture the whole board. The strong blindfold player was using a more efficient way of storing the position in his mind.

Alfred Binet and his colleague Theodore Simon (1872-1961) created the Binet-Simon scale in 1905. It was aimed at identifying students who could benefit from extra help in school. His assumption was that lower IQ indicated the need for more teaching, not an innate ability to learn.

In 1906, Lewis Terman (1877-1956) decided to see what mental tests could do in distinguishing unusually backward students from very bright ones. One of his tests was documenting the skill in learning the game of chess. At the time, he was unaware of the work of Binet and Simon. Terman did not find significant differences of slow students and bright students learning chess, partly because he had failed to take into account the student's age. Terman defined intelligence as the ability to acquire and manipulate concepts.

In 1912, German psychologist William Stern (1871-1938) coined the phrase "intelligence quotient," or IQ, in which a student's score was the quotient of his or her tested mental age with his or her actual age. His work was based on the work of Alfred Binet. His IQ test was later used for U.S. Army recruits.

In 1916, Stanford University psychologist Lewis Terman (1877-1956) released the "Stanford Revision of the Binet-Simon Scale," generally known as the Stanford-Binet test.

In Terman's Ph.D. thesis, he decided to see what mental tests could do in distinguishing backward students from very bright ones. The tests fell in eight categories, in which skill in learning the game of chess was one of them.

William James Sidis (1898-1944) was considered the greatest genius of the 20th century with an IQ of over 250. He was a Jewish Ukrainian-American child prodigy and a gifted mathematician. He was able to read newspapers at 18 months, taught himself Latin at the age of 2 and Greek at age 3. By age 4 he had written a treatise on anatomy. At age 6, he learned Aristotelian logic and memorized Gray's Anatomy. At age 7, he passed the Harvard Medical School anatomy class. By age 8, he knew 10 languages (English, Latin, Greek, Russian, Hebrew, French, German, Turkish, Armenian, and a language of his own invention). By age 8, he wrote two books on anatomy and two books on astronomy. He attempted to enroll in Harvard at the age of 9, passing all exams. By age 11, he had mastered higher mathematics and calculus. In 1909, at the age of 11, he became the youngest student to ever enroll at Harvard. At the age of 16, he graduated from Harvard, cum laude. He then became a professor of mathematics at Rice University, but got bored with it. At 18, he entered Harvard Law School, but never finished, finding it too boring. In 1919 he became interested in politics, but was arrested for participating in an anti-draft parade. He lived the rest of his life in obscurity, writing books using a pseudonym and collecting streetcar transfers. He was able to read and write over 40 different languages and dialects.

In 1925, three Soviet psychologists, Djakow, Rudik, and Petrovsky, conducted extensive tests on chess masters and came to the conclusion that their powers of memory were only greater than that of the layman as far as chess was concerned. In other areas, there was no difference. The researchers determined that high achievement in chess is based on exceptional visual memory, combinational power, speed of calculation, power of concentration, and logical thinking.

In 1930, F. Baumgarten studied 9 child prodigies (IQs with 120 to at least 160), including one chess prodigy. She found that they all appeared ambitious, pragmatic, wary of those who might harm their careers, passionately devoted to their fields, unafraid of public performance, and desirous of using their gifts to benefit their families.

In 1938, Louis Thurstone (1887-1955) broke intelligence up into 7 primary abilities - verbal comprehension, fluency of words, spatial visualization, number facility, inductive reasoning, associate memory, and perceptual speed. Thurstone was responsible for the standardized mean and standard deviation of IQ scores today, as opposed to the older Intelligent Test system originally used by Binet. His statistical analysis method has been a model for rating chess players.

In the 1930s, Leta Stetter Hollingsworth (1886-1939) studied children with IQs of 180 or more. Included were two chess players, one who became nationally ranked and had an IQ of 184 (source not named). She found out that early talking and reading was what most differentiated these children from the average. She observed that high IQ children failed to develop desirable work habits in a school setting geared for average children. In such a setting, the high IQ children spent considerable time in idleness and daydreaming. Consequently, they learned to dislike school. She also noted that high IQ children found it difficult in finding companionship. Consequently, these high IQ children became socially isolated. Hollingsworth believed that high IQ children need to be educated for leisure and recommended that high IQ children play chess since it could be enjoyed by people of all ages and could potentially assist these children in bridging social gaps. The chess player was a college freshman at age 12 who graduated Phi Beta Kappa from a large Eastern university at age 16.

In 1949, David Wechsler (1896-1981), an American psychologist, developed the Wechsler Intelligence Scale for Children (WISC). It consisted of 6 verbal and 5 performance subtests to measure IQ.

In 1955, W. Freeman regarded intelligence as the extent to which a person is educable. He defined intelligence as an adjustment or adaptation of the individual to his total environment. Intelligence was the capacity to reorganize one's behavior patterns so as to act more effectively and more appropriately in novel situations.

In September 1956, Marilyn Mach (Marilyn vos Savant) scored an IQ of 228 in the Stanford-Binet score as a 10 year old, the highest IQ ever recorded up to that time. As an adult, she was given a second intelligence test and scored an IQ of 186.

For chess players, some sources list Bobby Fischer's IQ between 180 and 187. As a child, he was accepted by Community Woodward school in Brooklyn as the result of his IQ test score of 180 (Brady, *Endgame*, p. 25). Some sources give Garry Kasparov's IQ between 185 and 190. Judit Polgar is alleged to have an IQ of 170.

