

## Analytic Intelligence

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### Synonyms

Academic problem-solving skills; Componential knowledge; Fluid intelligence; Implicit knowledge

### Definition

Analytic intelligence relates to the mental mechanisms individuals utilize to plan and undertake academic and problem-solving tasks, which are often measured in traditional intelligence tests. Analytic intelligence relies on applying internal mental knowledge to solving novel problems rather than on explicit or learned knowledge from prior experience and/or schooling.

### Description

Analytic intelligence tasks typically require an individual to provide a single-correct response to well-defined questions involving new information without utilizing crystallized knowledge, or explicit, declarative knowledge from schooling or prior experience. In this manner, analytic intelligence is similar to Cattell's (1963) notion of *fluid intelligence*. Like fluid intelligence, analytic intelligence challenges an individual to contend with novelty, and to adapt one's problem-solving to a new cognitive problem rather than relying on crystallized skills from one's prior education and experience.

The Ravens Progressive Matrices Test (1962), a classic test of analytic intelligence, consists of a set of visual analogy problems. Each problem presents a  $3 \times 3$  matrix, wherein the bottom right entry is absent and must be designated from eight response alternative entries which lie below the matrix. Each of these entries normally contains one to five figural elements including geometric figures, lines, or background textures. The test-taker is asked to examine the rows and columns in order to determine which rules will be relevant towards identifying the missing entry. This test benefits from strong stability of individual differences, a relatively large number of items for sufficient theoretical and experimental analysis of problem-solving behavior and correlations with measures of general intellectual achievement.

Sternberg's Triarchic Abilities Test (2003) is a more recent test which delineates analytic intelligence, corresponding to his earlier *componential intelligence*, as one of the key forms of intelligence and as imperative for

success in academic pursuits. According to Sternberg, analytic intelligence describes the standard psychometric definition of intelligence as measured by academic problem solving tasks like analogies and puzzles. Sternberg asserts that analytic intelligence is comprised of the joint operation of *metacomponents*, *performance components* and *knowledge acquisition components* of intelligence. *Metacomponents* refer to the higher-order processes which utilize executive functioning skills to order, organize and devise which strategy to use to solve performance components. *Performance components* are the basic operations and cognitive processes which afford test-takers the ability to encode stimuli, store information in short-term memory, formulate calculations, perform mental calculations, and mentally compare diverse stimuli and retrieve information from long-term memory. Finally, *knowledge acquisition components* are used to acquire and store new information as in the process of memorization.

Moreover, analytic intelligence can be divided into three subtypes: verbal analytic intelligence, numeric analytic intelligence and spatial analytic intelligence. Verbal analytic intelligence includes *lexical intelligence*, *phrasiological intelligence*, *narrative intelligence* and *conceptual intelligence*. *Lexical intelligence* refers to responding quickly to word problems, for instance determining the anagram for intelligence (intelligence) or completing the following word, "l\_ngua\_e" (language). *Phrasiological intelligence* refers to sequencing words in a correct order to form sentences while *Narrative intelligence* relates to sequencing sentences in the appropriate order to form a short story. Finally, *Conceptual Intelligence* involves determining which word does not belong and to evaluate the values and attributes of concepts.

Numeric analytic intelligence relates to arithmetic and the completion of a sequence or matrix of numbers since it is the ability to determine the relations between numbers. For instance, a numeric analytic test question may ask an individual to combine 6, 2, 3, and 4 to form 24. A spatial intelligence IQ is essential to complete larger complex formulas. Spatial analytic intelligence encompasses mental rotation, mirroring, translation, comparing shapes, estimating angles and relative distances. For instance, this ability requires one to observe the relationships between complex formulas in mathematical analyses and shapes in geometry. Spatial analytic intelligence is related to both verbal (words, sentences, text and meaning) and numeric (meaning of numbers) analytic intelligence. Spatial intelligence is considered the most pure intelligence despite including some aspects of numeric intelligence (calculating and comparing numbers of lines or dots).

Finally, with regard to gender distinctions in analytic intelligence, Anastasi (1958), Lynn (1962) and Milton (1957) reviewed findings which suggested that males demonstrate superior performance on spatial and analytic tasks but are less successful on measures of verbal ability as compared to females. These findings suggested that while boys and girls may perform equally on social interaction or communication tasks, boys would rely more on analytic abilities while girls would rely more on verbal skills to successfully complete the tasks. While later studies including Coie and Dorval [2] dispute these gender findings, future research will help divulge these distinctions.

### Relevance to Childhood Development

Due to the strong correlation of analytic intelligence to general intellectual achievement, analytic intelligence is an important construct for cognitive development in childhood. Furthermore, since the fluid (cognitive mechanic) abilities of analytic intelligence are thought to constrain or support the acquisition or expression of crystallized abilities (cognitive pragmatics) in later life, it is critical to examine various features of analytic intelligence in early life in order to target the full scope of intelligence and intellectual achievement during the life-span.

### References

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4. Sternberg's Triarchic Theory of Intelligence. (2008). Retrieved December 28, 2008, from <http://wilderdom.com/personality/L2-2SternbergTriarchicTheory.html>

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## Anastasi, Ann

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### Life Dates

1908–2001.

### Educational Information

Anastasi studied at Barnard College, and then earned her doctorate at the age of 21 from Columbia University under supervision from Henry Edward Garrett (1894–1973).

### Accomplishments

Anastasi taught at Barnard College and Queens College, where she would be the psychology department's chairperson, before joining Fordham University in 1947. It was at Fordham where she would spend the remainder of her long and successful academic career. Anastasi's early mathematical aptitude translated easily into the world of psychological measurement and, influenced by the work of both Leta Stetter Hollingsworth (1886–1939) and Charles Spearman (1863–1945), she developed a nationwide reputation as an expert – as well as a critic – regarding standardized testing.

Anastasi cautioned against the interpretation of test scores as indicative of primarily genetically-based ability and stressed the importance of environment, nurturing, and learning as components of intelligence testing. Long before the boom in test-prep courses for standardized educational assessments, Anastasi wrote of the dangers coaching presented to the integrity of all standardized tests. Anastasi's conception of test validity as a living document of sorts stands in sharp contrast to how tests are often presented to the public. Anastasi was also an early advocate for the cultural relativism of intelligence, arguing that since different cultures value different aspects of the global concept of intelligence, the very concept of a "culture free" intelligence test is a misleading one.

A prolific author with more than 150 publications to her name, Anastasi's most indelible contributions outside of Fordham University were two influential textbooks, *Differential Psychology* (first published in 1937), and *Psychological Testing* (first published in 1954) [2, 3]. These works have appeared in multiple editions, been translated in several languages, and have been used around the globe. References to them still appear in testing literature, and Anastasi's colleagues remember her as an author with justifiable pride in her meticulous attention to both detail and style [1, 4, 5].

A leader as well as an influential author and scholar, Anastasi's multiple professional presidential positions were capped with her 1972 presidency of the American Psychological Association. She was an avid consultant and committee member for both government and private industries, and received honorary doctorates from Villanova University and University of Windsor, among others. The recipient of multiple awards from both academia and professional organizations for her work in testing