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Meaning and nature of human intelligence: A review

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ABSTRACT

How to define intelligence seems to be a conundrum with human race. People have been pondering over the nature of intelligence for millennia. Simply put, intelligence is the ability to learn about, learn from, understand and interact with one's environment. This mental ability helps one in the task of theoretical as well as practical manipulation of things, objects or events present in one's environment in order to adapt to or face new challenges and problems of life as successfully as possible. Some psychometric theorists like Spearman believed that intelligence is a basic ability that affects performance on all cognitively oriented tasks – from computing mathematical problems to writing poetry or solving riddles, and that it can be measured through IQ tests. On the other hand, cognitive theorists like Earl B. Hunt hold that intelligence comprises of a set of mental representations of information and a set of processes that can operate on the mental representations. The latest ones – cognitive-contextual theorists of intelligence such as Howard Gardner – think that cognitive processes operate in various environmental contexts. The present paper tries to understand the meaning and nature of human intelligence from various perspectives, development of intelligence, and its measurement.

KEY WORDS: Intelligence, understanding, psychometric theory, cognitive theory, cognitive-contextual theory.

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INTRODUCTION

Aristotle and Cicero were some of the first great minds in the human history to ponder over and possibly to allocate a name to the phenomenon, now referred to as 'intelligence'. Plato also contemplated over human intelligence 2000 years ago and believed that people vary in intelligence. Anonymous[1] in her web-article explained that the word 'intelligence' derived from a Latin verb 'intelligere' that has its root in 'inter-legere'– meaning 'to pick out' or 'discern'. A form of this verb, 'intellectus' became the medieval technical term to denote 'understanding'. This term was, however, strongly linked to the metaphysical and cosmological theories of teleological scholasticism including theories of the immortality of soul and the concept of 'Active Intellect' (Also known as the 'Active Intelligence'). Some early modern philosophers such as Francis Bacon, Hobbes, Locke and David Hulme preferred the word 'understanding' in their English philosophical works to denote 'intelligence'. The term 'intelligence' has, therefore, become less common in English language philosophy but has later been taken up, without the scholastic theories which it once implied, in more contemporary psychology.

People have been pondering over the nature of intelligence for millennia. How to define intelligence has always given birth to differences in opinion. American psychologist Sternberg[2] held that, there seem to be almost as many definitions of intelligence as there are experts asked to define it.

Neisser et al.[3] as well as Sternberg and Detterman[4] reported that 13 psychologists in 1921 and 24 psychologists in 1986 met to discuss about the nature of intelligence. Both times, about half of the experts mentioned 'higher-level thinking processes' such as abstract reasoning and problem solving as important aspects of intelligence. The definition of intelligence advanced in 1986 added meta-cognition and executive processes, the interaction of knowledge with mental processes and the cultural context – what is valued by culture – as elements of intelligence. Sternberg and Kaufman[5] held that both the times, the psychologists disagreed about the structure of intelligence – whether it is a single ability or many separate abilities.

An editorial statement by fifty-two researchers of "Mainstream Science on Intelligence" opined that intelligence is a very general mental capability that among other things, involves the ability to reason, plan, solve problems, think abstractly, comprehend complex ideas, learn quickly and learn from experience (Gottfredson[6]). It is not merely book learning, a narrow academic skill or test-taking-smarts. Rather, intelligence reflects a broader and deeper capability for comprehending our surroundings – 'catching on', 'making sense' of things or 'figuring out' what to do. A recent definition of intelligence stresses on higher order thinking: "the ability to reason deductively or

inductively, think abstractly, use analogies, synthesize information and apply it to new domains" (Kanazawa[7]).

Simply put, however, intelligence is the ability to learn about, learn from, understand and interact with one's environment. This general ability consists of a number of specific abilities, such as:

- Adaptability to a new environment or to changes in the current environment;
- Capacity for knowledge and ability to acquire it;
- Capacity for reason and abstract thought;
- Ability to comprehend relationships among things or ideas;
- Ability to evaluate and judge ;
- Capacity for original and productive thought.

However varied the terminology and language used in defining intelligence, there seems to be some agreement among the psychologists that:

- Intelligence must be understood as the mental capacity or mental energy available with an individual at a particular time in a particular situation.
- This mental capacity helps one in the task of theoretical as well as practical manipulation of things, objects or events present in one's environment in order to adapt to or face new challenges and problems of life as successfully as possible.
- This capacity or the fund of mental energy available with one can be judged only in terms of the quality of one's behaviour or performance.