In 1965, Adrian de Groot (1914-2006) published his book *Thought and Choice in Chess*. He found that visual memory and visual perception were important attributers and that problem-solving ability was of paramount importance. Memory was particularly important.

In 1973, Dr. William Chase (1940-1983) and Dr. Herbert Simon (1916-2001), writing about perception in chess for *Cognitive Psychology*, showed superior memory for chess positions by chess experts through "chunking." The ability to recall a position from an actual game increased as a function of chess skill. For positions, beginners were able to recall the correct location of about four pieces in 5 seconds, whereas grandmasters recalled virtually all of the more than 20 pieces.

In 1973-74, a study in Zaire (Chess and Aptitudes) by Dr. Albert Frank showed that introducing chess to teenage players increased their IQ. These players that were taught an additional 2 hours of chess instead of mathematics had stronger spatial, numerical, administrative-directional, and paperwork abilities than the group that did not get introduced to chess. He found that the ability to learn chess was mostly a function of spatial aptitude, but also a function of perceptive speed, reasoning, creativity, and general intelligence.

In 1974-76, Dr. Johan Christiaen conducted research (Chess and Cognitive Development) in Belgium on fifth grade students. The group that had 42 one-hour chess lessons had better academic results than the group that did not have chess lessons.

In 1975, David Feldman studied six prodigies, including two 8-year old chess prodigies. None of the prodigies performed any higher in logic, role-taking, spatial reasoning, and moral judgment than children of their own age. Feldman studies these prodigies for 10 years. The chess players opted out of an intense commitment to the study of chess due to peer acceptance and popularity.

In a 1977-79 study by Dr. Yee Wang Fung in Hong Kong, chessplayers showed a 15% improvement in math and science test scores.

From 1979 to 1983, a Bradford, Pennsylvania study found that a chess-playing group consistently outperformed a control group engaged in other thinking development programs. All the students had IQs of 130 or more in grades 7 through 9. The study was done by Dr. Robert Ferguson.

From 1979 to 1984, a Venezuela experiment, Learning to Think Project, tested whether chess could develop intelligence of 4,266 elementary age children as measured by the Wechsler Intelligence Scale for Children. The children showed an increase in IQ after less than one year of studying chess in a systematic way. The Venezuelan government was so impressed that all Venezuelan schools introduced chess lessons in 1988.

In 1982, Terrell Bell, former Secretary of Education, recommended chess as a way to develop a preschooler's intellect and academic readiness.

Some sources give Kasparov an IQ between 185 and 190. But one source has it listed as 135. In 1987-88, the German magazine *Der Spiegel* went to considerable effort and expense to find out Kasparov's IQ. Under the supervision of an international team of psychologists, Kasparov was given a large battery of tests designed to measure his memory, spatial ability, and abstract reasoning. They measured his IQ as 135 and his memory as one of the very best.

In 1987-88, all students in a rural Pennsylvania 6th grade class were required to participate in chess lessons. None of the pupils had previously played chess. After a year, the pupils significantly improved in both memory and verbal reasoning. The program was called 'Development of Reasoning and Memory through Chess.'

In 1988, British Grandmaster Jon Levitt came up with the Levitt equation. His equation says that a player with an IQ of Y, after many years of tournament play and study, would tend to have a chess Elo rating of about $10Y + 1000$. So if Fischer's IQ was 180, then his Elo rating would be $10 \times 180 + 1000$ or 2800. Fischer's Elo rating was 2785. His maximum USCF rating was 2825.

In 1989-92, 5th graders in New Brunswick, Canada were split into groups. The group that had chess and math increased gains in math problem-solving and comprehension proportionate to the amount of chess in the curriculum. In 1989, 120 students played in the provincial school chess championship. In 1992, over 19,000 played.

In 1991, Dr. Stuart Margulies studied 53 elementary pupils who participated in the New York City Schools Chess Program and compared them with 1,118 nonparticipants. He concluded that chess participation enhanced the reading performance of its participants.

In 1994-1997, a Texas study in Houston showed that regular elementary students between 3rd and 5th grade who participated in a school chess club showed twice the improvement of non-chessplayers in Reading and Mathematics.

In 2002, Chinese researchers did brain scans of chess players and GO players and concluded that chess and GO take practice, not intellect. From brain scans, intelligence areas appeared inactive when people puzzled over game strategy in chess and GO. (source: *Nature* magazine, Dec 12, 2002).

In 2006, Grabber, Neuberger, and Stern did a study of chess players and IQ and could not establish a significant association between a person's chess rating and intelligence (as measured by the Intelligenz-Struktur Test) among 47 adult players. These players included chess masters and solid tournament players. A similar test was conducted by Unterrainer, Kaller, Halsband, and Rahm in 2006, with the same conclusions. In addition, the same group of chess players did not have better intelligence, memory capacity, or visuo-spatial working memory than a group of non-players matched for age and education.

Chess is found as required curricula in nearly 30 countries. In 2011, chess was made mandatory in Armenia schools. In 2013, chess became mandatory in schools in Tamil Nadu schools in India.

Un 2016, a study by researchers was made at Michigan State University that showed intelligence played a significant role in determining chess skill. It showed that cognitive ability is linked to skilled performance. It refutes theories that expertise is based solely on intensive training. Chess is used as the single most studied domain in research on expertise. The researchers analyzed 50 years worth of research on intelligence and chess skill and found that cognitive ability contributes meaningfully to individual differences in chess skill. (source: "Chess skill is linked to intelligence," *Science Daily*, Sep 13, 2016)