INTELLIEGENCE: UNITARY OR MULTIPLE

Some theorists believe that intelligence is a basic ability that affects performance on all cognitively oriented tasks – from computing mathematical problems to writing poetry or solving riddles. Carroll[8] held that evidence for this position comes from study after study, finding moderate to high positive correlations among all the different tests that are designed to measure separate intellectual abilities. In fact, this consistent finding "is arguably both the best established and the most striking phenomenon in the psychological study of intelligence (van der Mass, Dolan, Grasman, Wicherts, Huizenga and Raijmakers[9]). Spearman[10] suggested that there is one mental attribute, which he called g or general intelligence, that is used to perform any mental task; but each task also requires some specific abilities in addition to g. For example, memory for a series of numbers probably involves both g and some specific ability for immediate recall of what is heard. Spearman assumed that individuals vary in both general intelligence and specific abilities, and that together these factors determine performance on mental tasks.

The most widely accepted view today is that, intelligence, like self-concept, has many facets and is a hierarchy of abilities, with general ability at the top and more specific abilities at lower levels of the hierarchy (Sternberg[11]). Hunt[12] summarized the current thinking about the structure of intelligence thus: "After almost a century of such research, that structure is pretty well-established. There is considerable agreement for the bottom two levels of a three-tiered lattice model of intelligence. At the bottom are elementary information-processing actions, and immediately above them are eight or so secondary abilities. These are more broadly defined capabilities, such as holding and accessing information in short and long-term memory and, most importantly, the trio of 'intellectual' abilities: crystallized intelligence.., fluid intelligence .., and visual-spatial reasoning ability [which] may be just the most visible of several abilities to manipulate information coded in a particular sensory modality".

THEORIES OF INTELLIGENCE

Starting from the beginning of the 20th century, theories of intelligence have evolved through a succession of paradigms that have been put forward to clarify the idea. The major paradigms are:

1. Psychometric theory
2. Cognitive theory
3. Cognitive-contextual theory

Psychometric theory of intelligence

The psychometric approach to intelligence is based on the presumption that intelligence is a measurable factor and that it can be measured through IQ tests. Underlying the psychometric theory is a psychological model according to which intelligence is a composite of abilities measured by mental tests. This model is often quantified by assuming that each test score is a weighted linear composite of scores on the underlying abilities. IQ or 'Intelligence Quotient' was originally obtained by dividing a person's mental age by his/her actual age. These measurements are scaled in comparison with many other people of the same age. The scale is set to have a mean of 100 and standard deviation of 15. The belief behind the psychometric principle of measuring intelligence is that, intelligence is essentially what the IQ tests measure. Anonymous[13] in her web-article "Human Intelligence" wrote about the following major proponents of the psychometric theory of intelligence:

- Charles Spearman (1863-1945)

British psychologist Spearman was the first to offer a tenable psychometric definition of intelligence. In a famous article, "General intelligence objectively determined and measured", Spearman[14] proposed the idea that intelligent behaviour is generated by a single unitary quality within the human mind or brain. He devised a technique for statistical analysis, which he called

factor analysis that examined patterns of individual differences in test scores and is said to provide an analysis of the underlying sources of these individual differences. The factor analyses of test data suggested to him that just two kinds of factors underlie all individual differences in test scores. Spearman labelled the first and more important factor as the 'general factor' or g which is said to pervade performance on all tasks requiring intelligence. In other words, regardless of the task, if it requires intelligence, it undoubtedly requires g. The second factor, named 'specific factor' or s is specifically related to each particular test.

❖ L. L. Thurstone (1887-1955)

According to Thurstone[15], "intelligence, considered as a mental trait, is the capacity to make impulses focal at their early, unfinished stage of formation. Intelligence is, therefore, the capacity for abstraction, which is an inhibitory process". Thurstone provided the theory of "Primary Mental Abilities" – a model of human intelligence – that challenged Spearman's paradigm of a unitary concept of intelligence. Using his new approach to factor analysis, Thurstone[16] found that, intelligent behaviour does not arise from a general factor; rather it emerges from seven independent factors that he called primary abilities: word fluency, verbal comprehension, spatial visualization, number facility, associative memory, reasoning, and perceptual speed. Furthermore, when Thurstone analyzed mental test data from samples comprised of people with overall similar IQ scores, he found that they had different profiles of primary mental abilities, further supporting his model and suggesting that his work had more clinical utility than Spearman's unitary theory. However, when Thurstone administered his tests to an intellectually heterogeneous group of children, he failed to find that the seven primary abilities were entirely separate; rather he found evidence of g. The final version of his theory of intelligence was a compromise that accounted for the presence of both a general factor and the seven specific abilities. According to Ruzgis[17], this compromise helped lay the groundwork for future researchers who proposed hierarchical theories and theories of multiple intelligences.

❖ Philip E. Vernon (1905-1987)

Canadian psychologist Vernon was a follower of Donald Hebb's theory of intelligence which divided human intellectual ability into two categories: 'Intelligence A' and 'Intelligence B.' Hebb called the biological substrate of human cognitive ability 'Intelligence A'. When 'Intelligence A' interacts with environmental influences, 'Intelligence B' is generated. Vernon elaborated this definition to include 'Intelligence C' which manifests itself on tests of cognitive ability – the score of IQ, obtained on a particular test. In "The structure of human abilities", Vernon[18] presented his hierarchical group-factor theory of the structure of human intellectual abilities. At the top of this hierarchy was Spearman's general factor (g), which accounted for the largest source of the variance

in intelligence. Below g were several major, minor and specific group factors. As Vernon's theory accounted for a general factor and group factors, it was seen as a reconciliation between Spearman's two factor theory which did not have group factors and Thurstone's multiple factor theory which did not have a general factor.

❖ Raymond B. Cattell (1905 -1998)

American psychologist Cattell developed the theory of fluid and crystallized intelligence which was later elaborated by John Horn. While speaking on fluid and crystallized intelligence, Horn and Cattell[19] proposed that, general intelligence is actually a conglomeration of perhaps 100 abilities working together in various ways in different people to bring out different intelligences. This theory classified these abilities broadly into two different sets of abilities that have quite different trajectories over the course of development from childhood through adulthood. Fluid abilities (Gf) drive individual's ability to think and act quickly, solve novel problems and encode short-term memories. These have been described as the source of intelligence that an individual uses when he/she doesn't know what to do. Fluid intelligence is grounded in physiological efficiency and is relatively independent of education and acculturation. The other factor, encompassing crystallized abilities (Gc), stems from learning and acculturation and is reflected in tests of knowledge, general information, use of language and a wide variety of acquired skills (Horn and Cattell[20]). Personality factors, motivation, educational and cultural opportunities are central to the development of crystallized intelligence.

❖ J. P. Guilford (1897-1987)

American psychologist Guilford defined intelligence as a systematic collection of abilities for processing information of different kinds in various ways. He came to believe that intelligence is not one monolithic, global attribute but a combination of multiple abilities. According to Guilford, the typical intelligence tests revealed little about a person's creative nature. In 1955, he presented the first version of the "Structure of Intellect" (SOI). The SOI model includes three dimensions–content dimension, product dimension and operation dimension. It is represented as a cube with each of the three dimensions occupying one side. Each ability is defined by a conjunction of the three categories, occupying one cell in the three-dimensional figure. There are five categories of 'content' dimension – visual, auditory, symbolic, semantic and behavioural. Six categories exist in the 'product' dimension – units, classes, relations, systems, transformation and implications. The five kinds of 'operation' include cognition, memory, divergent production, convergent production and evaluation (Guilford[21]). Guilford's SOI model is an open system as it allows for newly discovered categories to be added in any of the three dimensions. Many of these abilities are believed to be correlated with

each other. The 5x6x5 figure provides at least 150 possible abilities, with over 100 having been empirically verified.

Critique of the psychometric theory of intelligence

The major fault of the psychometric theory of intelligence lies in the concept that intelligence is measurable. An essential aspect of the theory is that, even though there are innumerable mental abilities, there is a general (g) factor that correlates to them all. In searching for a finite characteristic of intelligence, this theory provides evidence that, in fact, there is no fixed attribute of intelligence. Moreover, this theory failed to say anything substantial about the mental processes underlying intelligence. It is one thing to discuss 'general ability' or 'fluid ability', but quite another to describe what is happening in people's mind when they are exercising the ability in question. The cognitive psychologists proposed a solution to these problems and tried to study directly the mental processes underlying intelligence.

Cognitive theories of intelligence

During the era of psychometric theories, the study of intelligence was dominated by researchers investigating individual differences in people's test scores. In an address to the American Psychological Association (APA) in 1957, American psychologist Lee Cronbach, a leader in the testing field, decried the fact that some psychologists study individual differences and others study commonalities in human behaviour, but never do the two meet. Cronbach's plea to unite these two disciplines of scientific psychology led, in part, to the development of cognitive theories of intelligence.

The cognitive theorists held that without an understanding of the processes underlying intelligence, it is possible to come to misleading, if not wrong, conclusions while evaluating overall test scores or other assessments of performance. Underlying most cognitive approaches to intelligence is the assumption that intelligence comprises of a set of mental representations (e.g., propositions, images) of information and a set of processes that can operate on the mental representations. A more intelligent person is assumed to represent information better and, in general, to operate more quickly on these representations than does a less intelligent one. Researchers have sought to measure the speed of various types of thinking. Through mathematical modelling, they divide the overall time required to perform a task into the constituent times needed to execute each mental process. Usually, they assume that these processes are executed serially – one after another – and hence, the processing times are additive. But some investigators allow for partially or even completely parallel processing, in which case, more than one process is assumed to be executed at

the same time. Regardless of the type of model used, the fundamental unit of analysis is the same– mental process acting upon a mental representation.

A number of cognitive theorists of intelligence have come up till date. Among them, mention may be made of American psychologists Earl B. Hunt, Nancy Frost, and Clifford E. Lunneborg, who in 1973, showed one way in which psychometrics and cognitive modelling could be combined. Instead of starting with conventional psychometric tests, these cognitive theorists began with tasks that experimental psychologists were using in their laboratories to study the basic phenomena of cognition, such as perception, learning and memory. They showed that individual differences in these tasks which had never before been taken seriously, were in fact, related although rather weakly, to patterns of individual differences in psychometric intelligence test scores. These results, they argued, showed that the basic cognitive processes might be the building blocks of intelligence.

Some other cognitive psychologists have pursued different paths in the study of human intelligence, including the building of computer models of human cognition. Two leaders in this field have been the American psychologists Allen Newell and Herbert A. Simon. In the late 1950s and early 1960s, they worked with a computer expert, Clifford Shaw, to construct a computer model of human problem solving. Called the 'General Problem Solver', it could solve a wide range of fairly structured problems, such as logical proofs and mathematical word problems. Their programme relied heavily on a heuristic procedure called 'means-ends analysis' which, at each step of problem solving, determined how close the programme was to a solution and then tried to find a way to bring the programme closer to where it needed to be. In 1972, Newell and Simon proposed a general theory of problem solving, much of which was implemented on the computer.

Cognitive-contextual theories of intelligence

Cognitive-contextual theories of intelligence held that cognitive processes operate in various environmental contexts. Two of the major theorists of this school are American psychologists Howard Gardner and Robert Sternberg.

- H. Gardner (1943 –)

In 1983, Gardner[22] proposed the theory of "multiple intelligences". Gardner held that intelligence is the ability to create an effective product or offer a service that is valued in a culture. Earlier theorists had gone so far as to contend that intelligence comprises multiple abilities. But Gardner went a step further, arguing that there is no single intelligence. In his view, intelligences are multiple, including, at a minimum, linguistic, logical-mathematical, spatial, musical, bodily-kinaesthetic, interpersonal, intrapersonal and naturalist intelligence. Some of these intelligences are quite similar to the abilities proposed by the psychometric theorists, but others are not. Gardner

derived his listing of intelligences from a variety of sources, including studies of cognitive processing, of brain damage, of exceptional individuals and of cognition across cultures. Gardner proposed that, whereas most concepts of intelligence had been ethnocentric and culturally biased, his was universal, based upon biological and cross-cultural data as well as upon data derived from cognitive performance of a wide array of people.

- Robert J. Sternberg (1949 –)

Sternberg agreed with Gardner that conventional notions of intelligence were too narrow. But he disagreed with Gardner as to how psychologists should go beyond traditional concepts, suggesting that abilities such as musical and bodily-kinaesthetic ones are talents rather than intelligences in that they are fairly specific and are not prerequisites for adaptation in most cultures.

According to Sternberg, intelligence has three aspects. These are not multiple intelligences, as in Gardner's scheme. Whereas Gardner viewed various intelligences as separate and independent, Sternberg posited three integrated and interdependent aspects of intelligence. These aspects relate intelligence to what goes on internally within a person, to what goes on in the external world, and to experience which mediates between the internal and external worlds.

Sternberg held that intelligence is the cognitive ability to learn from experience, to reason well, to remember important information and to cope with the demands of daily living. He believed that the processes involved in intelligence are universal for humans. His "Triarchic theory of (successful) intelligence" asserted that intelligent behaviour arises from a balance between analytical, creative and practical abilities, and that these abilities function collectively to allow individuals to achieve success within particular socio-cultural contexts (Sternberg[23]). Analytical abilities enable an individual to evaluate, analyze, compare and contrast information. Creative abilities generate invention, discovery and other creative endeavours. Practical abilities tie everything together by allowing individuals to apply what they have learned in the appropriate setting. To be successful in life, the individual must make the best use of his/her analytical, creative and practical strengths, while at the same time, compensating for weaknesses in any of these areas. This might involve working on improving weak areas, to become better adapted to the needs of a particular environment or choosing to work in an environment that values the individual's particular strengths. Thus a central feature of the triarchic theory of successful intelligence is adaptability – both within the individual and within the individual's socio-cultural context (Cianciolo and Sternberg[24]). In recent years, Sternberg added the concept of 'wisdom' to his explanation of successful intelligence to create the WICS (Wisdom, Intelligence, Creativity Synthesized) theory. According to the WICS theory, the goal of education is to help people use "(a) creativity to generate new ideas and problems as well as possible solutions to the problems, (b) analytical intelligence to evaluate the quality of these

solutions, (c) practical intelligence to implement decisions and persuade others of their value, and (d) wisdom to ensure that these decisions help achieve a common good over the long and short terms" (Grigorenko, Jarvin, Diffley, Goodyear, Shanahan and Srernberg[25]).

DEVELOPMENT OF INTELLIGENCE

There have been a number of approaches to the study of the development of intelligence. Psychometric theorists, for instance, have sought to understand how intelligence develops in terms of changes in the factors of intelligence over time and changes in the amounts of the various abilities that children have. However, the landmark work about intellectual development in children has come out of the tradition forged by the Swiss psychologist Jean Piaget.

According to Piaget[26], "intelligence is an adaptation… it is essentially an organization and that its function is to structure the universe just as the organism structures its immediate environment…". Piaget held that our thinking process change radically, though slowly, from birth to maturity because we constantly strive to make sense of the world. Piaget identified four factors – biological maturation, activity, social experiences and equilibration – that interact to influence changes in thinking (Piaget[27]). Maturation is unfolding of biological changes that are genetically programmed. With physical maturation, comes the increasing ability to act on the environment (activity) and learn from it. As we explore, test, observe and eventually organize information, we are likely to alter our thinking processes at the same time. As we develop, we also learn from interaction with people of our society. Without social transmission, we would need to reinvent all the knowledge already offered by our culture. Maturation, activity and social interaction – all work together to influence our cognitive development.

Piaget held that all species inherit two basic tendencies – organization and adaptation. People are born with a tendency to organize their thinking processes into psychological structures. Simple structures are continually combined and coordinated to become more sophisticated and thus more effective. In Piaget's language, these structures are 'schemes'. Schemes are basic building blocks of thinking. As a person's thinking process becomes more organized, new schemes develop and his/her behaviour becomes better suited to environment. In addition to the tendency of organization, people also inherit the tendency to adapt to their environment. In such case, the basic processes involved are assimilation and accommodation. Assimilation involves trying to understand something new by fitting it into what we already know. On the other hand, accommodation occurs when we must change existing schemes to respond to a new situation. We adjust our thinking to fit the new information, instead of adjusting the information to fit our thinking in accommodation. In fact, both these processes are required most of the time. There are also times when neither assimilation nor

accommodation is used. If people encounter something that is too unfamiliar, they may ignore it. Experience is filtered to fit the kind of thinking a person is doing at a given time. However, in Piaget's theory, actual change in thinking takes place through the process of 'equilibration' – the act of searching for a balance. He assumed that people continually test the adequacy of their thinking process in order to achieve that balance.

Piaget believed that intellectual development in a child occurs in four distinct stages. The 'sensory-motor stage' begins at birth and lasts until the child is approximately two years old. At this stage, the child cannot form mental representations of objects that are outside his immediate view; rather his/her intelligence develops through his/her motor interactions with the environment. The 'preoperational stage' typically lasts until the child is six to seven years old. According to Piaget, this is the stage where true 'thought' emerges. At preoperational stage, children are able to make mental representations of unseen objects but they cannot use deductive reasoning. Then the 'concrete operational stage' follows and lasts till the child is 11 or 12 years old. At this stage, children are able to use deductive reasoning, demonstrate conservation of number and can differentiate their perspective from that of other people. 'Formal operational stage' is the final stage. Its most salient feature is the ability to think abstractly.

MEASUREMENT OF INTELLIGENCE

Almost all of the theories of intelligence have in common the use of fairly complex tasks for gauging intelligence in both children and adults. Some of these tasks include recognition of analogies, classification of similar terms, extrapolation of number series, performance of transitive inferences and the likes. The credit of devising a method for test of intelligence goes to French psychologist Alfred Binet and Theodore Simon. But an earlier tradition, and one that still shows some influence upon the field, is that of the English scientist Francis Galton.

Intelligence test by Galton

From 1884 to 1890, Galton maintained a laboratory at the South Kensington Museum in London where visitors could have themselves measured on a variety of psychophysical tasks, such as weight discrimination and sensitivity to musical pitch. Galton believed that these tests measured more than just psychophysical abilities. He also believed that psychophysical abilities were the basis of intelligence and hence, that his/her tasks were measures of intelligence. The earliest formal intelligence test, therefore, required a person to perform such simple tasks as deciding which of two weights was heavier or showing how forcefully he/she could squeeze his/her hand. The Galtonian tradition was taken to the United States by James McKeen Cattell. One of Cattell's students, Clark Wissler, collected data showing that, scores on Galtonian types of tasks were not good predictors of

grades in college. Cattell continued his work in psychometric research, however, and with Thorndike, developed the principal facility in the United States for mental testing and measurement.

IQ test by Alfred Binet (1857-1911) and Theodore Simon (1873-1961)

Binet and his collaborator Simon rejected the Galtonian tradition of intelligence test because they preferred to measure higher ability functions, such as judgement, comprehension and reasoning. The contemporary French Government asked Binet to devise a test that would detect those children who were too slow intellectually to profit from regular schooling. In collaboration with Simon, Binet published a scale in 1905 that he revised in 1908 and again in 1911. For many years, the best and most commonly used revision of the test was that made by Terman at Stanford University in 1916, referred to as Stanford-Binet scale. The test was revised in 1937, 1960, 1972 and most recently in 1986. Terman adopted a convenient index of intelligence that was suggested by the German psychologist William Stern. This index is known as 'intelligence quotient', or IQ. It expresses intelligence as a ratio of mental age to chronological age:

$$IQ = \frac{\text{Mental Age}}{\text{Chronological Age}} \times 100$$

Army Alpha and Army Beta Test

The United States' entry into World War I in 1917 prompted an immediate and unprecedented demand for standardized tests of intelligence. The federal government sought a way to quickly and efficiently determine the abilities of large numbers of military recruits to determine appropriate assignment of duties. Robert Yerkes of Harvard and other prominent psychiatrists created a committee in response to this need. Adopting the work of Arthur Otis, whose research in this field already was underway, they quickly produced two versions of a workable test. Army alpha was a written examination and Army beta was a verbal assessment for a considerable number of men who were unable to read. The impact of the army testing programme reached far beyond military service. Its success convinced the nation of the usefulness of wide-scale standardized testing.

WAIS, WISC and WPPSI

The Wechsler-Bellevue intelligence scale supplemented the Stanford-Binet test in 1939. Devised by David Wechsler of Bellevue Hospital in New York City, the results of this test included both verbal and nonverbal scores. The test was named the Wechsler Adult Intelligence Scale (WAIS) in 1955, later revised as WAIS-R. The expanded group of tests including the Wechsler Intelligence Scale for Children- Revised (WISC-R) and the Wechsler Pre-school and Primary Scale of Intelligence (WPPSI) form a battery of tests that continue to be widely used throughout the world.

Individual and group intelligence tests

The Stanford-Binet scale is an individual intelligence test. Some other important individual tests include the Wechsler Scales (WPPSI-III, WISC-III, WAIS-III, WAIS-IV), the McCarthy Scales of Children's Abilities, the Woodcock-Johnson Psycho-Educational Battery for Children, the Kaufman Adolescent and Adult Intelligence Test (KAIT) and the Das-Naglieri Cognitive Assessment System (Woolfolk[28]).

Psychologists also have developed group tests that can be given to whole classes or schools. Compared to an individual test, a group test is much less likely to yield an accurate picture of any one person's abilities. Some important group tests of intelligence include the "Cognitive Abilities Test (Cog AT – formerly the Lorge-Thorndike Intelligence Tests), the Analysis of Learning Potential, the Kuhlman-Anderson Intelligence Tests, the Otis-Lennon School Abilities Test (formerly the Otis-Lennon Intelligence Test), Slosson Intelligence Test, Raven Progressive Matrices, Naglieri Non-verbal Ability Test and the School and College Ability Tests (ibid).

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